



**FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 7**

CERTIFICATION TEST REPORT

FOR

EA544D_1 ETHERNET ADAPTER CARD FOR 2.4 / 5 GHz CLIENT APPLICATIONS

MODEL NUMBER: 65-VN663-P1

**FCC ID: J9C-EA544D1
IC: 2723A-EA544D1**

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NVLAP LAB CODE 200065-0

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: QUALCOMM, INC.
3165 KIFER RD
SANTA CLARA, CA 95051
U.S.A.

EUT DESCRIPTION: EA544D_1 ETHERNET ADAPTER CARD FOR 2.4 / 5 GHz
CLIENT APPLICATIONS

MODEL: 65-VN663-P1

SERIAL NUMBER: 7813 FOR ANTENNA PORT, 7908 FOR RADIATED EMISSIONS
9021, 9024 FOR ADDITIONAL TESTING

DATE TESTED: June 24 – July 18, 2009
January 29 – February 12, 2010

| APPLICABLE STANDARDS | |
|---|--------------|
| STANDARD | TEST RESULTS |
| CFR 47 Part 15 Subpart C | Pass |
| INDUSTRY CANADA RSS-210 Issue 7 Annex 8 | Pass |
| INDUSTRY CANADA RSS-GEN Issue 2 | Pass |

Compliance Certification Services, Inc. (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 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by 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 CCS By:



FRANK IBRAHIM
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:



VIEN TRAN
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 2, and RSS-210 Issue 7.

3. FACILITIES AND ACCREDITATION

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

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamplifier Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

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

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

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11a/b/g/n WLAN transceiver module for 2.4 / 5 GHz client applications. It is equipped with four identical transmitter / receiver chains and an Ethernet port.

The radio module is manufactured by Qualcomm, Inc.

5.2. MAXIMUM OUTPUT POWER

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

| Frequency Range (MHz) | Mode | Output Power (dBm) | Output Power (mW) |
|-----------------------|--------------|--------------------|-------------------|
| 2.4 GHz BAND | | | |
| 2412 - 2462 | 802.11b | 26.62 | 459.20 |
| 2412 - 2462 | 802.11g | 24.96 | 313.33 |
| 2412 - 2462 | 802.11n HT20 | 24.99 | 315.50 |
| 2422 - 2452 | 802.11n HT40 | 26.09 | 406.44 |
| 5.8 GHz BAND | | | |
| 5745 - 5825 | 802.11a | 25.22 | 332.66 |
| 5745 - 5825 | 802.11n HT20 | 25.19 | 330.37 |
| 5755 - 5795 | 802.11n HT40 | 25.14 | 326.59 |

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a dual band omni monopole (4 identical) antenna, each with a maximum gain of 2 dBi in the 2.4 GHz band and 3 dBi in the 5.8 GHz band.

For the 802.11a/b/g legacy modes the effective legacy antenna gain is:

| Antenna Gain (dBi) | 10 Log (# Tx Chains) (dB) | Effective Legacy Gain (dBi) |
|--------------------|---------------------------|-----------------------------|
| 2 | 6.02 | 8.02 |
| 3 | 6.02 | 9.02 |

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Qualcomm, rev. 0.0.500.5.

The test utility software used during emissions testing was PTT Gui, rev. 5.1.

5.5. WORST-CASE CONFIGURATION AND MODE

The EUT was tested as an external module connected to a host Laptop PC via a test fixture.

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

802.11b Mode (20 MHz BW operation): 1 Mbps, CCK.
802.11g Mode (20 MHz BW operation): 6 Mbps, OFDM.
802.11n MIMO HT20 Mode: MCS31, 260 Mbps, 4 Spatial Streams.
802.11n MIMO HT40 Mode: MCS31, 540 Mbps, 4 Spatial Streams.

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 11b mode, mid channel.

For bandwidth measurement preliminary testing showed that there is no significant difference among different chains, so the measurements were performed using Chain 0.

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

For PSD measurement preliminary testing showed that combiner is worst-case compared to individual chains; therefore final measurements were performed using combiner 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.

5.6 DESCRIPTION OF CLASS 2 PERMISSIVE CHANGE

A shield was added to the bottom side of the PCB to meet ETSI receiver spurious limits. This shield was subsequently incorporated into all versions of this radio module.

5.6. TEST RESULTS FOR C2PC SAMPLE

As a result of the C2PC, the original data was analyzed to find worst-case modes and margins, then preliminary tests were performed to determine where additional final testing was required. The original data is updated with all new final measurements that show degraded performance compared to the original configuration.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

| PERIPHERAL SUPPORT EQUIPMENT LIST | | | | |
|-----------------------------------|--------------|--------------|----------------|--------|
| Description | Manufacturer | Model | Serial Number | FCC ID |
| Laptop | IBM | T43 ThinkPad | L3-F9978 05/06 | DoC |
| AC Adapter | IBM | 08K8208 | 11S08K8208Z1Z6 | DoC |
| AC Adapter | Phihong | PSA15R-050P | N/A | N/A |
| Serial (DB9)/USB | Keyspan | N/A | N/A | N/A |
| Test Fixture | N/A | N/A | N/A | N/A |

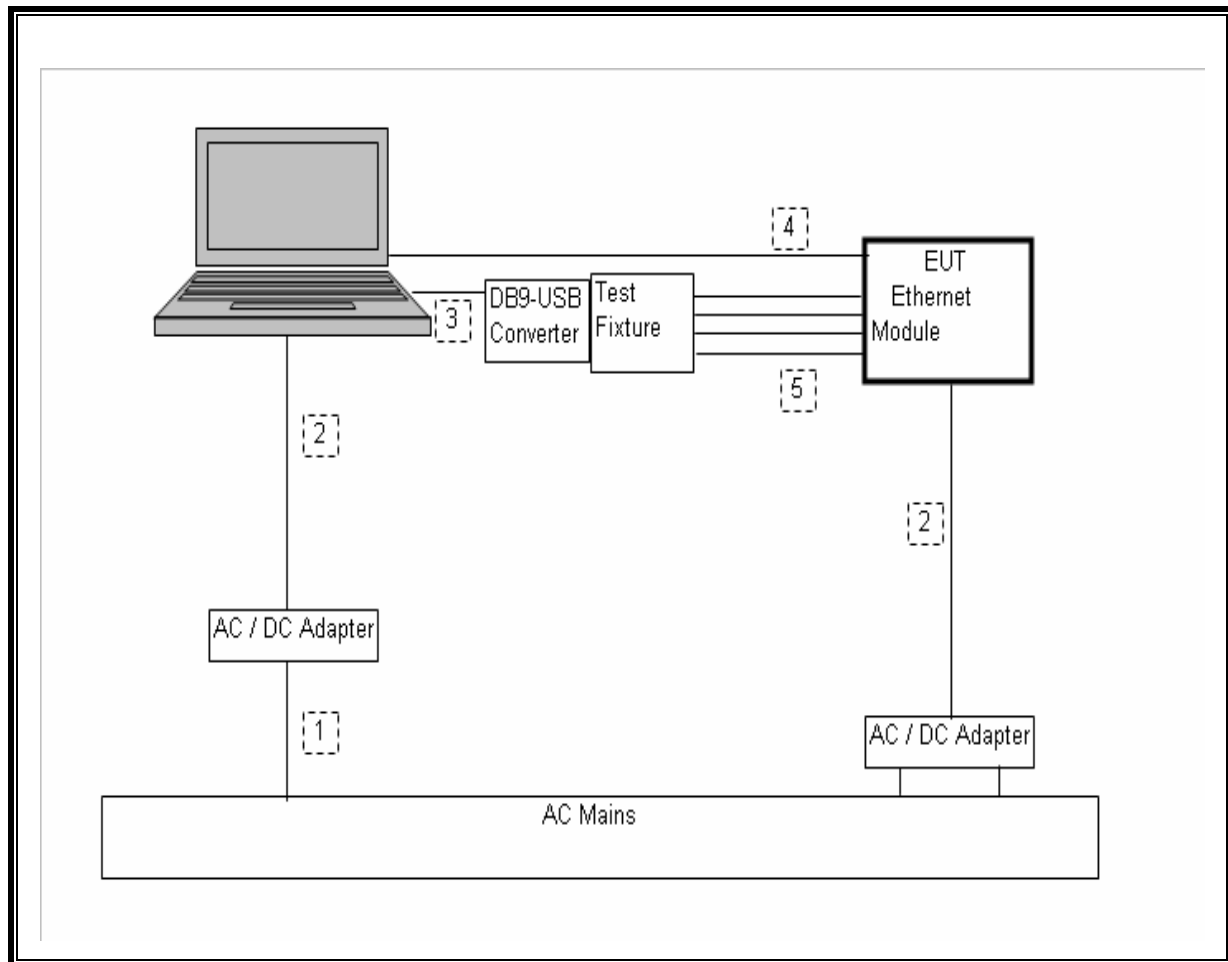
I/O CABLES

| I/O CABLE LIST | | | | | | |
|----------------|----------|----------------------|---------------|-------------|--------------|------------------------------|
| Cable No. | Port | # of Identical Ports | Connecto Type | Cable Type | Cable Length | Remarks |
| 1 | AC | 2 | US 115V | Shielded | 1m | For laptop & EUT |
| 2 | DC | 2 | DC | Un-shielded | 2m | For laptop & EUT |
| 3 | USB | 1 | USB | Shielded | .8m | From laptop to USB Converter |
| 4 | Ethernet | 1 | RJ45 | Un-shielded | 1 m | From laptop to EUT |
| 5 | Cable | 1 | Riibon | Un-shielded | .4 m | Test Fixture to EUT |

TEST SETUP

The EUT is installed in a host laptop computer via test fixture during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

| TEST EQUIPMENT LIST | | | | | |
|---------------------------|----------------|------------------|--------|----------|----------|
| Description | Manufacturer | Model | Asset | Cal Date | Cal Due |
| Spectrum Analyzer, 44 GHz | Agilent / HP | E4446A | C01069 | 01/05/09 | 01/05/10 |
| Antenna, Bilog, 2 GHz | Sunol Sciences | JB1 | C01011 | 01/14/09 | 01/14/10 |
| Antenna, Horn, 18 GHz | EMCO | 3115 | C00945 | 04/22/09 | 04/22/10 |
| Antenna, Horn, 26.5 GHz | ARA | MWVH-1826/B | C00589 | 09/29/08 | 11/28/09 |
| Antenna, Horn, 40 GHz | ARA | MWVH-2640B | C00981 | 05/21/09 | 05/21/10 |
| Preamplifier, 40 GHz | Miteq | NSP4000-SP2 | C00990 | 10/11/08 | 10/11/09 |
| Preamplifier, 1300 MHz | Agilent / HP | 8447D | C00885 | 03/31/09 | 03/31/10 |
| Preamplifier, 1-26GHz | Agilent / HP | 8449B | C01052 | 08/05/08 | 08/05/09 |
| Peak Power Meter | Boonton | 4541 | C01186 | 01/19/09 | 01/19/10 |
| Peak Power Sensor | Boonton | 4541 | C01189 | 01/15/09 | 01/15/10 |
| LISN, 30 MHz | FCC | LISN-50/250-25-2 | N02625 | 10/29/08 | 10/29/09 |
| EMI Test Receiver, 30 MHz | R & S | ESHS 20 | N02396 | 02/06/08 | 08/06/09 |

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

| TEST EQUIPMENT LIST | | | | | |
|---------------------------|--------------|-------------|--------|----------|----------|
| Description | Manufacturer | Model | Asset | Cal Date | Cal Due |
| Spectrum Analyzer, 44 GHz | Agilent / HP | E4446A | C01069 | 01/05/09 | 03/05/11 |
| Antenna, Horn, 18 GHz | EMCO | 3115 | C00945 | 04/22/09 | 04/22/10 |
| Antenna, Horn, 26.5 GHz | ARA | MWVH-1826/B | C00589 | 01/29/09 | 01/29/10 |
| Antenna, Horn, 40 GHz | ARA | MWVH-2640B | C00981 | 05/21/09 | 05/21/10 |
| Preamplifier, 40 GHz | Miteq | NSP4000-SP2 | C00990 | 02/03/09 | 02/03/10 |
| Preamplifier, 1300 MHz | Agilent / HP | 8447D | C00885 | 03/31/09 | 03/31/10 |
| Preamplifier, 1-26GHz | Agilent / HP | 8449B | C01052 | 02/04/09 | 02/04/10 |
| Peak Power Meter | Boonton | 4541 | C01186 | 01/19/09 | 01/19/10 |
| Peak Power Sensor | Boonton | 4541 | C01189 | 01/15/09 | 01/15/10 |

7. ANTENNA PORT TEST RESULTS

7.1. 2.4 GHz BAND CHANNEL TESTS FOR 802.11b MODE

7.1.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

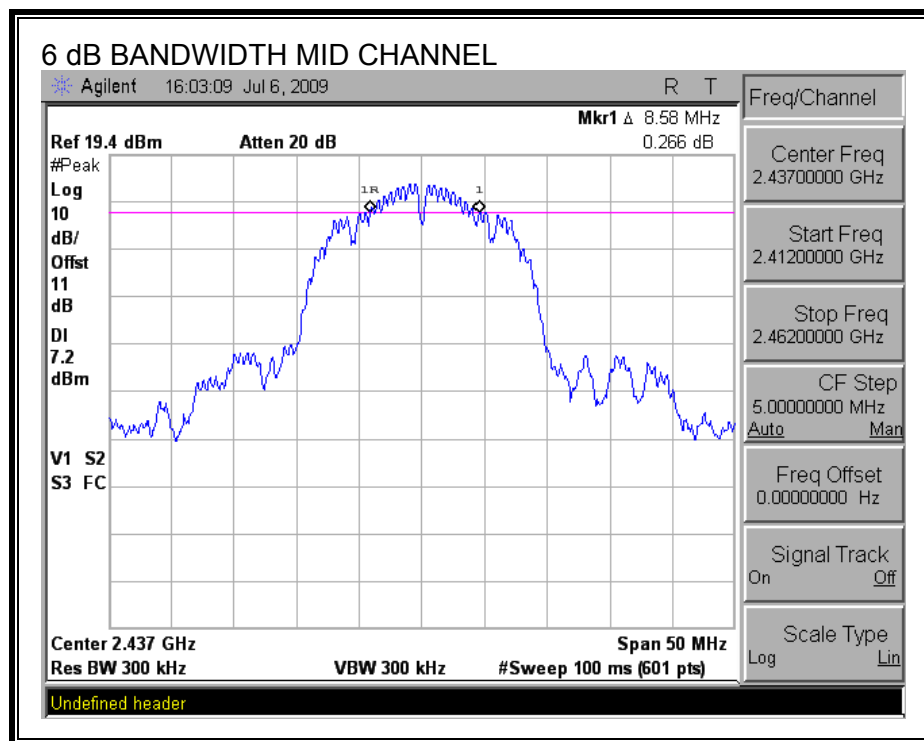
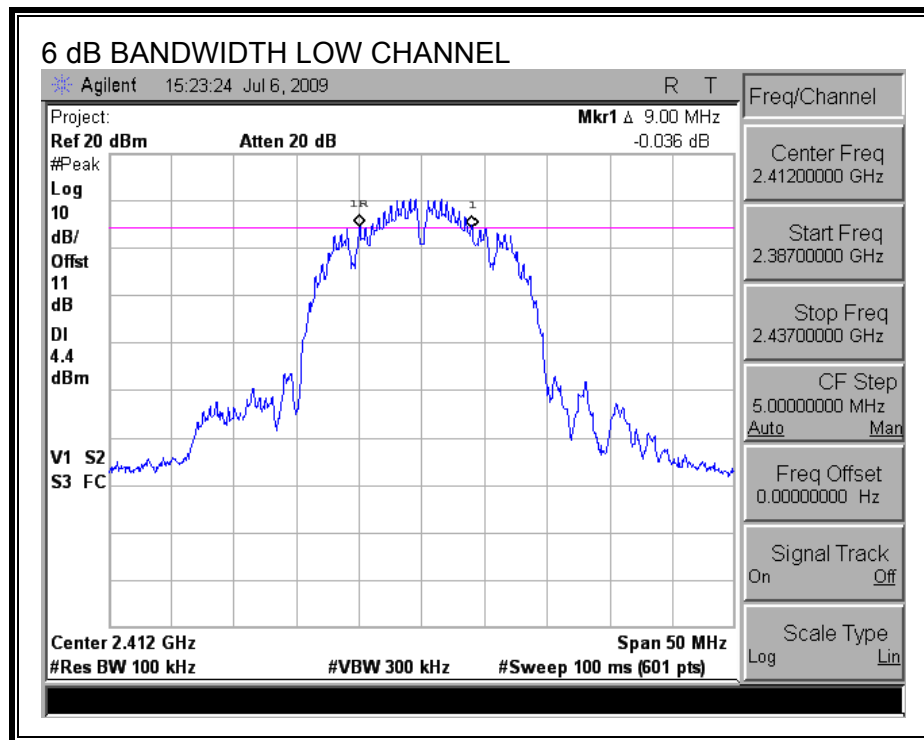
TEST PROCEDURE

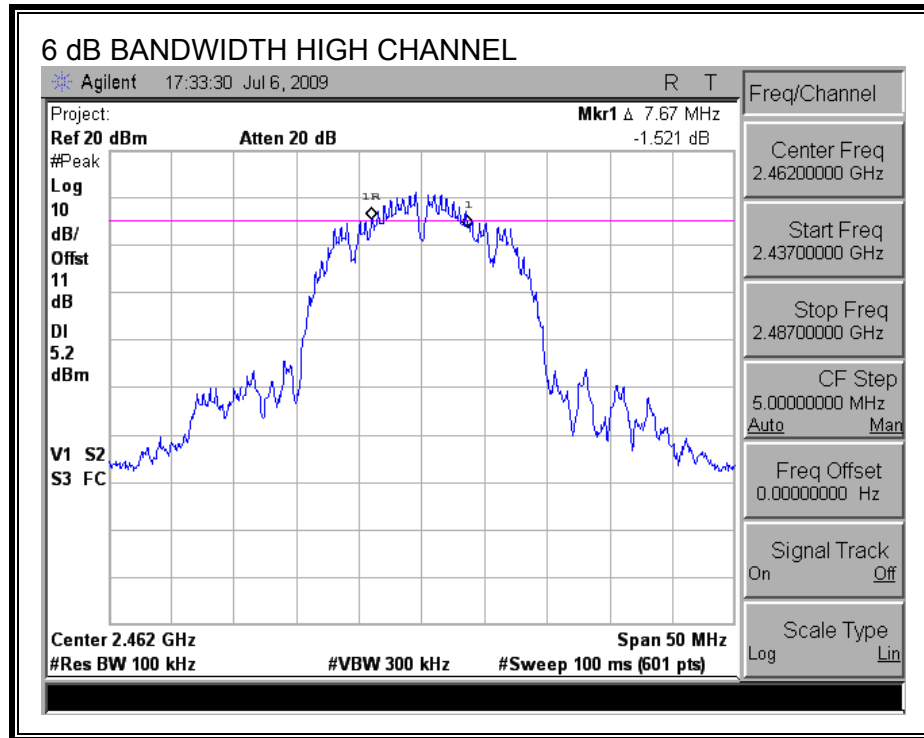
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

| Channel | Frequency (MHz) | 6 dB BW (MHz) | Minimum Limit (MHz) |
|---------|--------------------|------------------|------------------------|
| Low | 2412 | 9.00 | 0.5 |
| Middle | 2437 | 8.58 | 0.5 |
| High | 2462 | 7.67 | 0.5 |

6 dB BANDWIDTH





7.1.2. 99% & 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

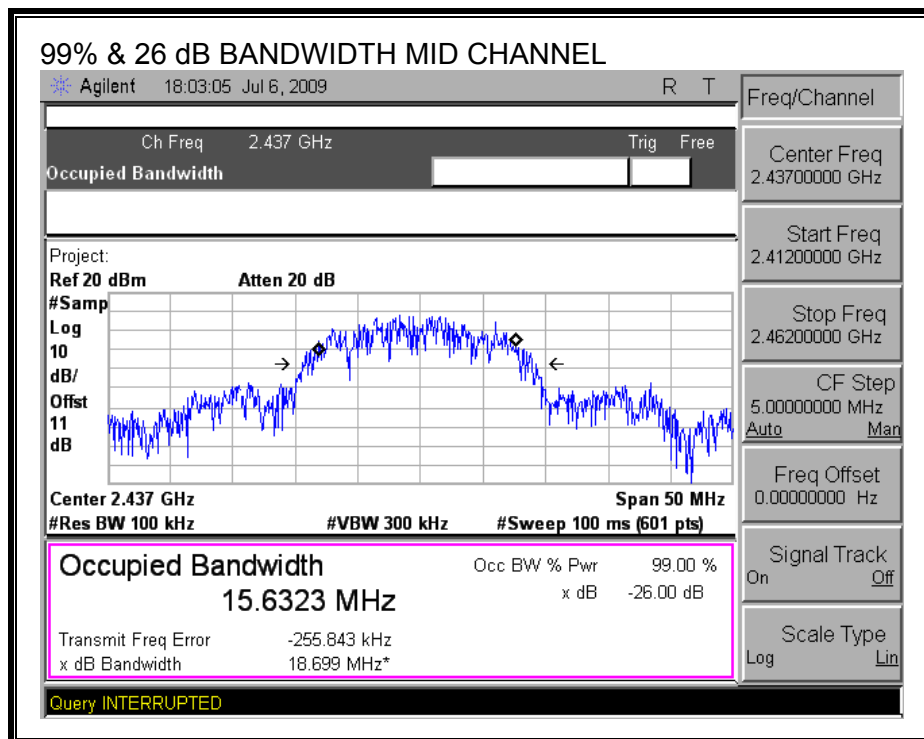
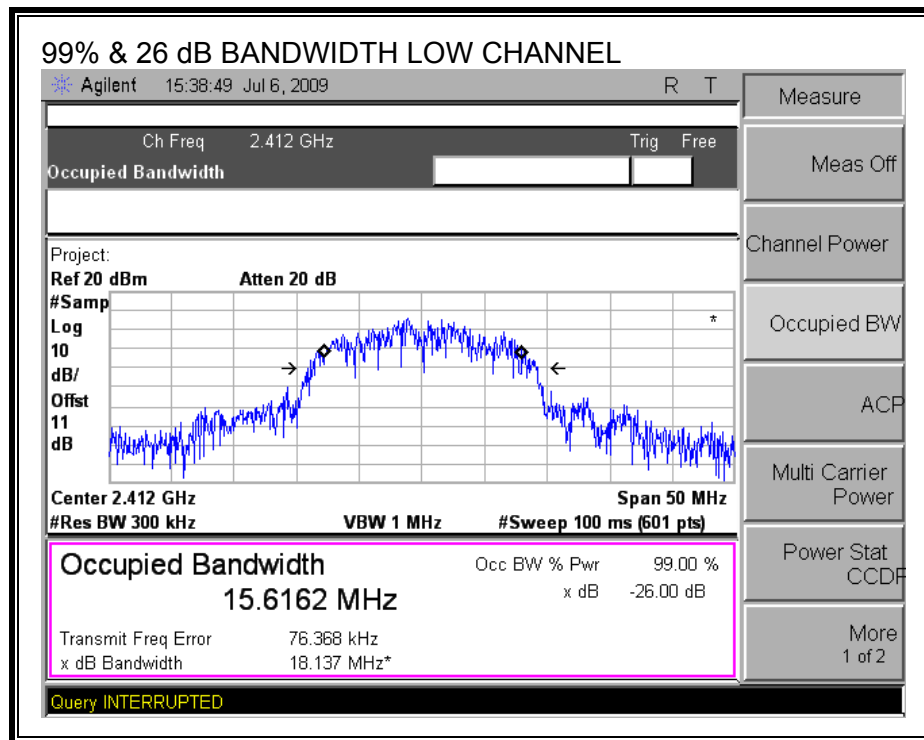
TEST PROCEDURE

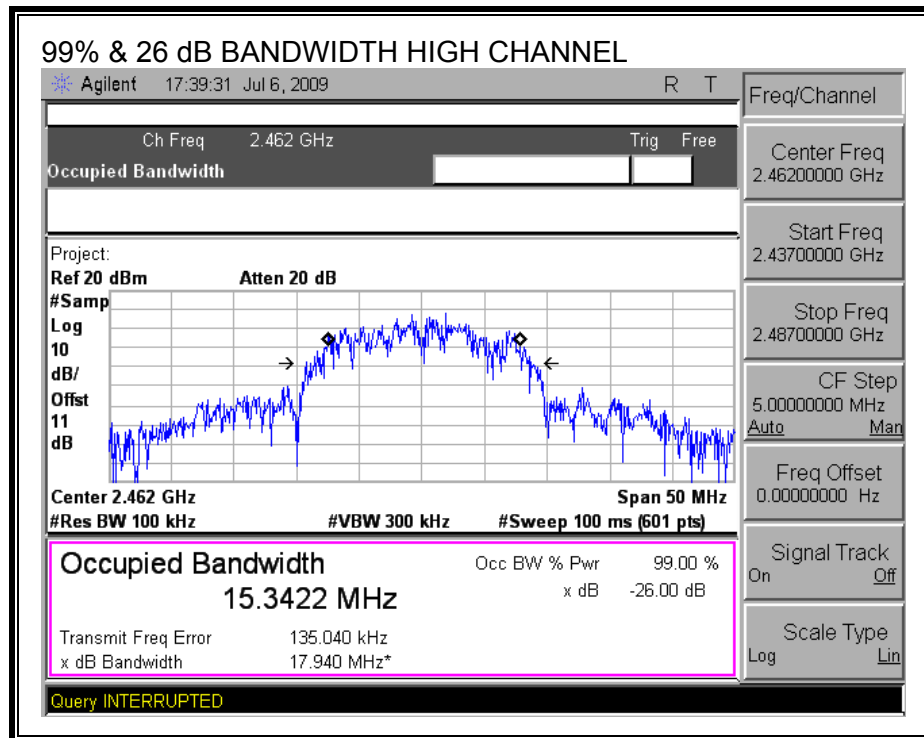
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth measurement function is utilized.

RESULTS

| Channel | Frequency (MHz) | 99% OBW (MHz) | 26 dB BW (MHz) |
|---------|--------------------|------------------|-------------------|
| Low | 2412 | 15.62 | 18.14 |
| Middle | 2437 | 15.63 | 18.70 |
| High | 2462 | 15.34 | 17.94 |

99% & 26 dB BANDWIDTH





7.1.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

TEST PROCEDURE

Output power was measured based on the use of RMS averaging over a time interval in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

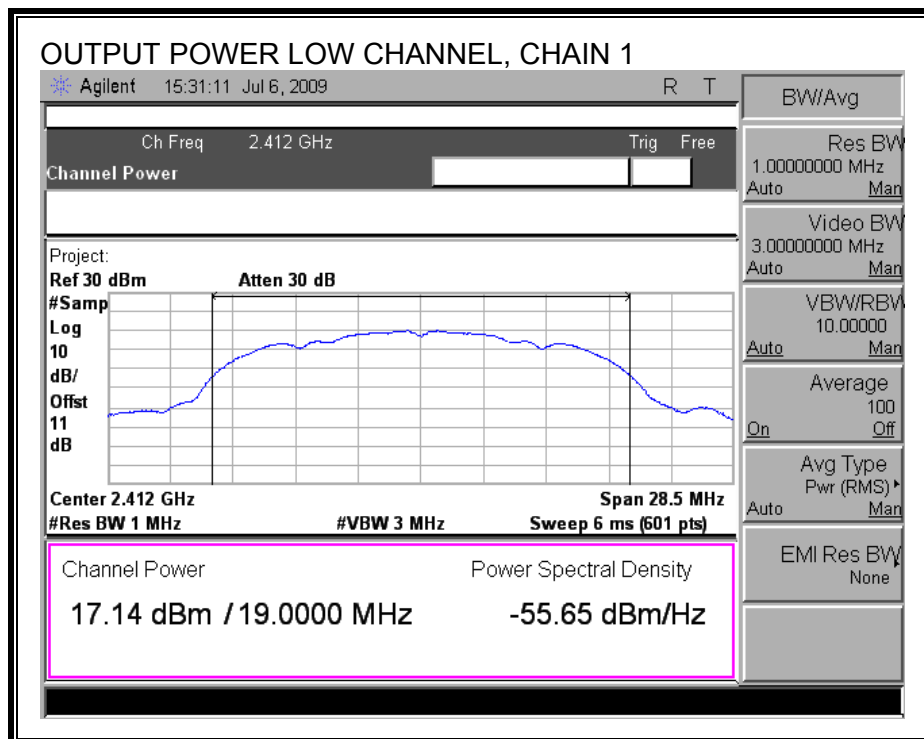
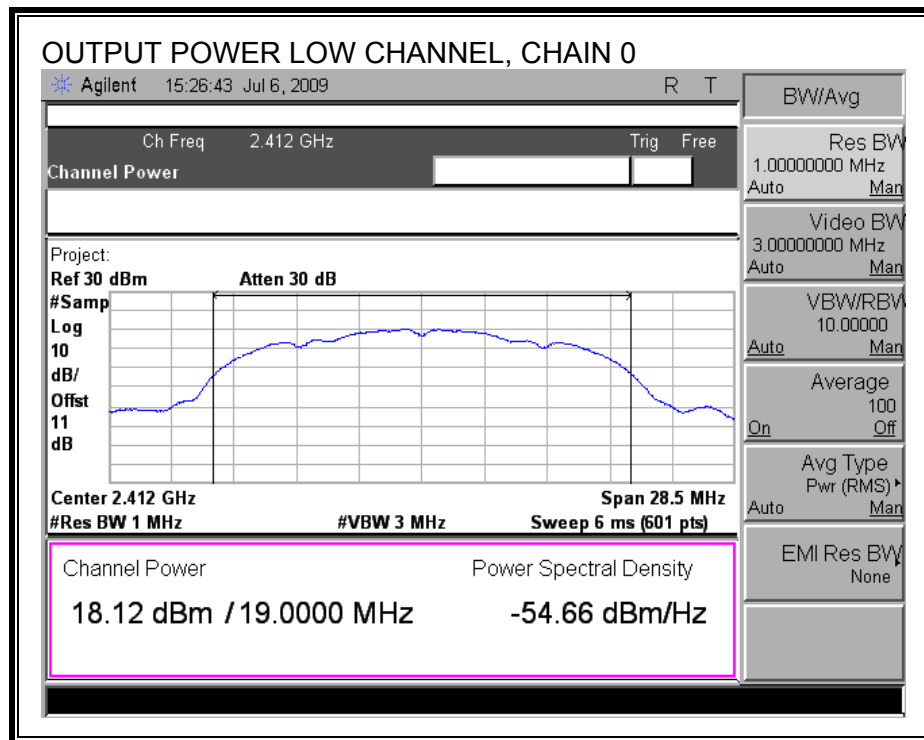
Effective Legacy Mode Composite Gain of 4 Identical Antennas:

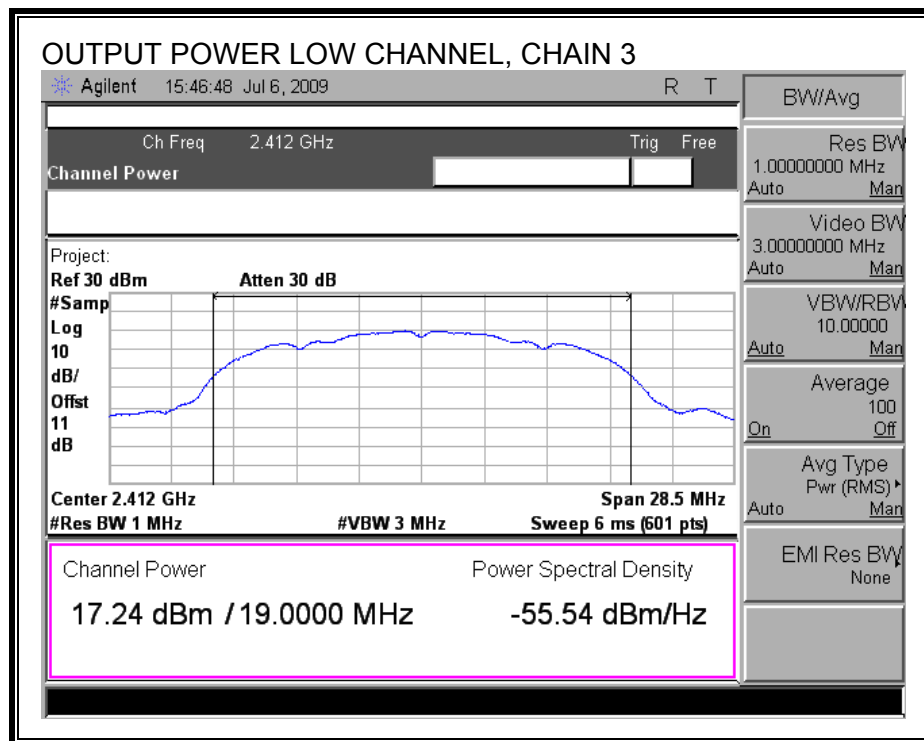
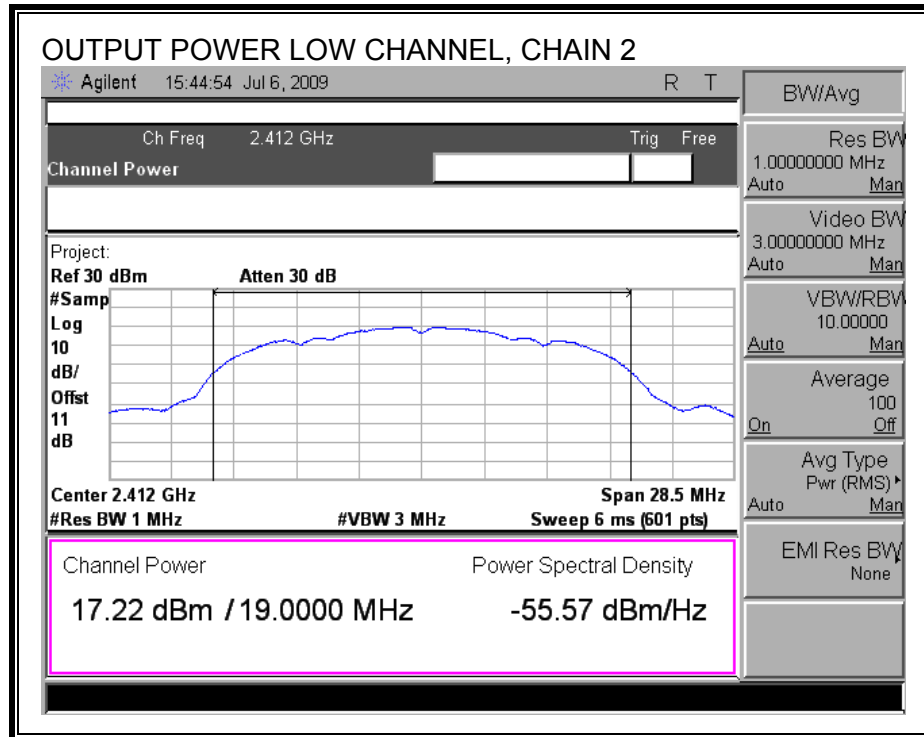
| Antenna Gain (dBi) | 10 Log (# Tx Chains) (dB) | Effective Legacy Gain (dBi) |
|-----------------------|------------------------------|--------------------------------|
| 2 | 6.02 | 8.02 |

The composite antenna gain is 8.02 dBi, therefore the limit is 27.98 dBm.

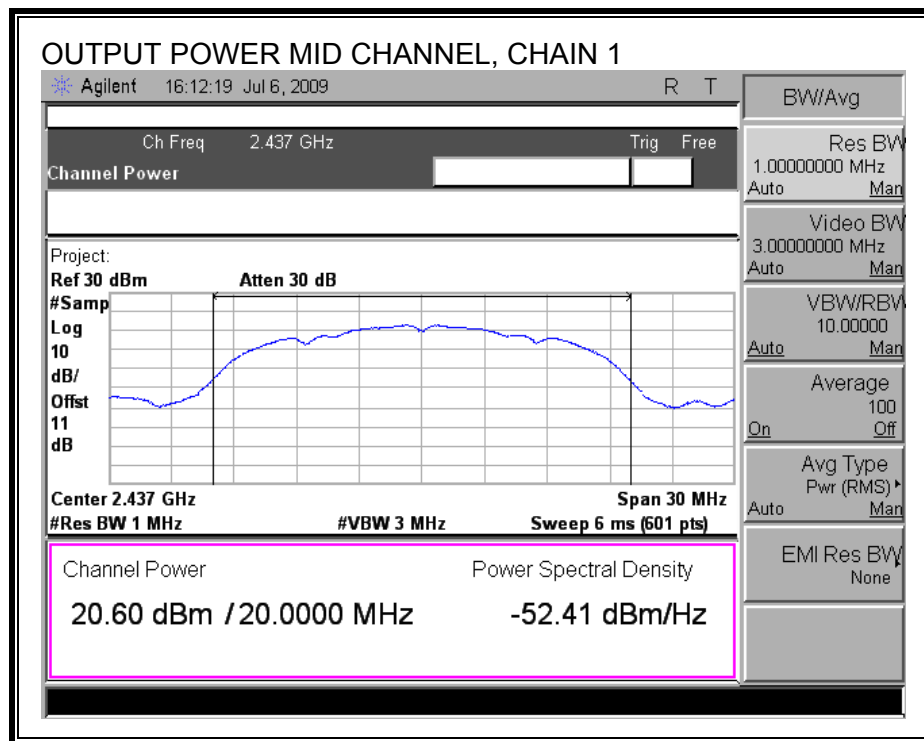
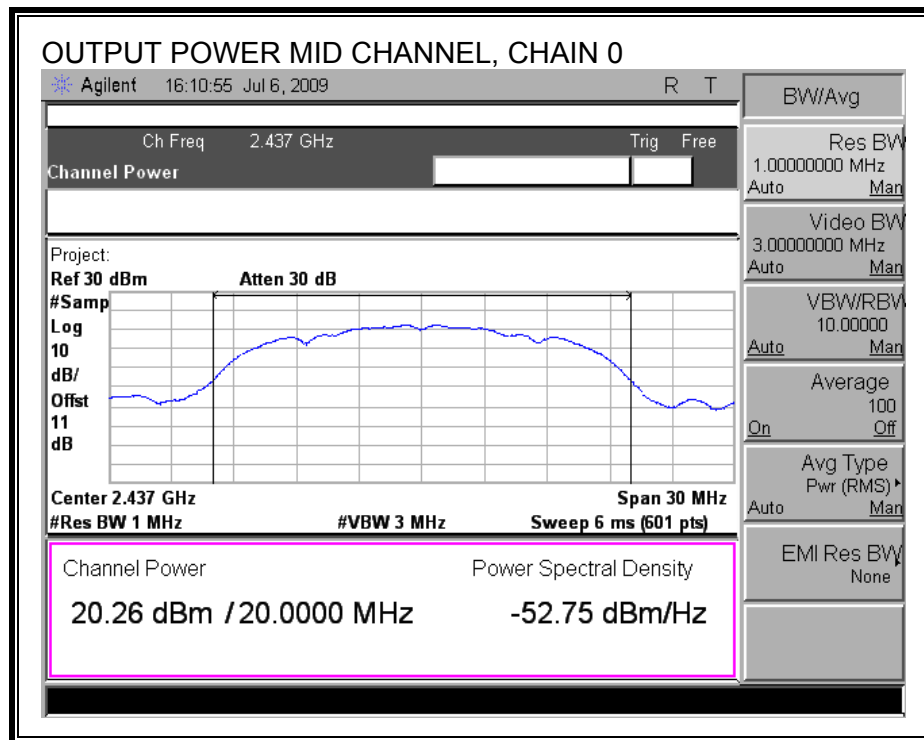
| Channel | Frequency (MHz) | Chain 0 Power (dBm) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Chain 3 Power (dBm) | Total Power (dBm) | Limit (dBm) | Margin (dB) |
|---------|--------------------|---------------------------|---------------------------|---------------------------|---------------------------|-------------------------|----------------|----------------|
| Low | 2412 | 18.12 | 17.14 | 17.22 | 17.24 | 23.47 | 27.92 | -4.45 |
| Mid | 2437 | 20.26 | 20.60 | 20.63 | 20.87 | 26.62 | 27.92 | -1.30 |
| High | 2462 | 18.27 | 18.44 | 18.18 | 18.72 | 24.43 | 27.92 | -3.49 |

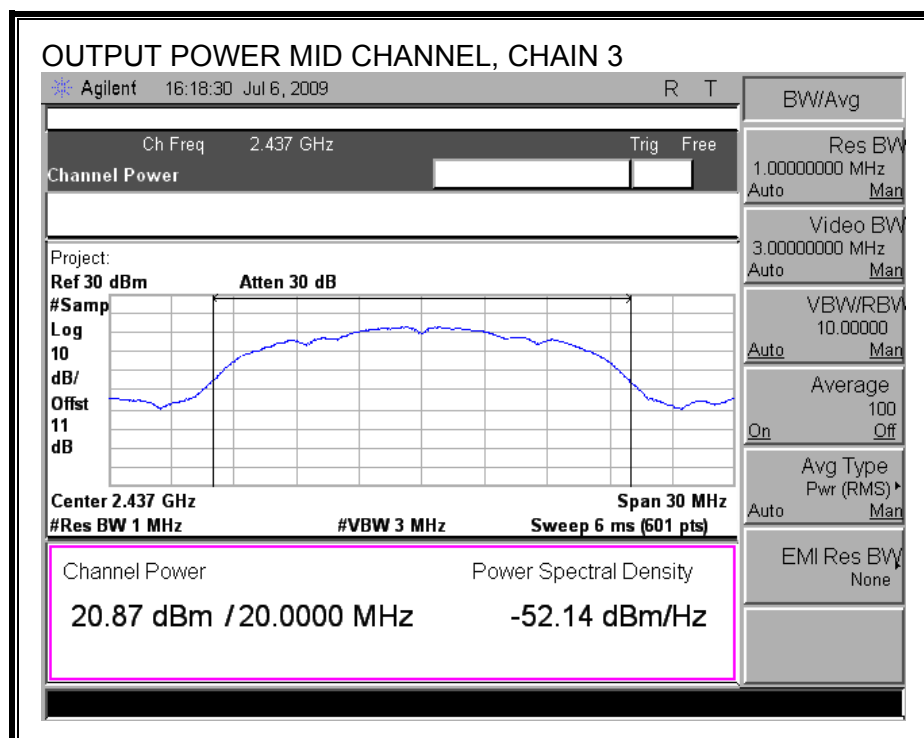
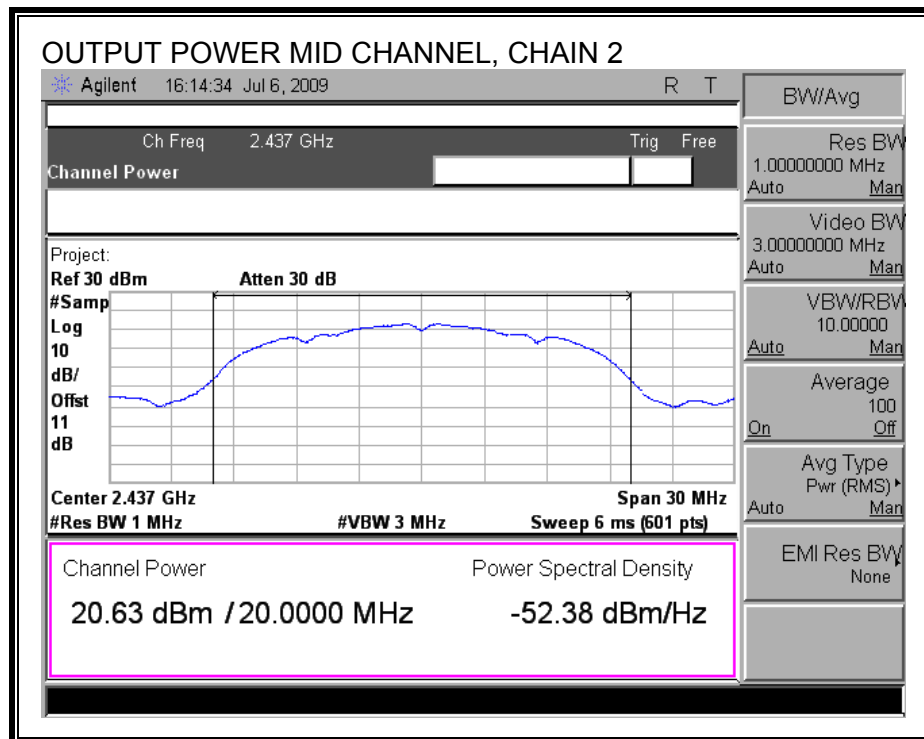
OUTPUT POWER, LOW CHANNEL



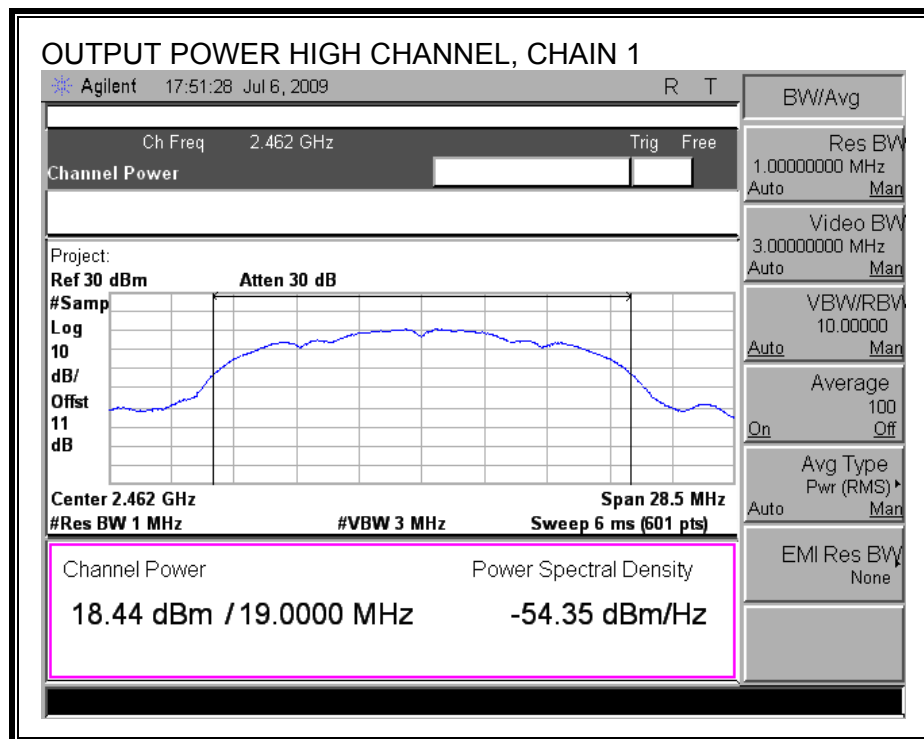
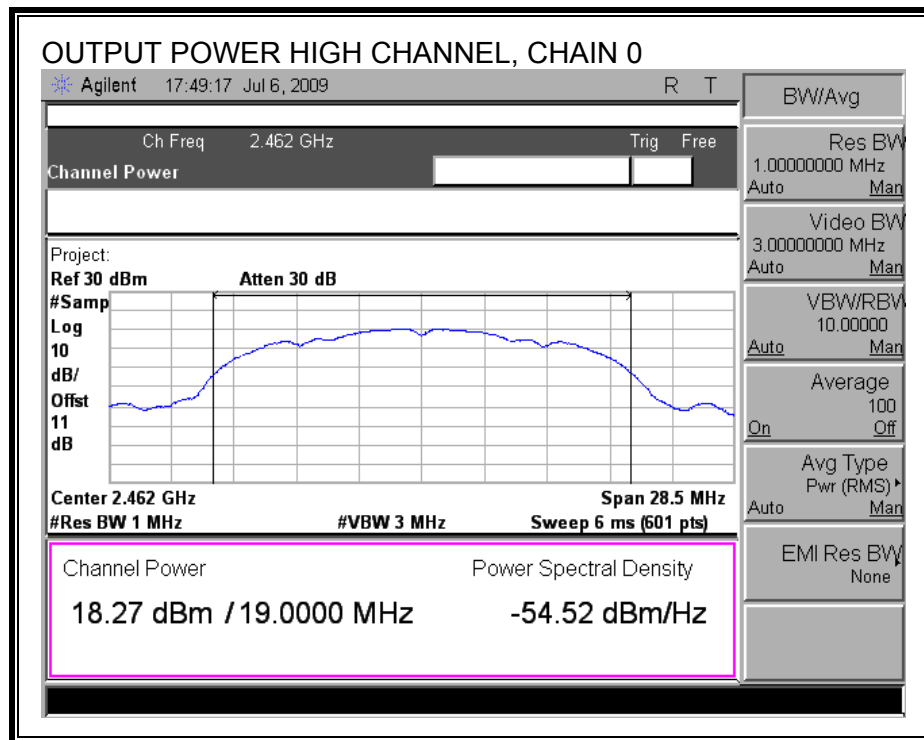


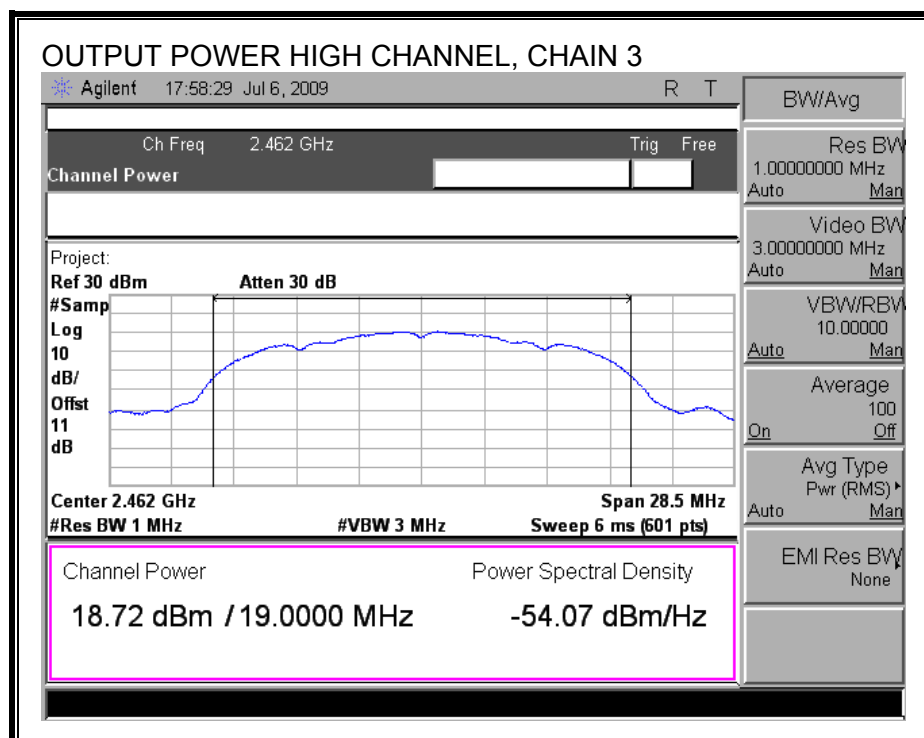
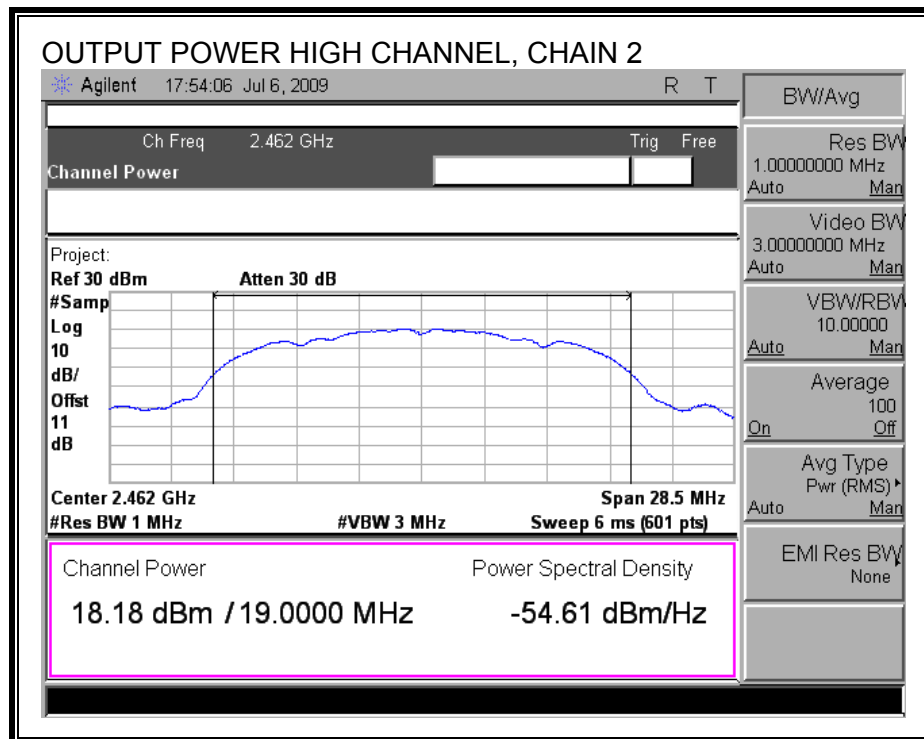
OUTPUT POWER, MID CHANNEL





OUTPUT POWER, HIGH CHANNEL





7.1.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

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

RESULTS

| Channel | Frequency (MHz) | Chain 0 Power (dBm) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Chain 3 Power (dBm) |
|---------|--------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Low | 2412 | 17.07 | 17.84 | 17.51 | 17.61 |
| Middle | 2437 | 20.44 | 20.69 | 20.51 | 20.66 |
| High | 2462 | 18.35 | 18.49 | 18.55 | 18.43 |

7.1.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

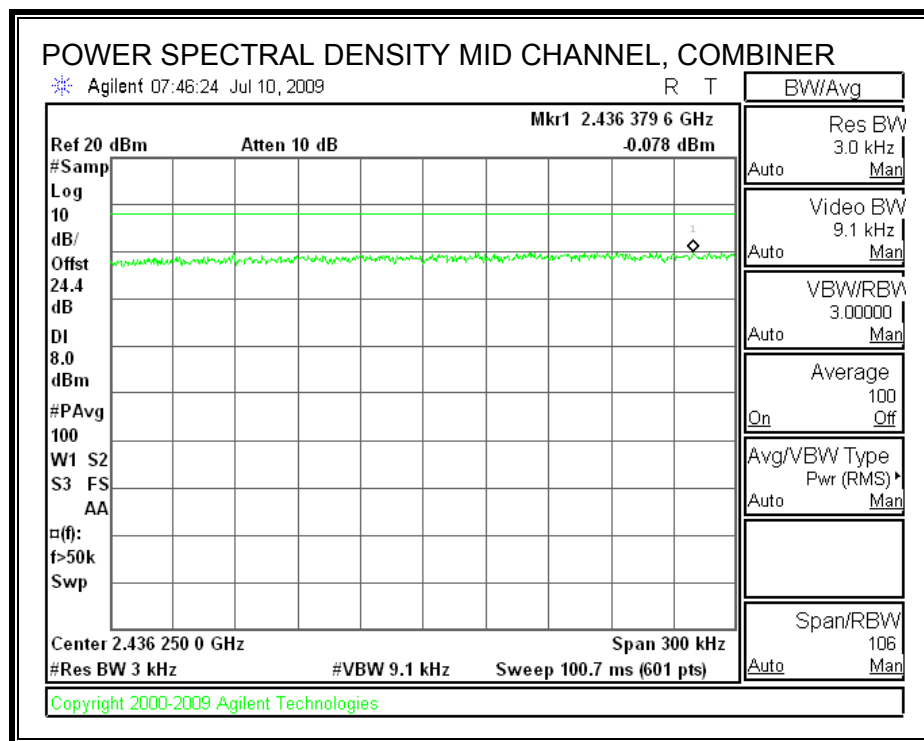
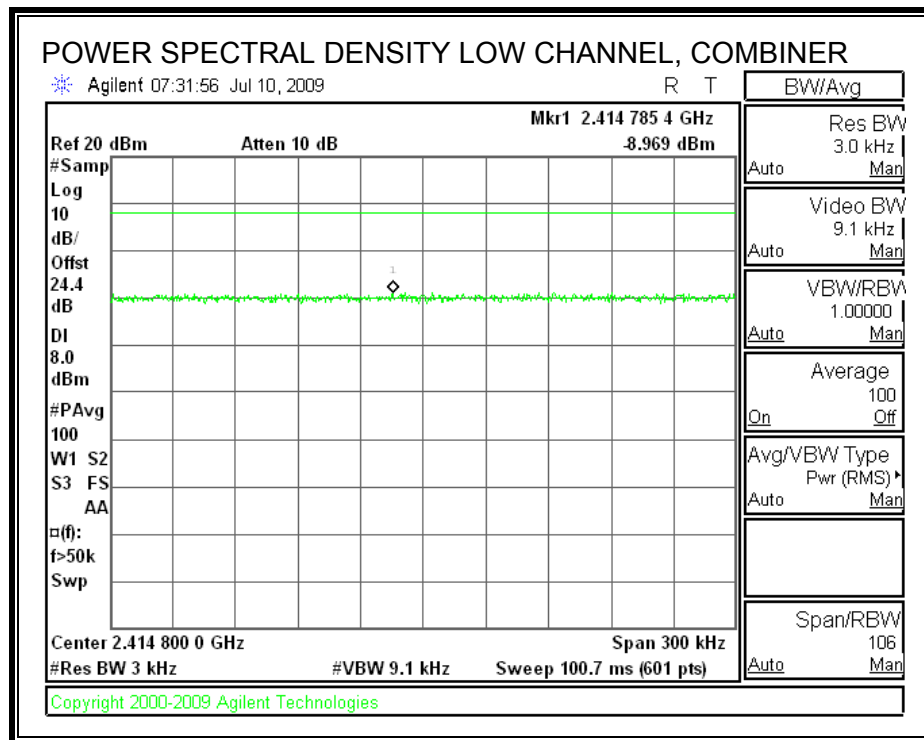
Output power was measured based on the use of RMS averaging over a time interval, therefore the power spectral density was measured using PSD Option 2 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

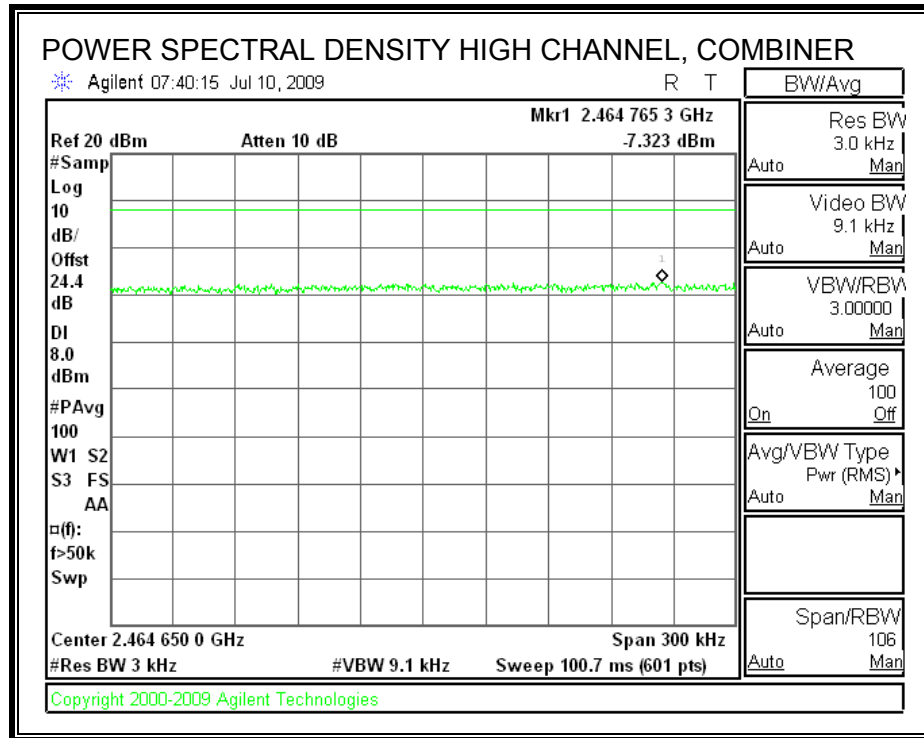
Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

RESULTS

| Channel | Frequency (MHz) | PSD with Combiner (dBm) | Limit (dBm) | Margin (dB) |
|---------|--------------------|----------------------------|----------------|----------------|
| Low | 2412 | -8.97 | 8 | -16.97 |
| Middle | 2437 | -0.08 | 8 | -8.08 |
| High | 2462 | -7.32 | 8 | -15.32 |

POWER SPECTRAL DENSITY





7.1.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dBc.

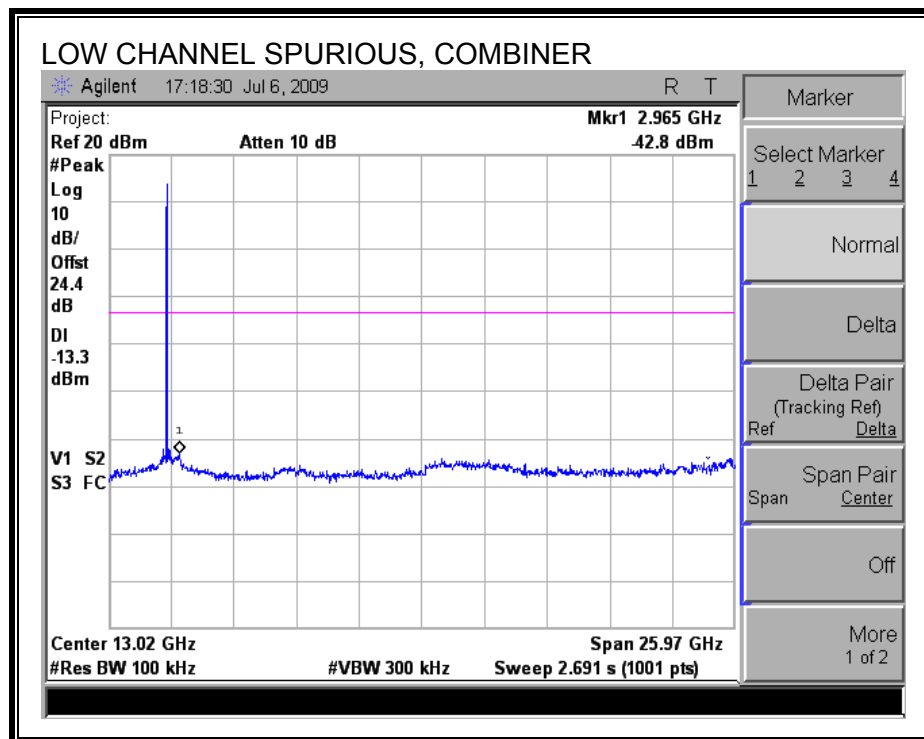
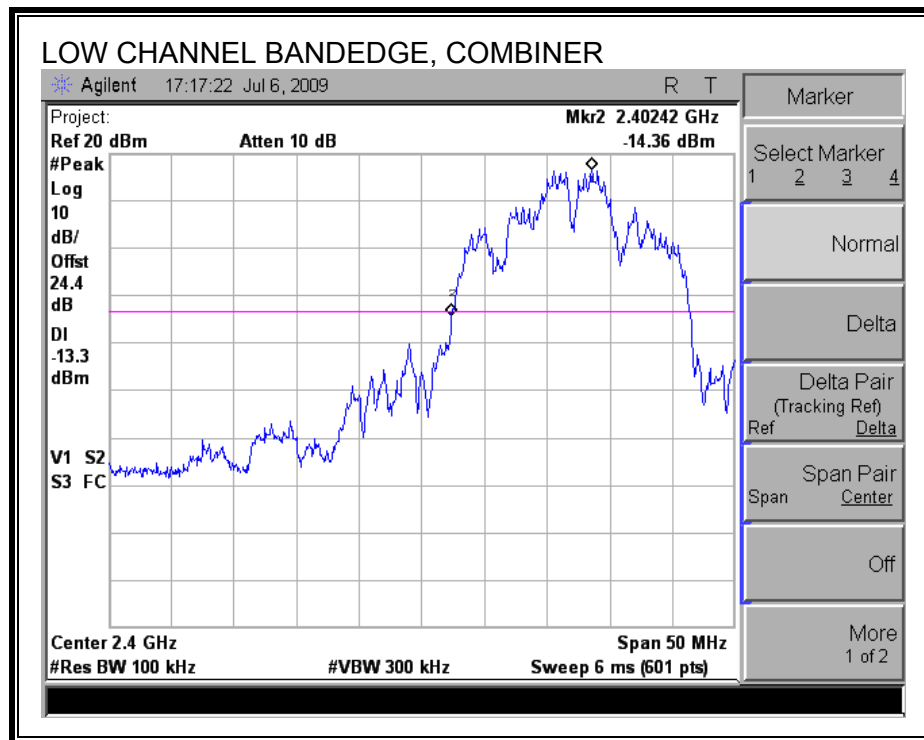
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

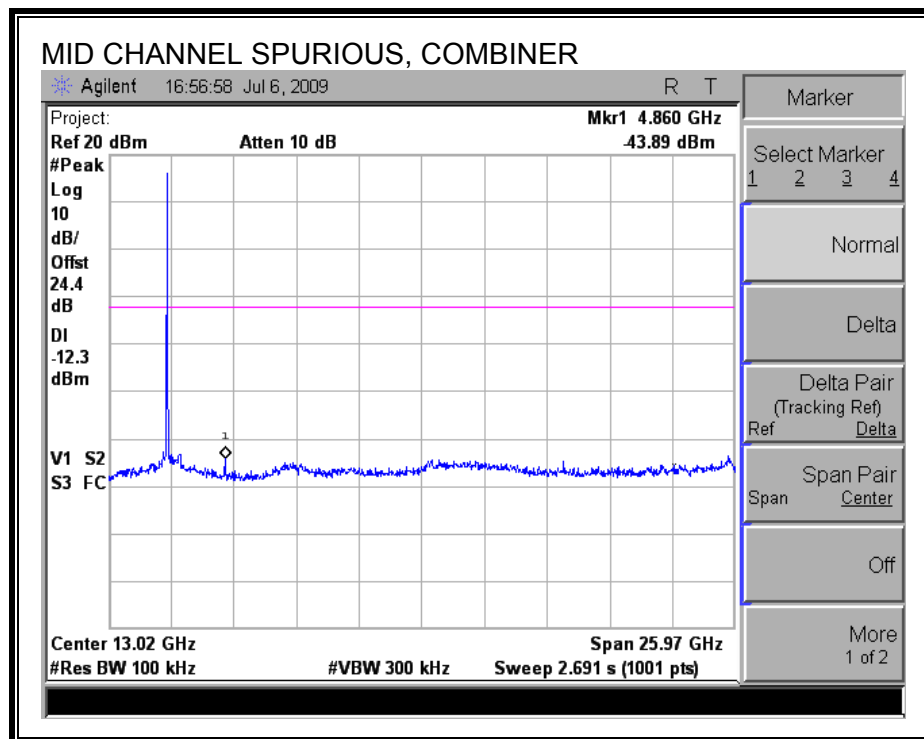
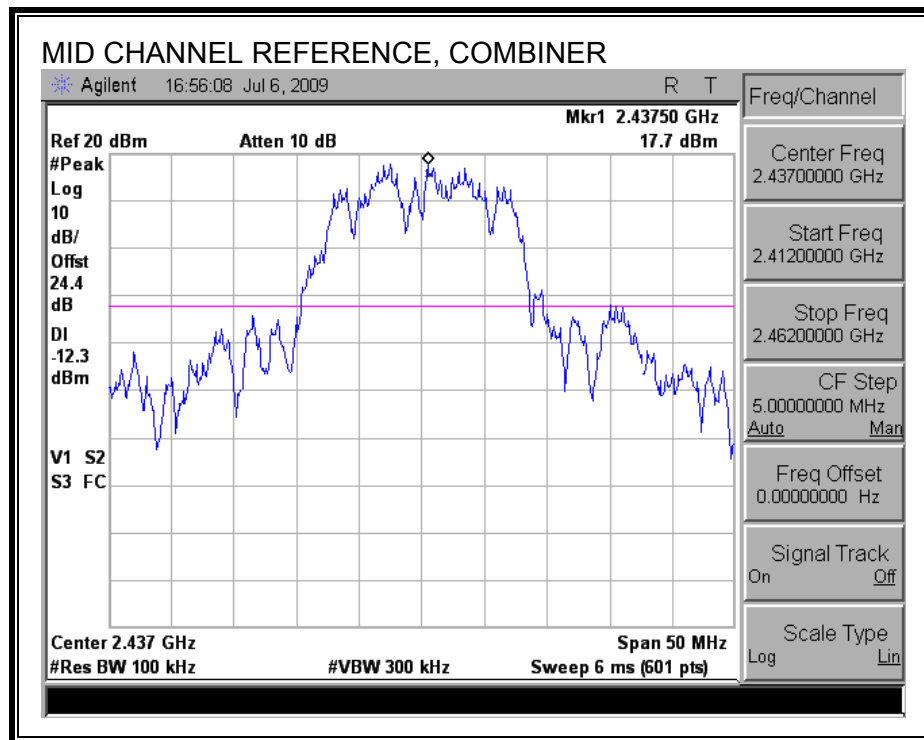
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

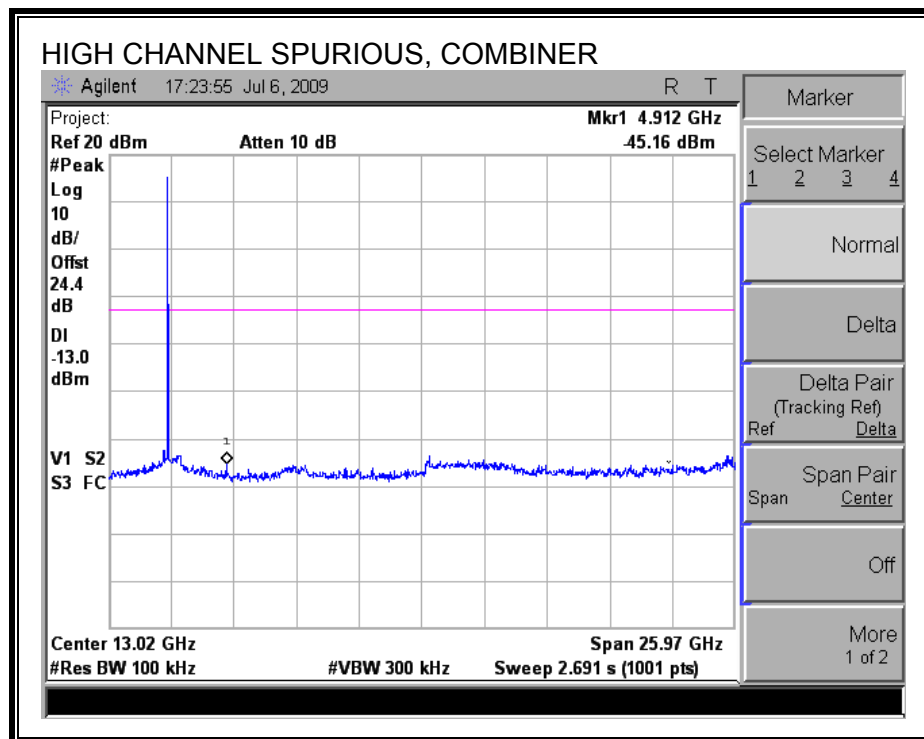
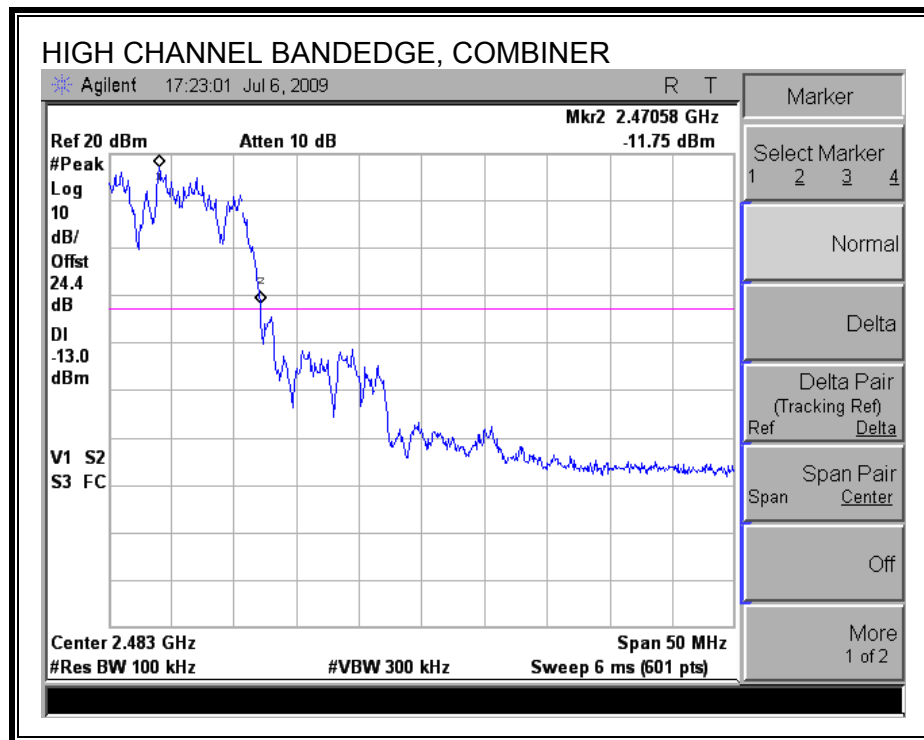
LOW CHANNEL SPURIOUS EMISSIONS



MID CHANNEL SPURIOUS EMISSIONS



HIGH CHANNEL SPURIOUS EMISSIONS



7.2. 2.4 GHz BAND CHANNEL TESTS FOR 802.11g MODE

7.2.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

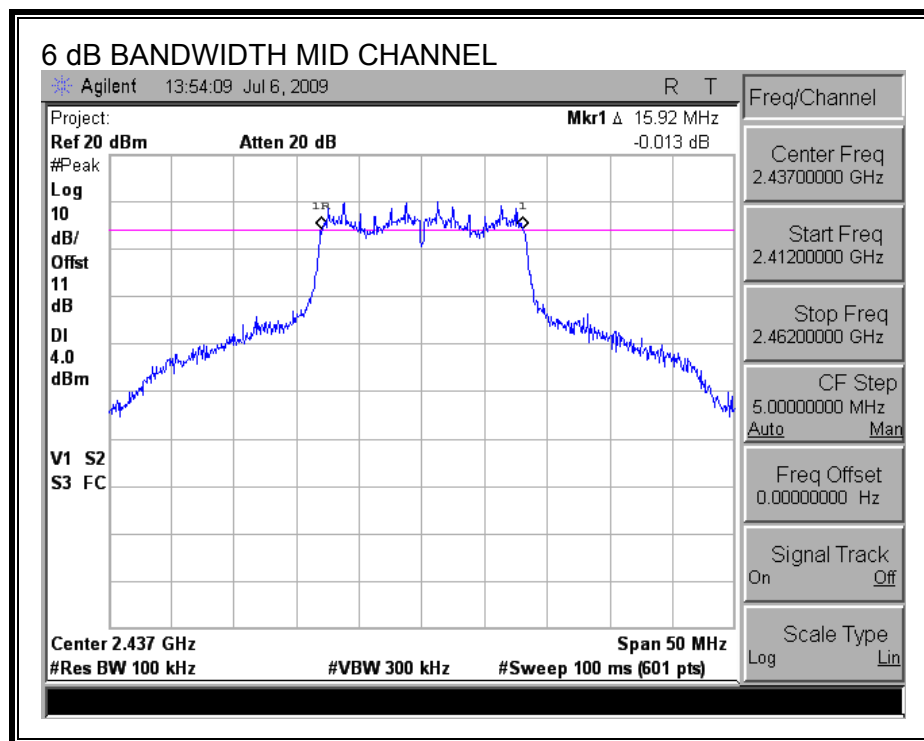
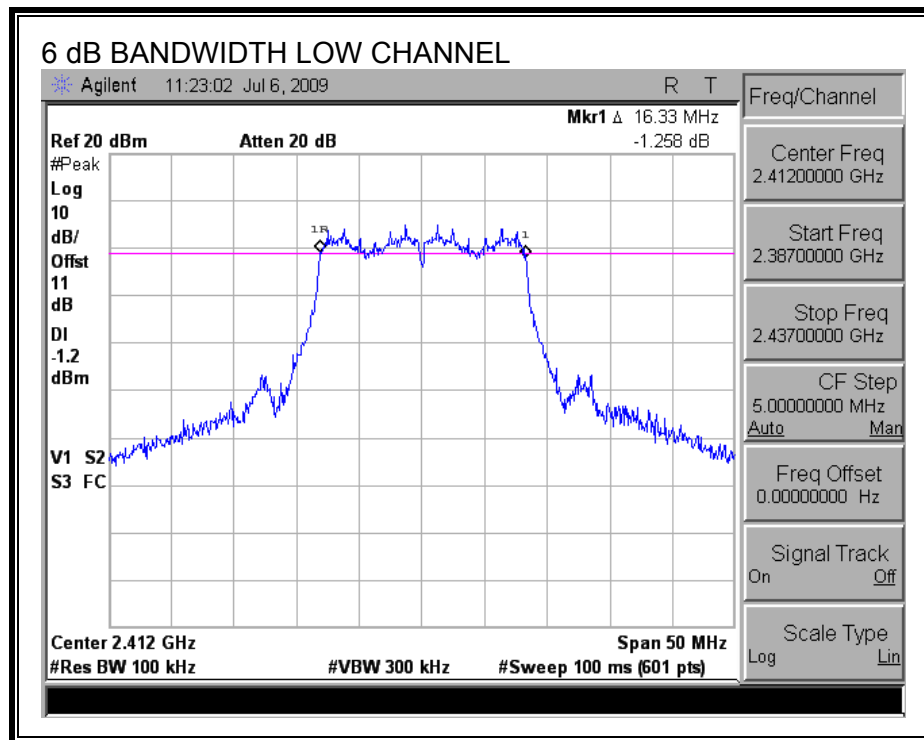
TEST PROCEDURE

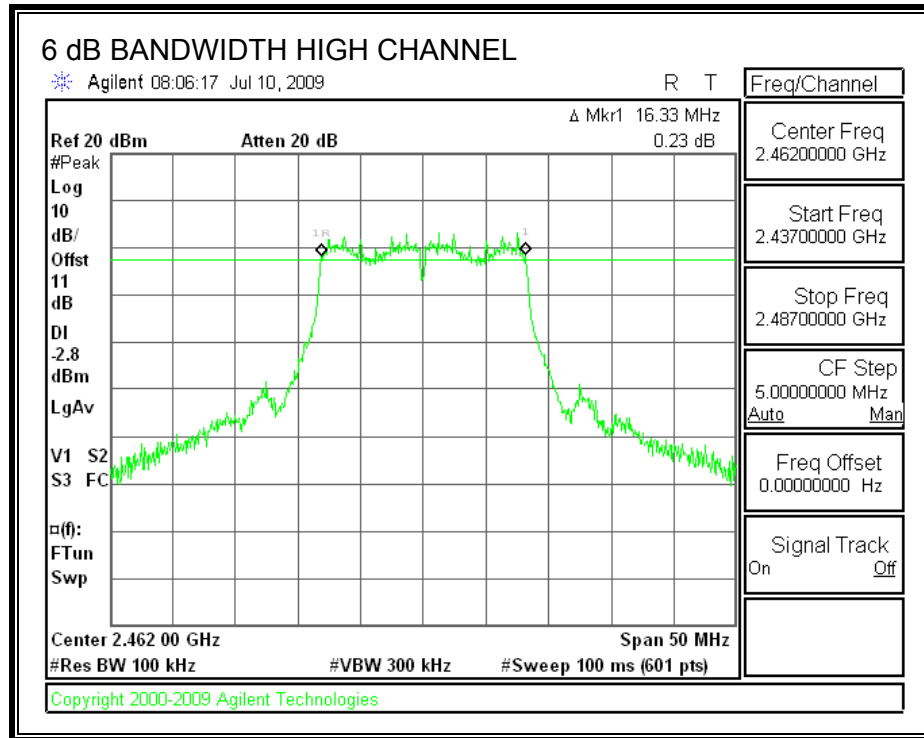
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

| Channel | Frequency (MHz) | 6 dB BW (MHz) | Minimum Limit (MHz) |
|----------------|----------------------------|--------------------------|--------------------------------|
| Low | 2412 | 16.33 | 0.5 |
| Middle | 2437 | 15.92 | 0.5 |
| High | 2462 | 16.33 | 0.5 |

6 dB BANDWIDTH





7.2.2. 99% & 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

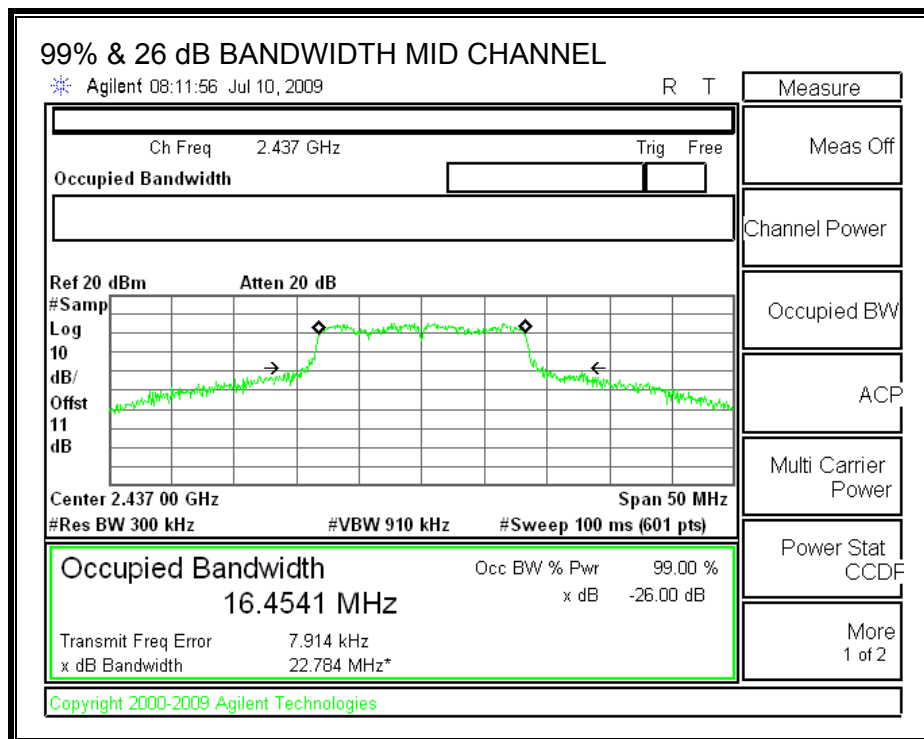
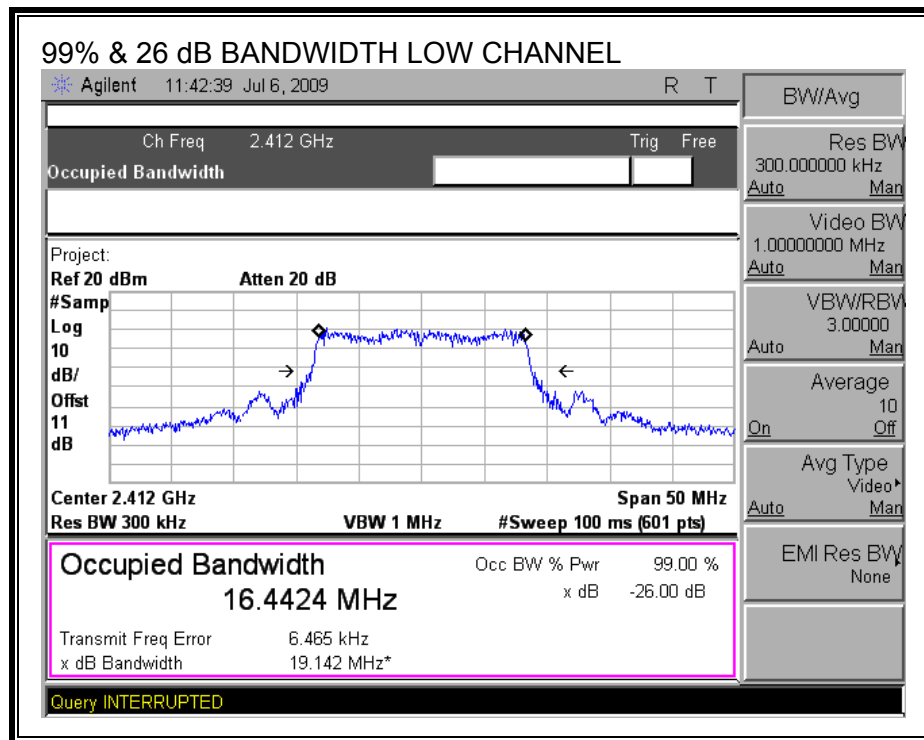
TEST PROCEDURE

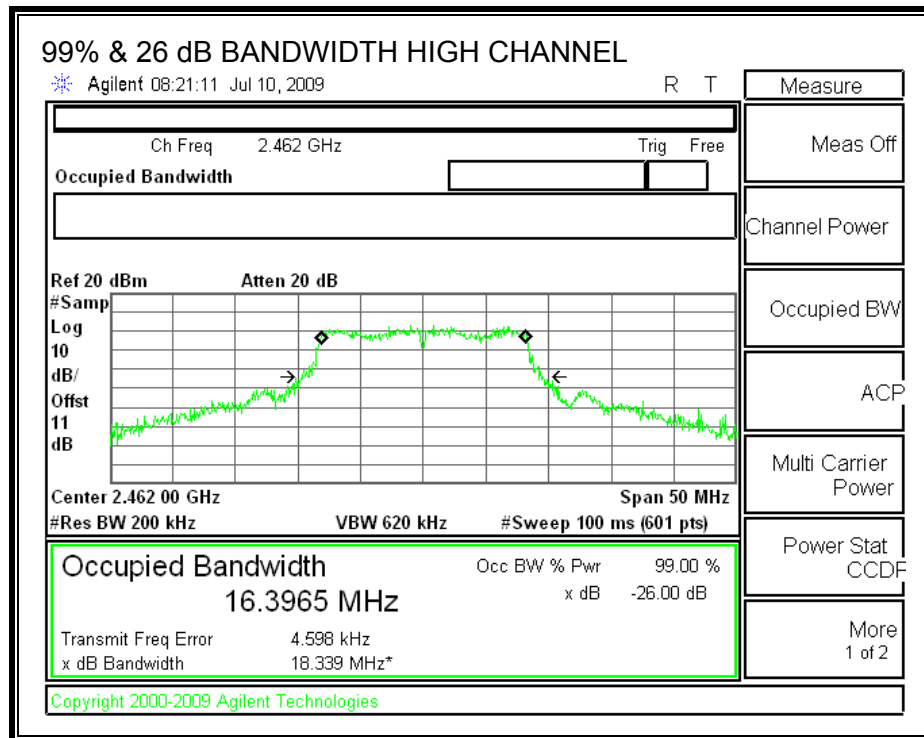
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth measurement function is utilized.

RESULTS

| Channel | Frequency (MHz) | 99% OBW (MHz) | 26 dB BW (MHz) |
|---------|--------------------|------------------|-------------------|
| Low | 2412 | 16.44 | 19.14 |
| Middle | 2437 | 16.45 | 22.78 |
| High | 2462 | 16.40 | 18.34 |

99% & 26 dB BANDWIDTH





7.2.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

TEST PROCEDURE

Output power was measured based on the use of RMS averaging over a time interval in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

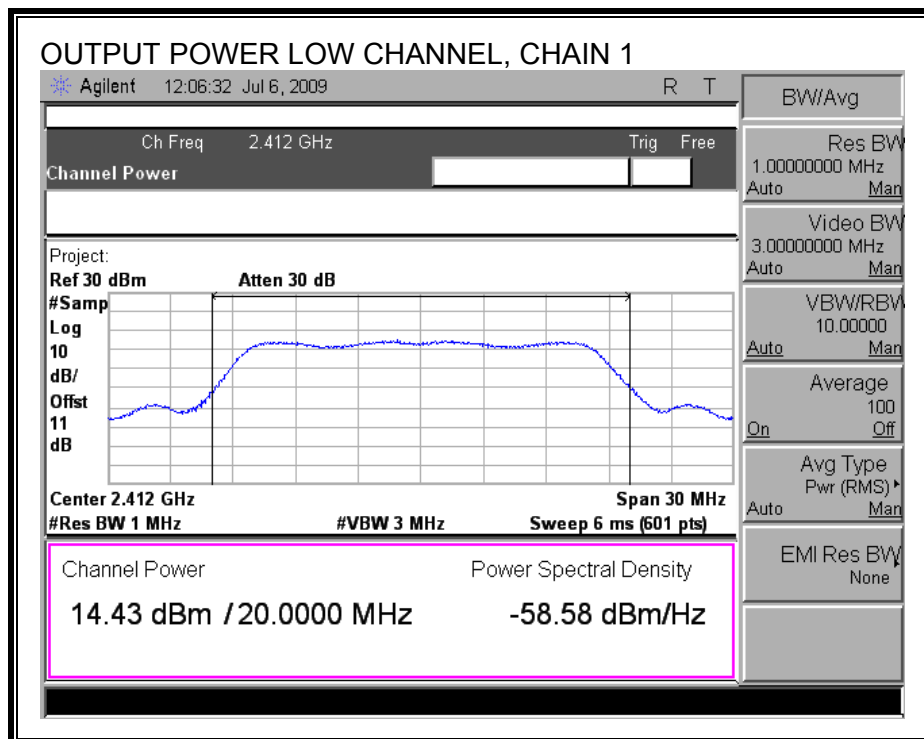
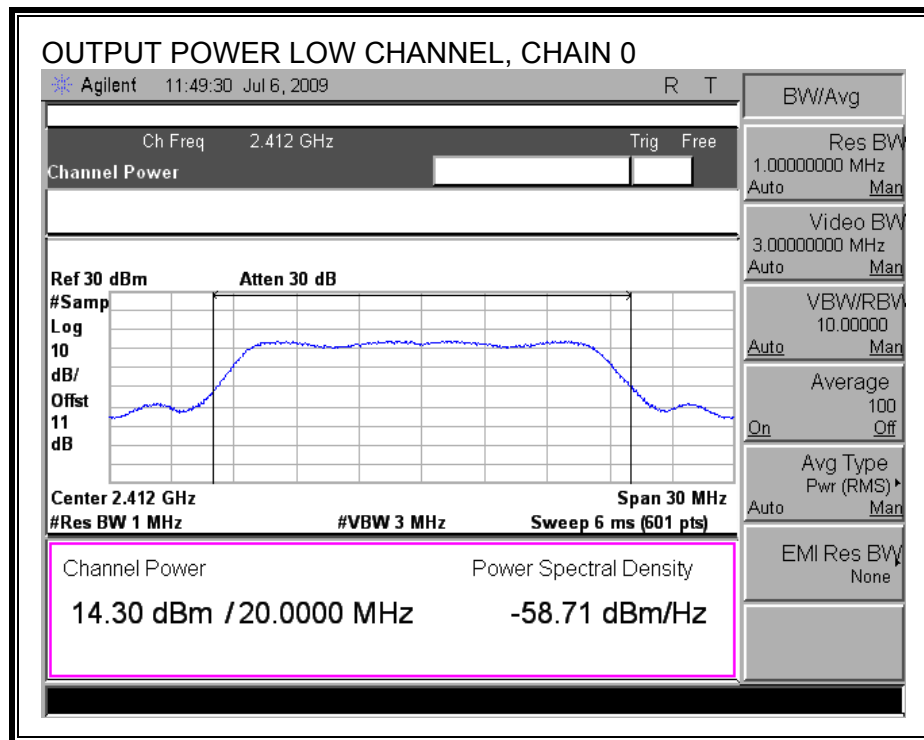
Effective Legacy Mode Composite Gain of 4 Identical Antennas:

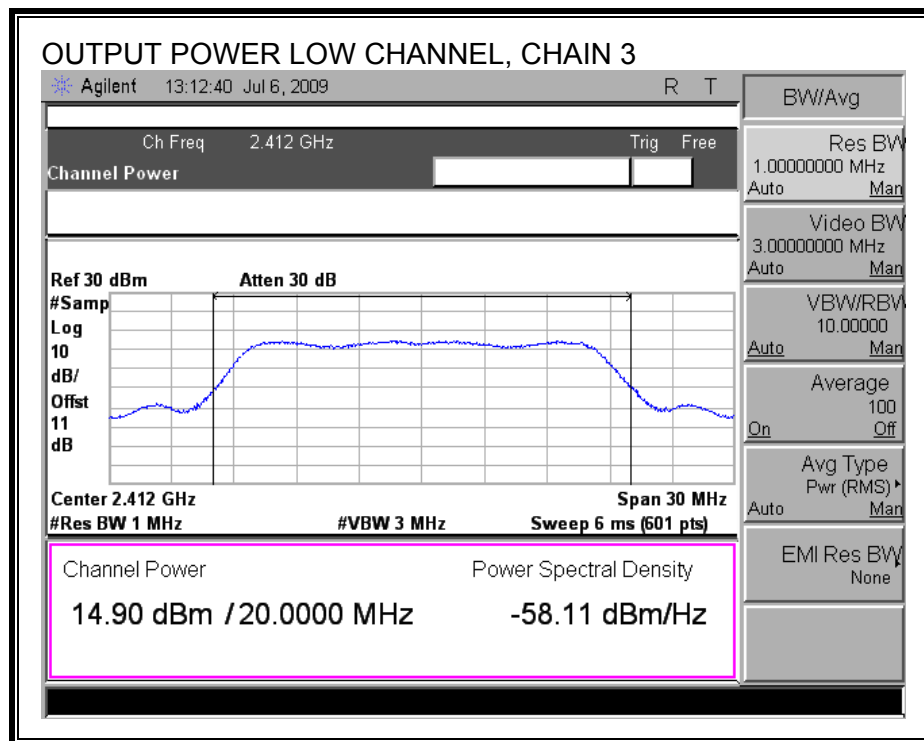
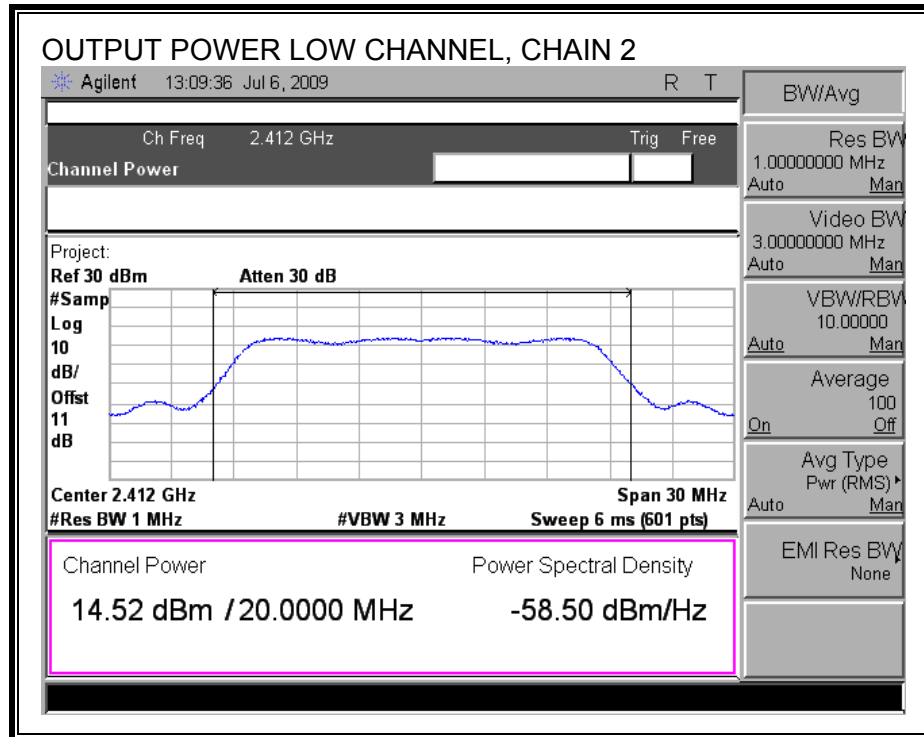
| Antenna Gain (dBi) | 10 Log (# Tx Chains) (dB) | Effective Legacy Gain (dBi) |
|-----------------------|------------------------------|--------------------------------|
| 2 | 6.02 | 8.02 |

The composite antenna gain is 8.02 dBi, therefore the limit is 27.98 dBm.

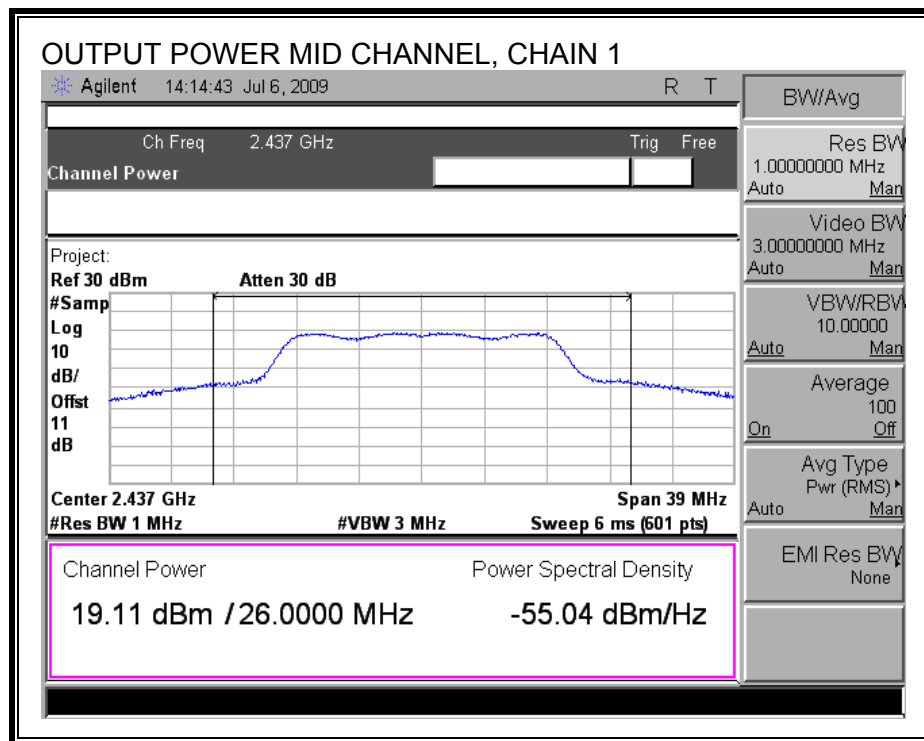
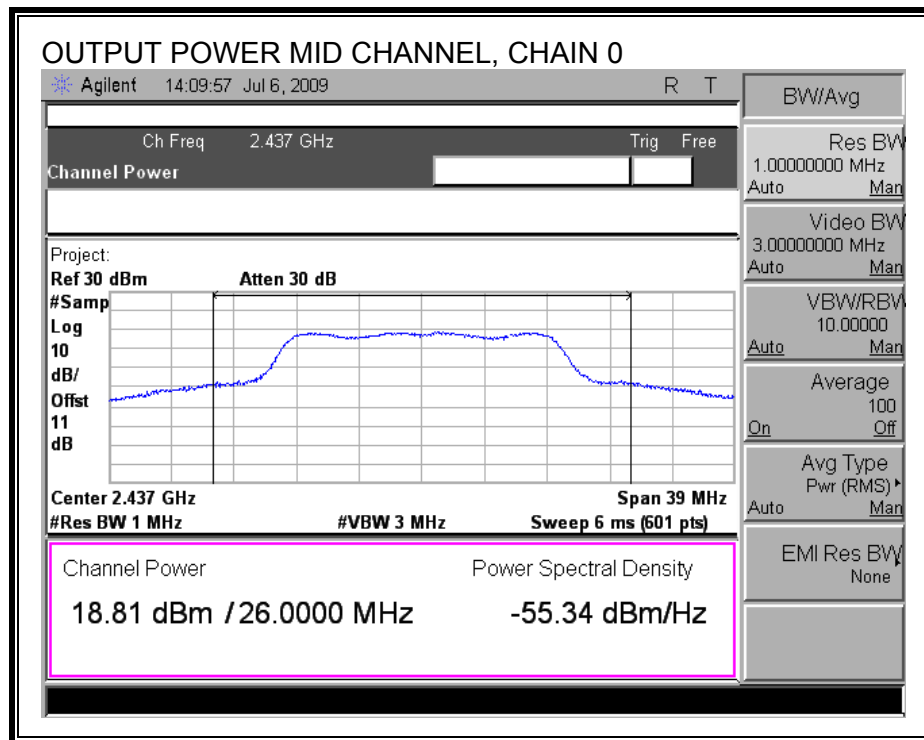
| Channel | Frequency (MHz) | Chain 0 Power (dBm) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Chain 3 Power (dBm) | Total Power (dBm) | Limit (dBm) | Margin (dB) |
|---------|--------------------|---------------------------|---------------------------|---------------------------|---------------------------|-------------------------|----------------|----------------|
| Low | 2412 | 14.3 | 14.43 | 14.52 | 14.9 | 20.56 | 27.98 | -7.42 |
| Mid | 2437 | 18.81 | 19.11 | 18.62 | 19.18 | 24.96 | 27.98 | -3.02 |
| High | 2462 | 13.62 | 13.46 | 13.46 | 14.09 | 19.69 | 27.98 | -8.29 |

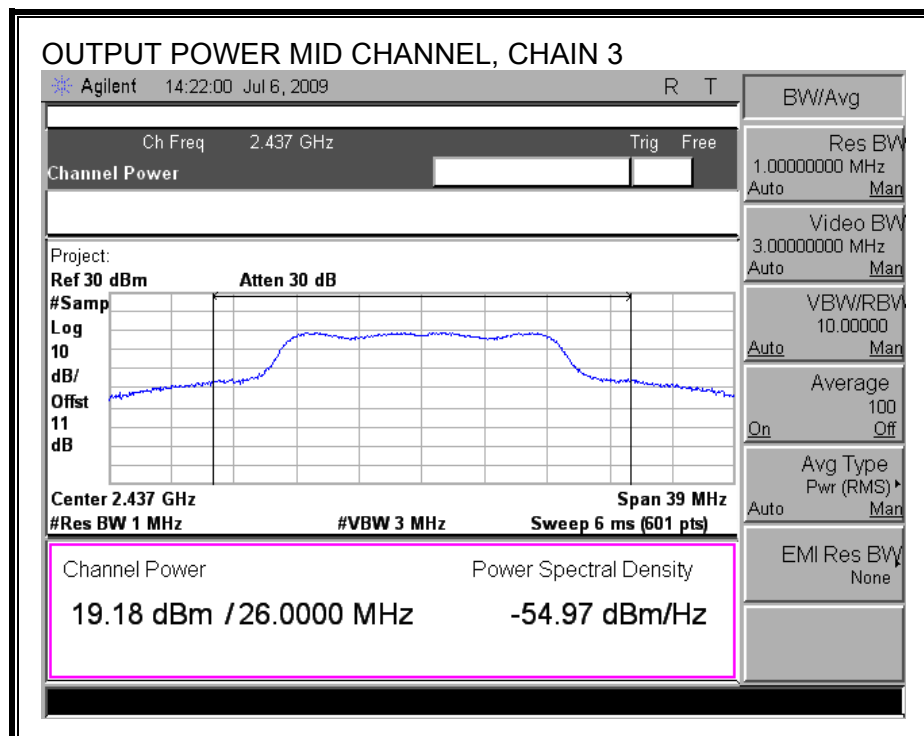
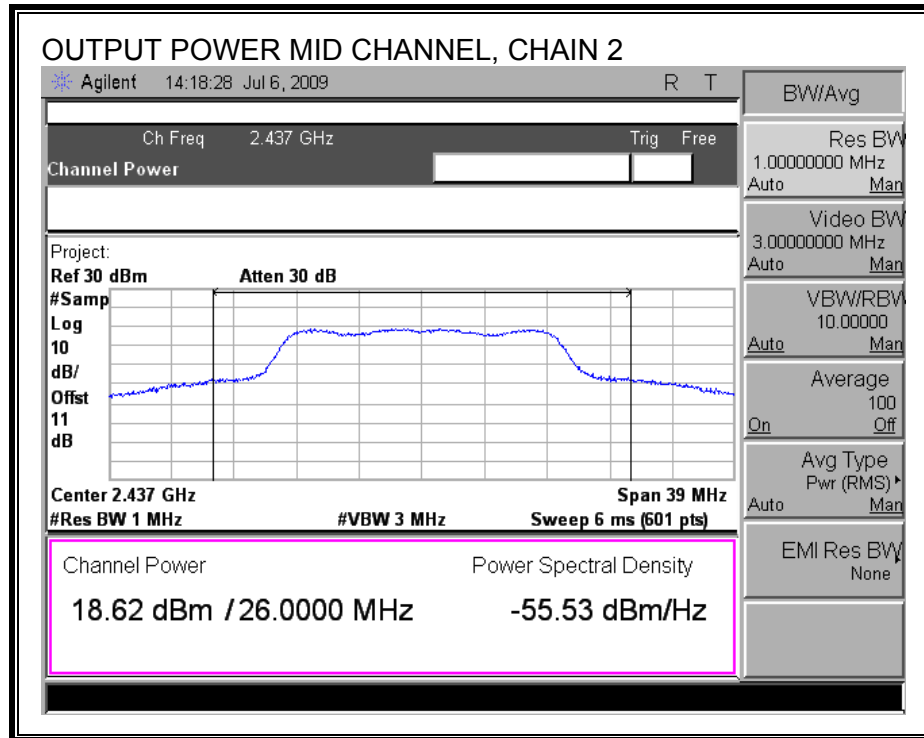
OUTPUT POWER, LOW CHANNEL



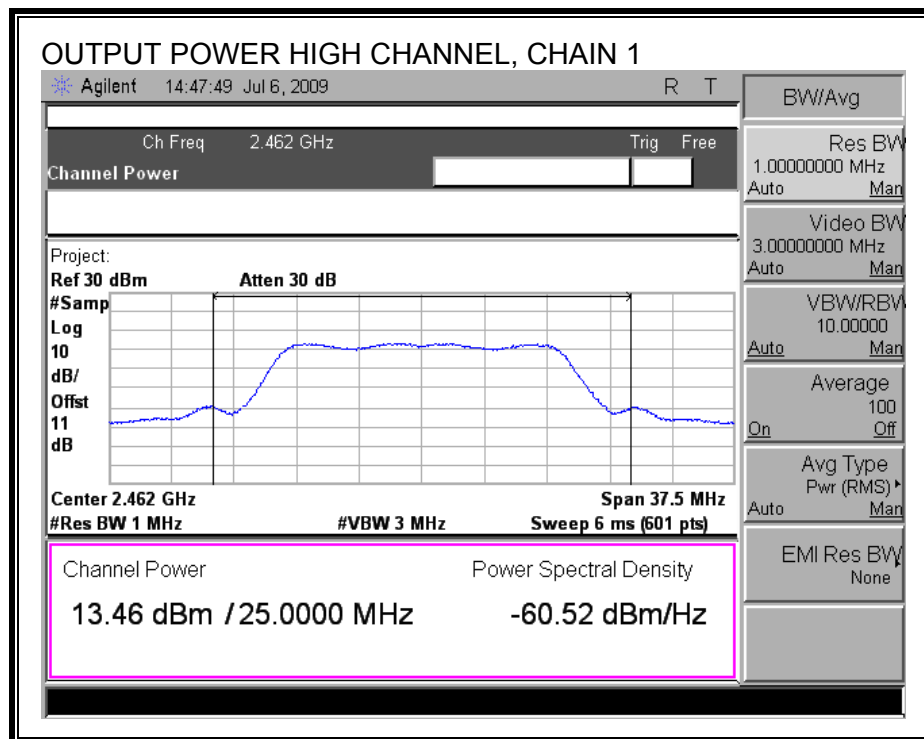
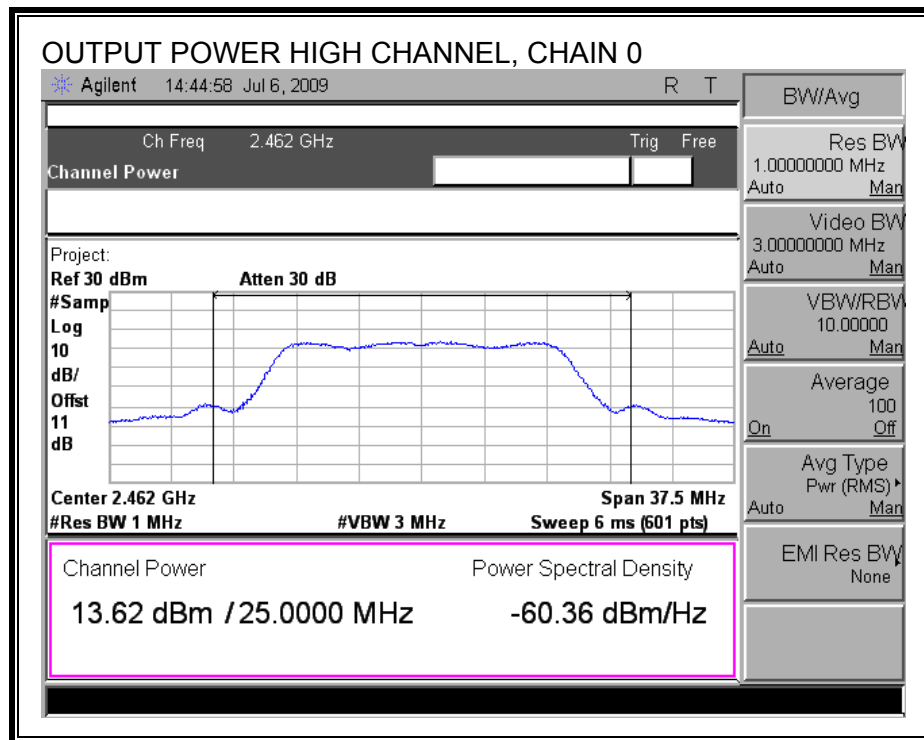


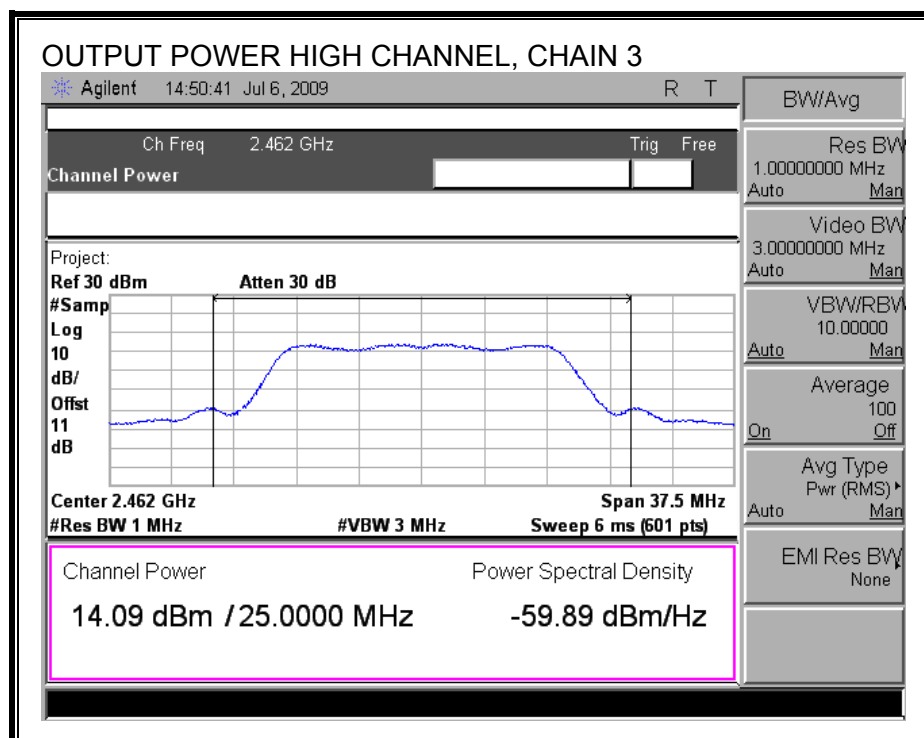
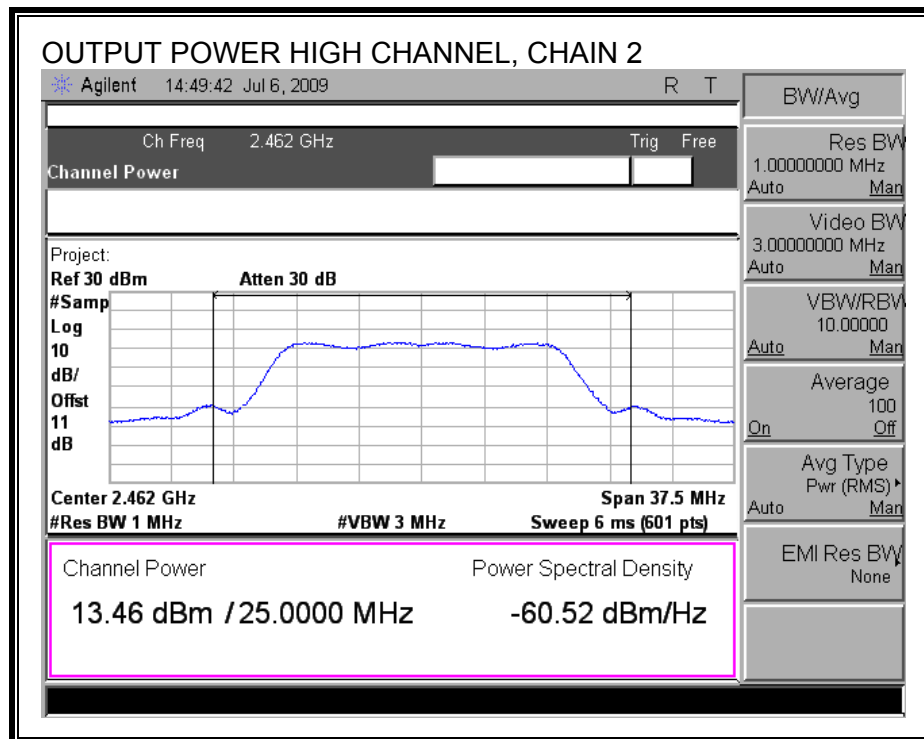
OUTPUT POWER, MID CHANNEL





OUTPUT POWER, HIGH CHANNEL





7.2.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

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

RESULTS

| Channel | Frequency (MHz) | Chain 0 Power (dBm) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Chain 3 Power (dBm) |
|---------|--------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Low | 2412.00 | 14.54 | 14.48 | 14.25 | 14.68 |
| Middle | 2437.00 | 18.92 | 19.26 | 19.07 | 19.01 |
| High | 2462.00 | 13.64 | 13.58 | 13.89 | 14.03 |

7.2.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

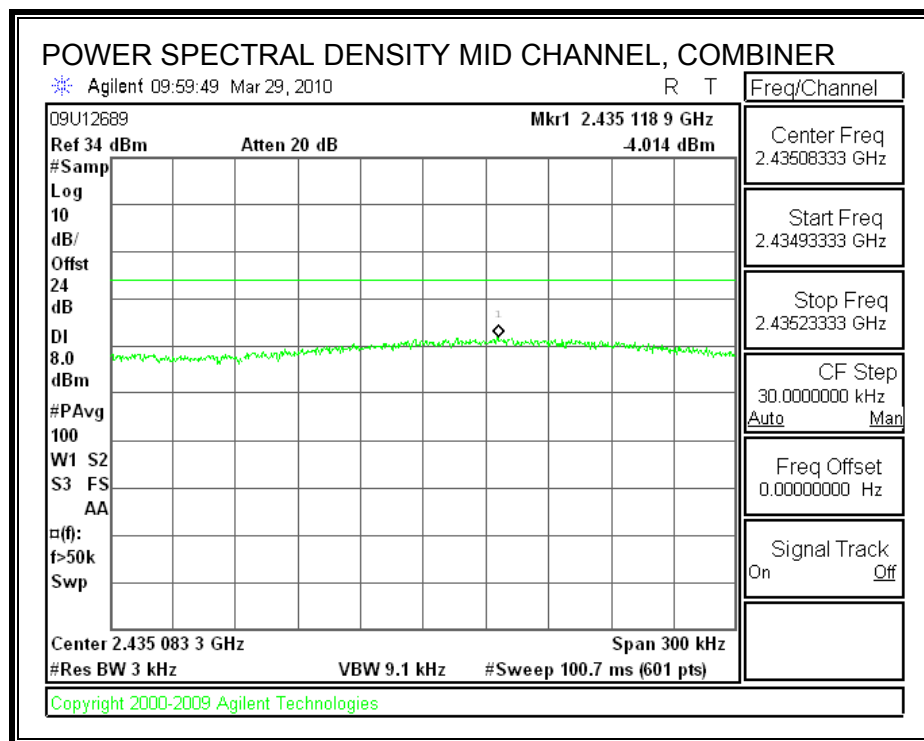
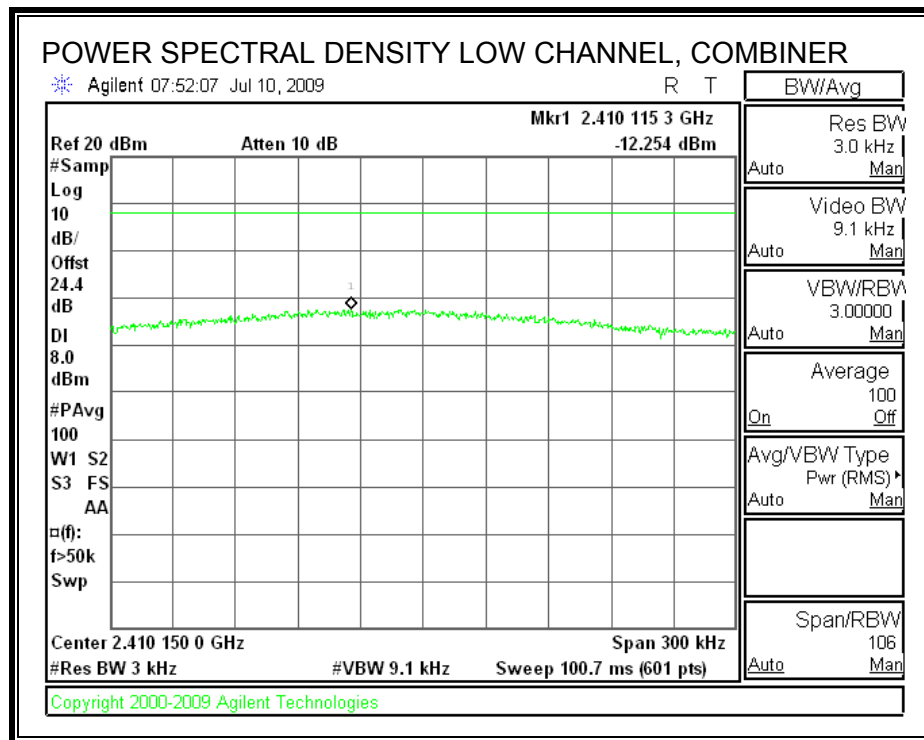
Output power was measured based on the use of RMS averaging over a time interval, therefore the power spectral density was measured using PSD Option 2 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

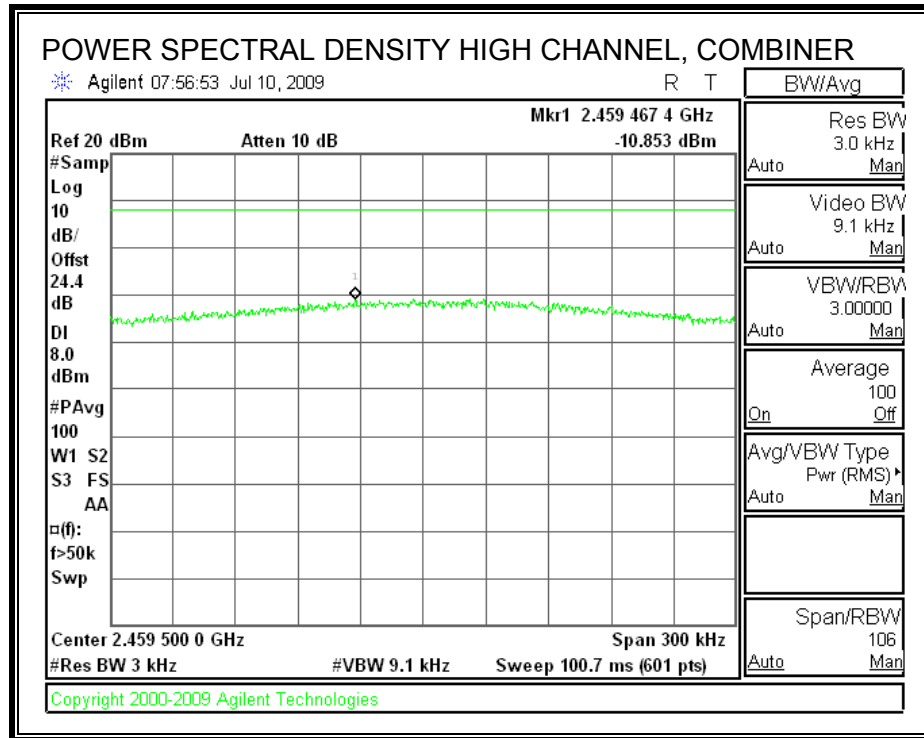
Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

RESULTS

| Channel | Frequency (MHz) | PSD with Combiner (dBm) | Limit (dBm) | Margin (dB) |
|---------|--------------------|----------------------------|----------------|----------------|
| Low | 2412 | -12.25 | 8 | -20.25 |
| Middle | 2437 | -4.01 | 8 | -12.01 |
| High | 2462 | -10.85 | 8 | -18.85 |

POWER SPECTRAL DENSITY





7.2.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dBc.

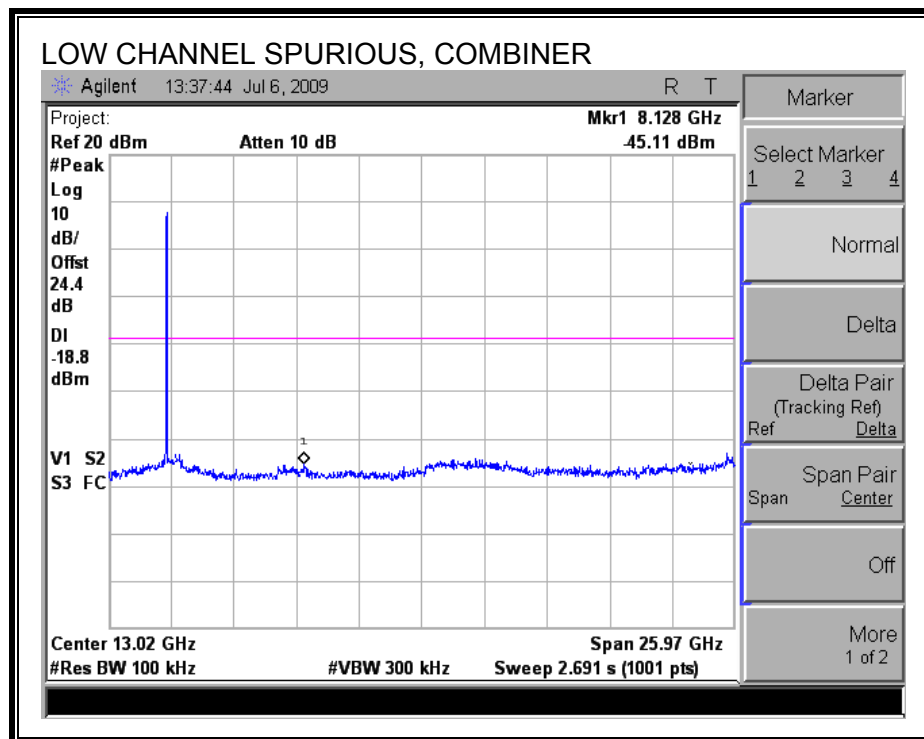
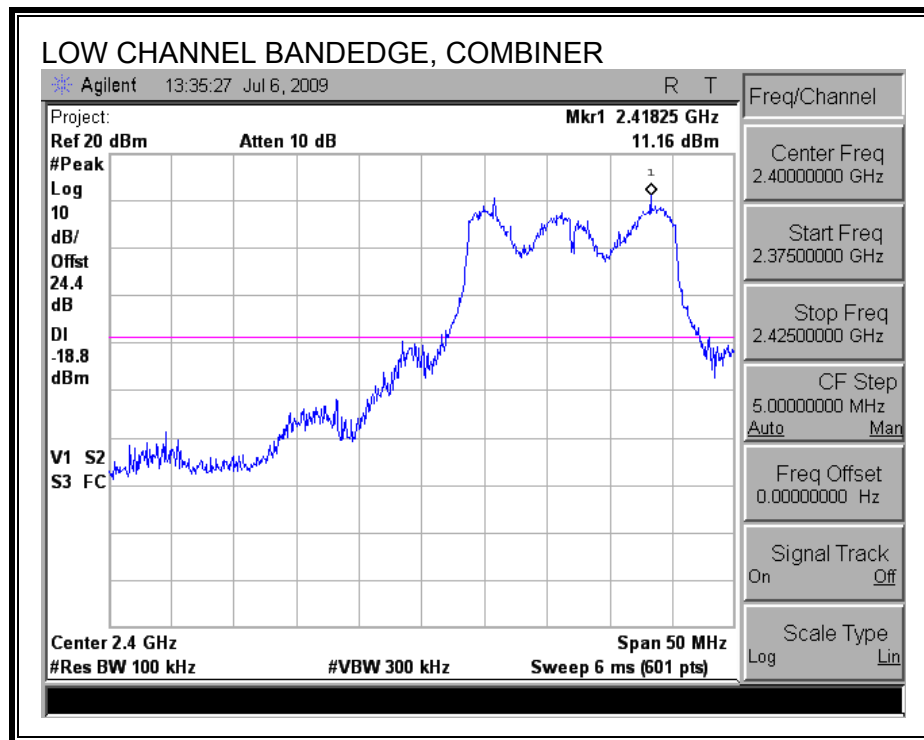
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

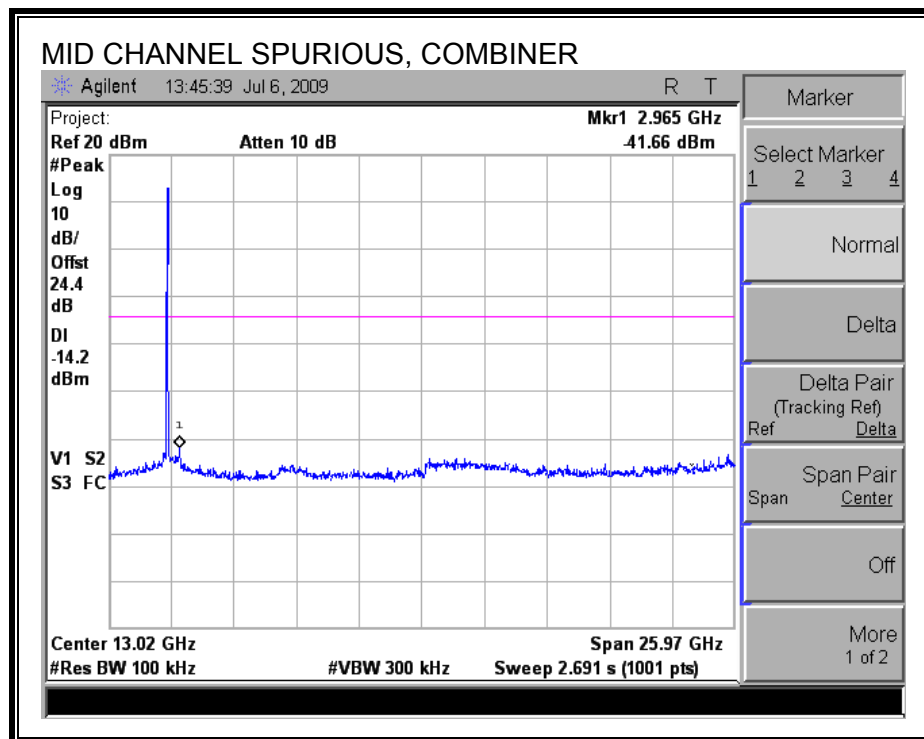
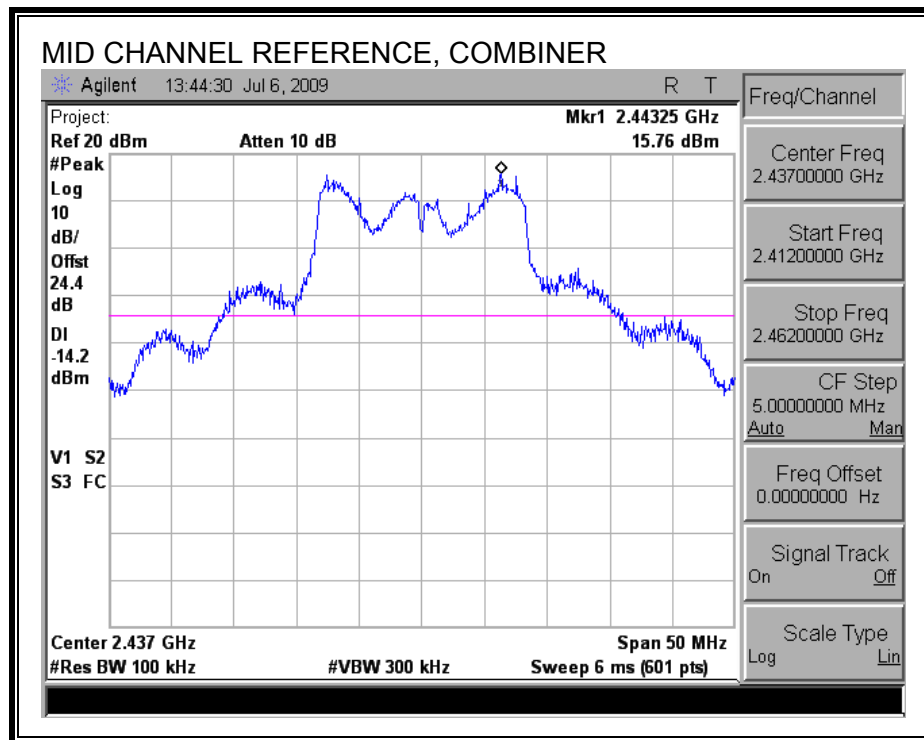
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

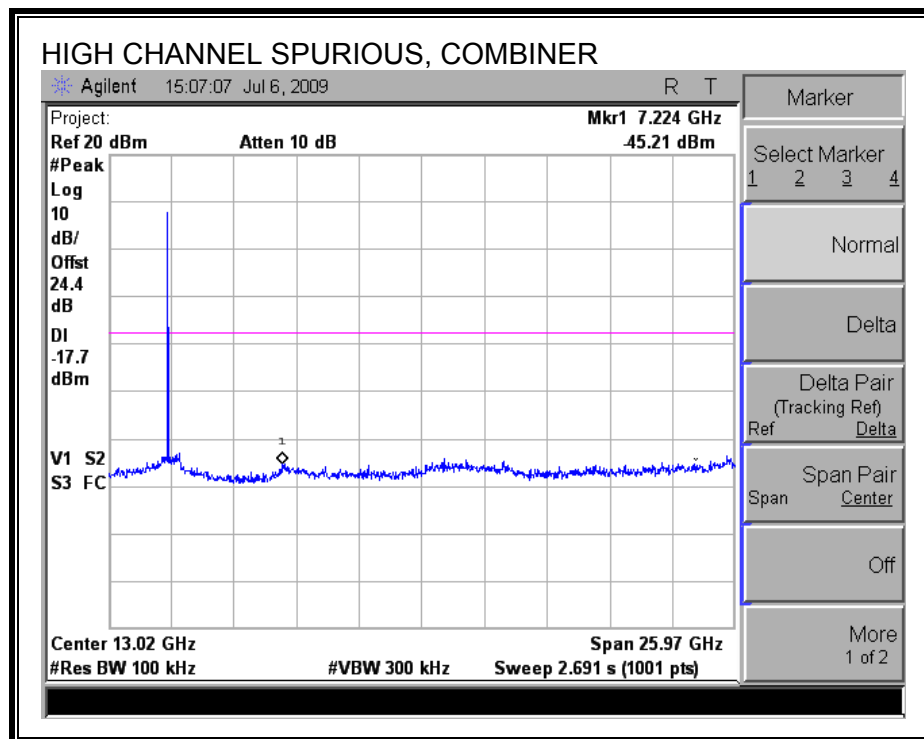
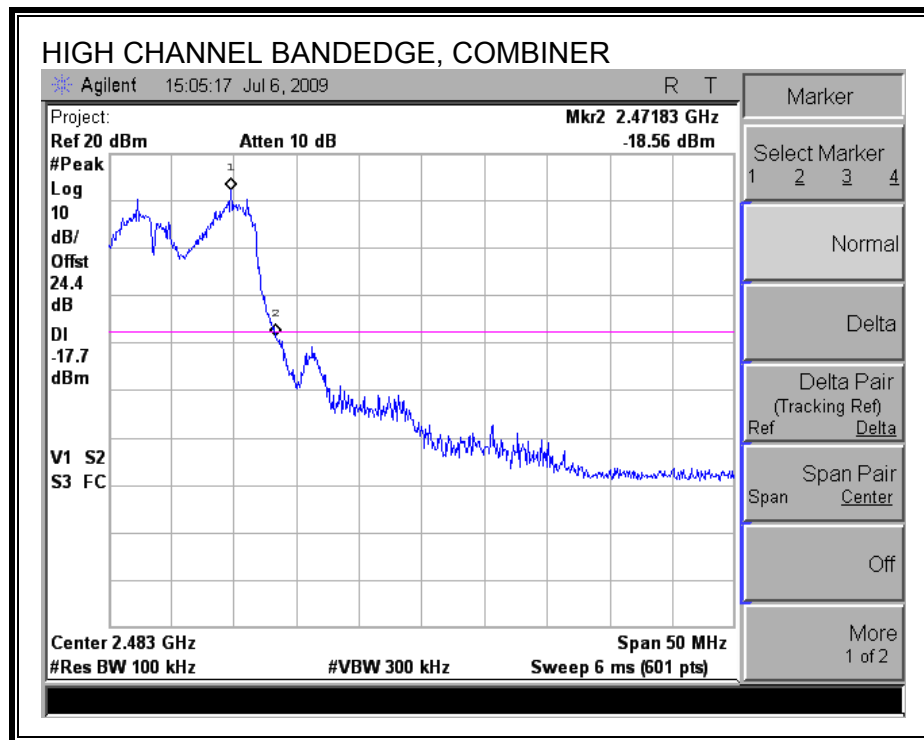
LOW CHANNEL SPURIOUS EMISSIONS



MID CHANNEL SPURIOUS EMISSIONS



HIGH CHANNEL SPURIOUS EMISSIONS



7.3. 2.4 GHz BAND CHANNEL TESTS FOR 802.11n HT20 MODE

7.3.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

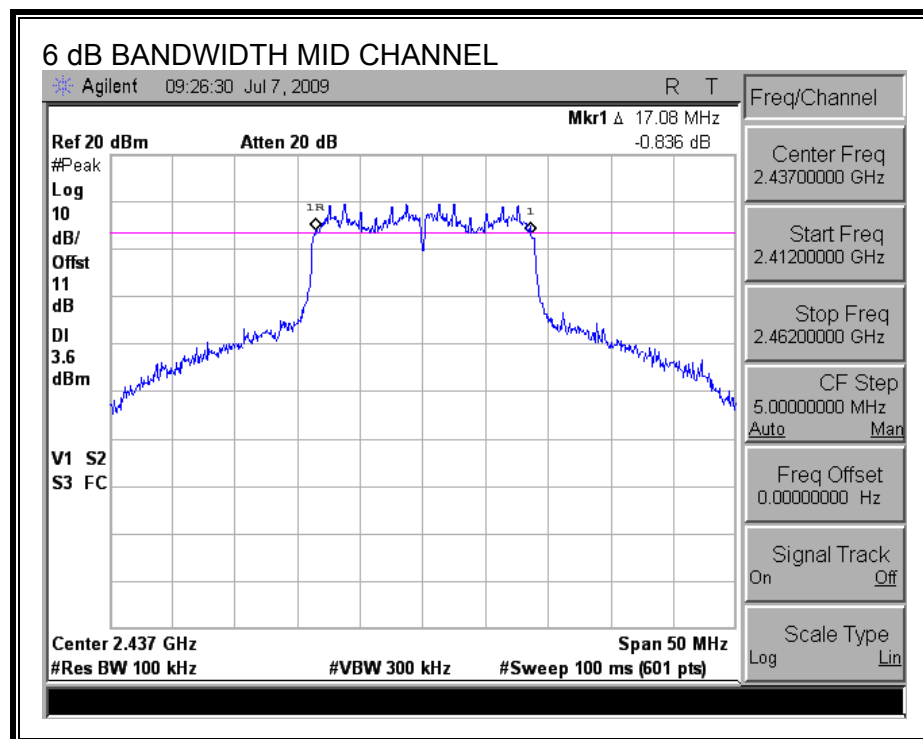
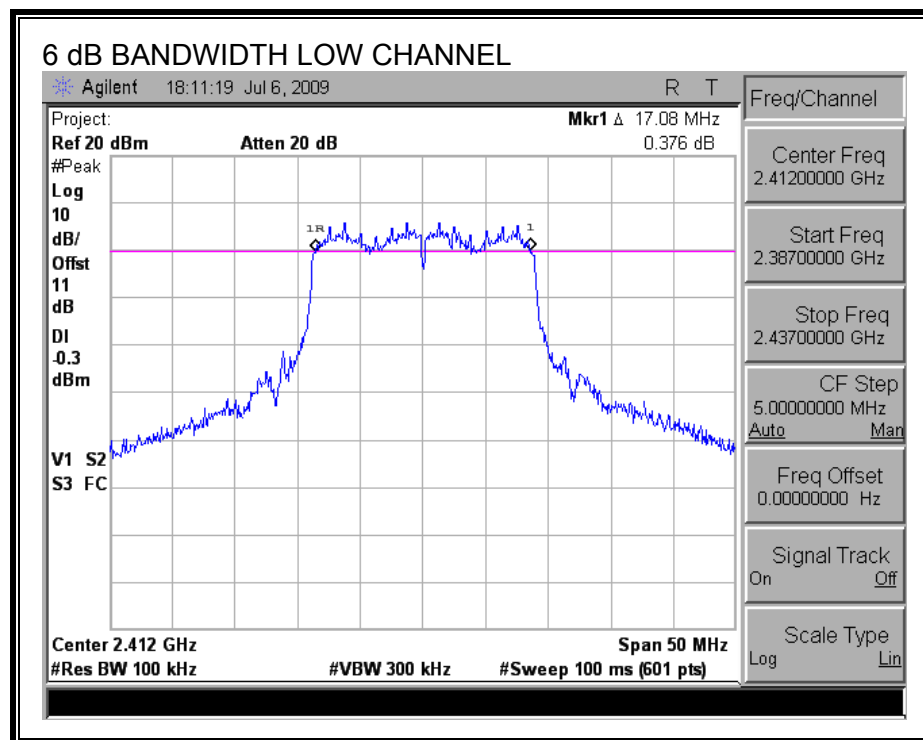
The minimum 6 dB bandwidth shall be at least 500 kHz.

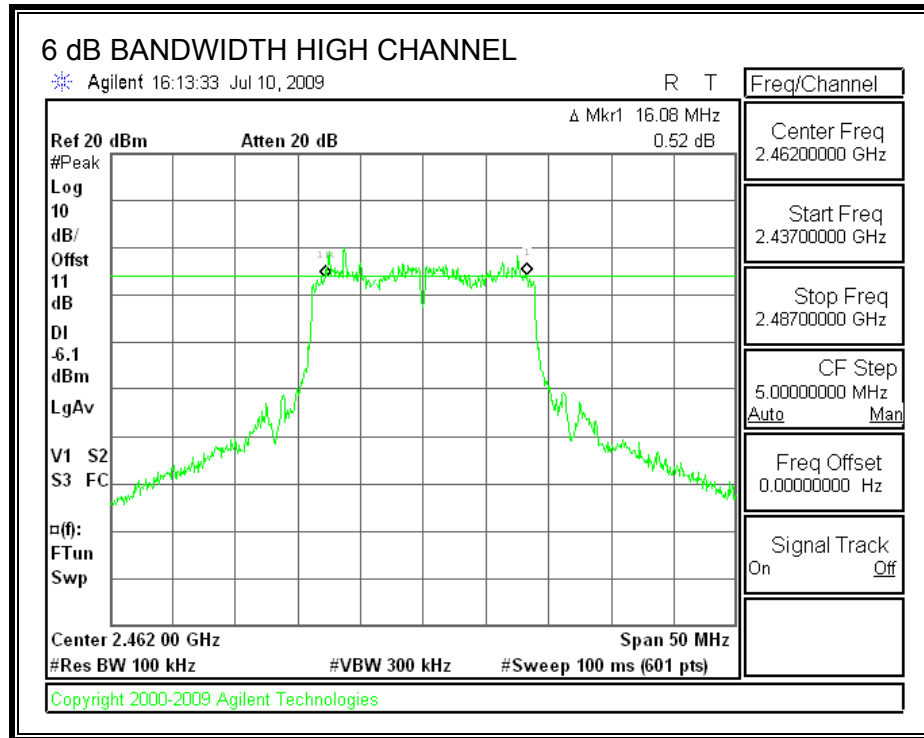
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

| Channel | Frequency (MHz) | 6 dB BW (MHz) | Minimum Limit (MHz) |
|---------|--------------------|------------------|------------------------|
| Low | 2412 | 17.08 | 0.5 |
| Middle | 2437 | 17.08 | 0.5 |
| High | 2462 | 16.08 | 0.5 |





7.3.2. 99% & 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

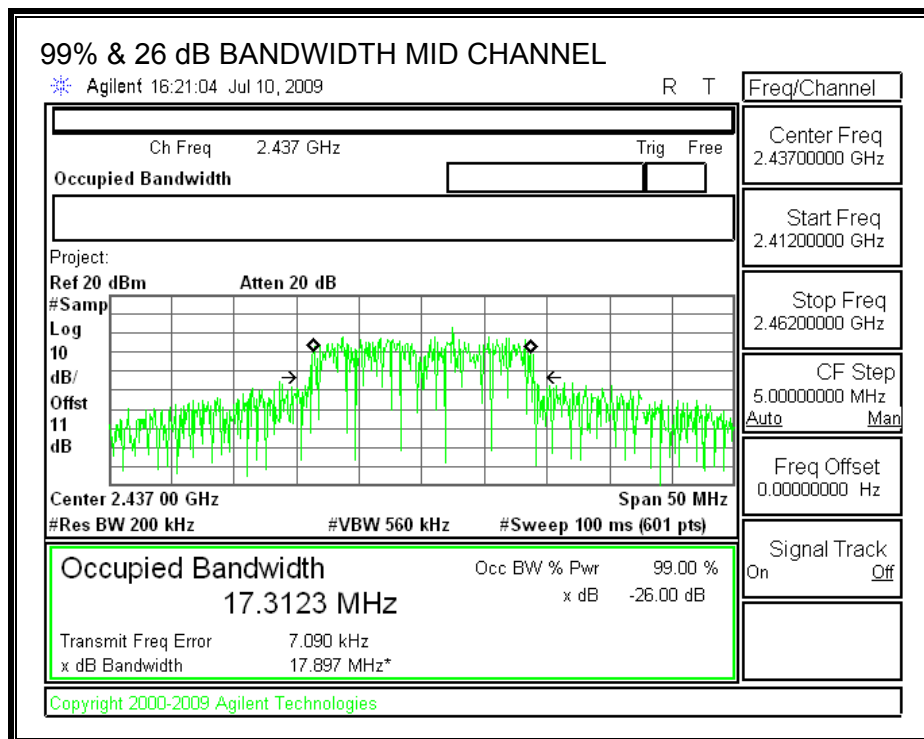
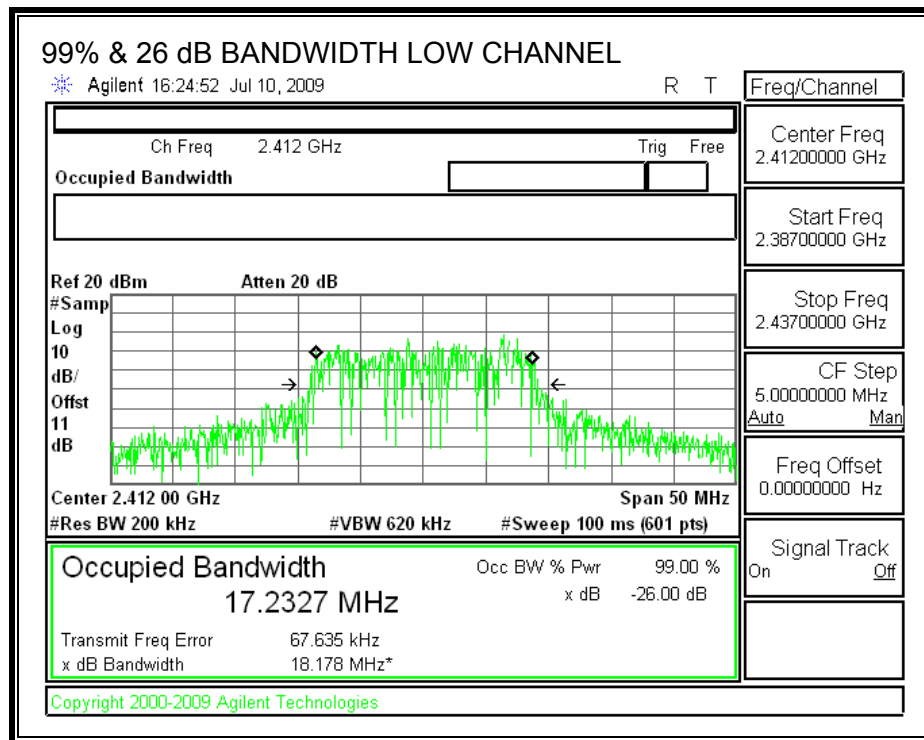
TEST PROCEDURE

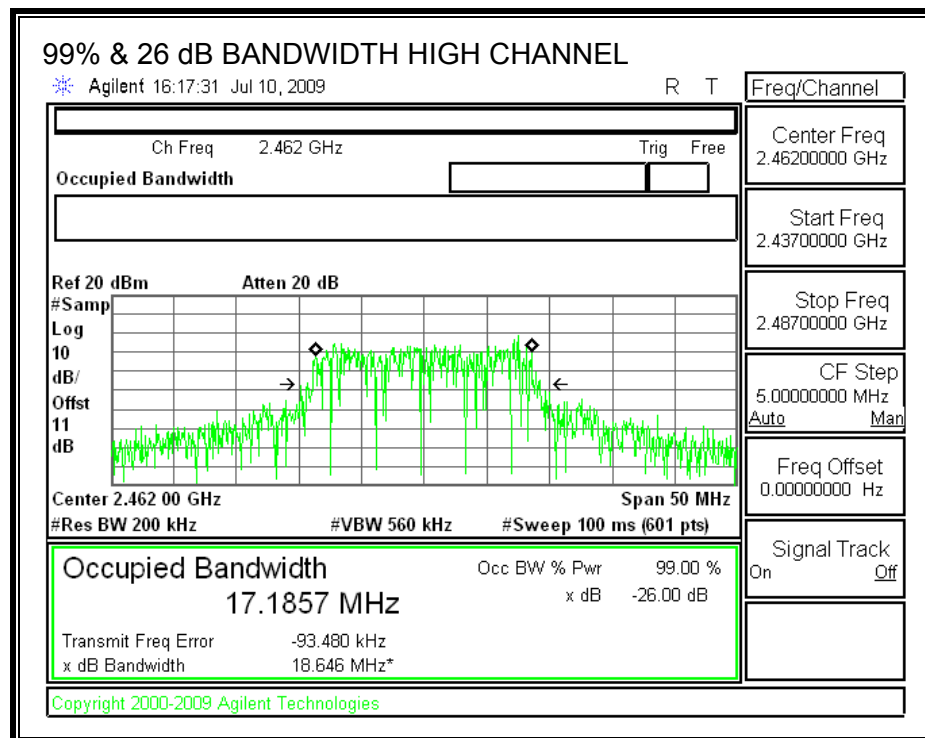
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth measurement function is utilized.

RESULTS

| Channel | Frequency (MHz) | 99% OBW (MHz) | 26 dB BW (MHz) |
|---------|--------------------|------------------|-------------------|
| Low | 2412 | 17.23 | 18.18 |
| Middle | 2437 | 17.31 | 17.90 |
| High | 2462 | 17.19 | 18.65 |

99% & 26 dB BANDWIDTH





7.3.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

TEST PROCEDURE

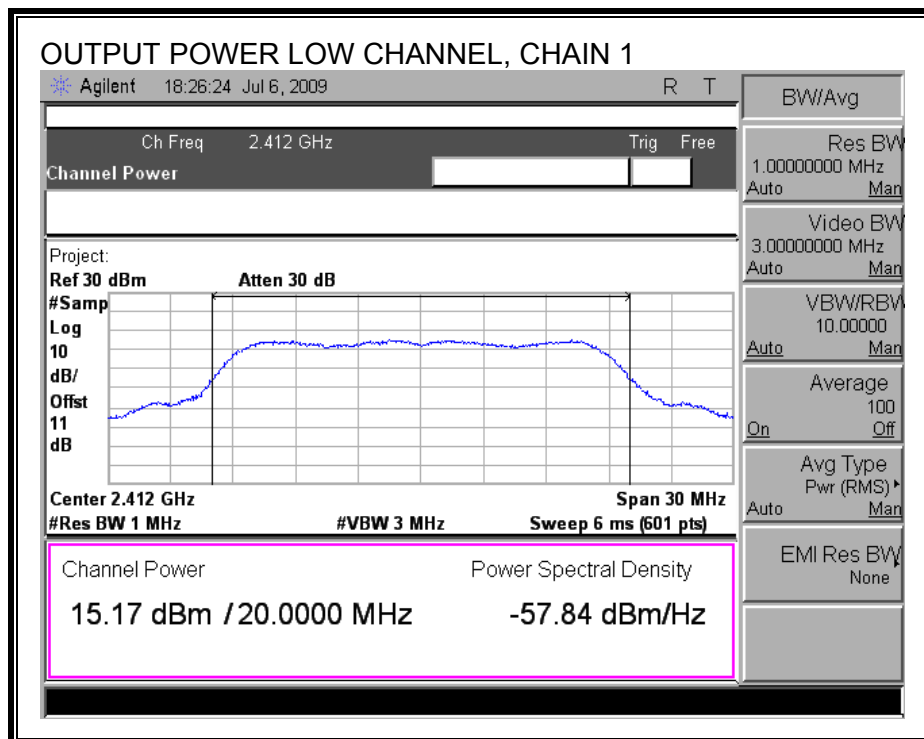
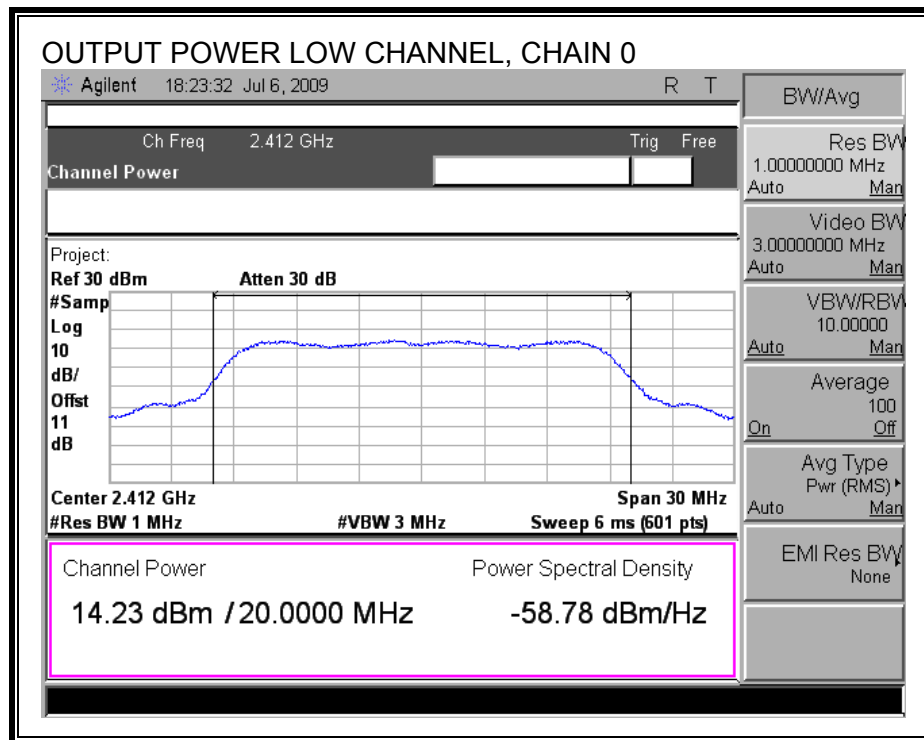
Output power was measured based on the use of RMS averaging over a time interval in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

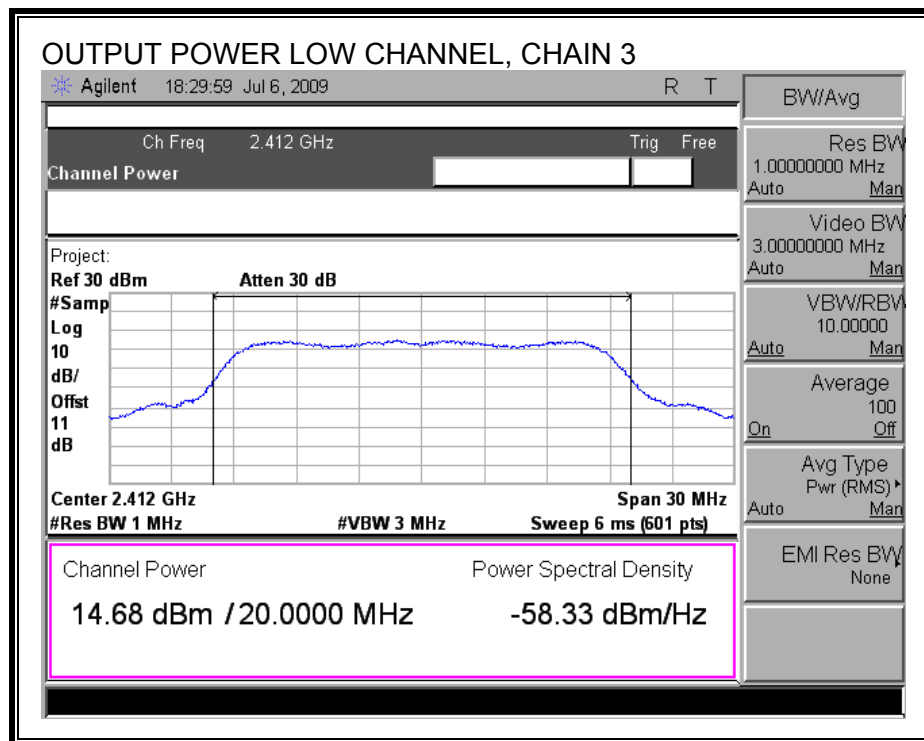
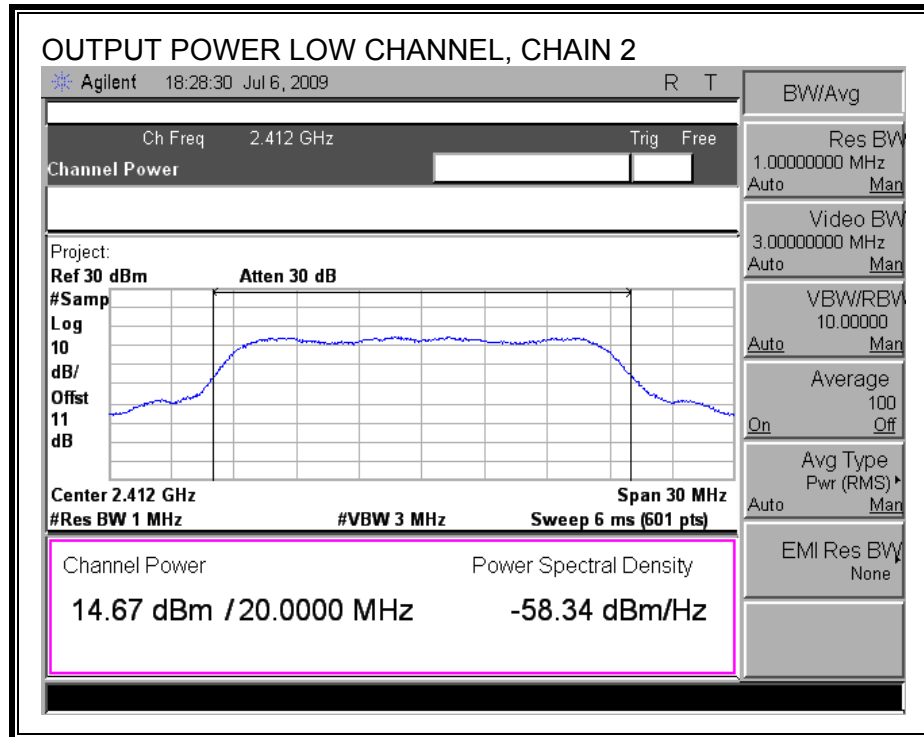
RESULTS

The antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

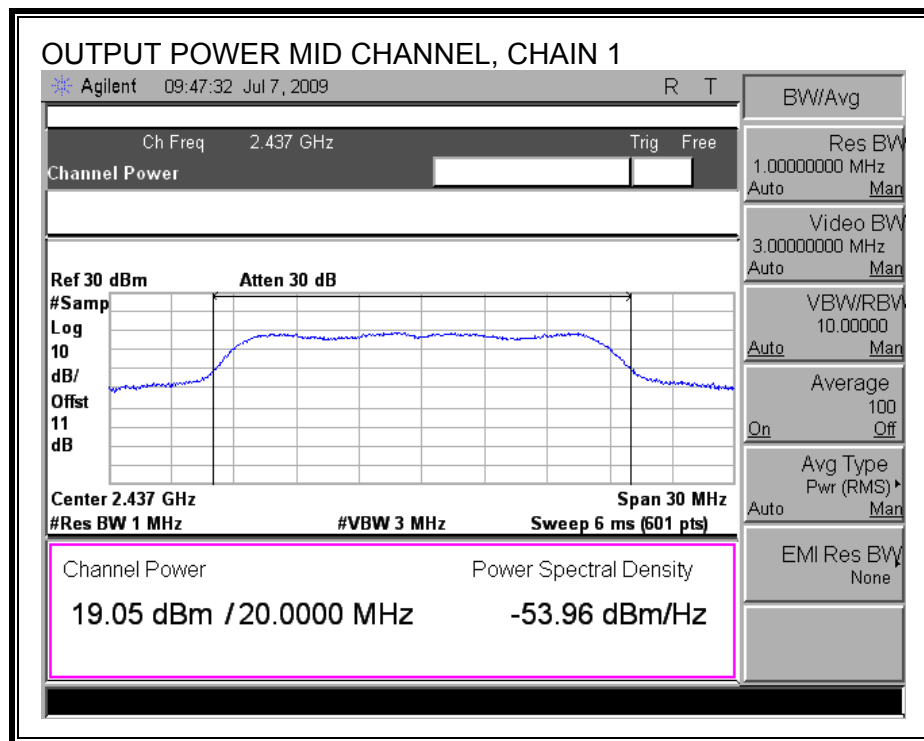
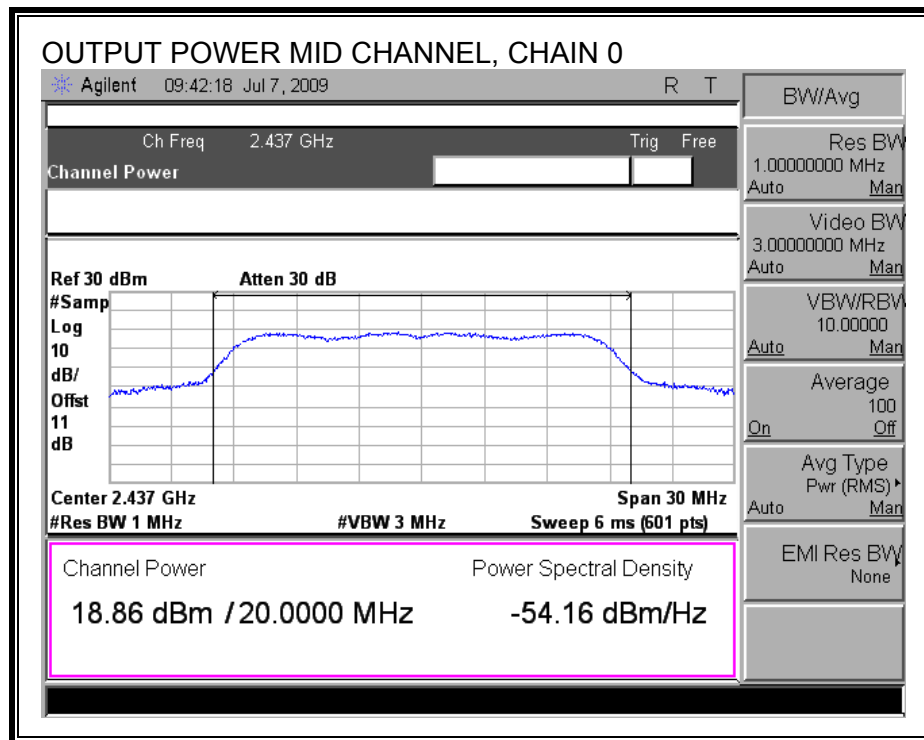
| Channel | Frequency (MHz) | Chain 0 Power (dBm) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Chain 3 Power (dBm) | Total Power (dBm) | Limit (dBm) | Margin (dB) |
|---------|--------------------|---------------------------|---------------------------|---------------------------|---------------------------|-------------------------|----------------|----------------|
| Low | 2412 | 14.23 | 15.17 | 14.67 | 14.68 | 20.72 | 30 | -9.28 |
| Mid | 2437 | 18.86 | 19.05 | 19.00 | 18.97 | 24.99 | 30 | -5.01 |
| High | 2462 | 14.45 | 14.53 | 14.37 | 14.48 | 20.48 | 30 | -9.52 |

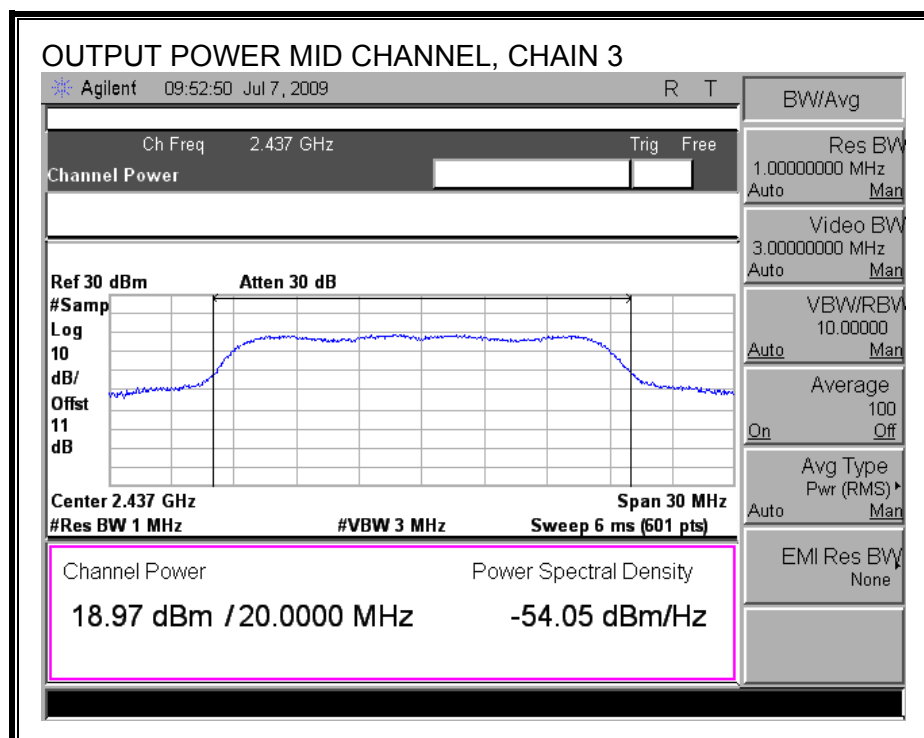
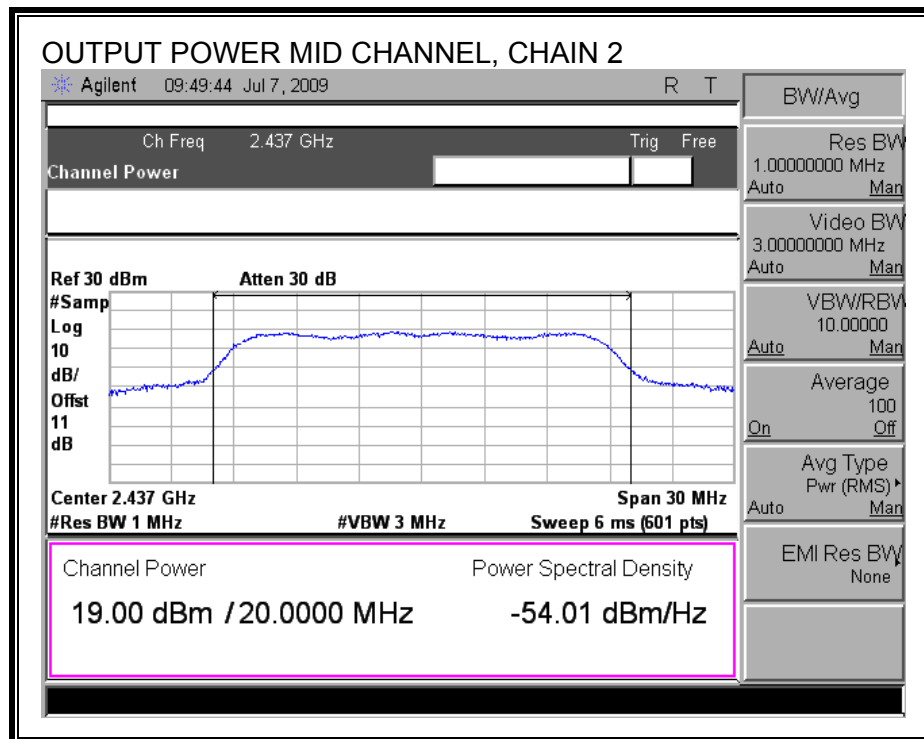
OUTPUT POWER, LOW CHANNEL



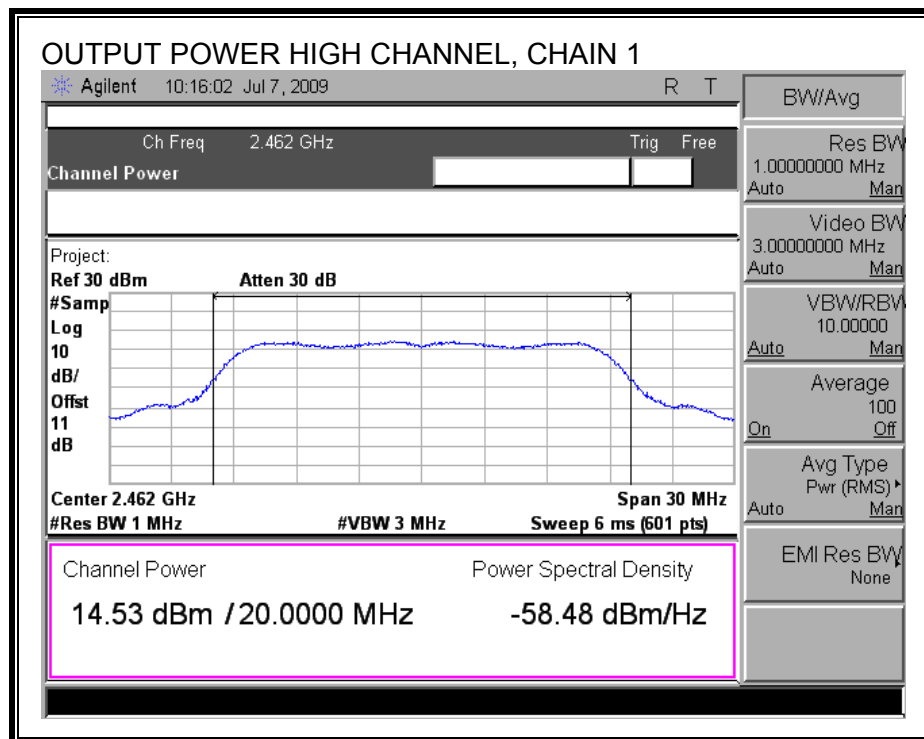
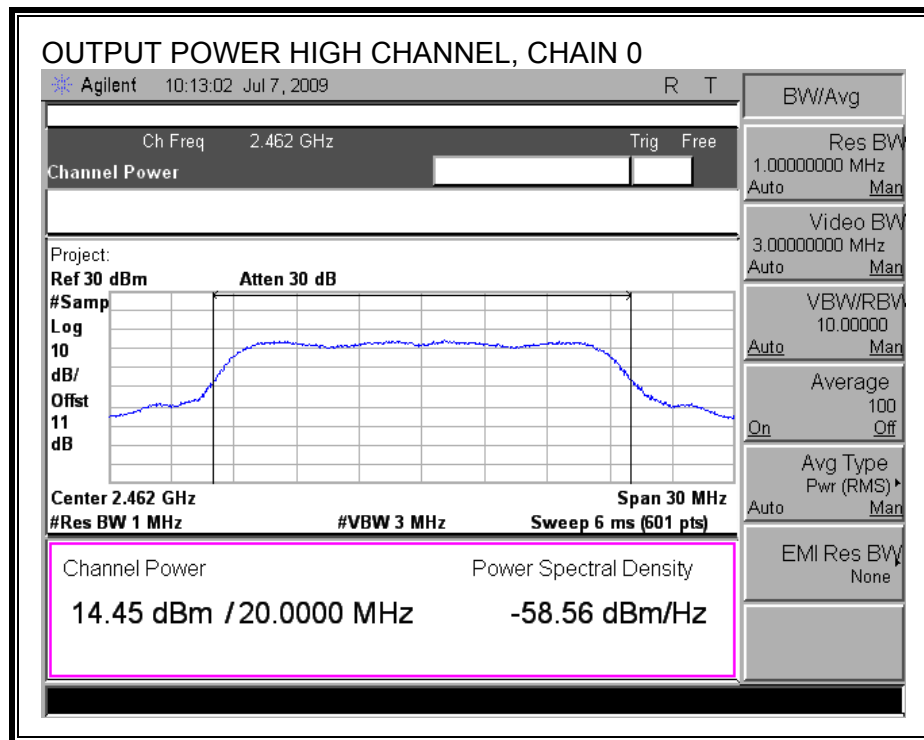


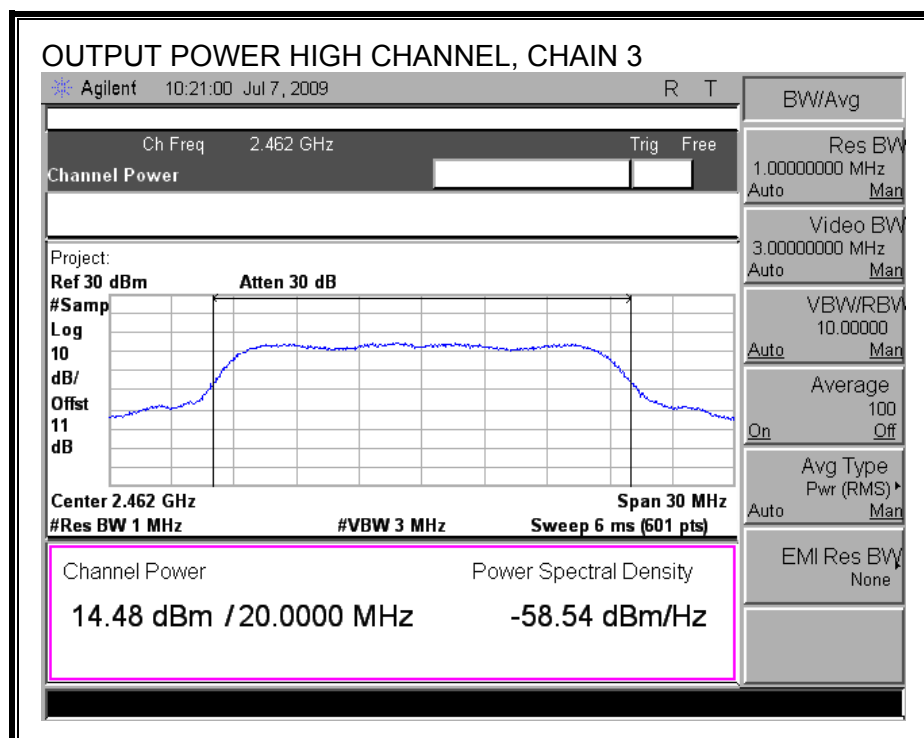
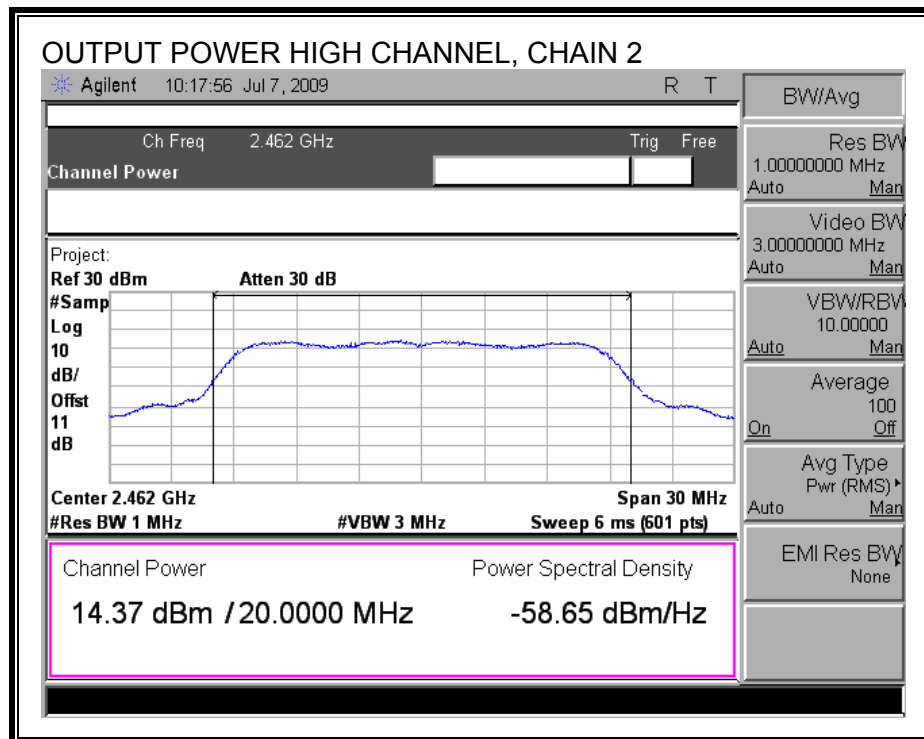
OUTPUT POWER, MID CHANNEL





OUTPUT POWER, HIGH CHANNEL





7.3.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

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

RESULTS

| Channel | Frequency (MHz) | Chain 0 Power (dBm) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Chain 3 Power (dBm) |
|---------|--------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Low | 2412.00 | 14.94 | 15.12 | 15.05 | 15.07 |
| Middle | 2437.00 | 18.98 | 19.17 | 19.01 | 19.10 |
| High | 2462.00 | 14.58 | 14.60 | 14.53 | 14.57 |

7.3.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

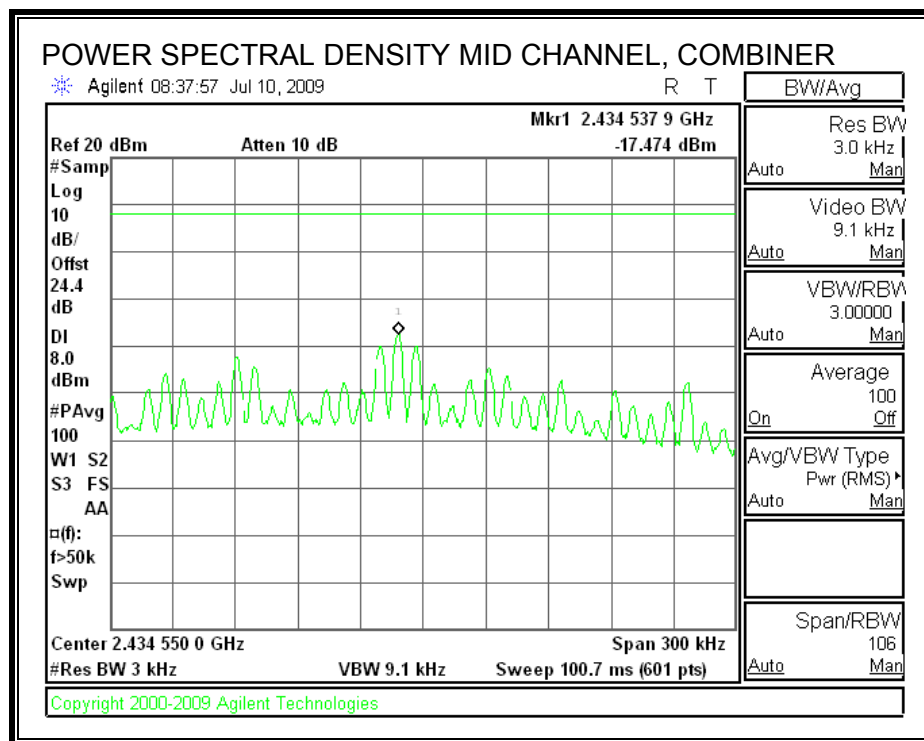
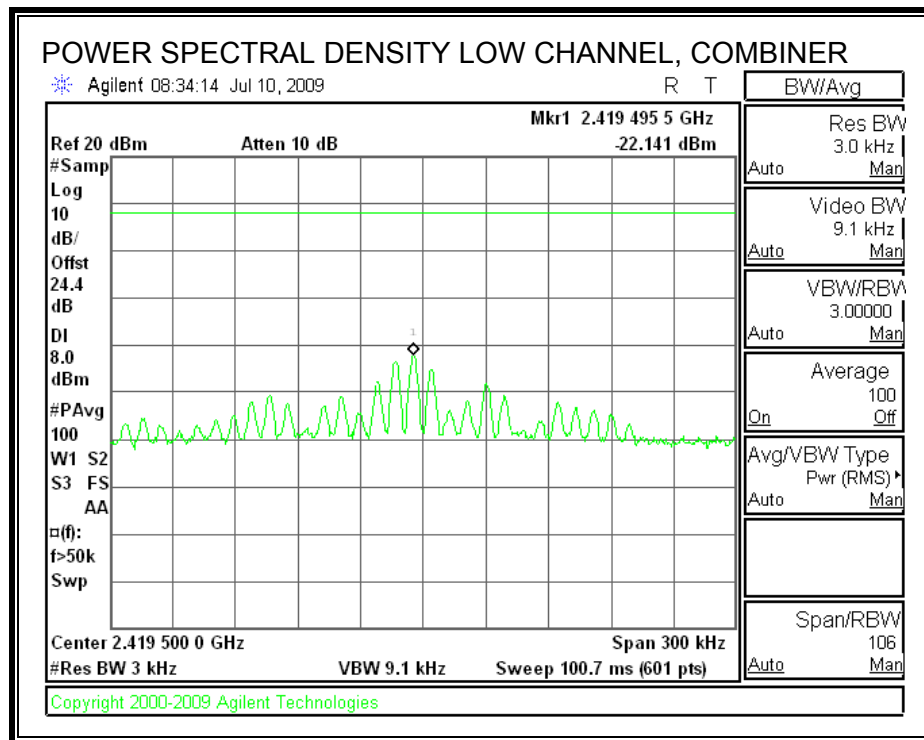
Output power was measured based on the use of RMS averaging over a time interval, therefore the power spectral density was measured using PSD Option 2 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

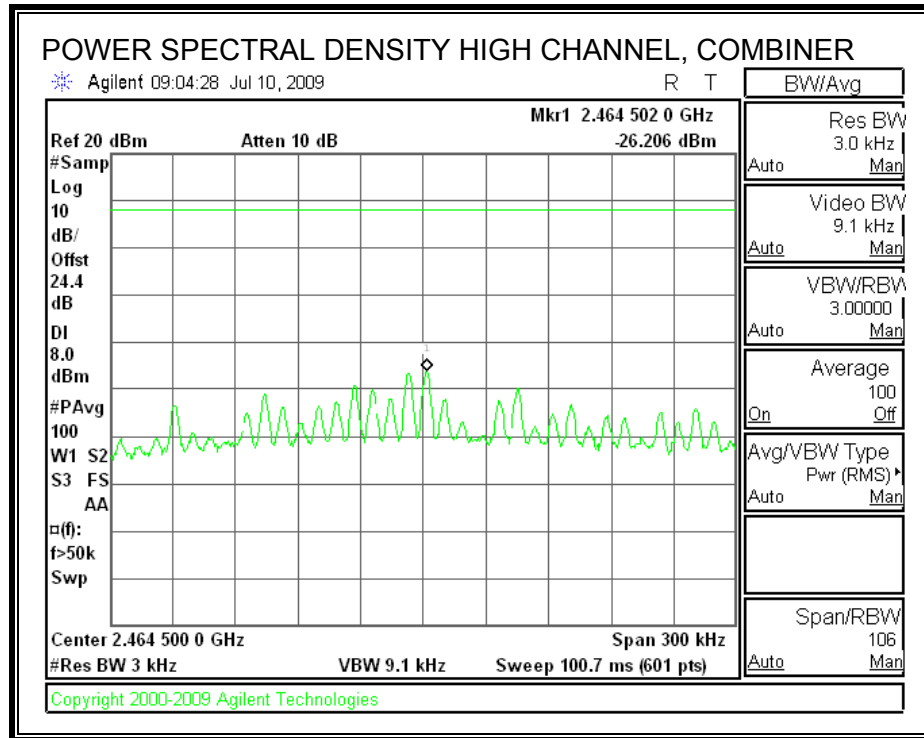
Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

RESULTS

| Channel | Frequency (MHz) | PSD with Combiner (dBm) | Limit (dBm) | Margin (dB) |
|---------|--------------------|----------------------------|----------------|----------------|
| Low | 2412 | -22.14 | 8 | -30.14 |
| Middle | 2437 | -17.47 | 8 | -25.47 |
| High | 2462 | -26.21 | 8 | -34.21 |

POWER SPECTRAL DENSITY





7.3.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dBc.

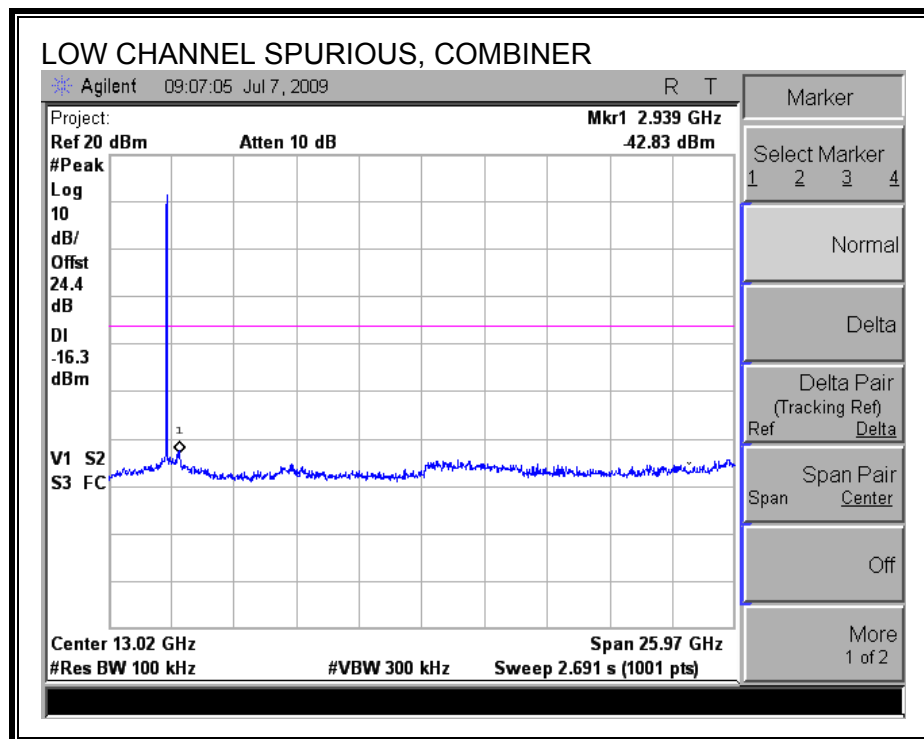
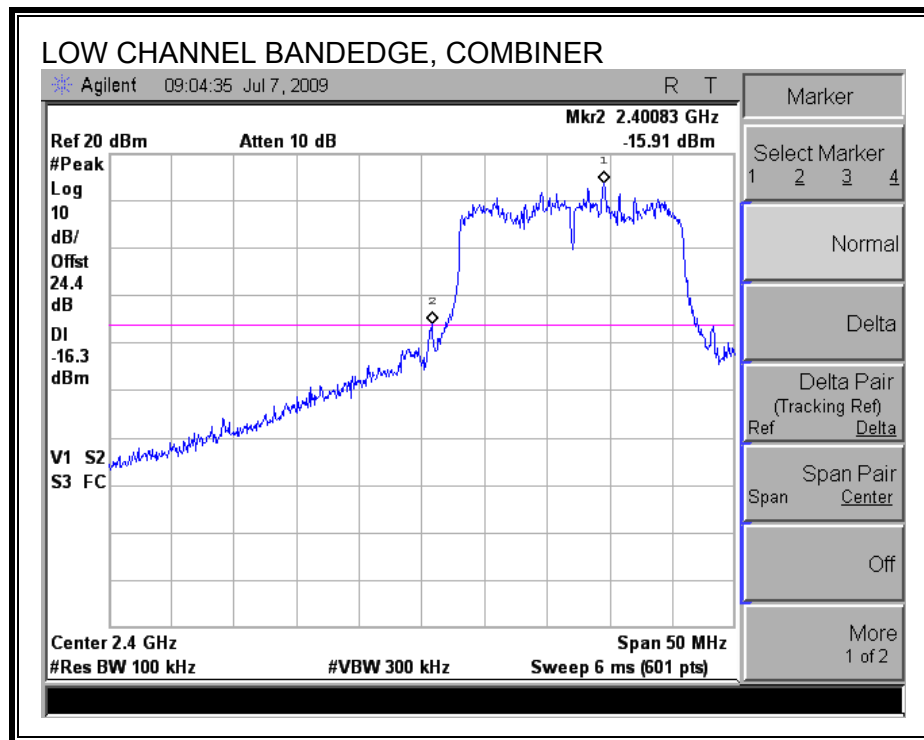
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

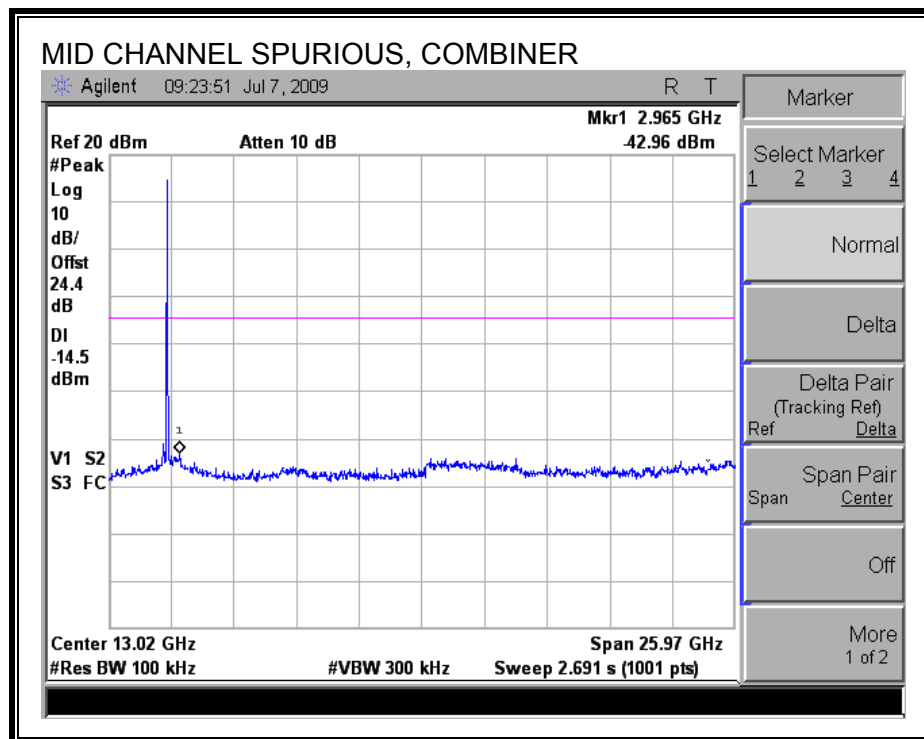
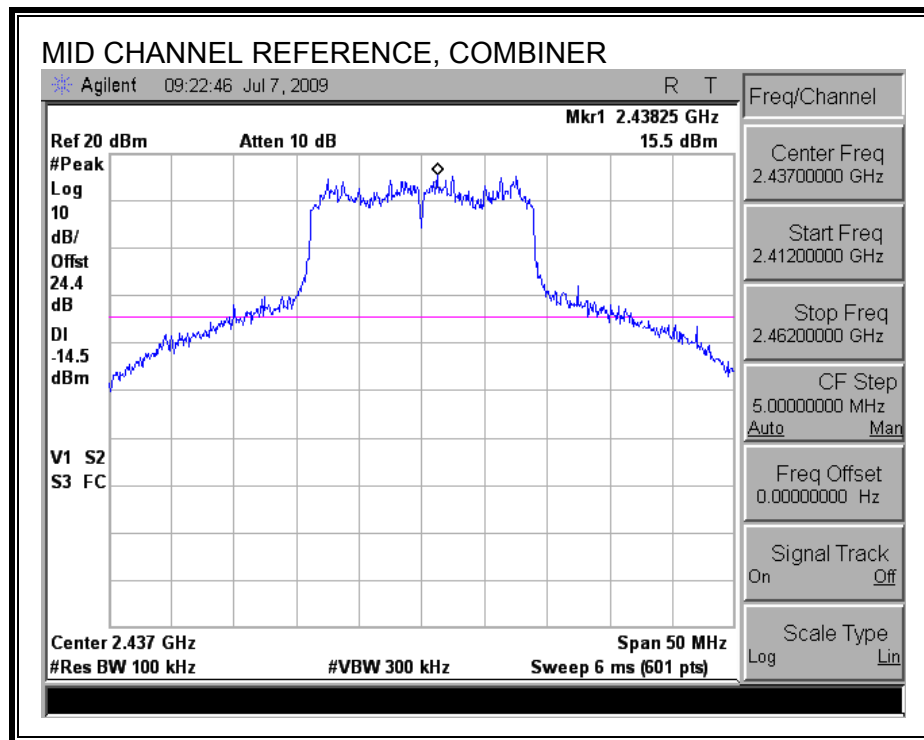
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

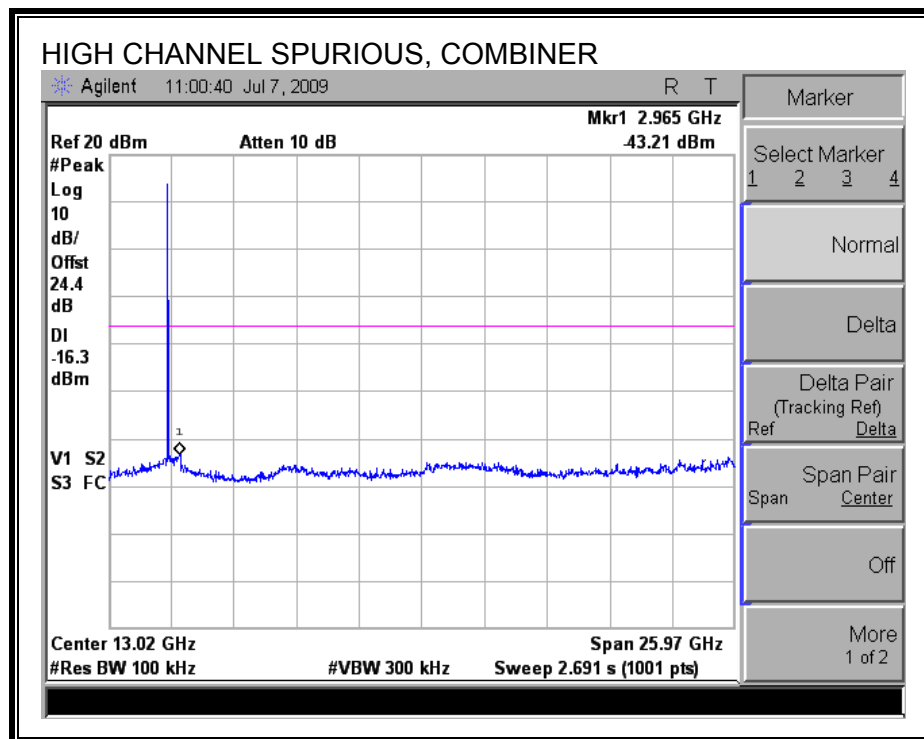
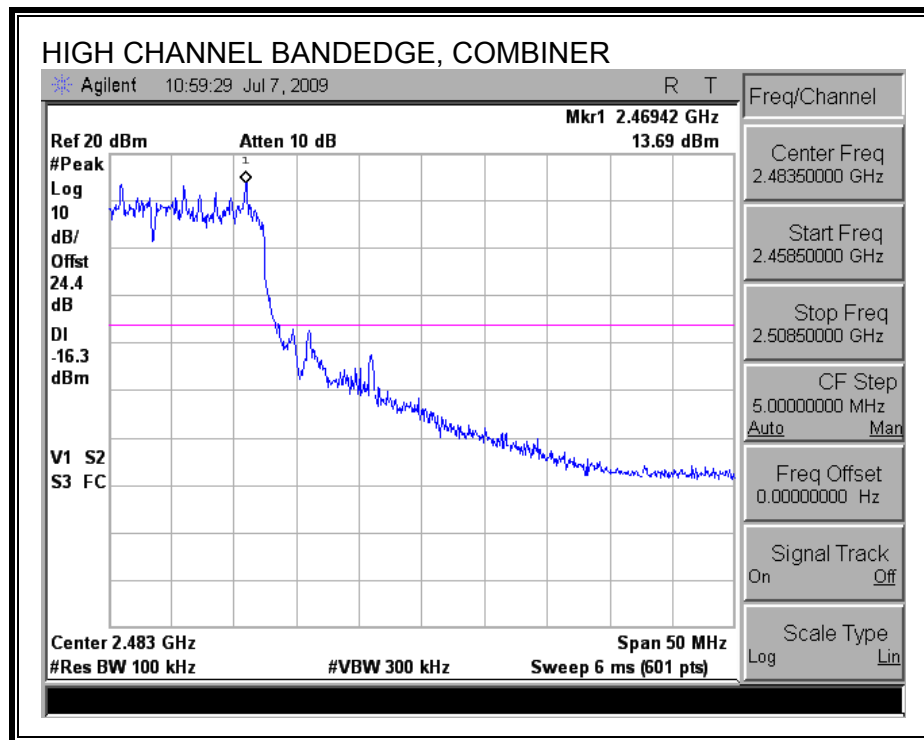
LOW CHANNEL SPURIOUS EMISSIONS



MID CHANNEL SPURIOUS EMISSIONS



HIGH CHANNEL SPURIOUS EMISSIONS



7.4. 2.4 GHz BAND CHANNEL TESTS FOR 802.11n HT40 MODE

7.4.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

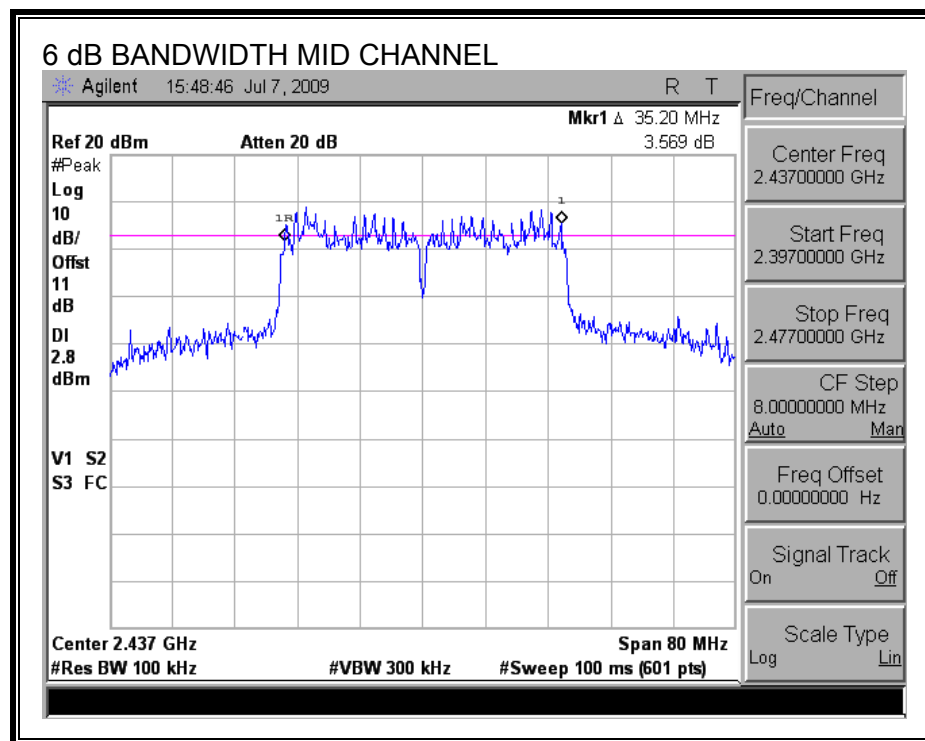
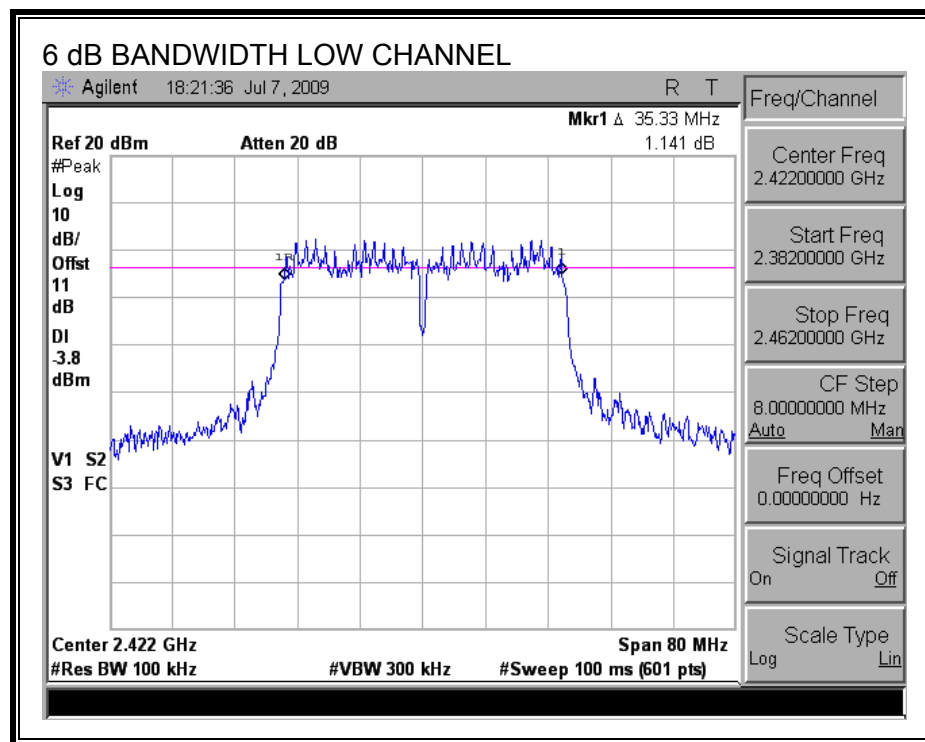
The minimum 6 dB bandwidth shall be at least 500 kHz.

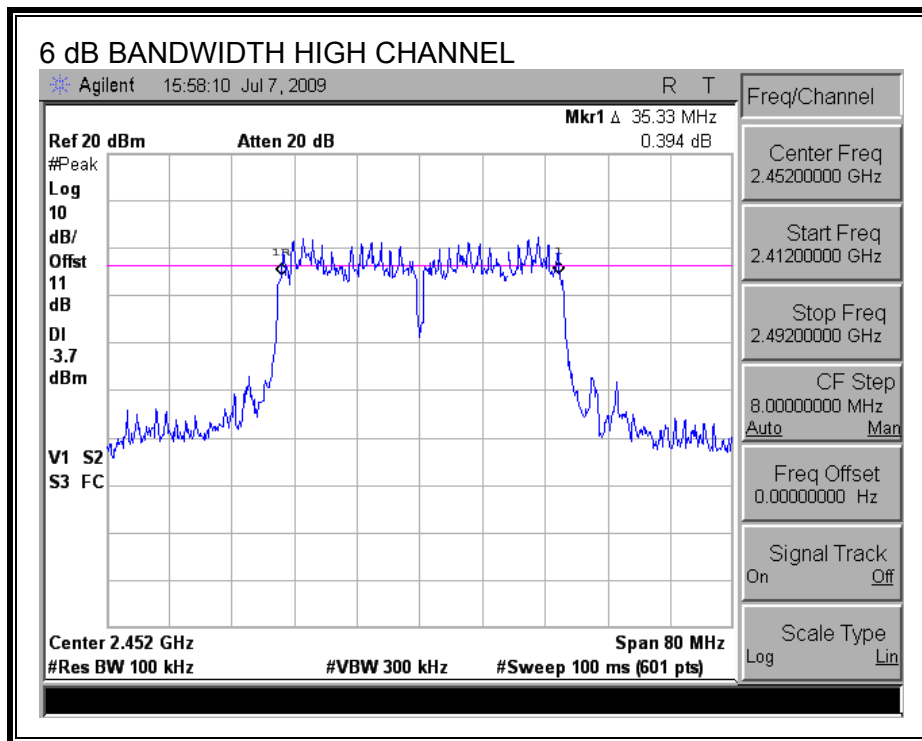
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

| Channel | Frequency (MHz) | 6 dB BW (MHz) | Minimum Limit (MHz) |
|----------------|----------------------------|--------------------------|--------------------------------|
| Low | 2422 | 35.33 | 0.5 |
| Mid | 2437 | 35.20 | 0.5 |
| High | 2452 | 35.33 | 0.5 |





7.4.2. 99% & 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

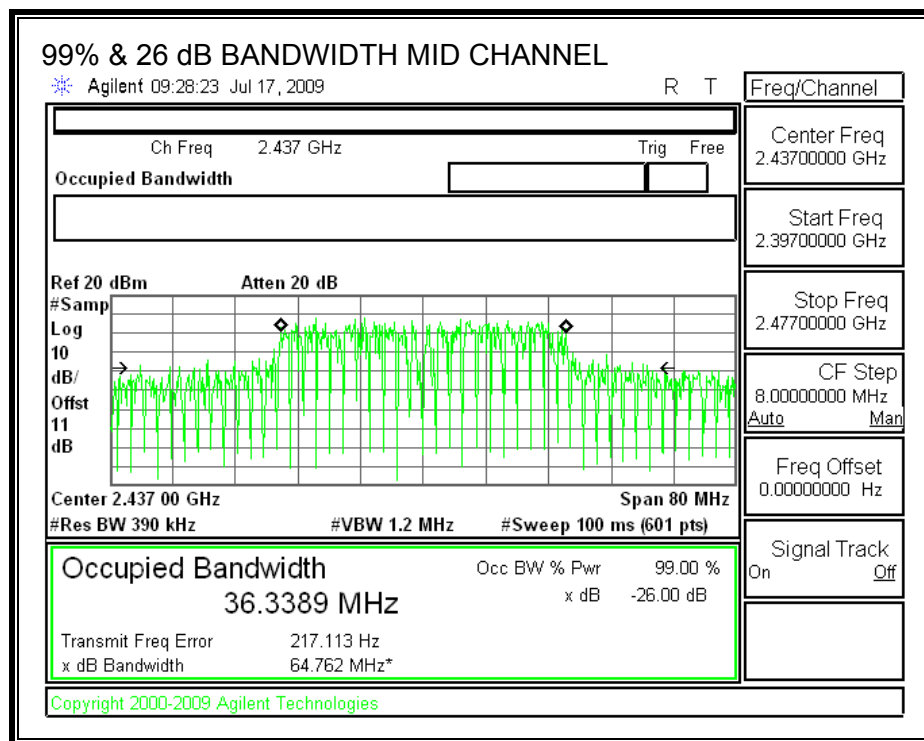
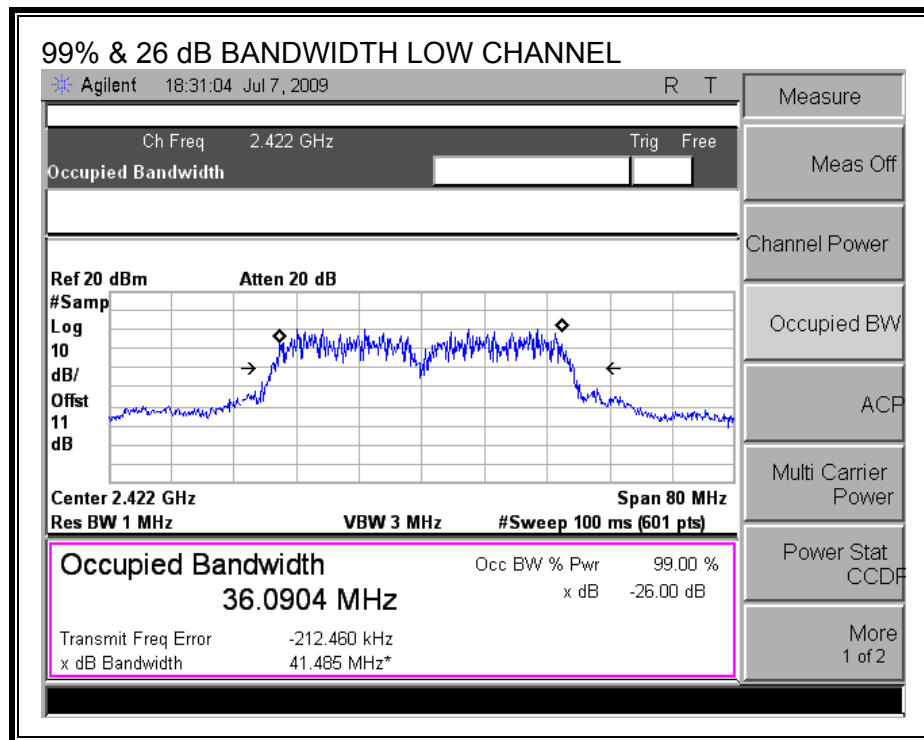
TEST PROCEDURE

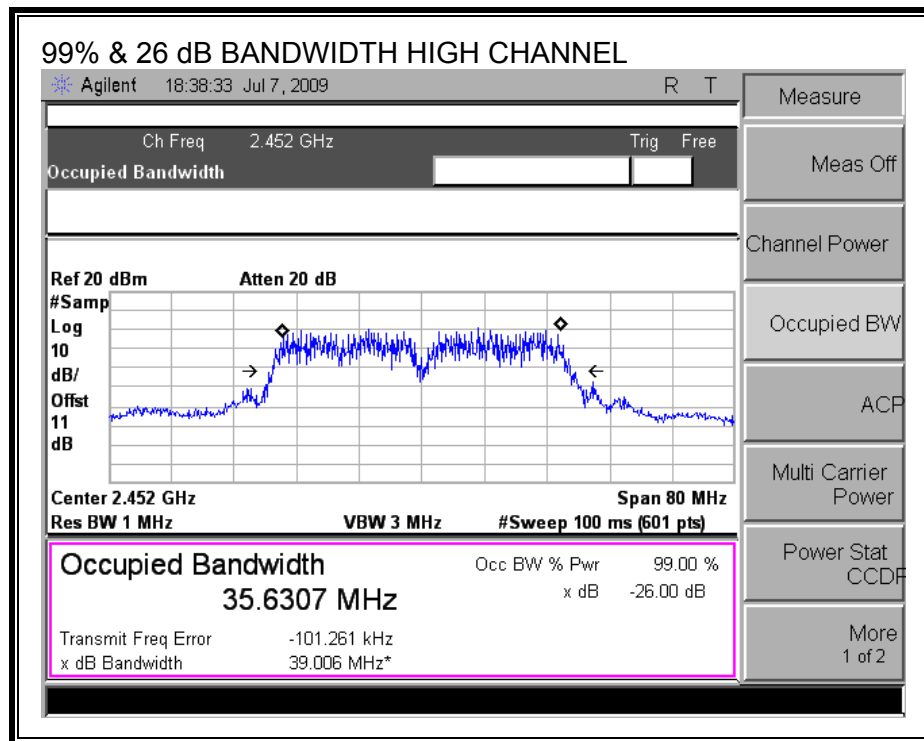
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth measurement function is utilized.

RESULTS

| Channel | Frequency (MHz) | 99% OBW (MHz) | 26 dB BW (MHz) |
|---------|--------------------|------------------|-------------------|
| Low | 2422 | 36.09 | 41.49 |
| Mid | 2437 | 36.34 | 64.76 |
| High | 2452 | 35.63 | 39.01 |

99% & 26 dB BANDWIDTH





7.4.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

TEST PROCEDURE

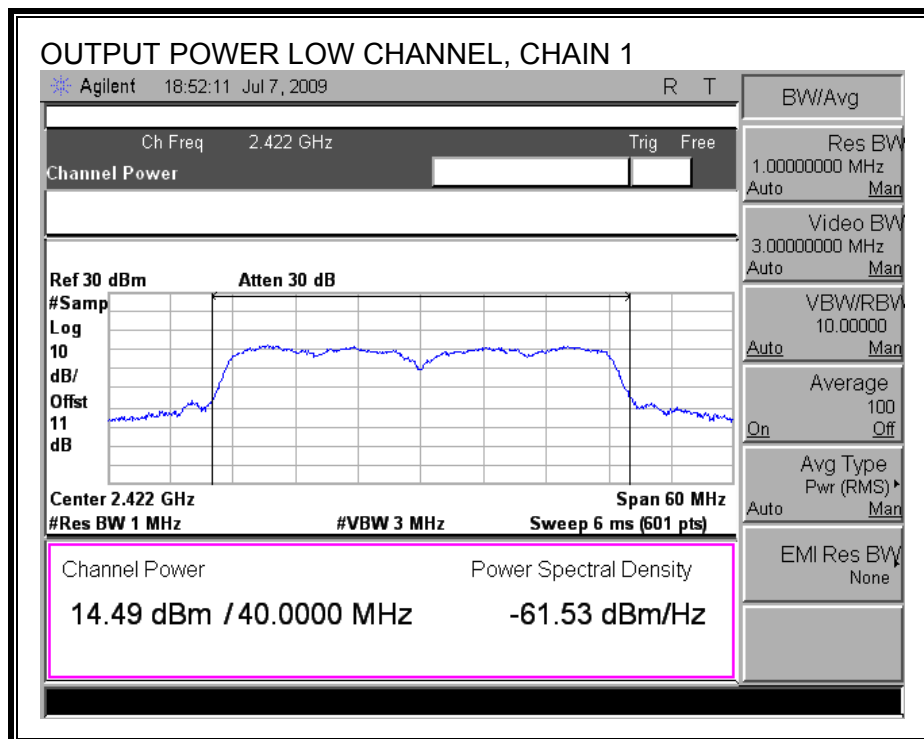
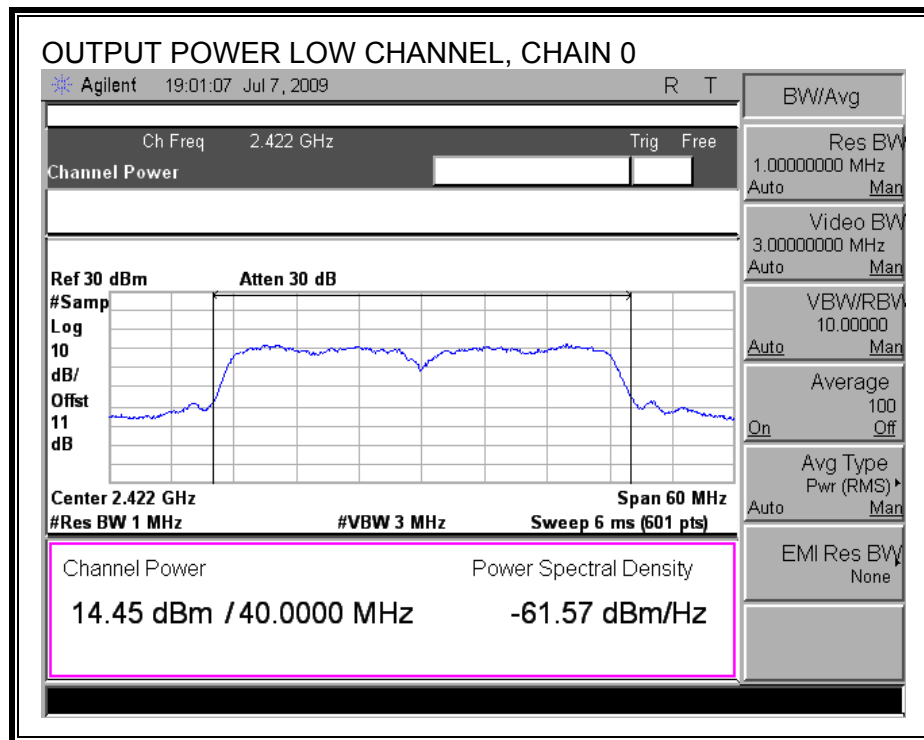
Output power was measured based on the use of RMS averaging over a time interval in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

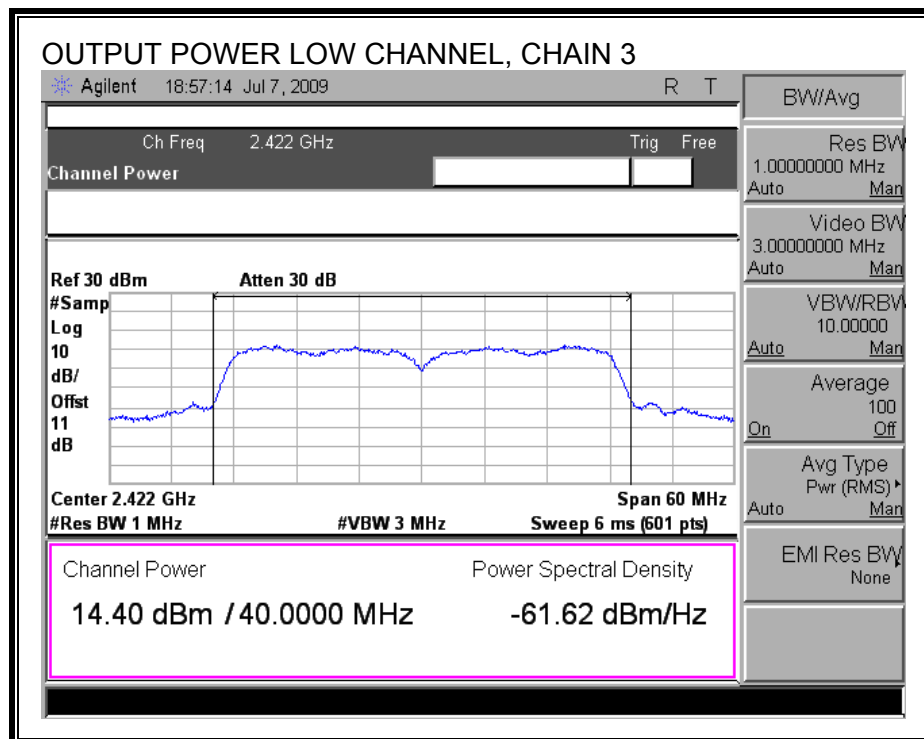
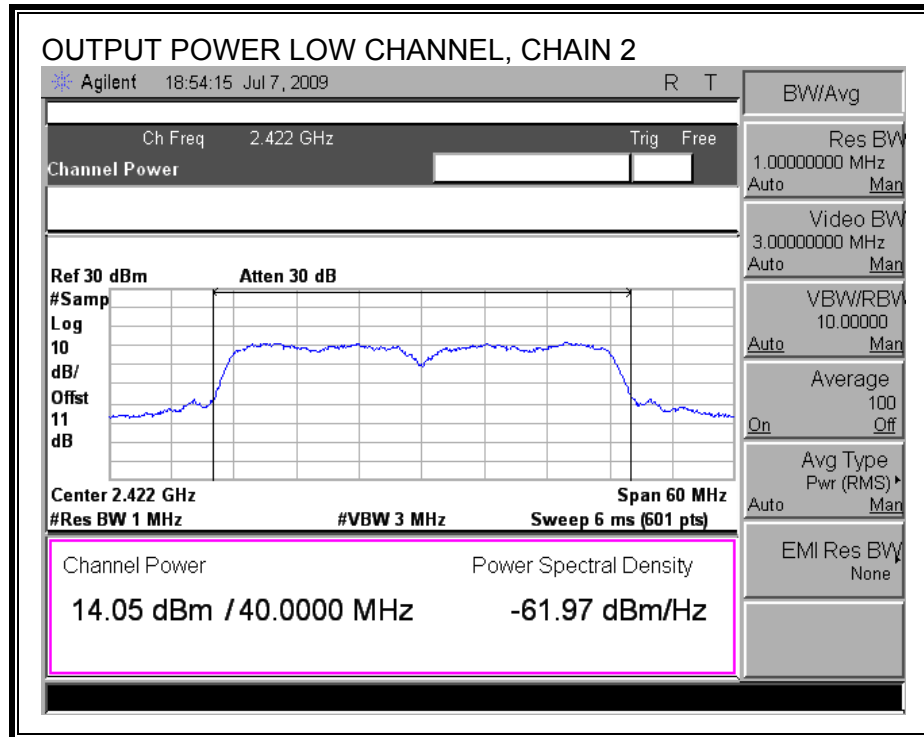
RESULTS

The antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

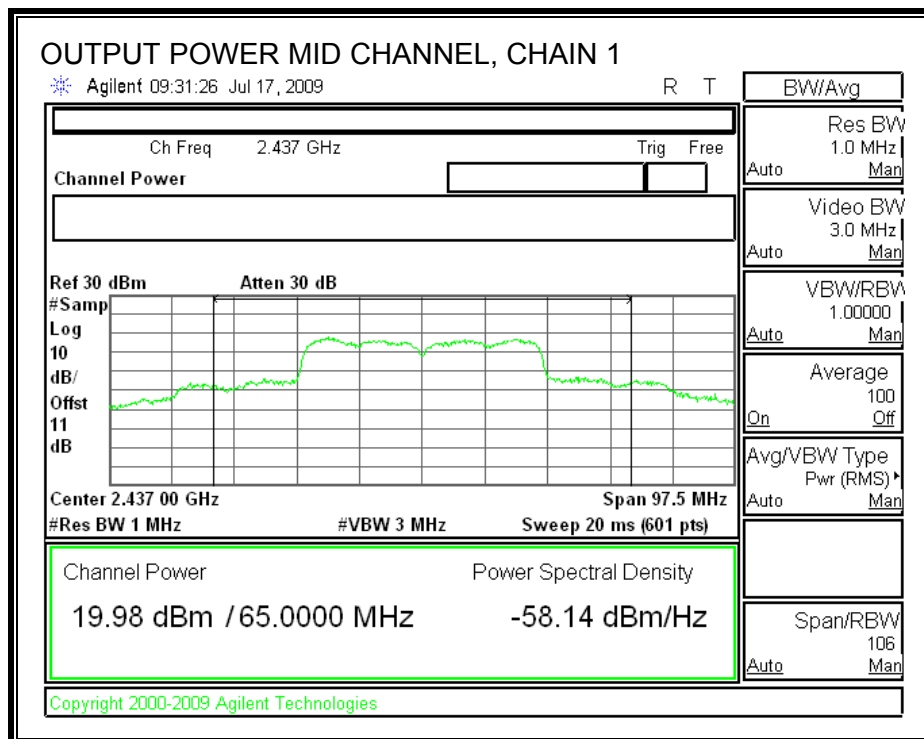
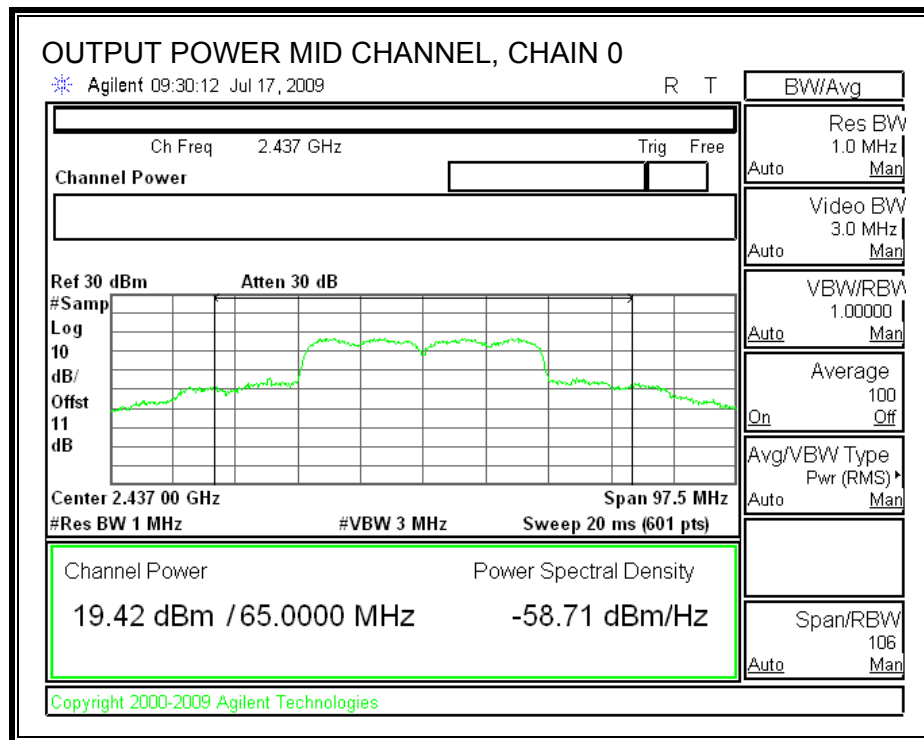
| Channel | Frequency (MHz) | Chain 0 Power (dBm) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Chain 3 Power (dBm) | Total Power (dBm) | Limit (dBm) | Margin (dB) |
|---------|--------------------|---------------------------|---------------------------|---------------------------|---------------------------|-------------------------|----------------|----------------|
| Low | 2422 | 14.45 | 14.49 | 14.05 | 14.40 | 20.37 | 30 | -9.63 |
| Mid | 2437 | 19.42 | 19.98 | 19.91 | 20.08 | 25.88 | 30 | -4.12 |
| High | 2452 | 13.21 | 13.45 | 13.30 | 13.47 | 19.38 | 30 | -10.62 |

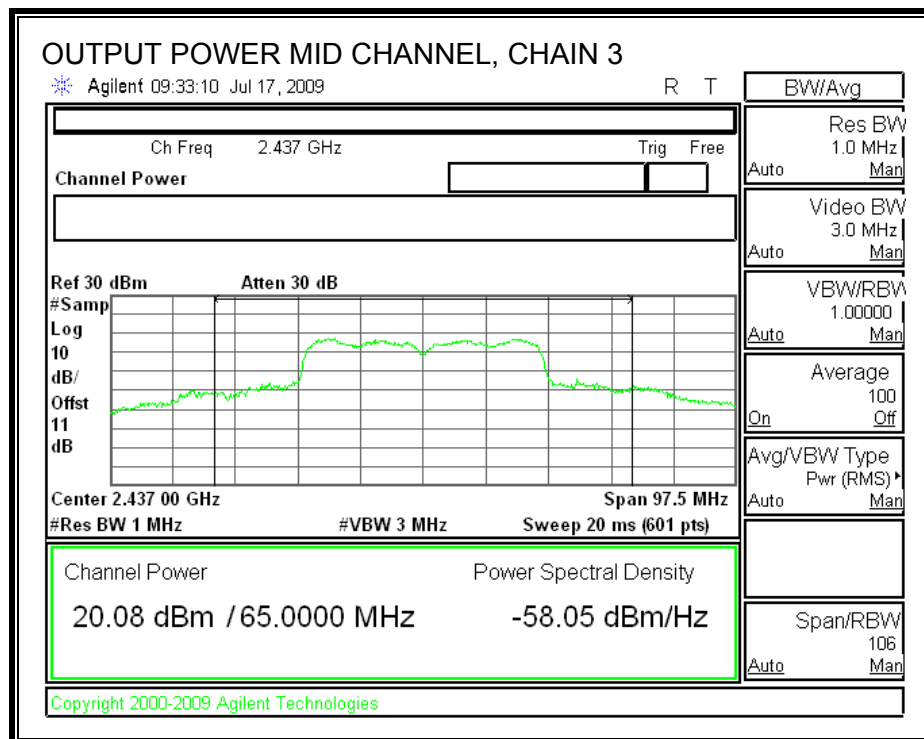
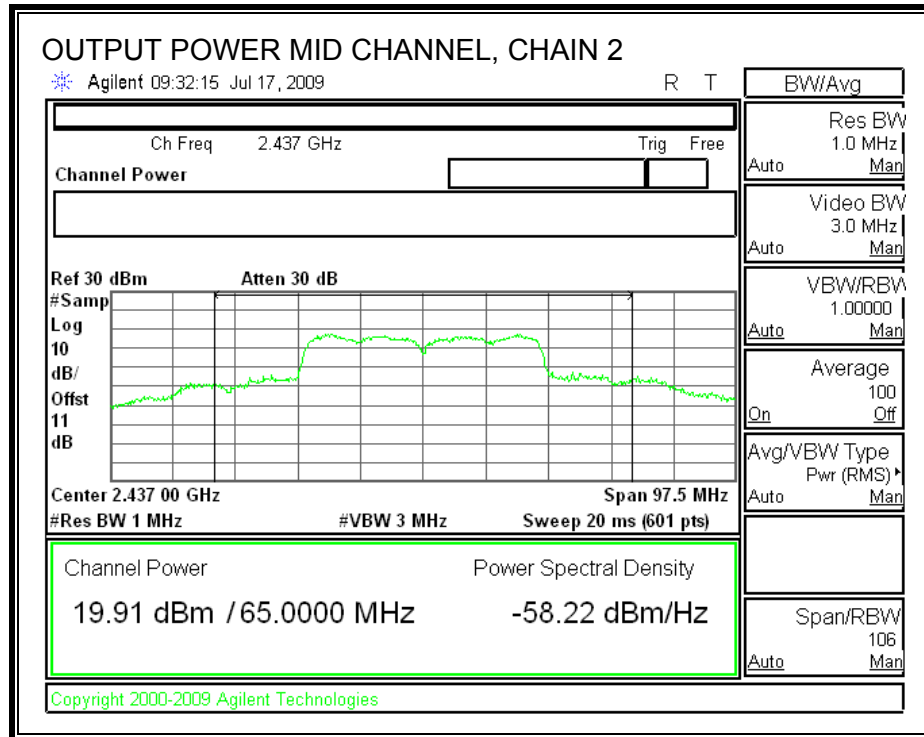
OUTPUT POWER, LOW CHANNEL



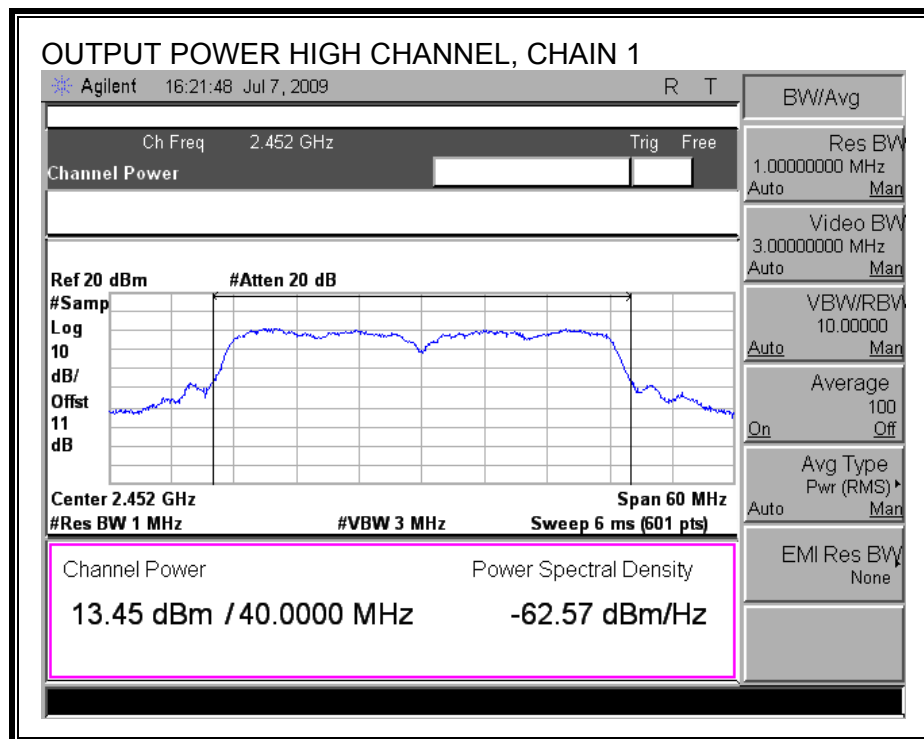
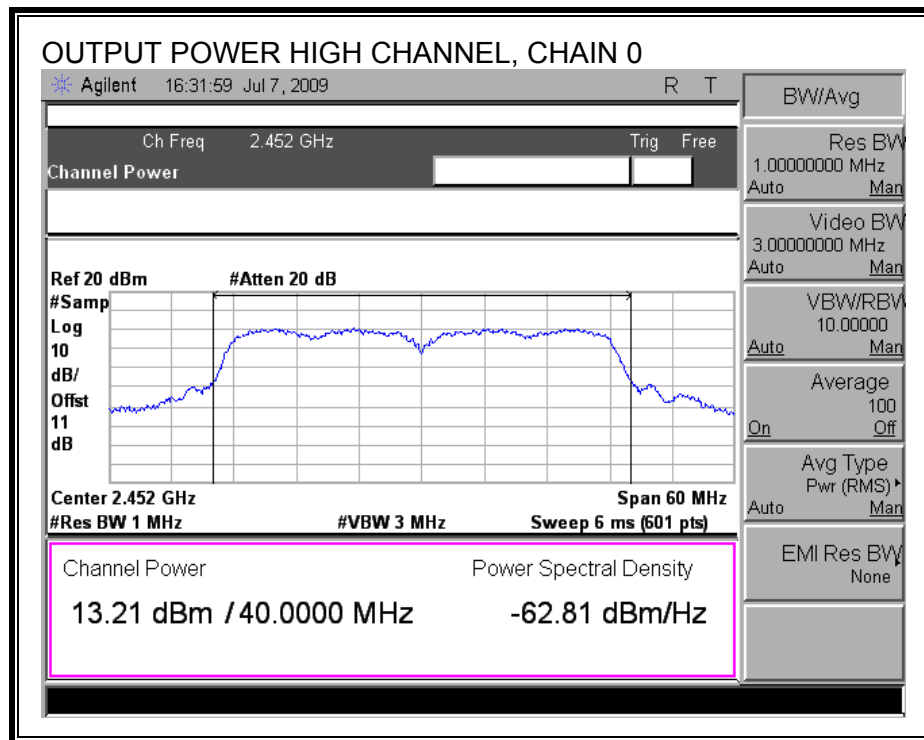


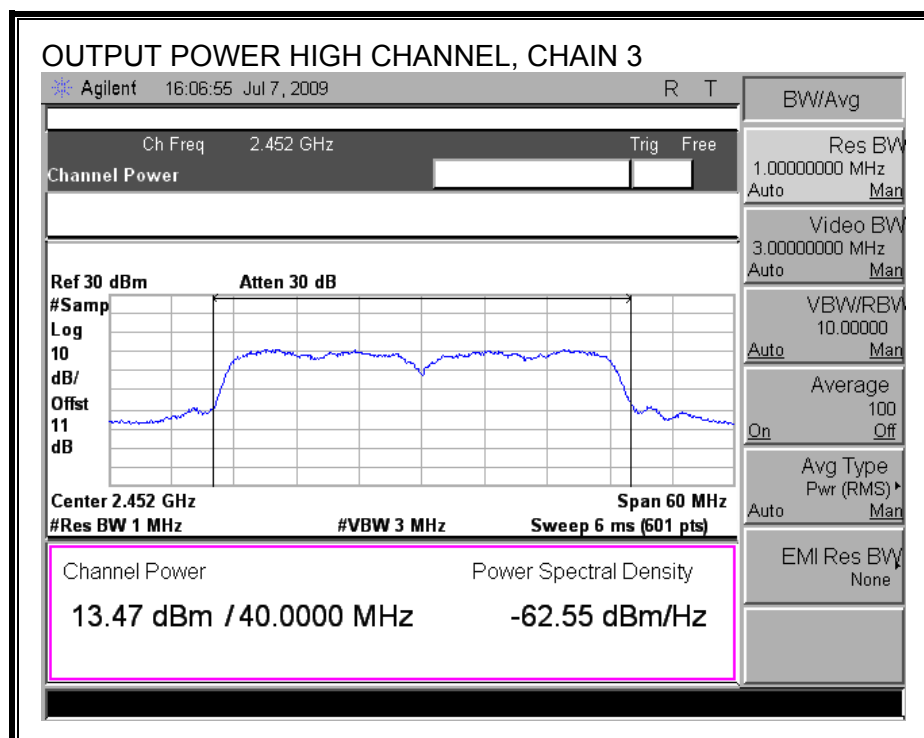
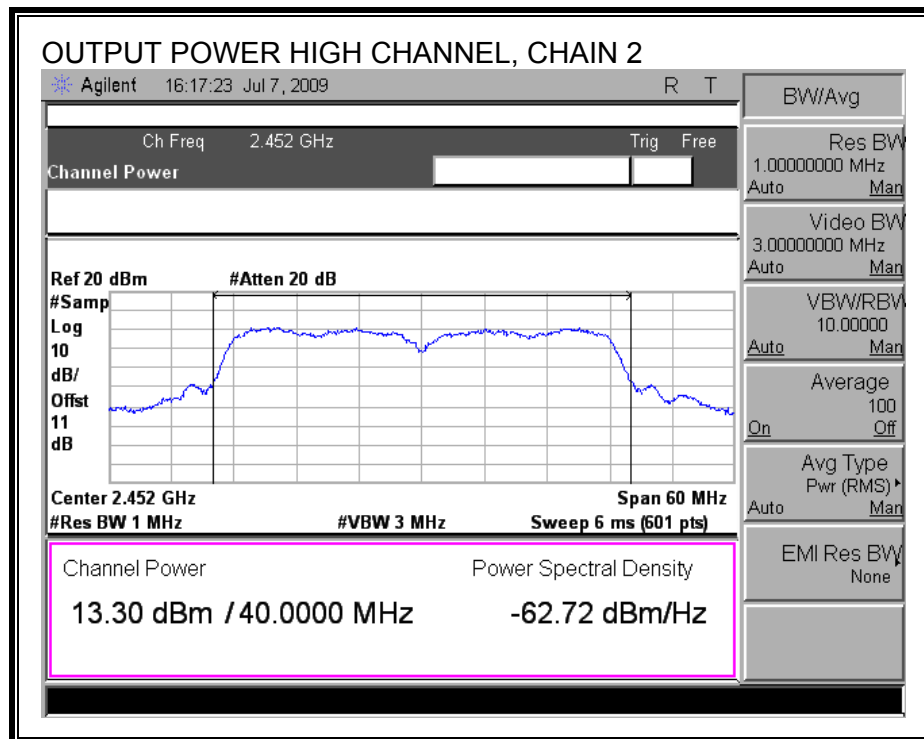
OUTPUT POWER, MID CHANNEL





OUTPUT POWER, HIGH CHANNEL





7.4.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

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

RESULTS

| Channel | Frequency (MHz) | Chain 0 Power (dBm) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Chain 3 Power (dBm) |
|---------|--------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Low | 2422.00 | 14.29 | 14.28 | 14.12 | 14.33 |
| Mid | 2437.00 | 19.55 | 19.68 | 19.67 | 19.74 |
| High | 2452.00 | 13.47 | 13.53 | 13.52 | 13.53 |

7.4.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

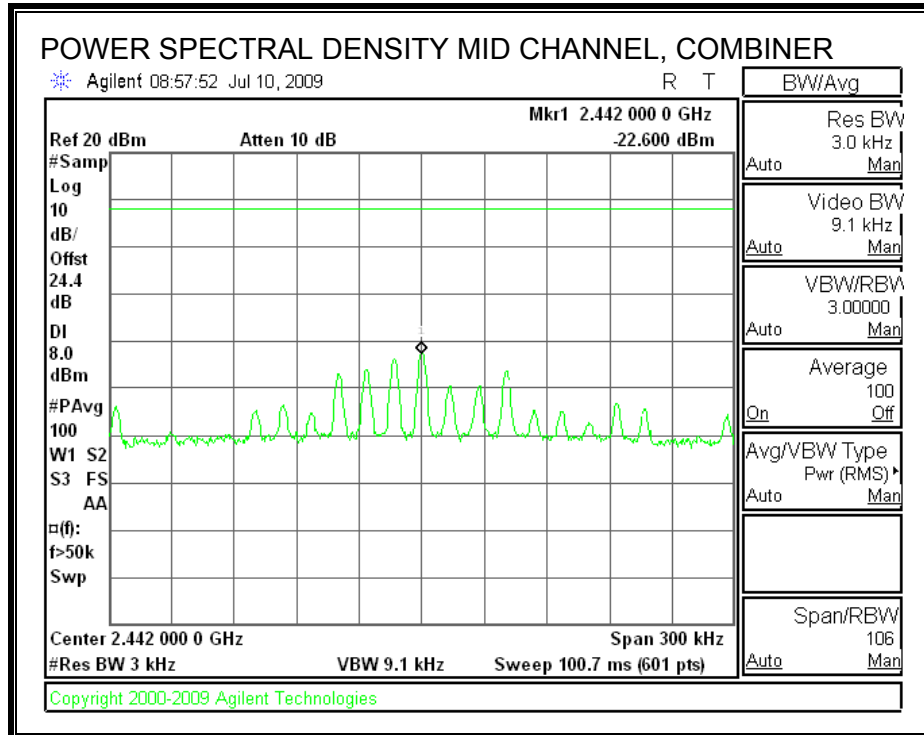
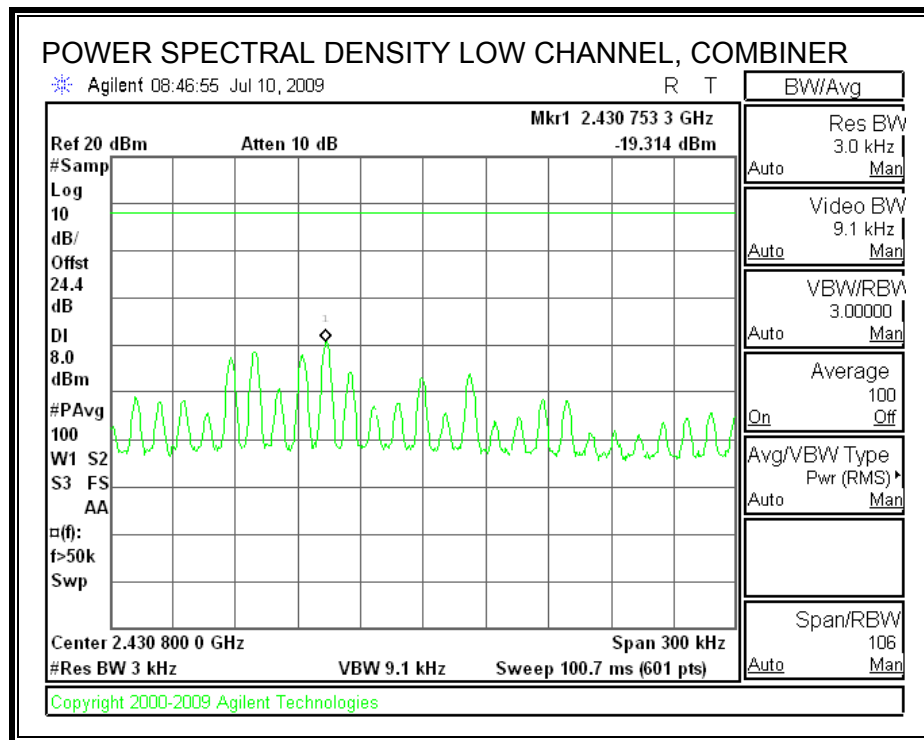
Output power was measured based on the use of RMS averaging over a time interval, therefore the power spectral density was measured using PSD Option 2 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

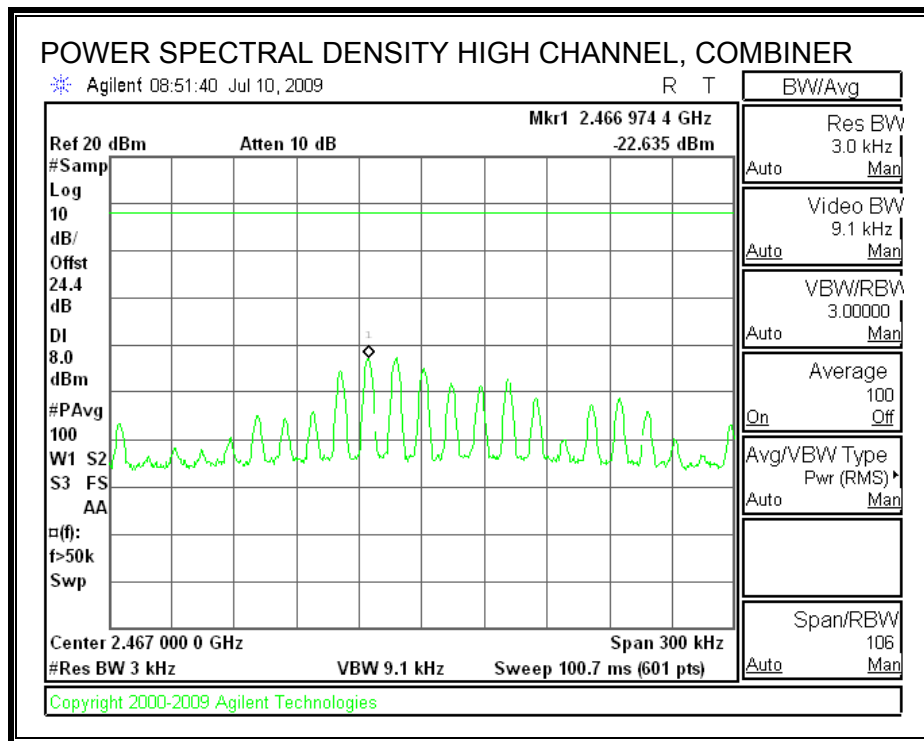
Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

RESULTS

| Channel | Frequency (MHz) | PSD with Combiner (dBm) | Limit (dBm) | Margin (dB) |
|---------|--------------------|----------------------------|----------------|----------------|
| Low | 2422 | -19.31 | 8 | -27.31 |
| Mid | 2437 | -22.60 | 8 | -30.60 |
| High | 2452 | -22.64 | 8 | -30.64 |

POWER SPECTRAL DENSITY





7.4.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dBc.

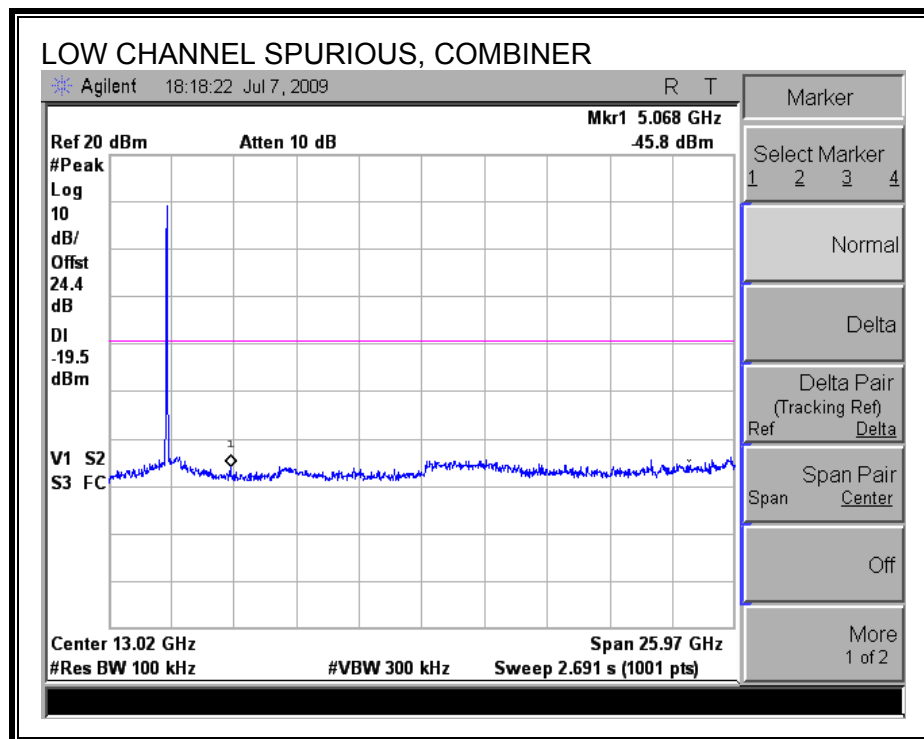
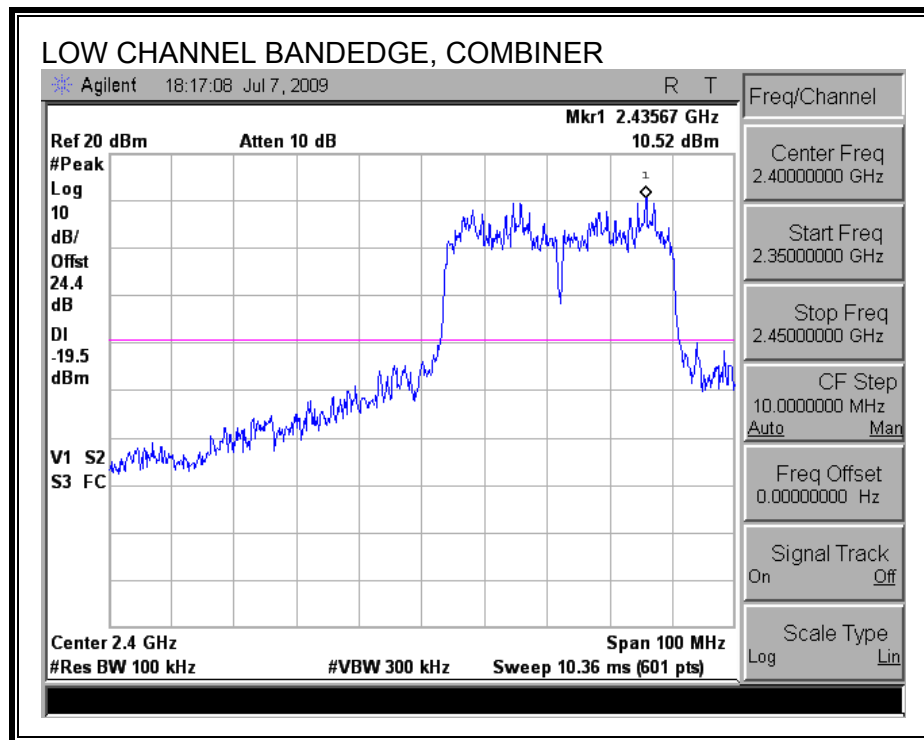
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

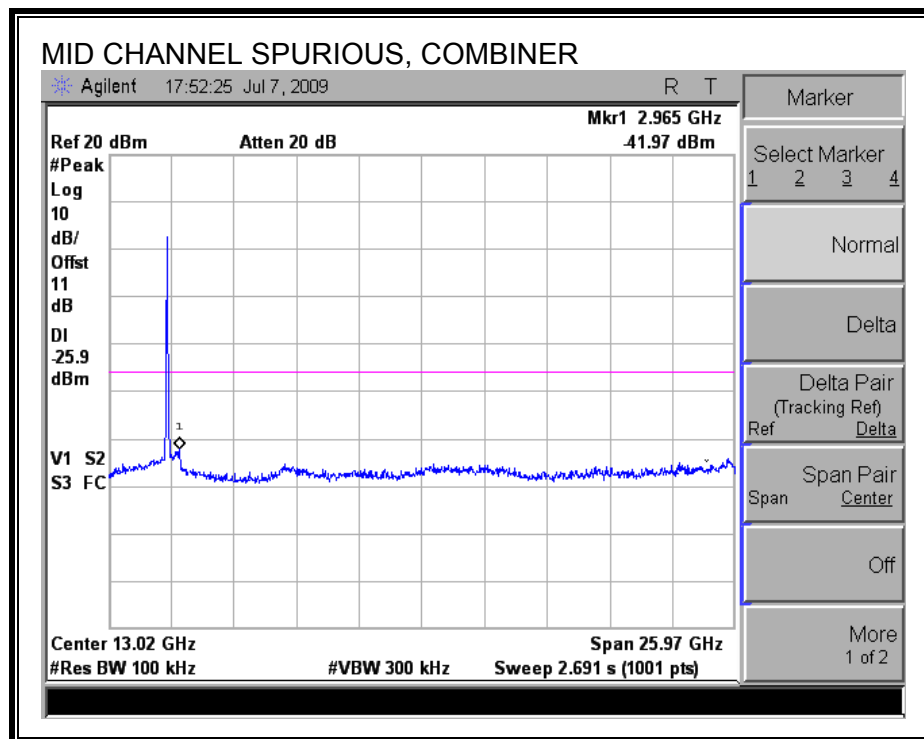
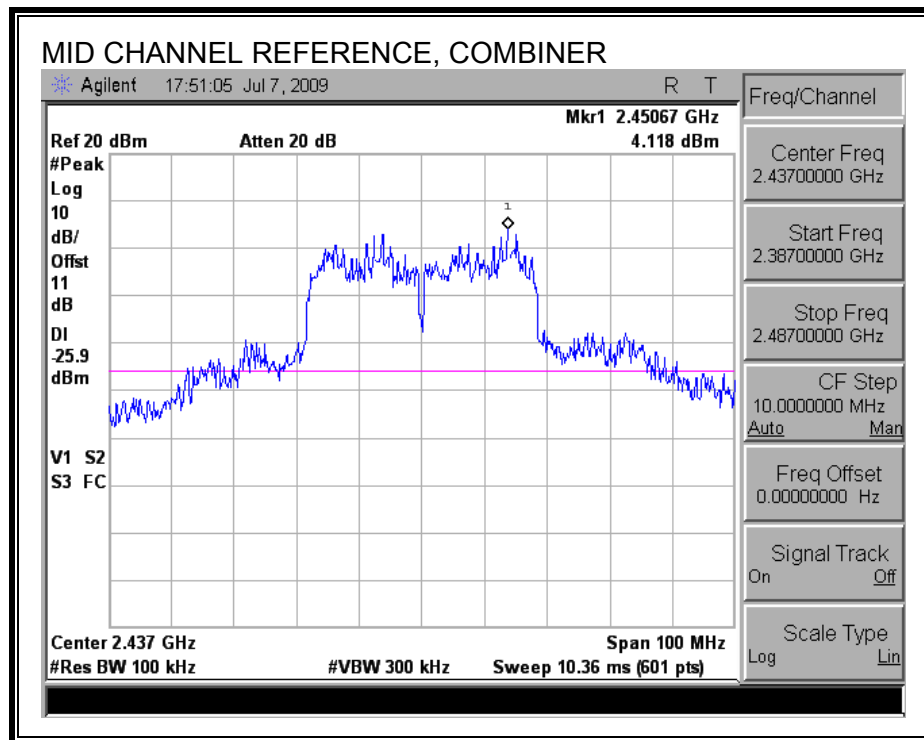
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

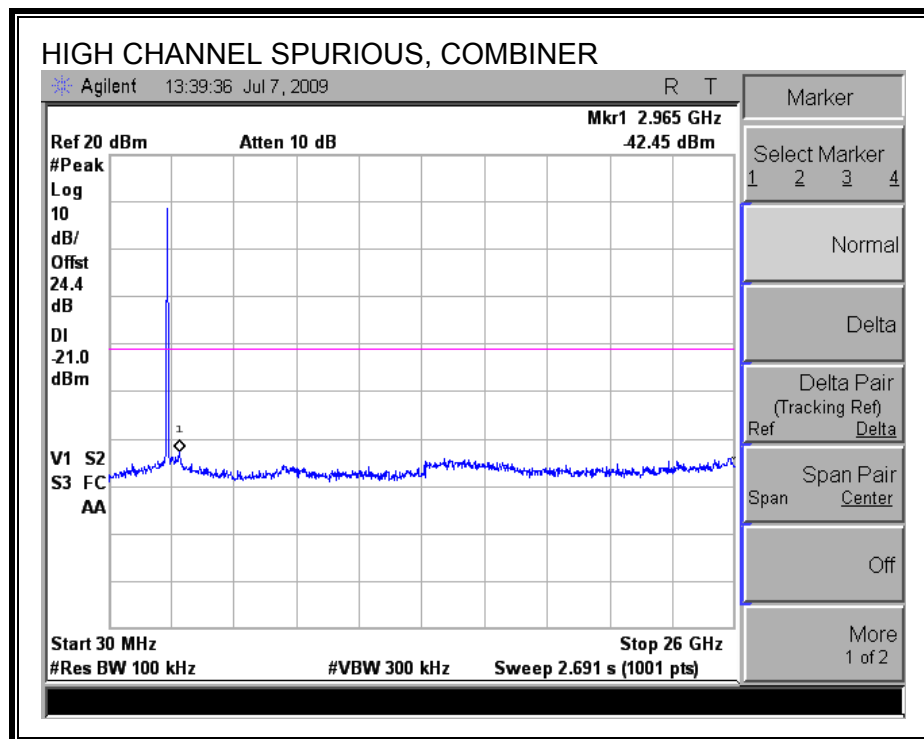
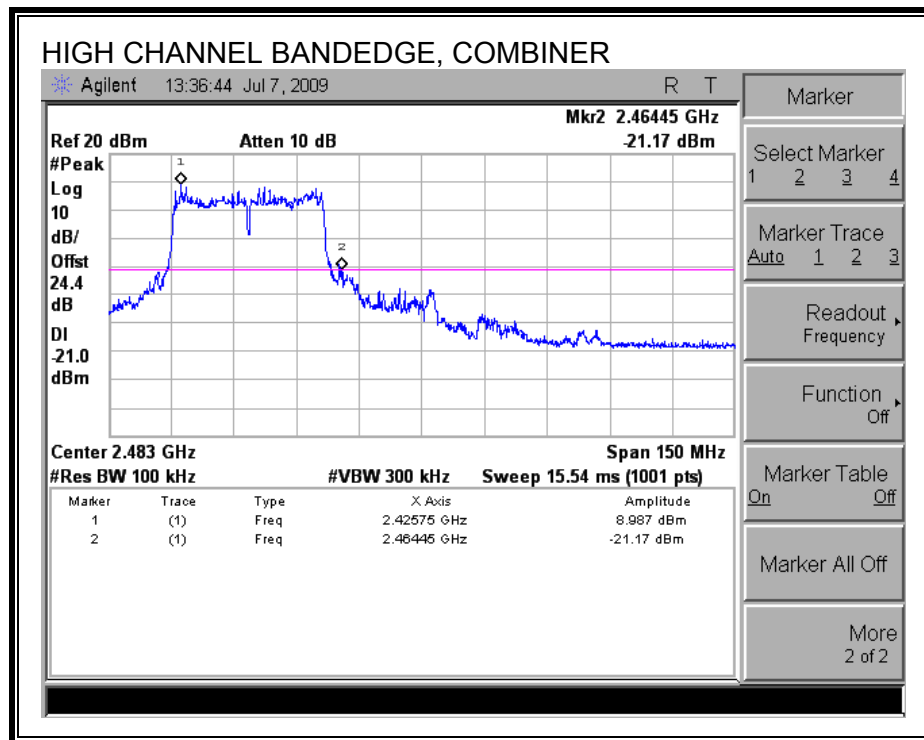
LOW CHANNEL SPURIOUS EMISSIONS



MID CHANNEL SPURIOUS EMISSIONS



HIGH CHANNEL SPURIOUS EMISSIONS



7.5. 5.8 GHz BAND CHANNEL TESTS FOR 802.11a MODE

7.5.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

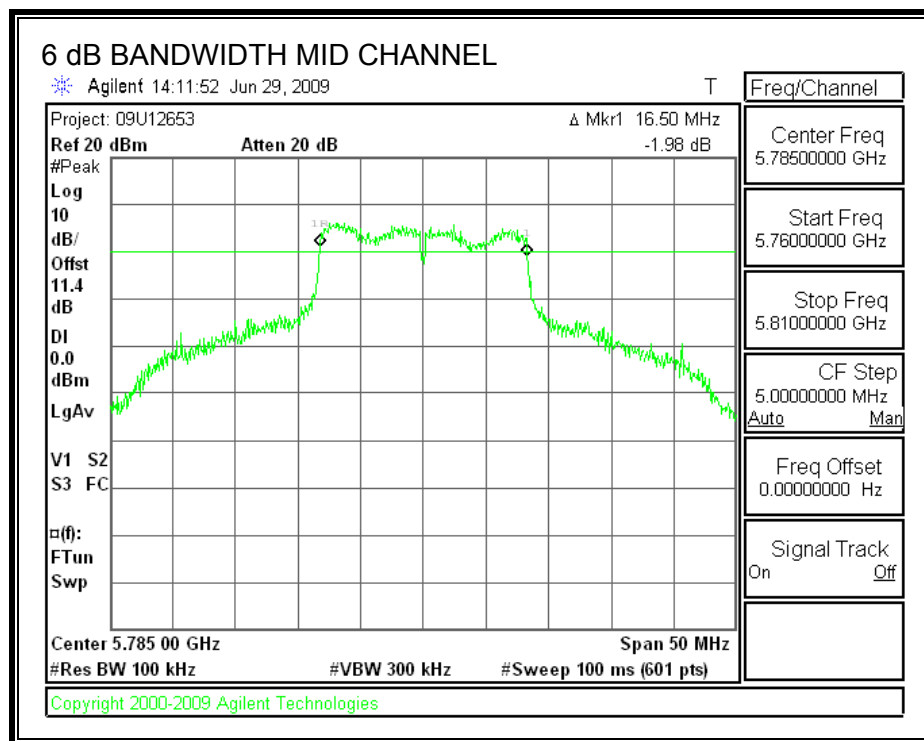
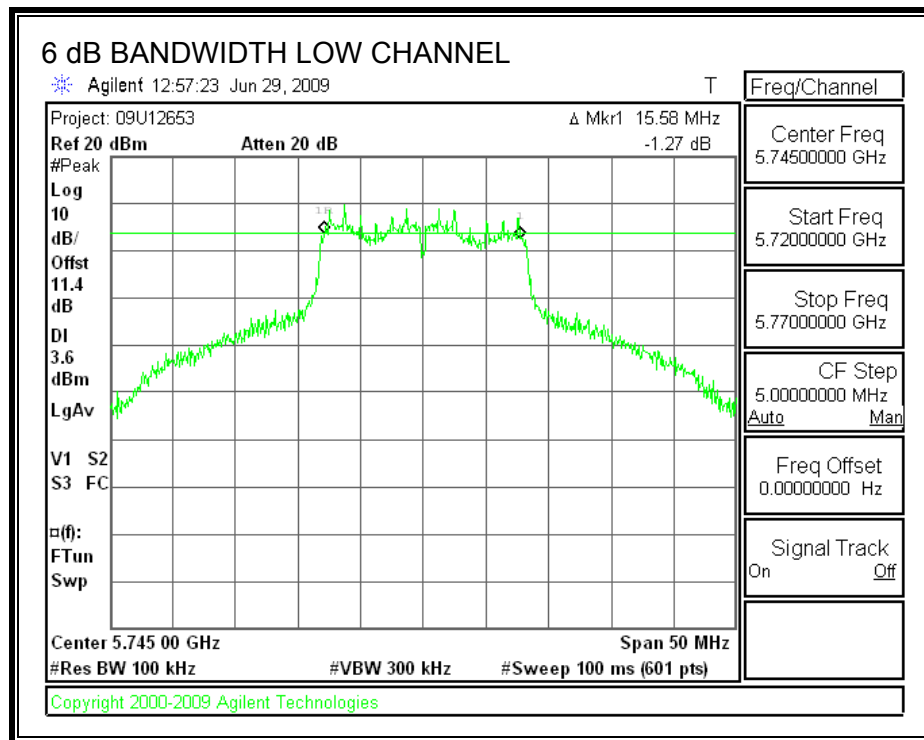
TEST PROCEDURE

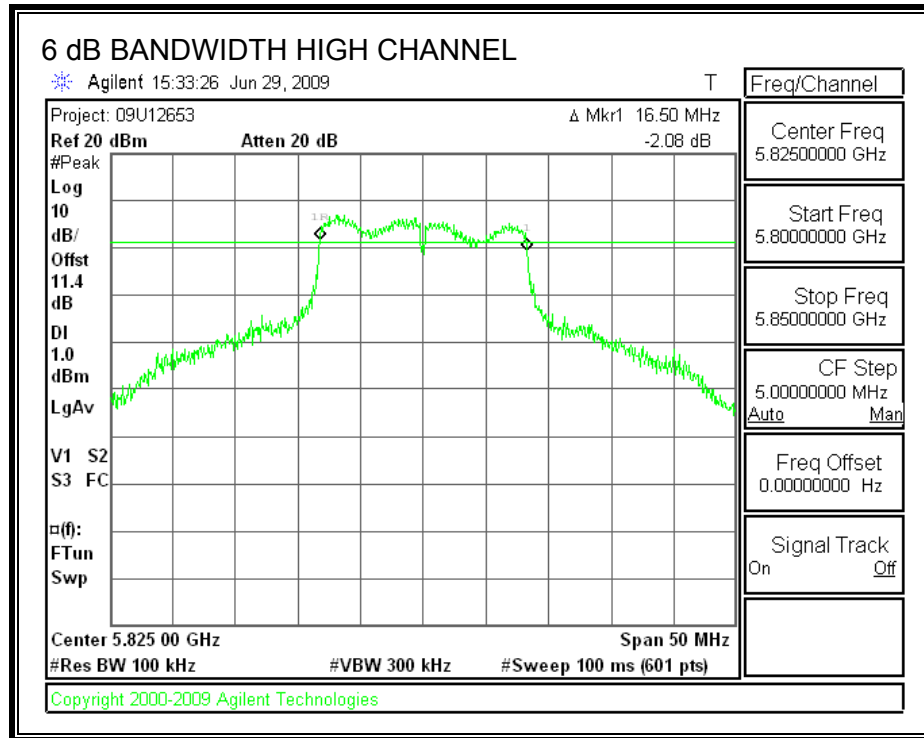
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

| Channel | Frequency (MHz) | 6 dB BW (MHz) | Minimum Limit (MHz) |
|----------------|----------------------------|--------------------------|--------------------------------|
| Low | 5745 | 15.58 | 0.5 |
| Middle | 5785 | 16.50 | 0.5 |
| High | 5825 | 16.50 | 0.5 |

6 dB BANDWIDTH





7.5.2. 99% & 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

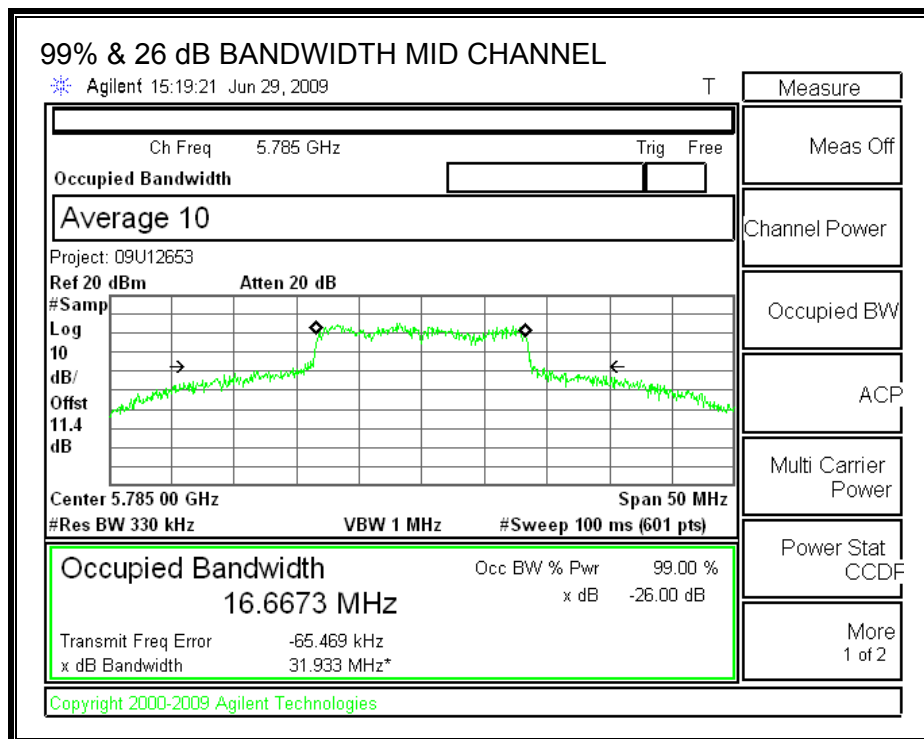
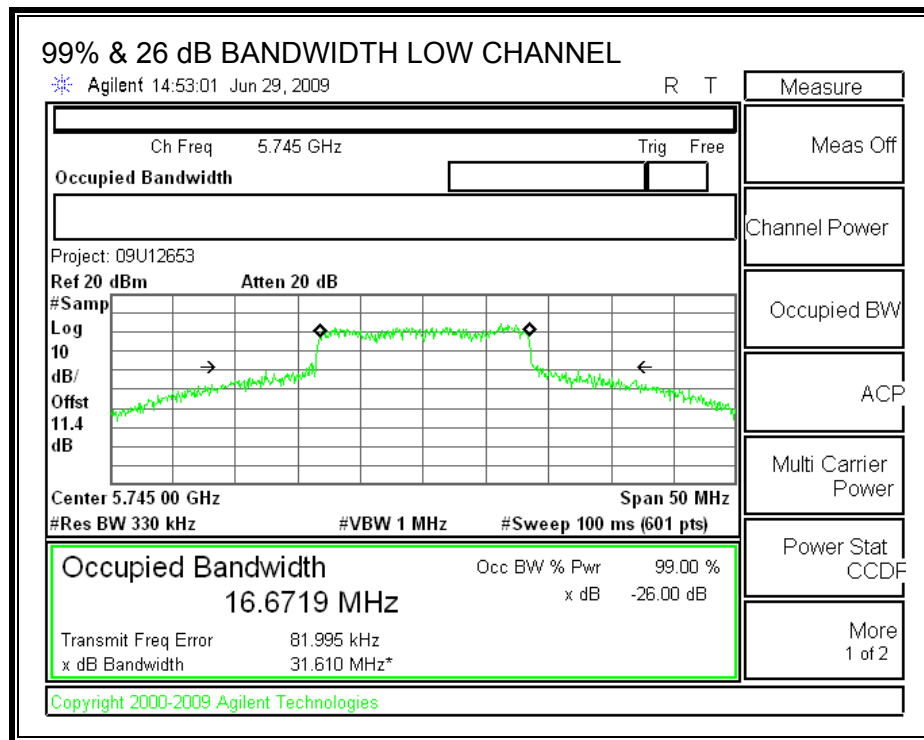
TEST PROCEDURE

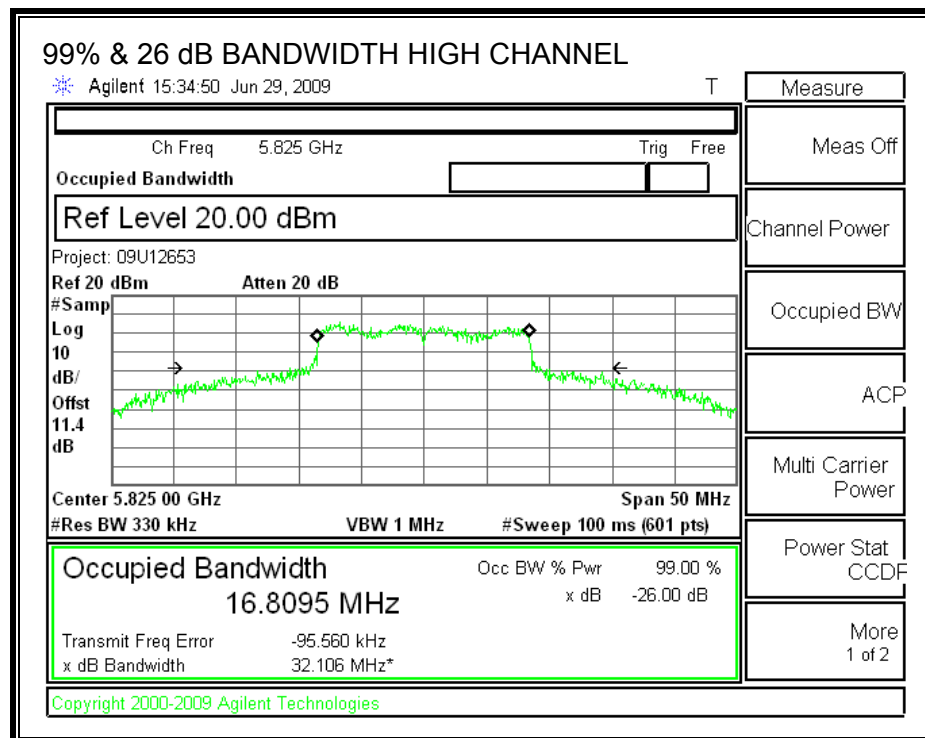
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth measurement function is utilized.

RESULTS

| Channel | Frequency (MHz) | 99% OBW (MHz) | 26 dB BW (MHz) |
|---------|--------------------|------------------|-------------------|
| Low | 5745 | 16.67 | 31.61 |
| Middle | 5785 | 16.67 | 31.93 |
| High | 5825 | 16.81 | 32.11 |

99% & 26 dB BANDWIDTH





7.5.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

TEST PROCEDURE

Output power was measured based on the use of RMS averaging over a time interval in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

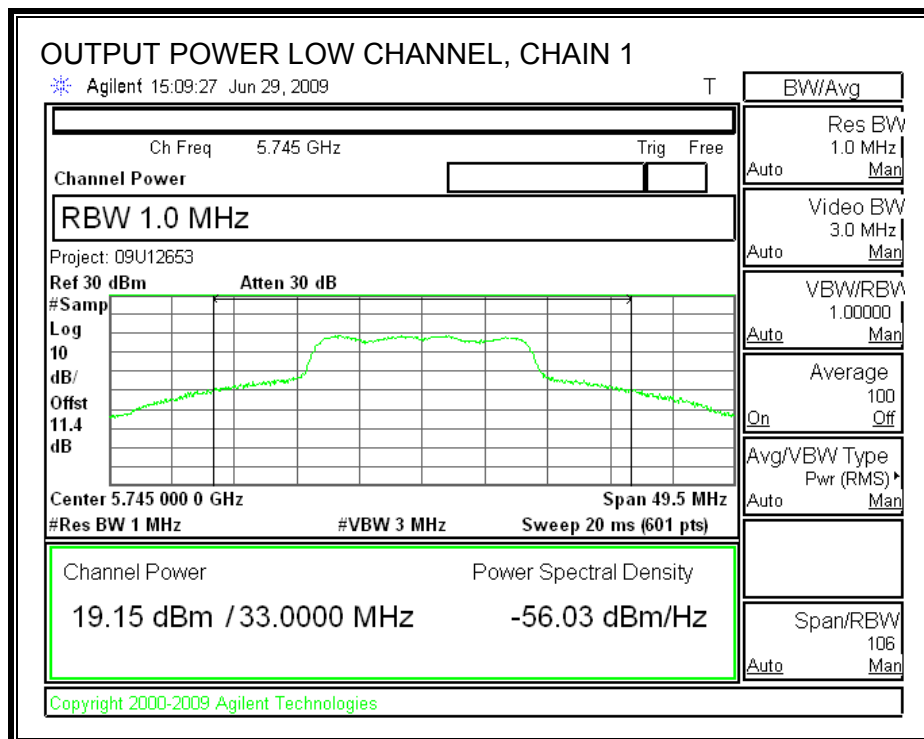
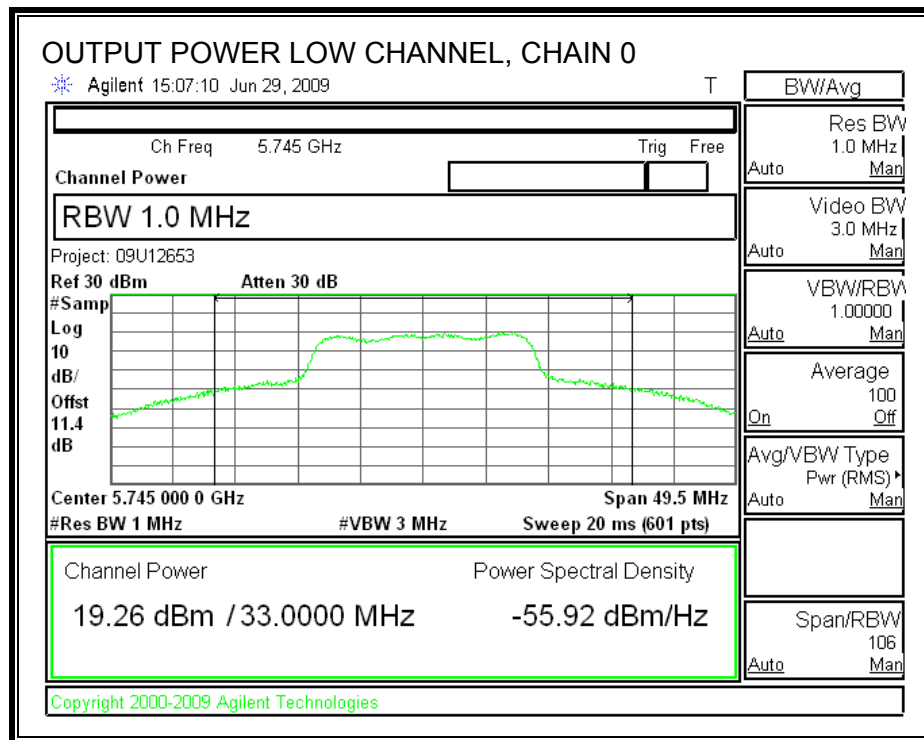
Effective Legacy Mode Composite Gain of 4 Identical Antennas:

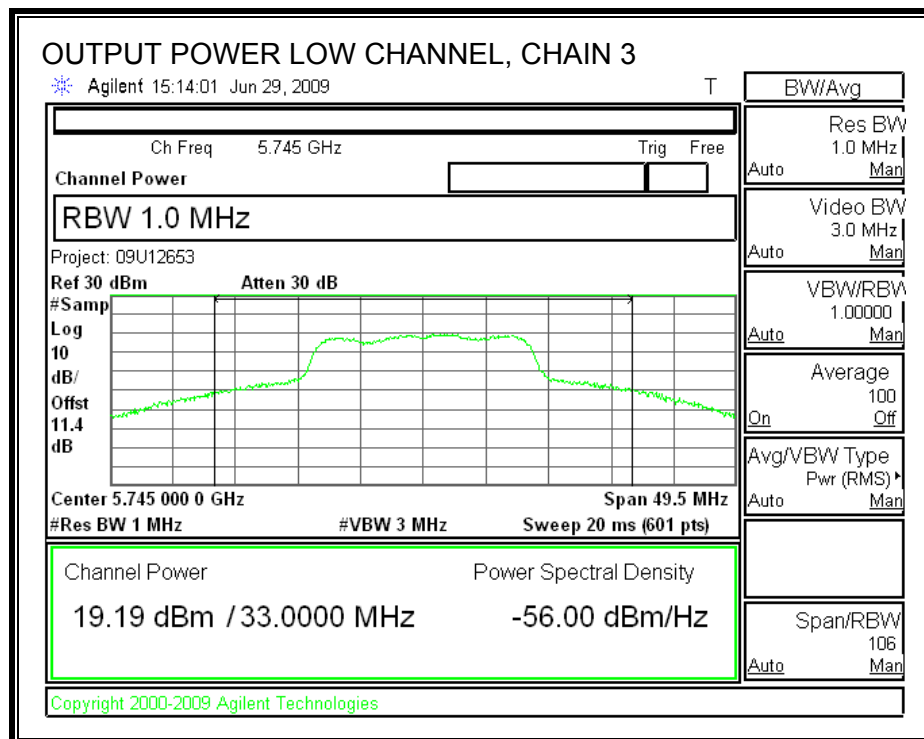
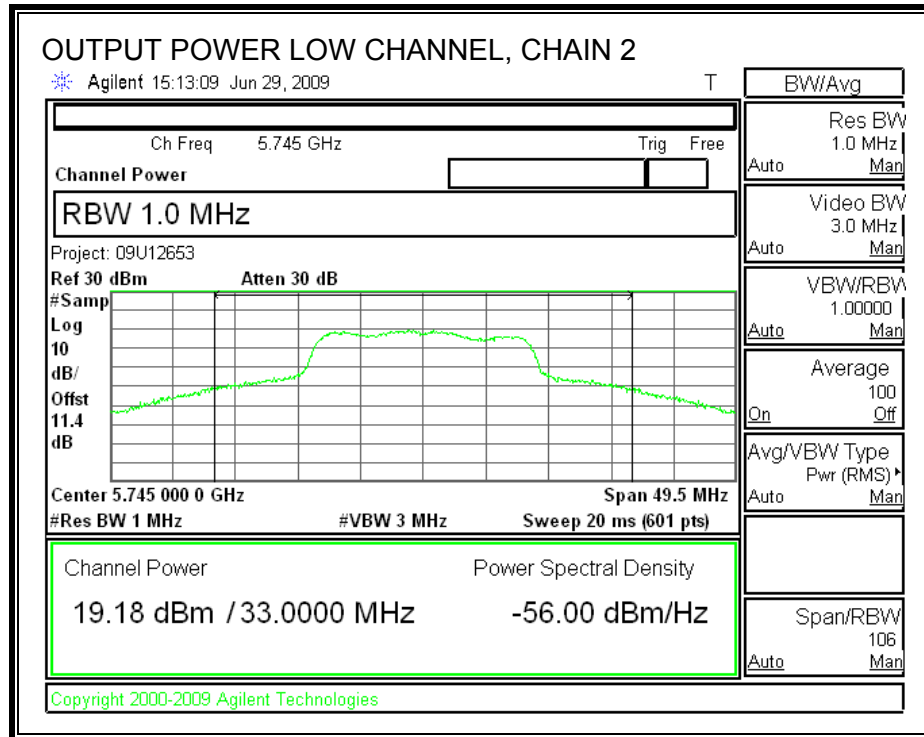
| Antenna Gain (dBi) | 10 Log (# Tx Chains) (dB) | Effective Legacy Gain (dBi) |
|-----------------------|------------------------------|--------------------------------|
| 3 | 6.02 | 9.02 |

The composite antenna gain is 9.02 dBi, therefore the limit is 26.98 dBm.

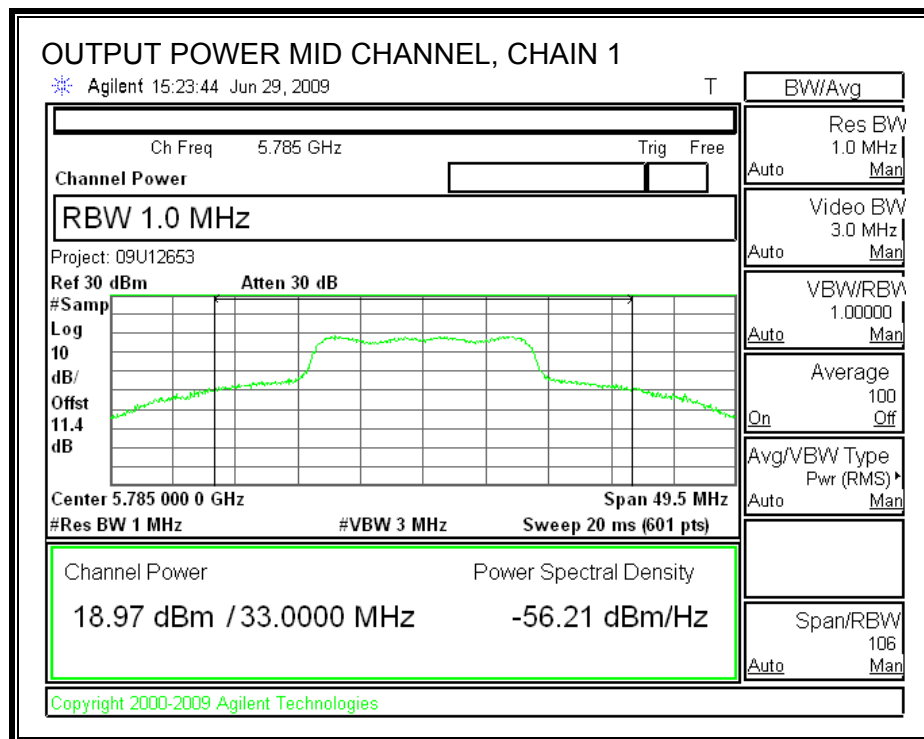
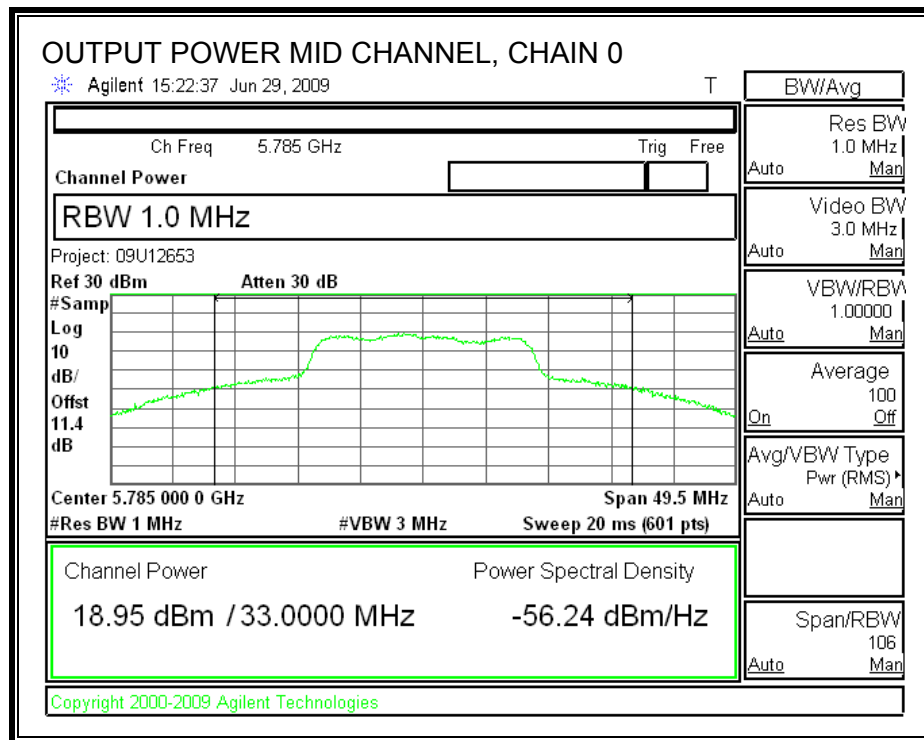
| Channel | Frequency (MHz) | Chain 0 Power (dBm) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Chain 3 Power (dBm) | Total Power (dBm) | Limit (dBm) | Margin (dB) |
|---------|--------------------|---------------------------|---------------------------|---------------------------|---------------------------|-------------------------|----------------|----------------|
| Low | 5745 | 19.26 | 19.15 | 19.18 | 19.19 | 25.22 | 26.98 | -1.76 |
| Mid | 5785 | 18.95 | 18.97 | 18.98 | 19.08 | 25.02 | 26.98 | -1.96 |
| High | 5825 | 19.17 | 19.18 | 19.09 | 19.12 | 25.16 | 26.98 | -1.82 |

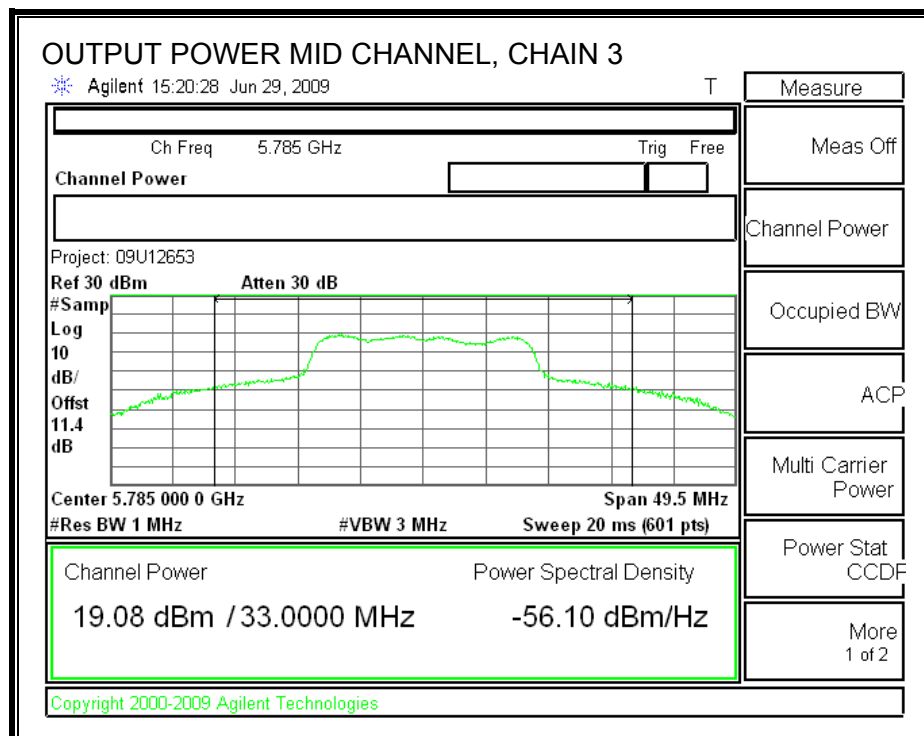
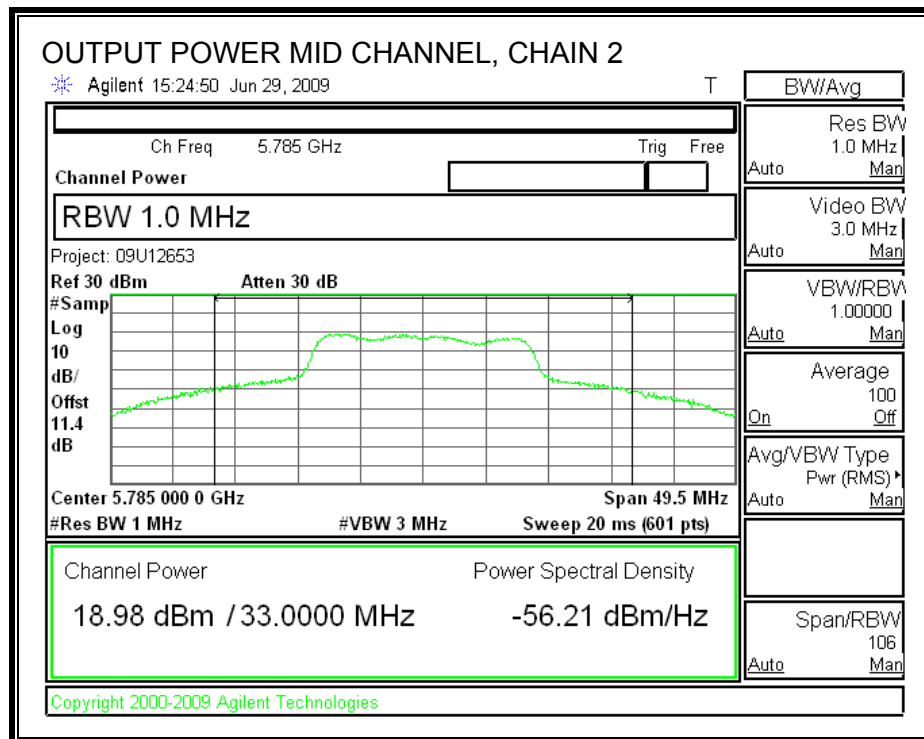
OUTPUT POWER, LOW CHANNEL



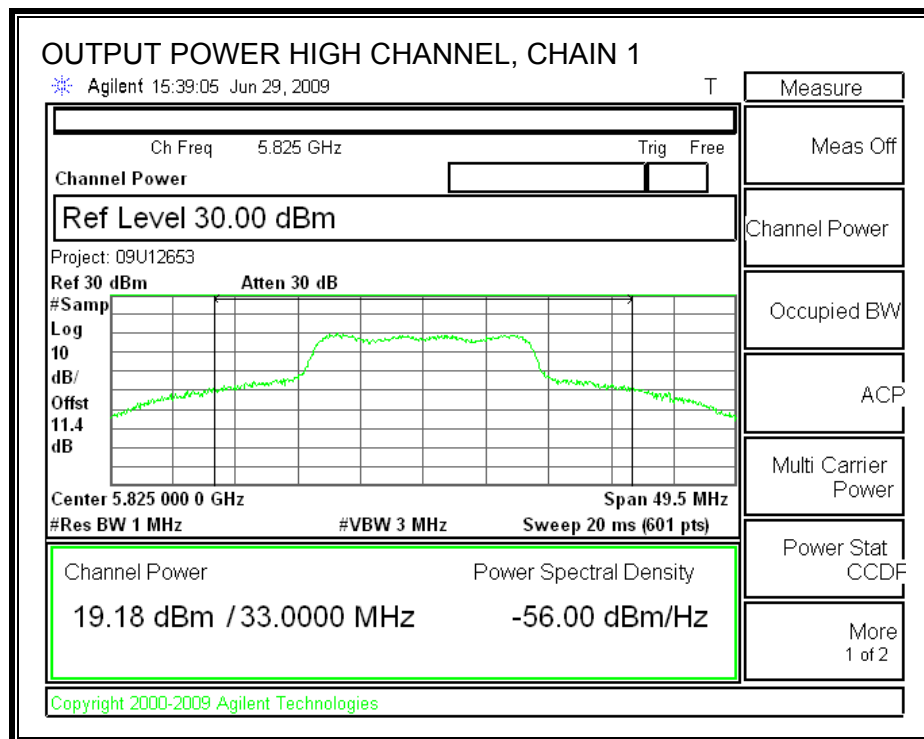
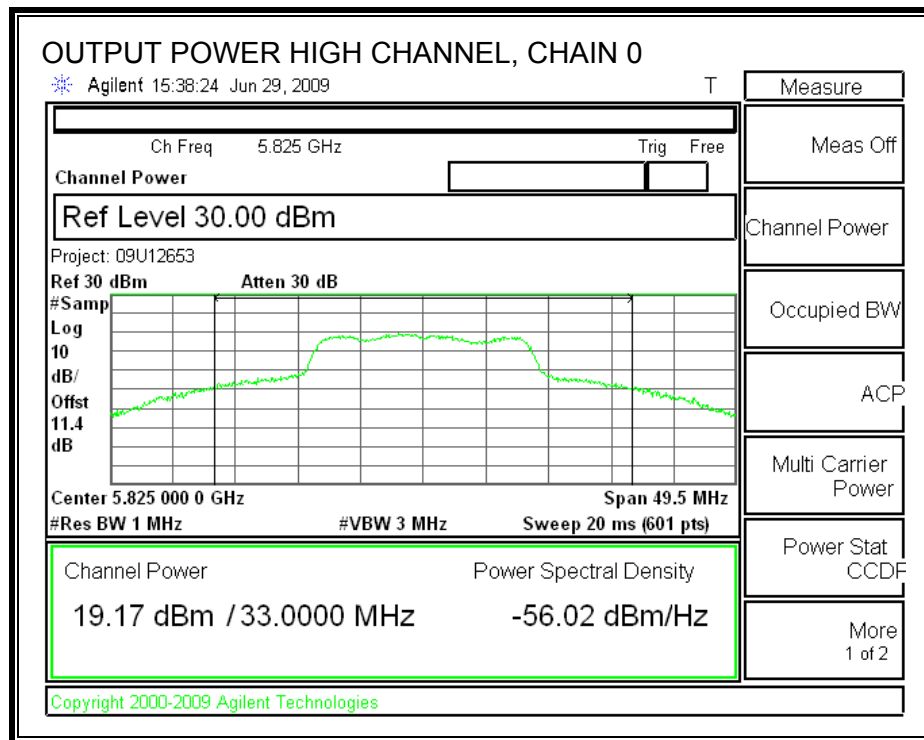


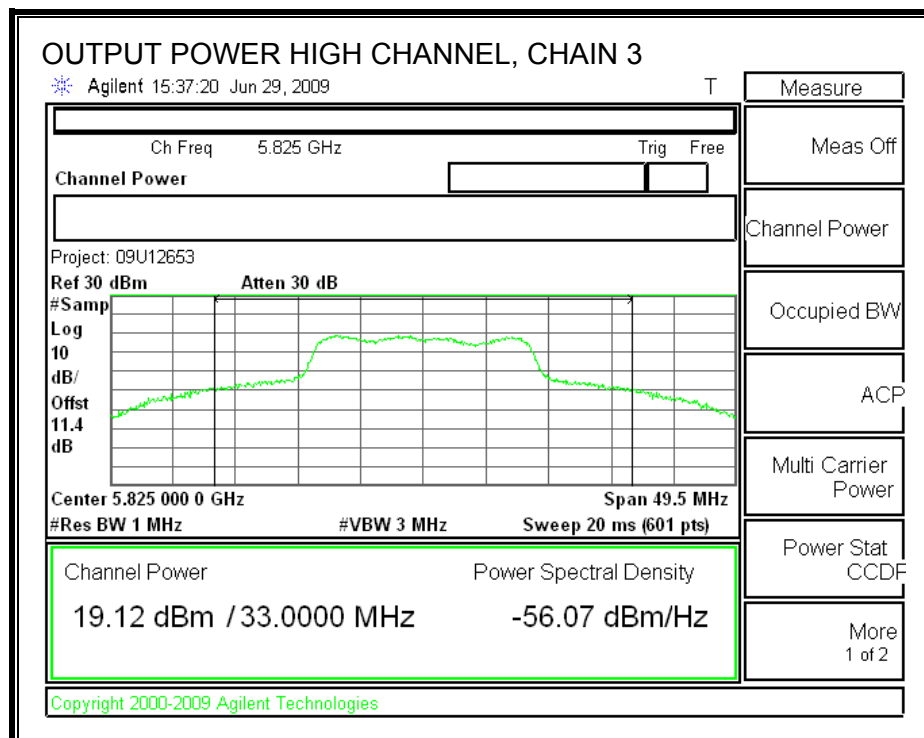
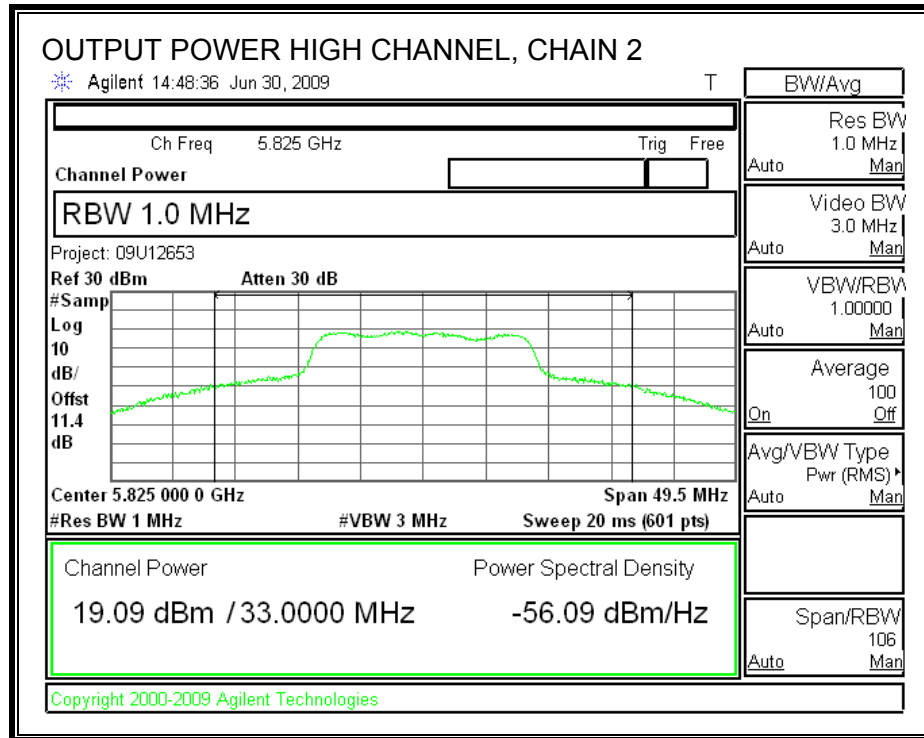
OUTPUT POWER, MID CHANNEL





OUTPUT POWER, HIGH CHANNEL





7.5.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

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

RESULTS

| Channel | Frequency (MHz) | Chain 0 Power (dBm) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Chain 3 Power (dBm) |
|---------|--------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Low | 5745 | 19.22 | 19.01 | 19.19 | 19.26 |
| Middle | 5785 | 19.15 | 19.23 | 19.14 | 19.02 |
| High | 5825 | 19.22 | 19.21 | 19.13 | 19.06 |

7.5.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

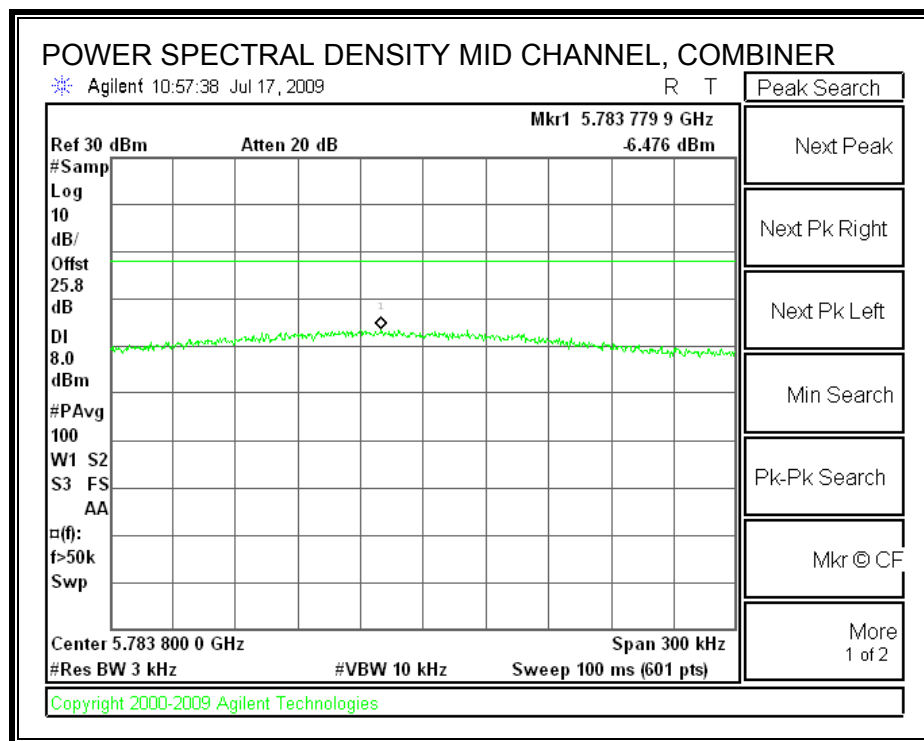
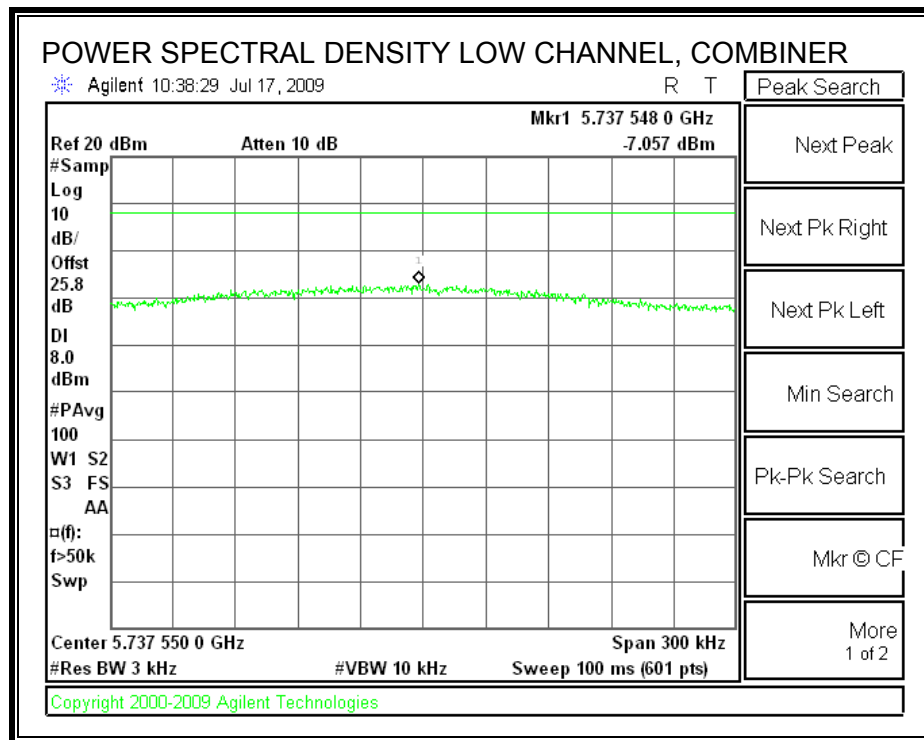
Output power was measured based on the use of RMS averaging over a time interval, therefore the power spectral density was measured using PSD Option 2 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

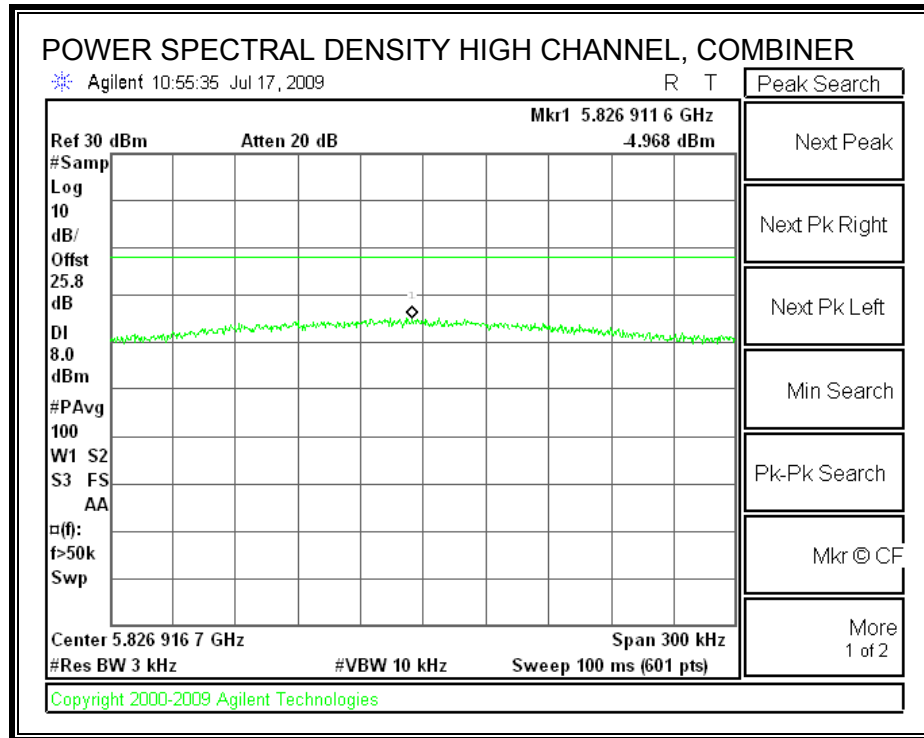
Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

RESULTS

| Channel | Frequency (MHz) | PSD with Combiner (dBm) | Limit (dBm) | Margin (dB) |
|---------|--------------------|----------------------------|----------------|----------------|
| Low | 5745 | -7.057 | 8 | -15.06 |
| Middle | 5785 | -6.476 | 8 | -14.48 |
| High | 5825 | -4.968 | 8 | -12.97 |

POWER SPECTRAL DENSITY





7.5.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dBc.

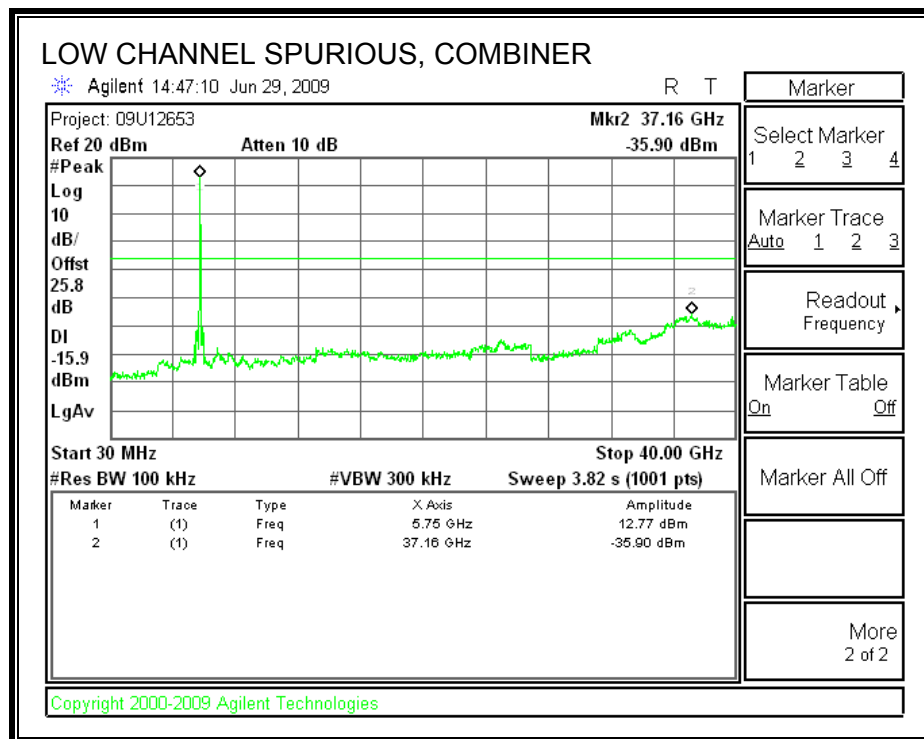
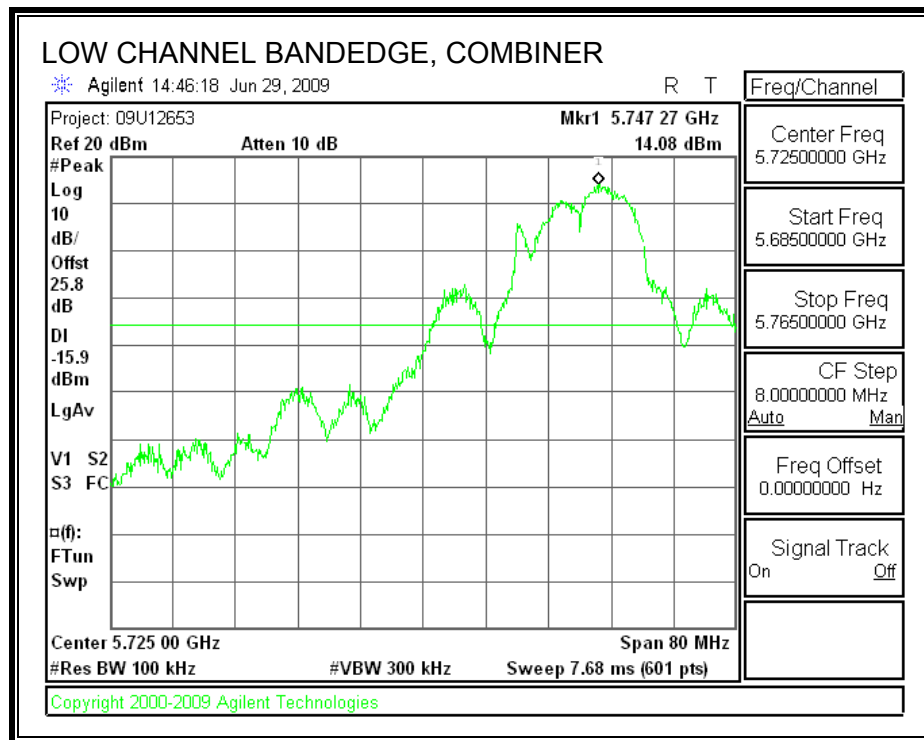
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

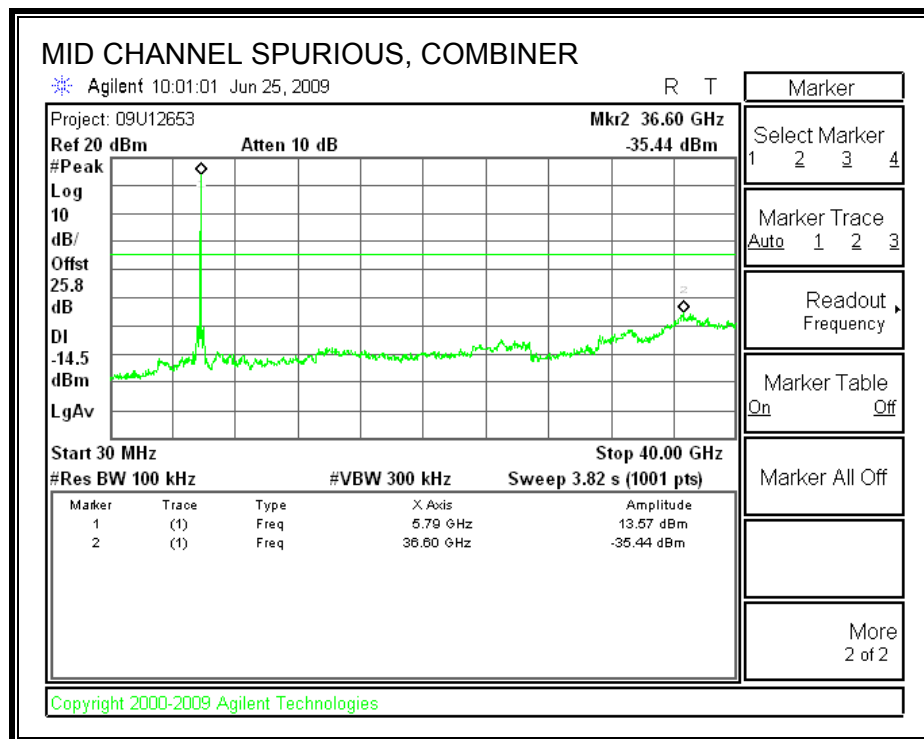
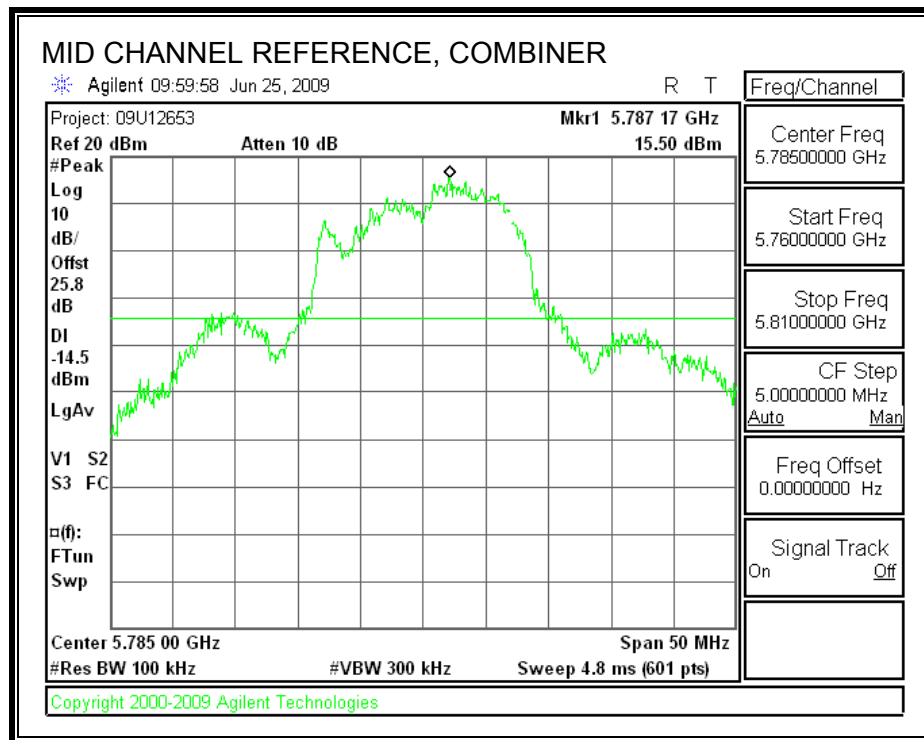
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

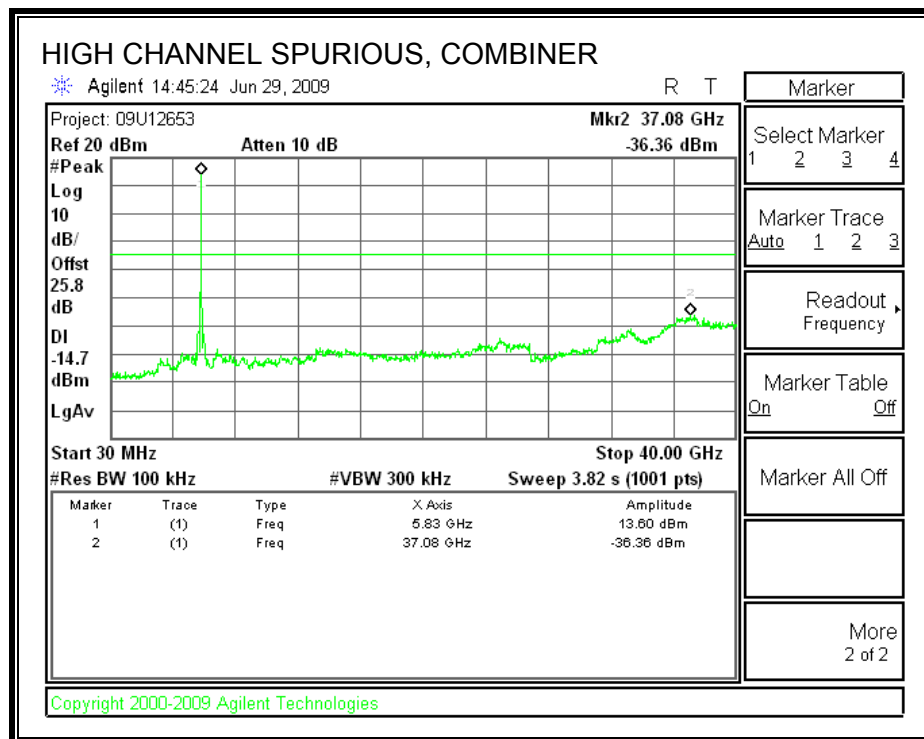
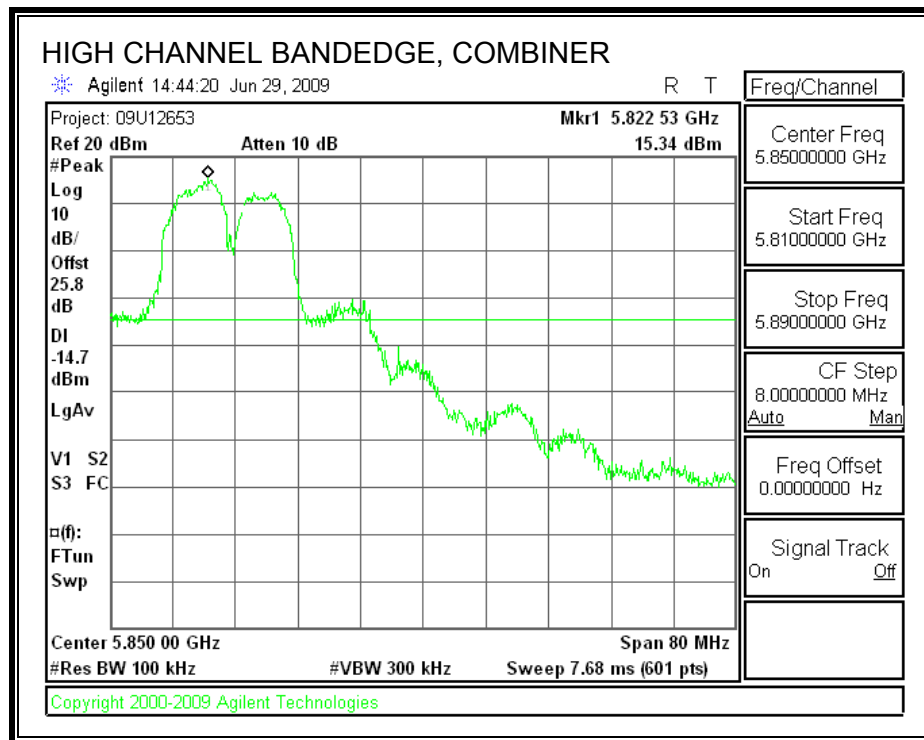
LOW CHANNEL SPURIOUS EMISSIONS



MID CHANNEL SPURIOUS EMISSIONS



HIGH CHANNEL SPURIOUS EMISSIONS



7.6. 5.8 GHz BAND CHANNEL TESTS FOR 802.11n HT20 MODE

7.6.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

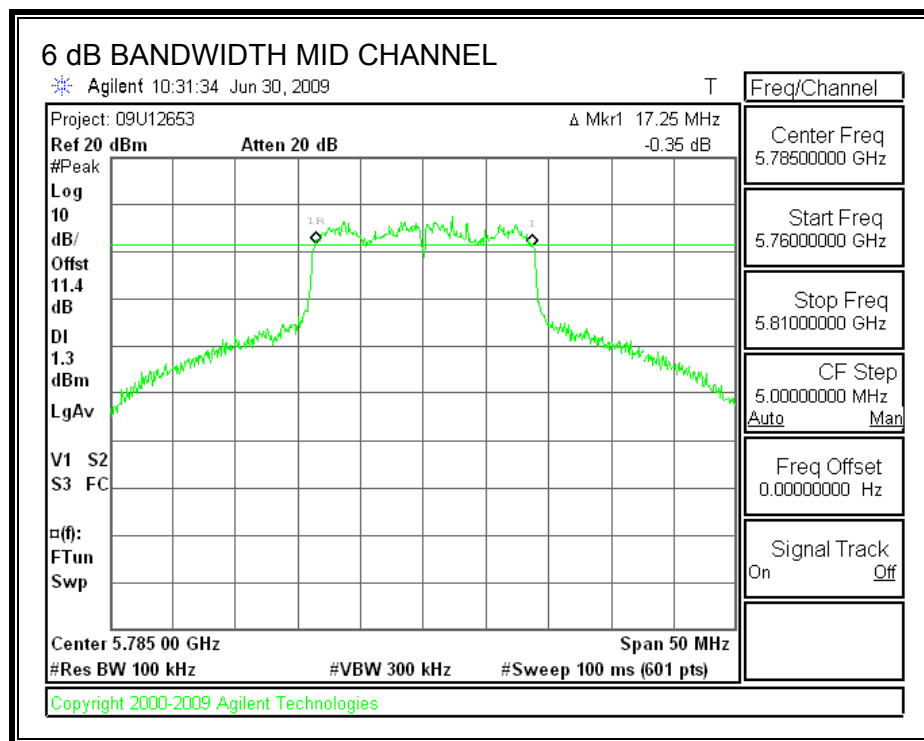
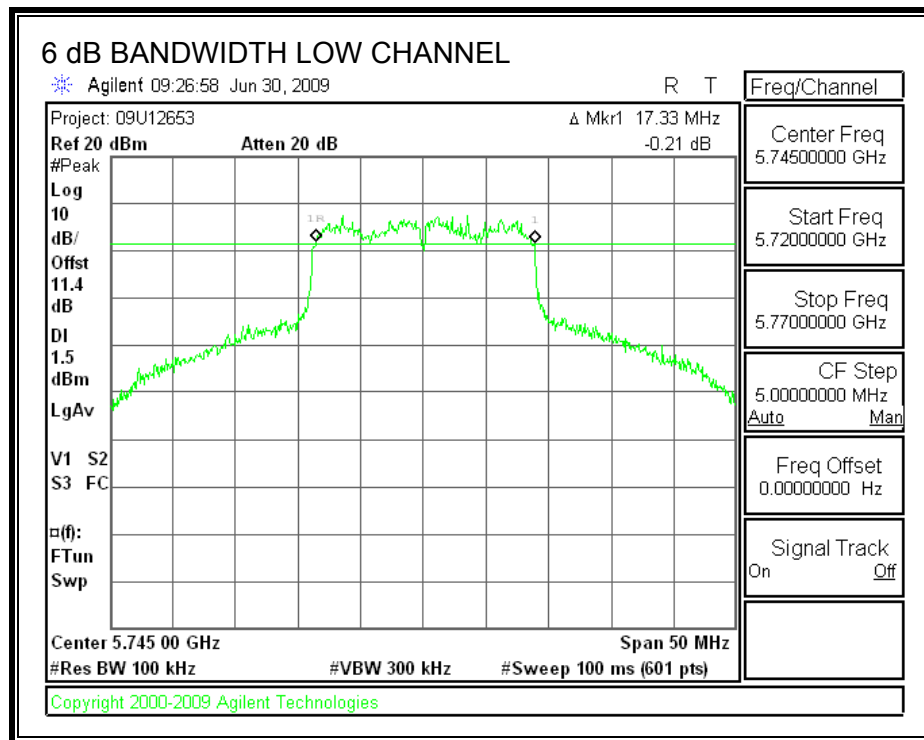
TEST PROCEDURE

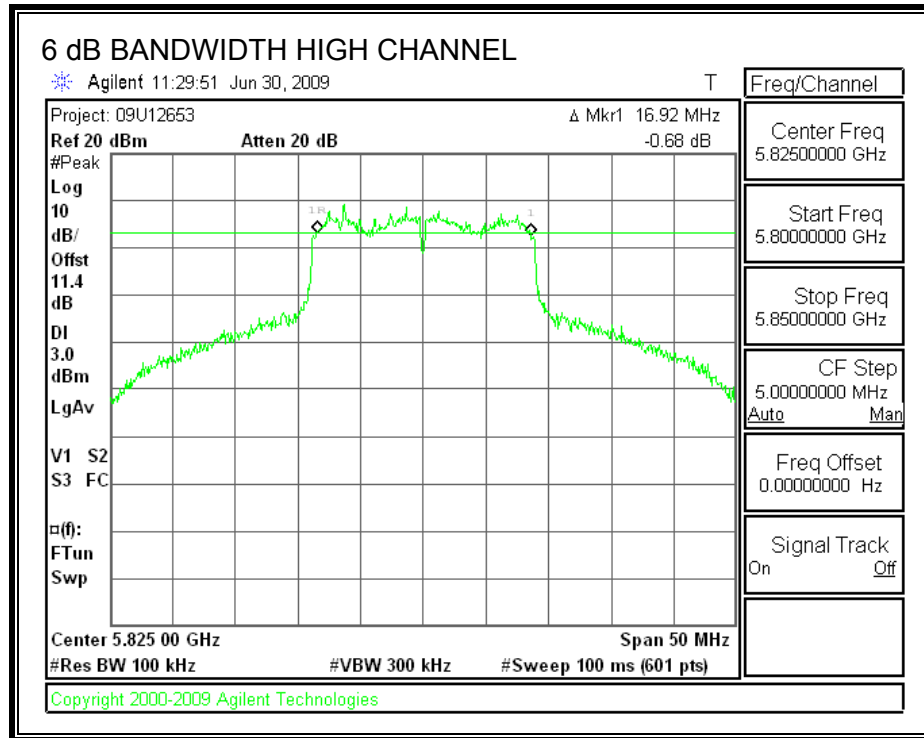
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

| Channel | Frequency (MHz) | 6 dB BW (MHz) | Minimum Limit (MHz) |
|----------------|----------------------------|--------------------------|--------------------------------|
| Low | 5745 | 17.33 | 0.5 |
| Middle | 5785 | 17.25 | 0.5 |
| High | 5825 | 16.92 | 0.5 |

6 dB BANDWIDTH





7.6.2. 99% & 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

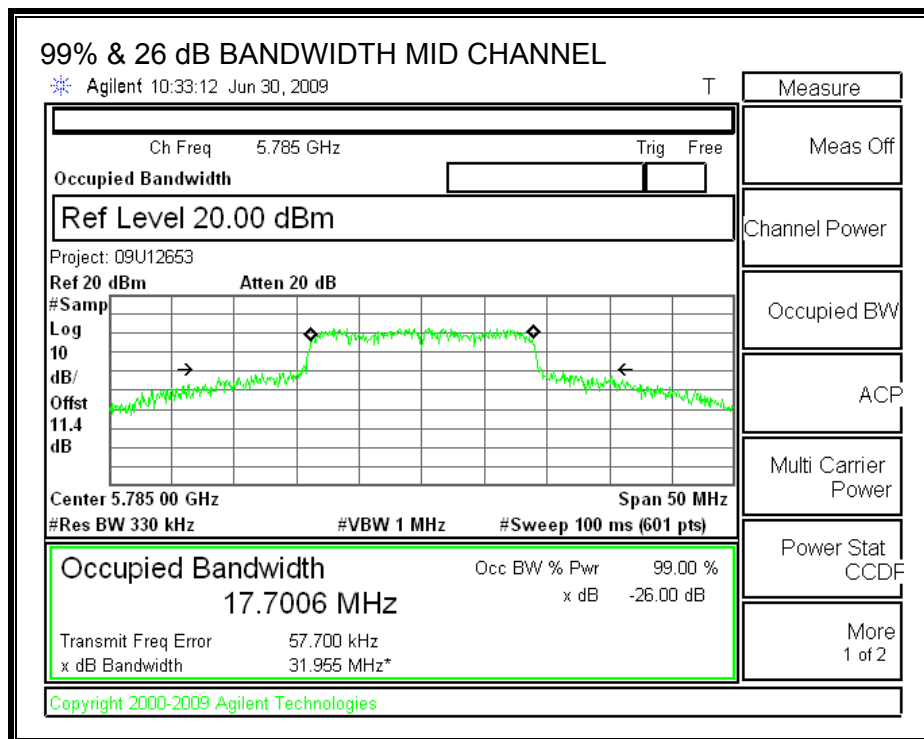
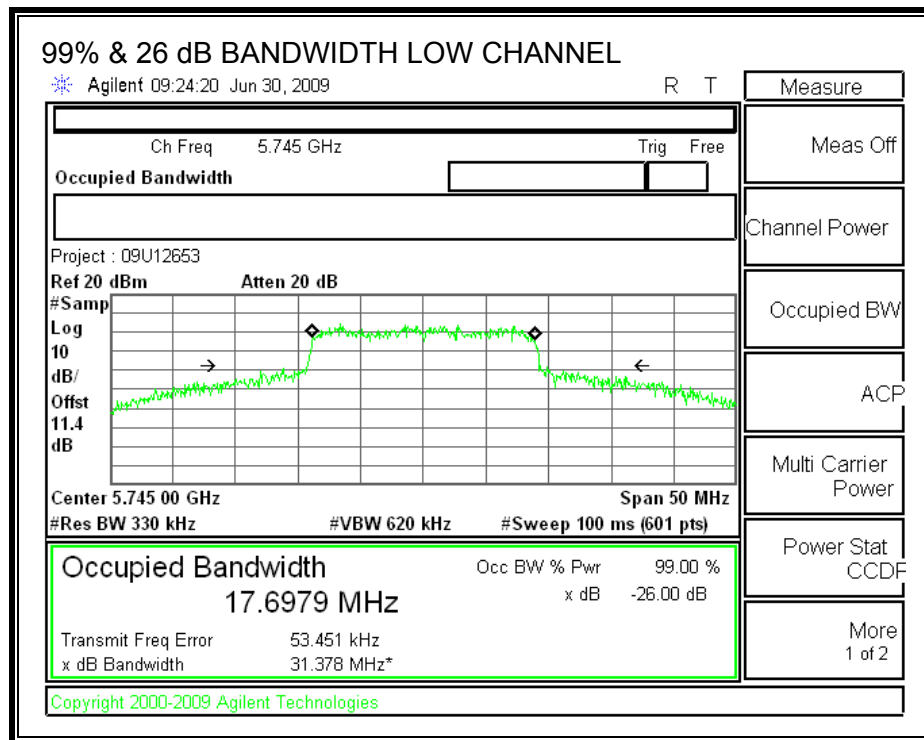
TEST PROCEDURE

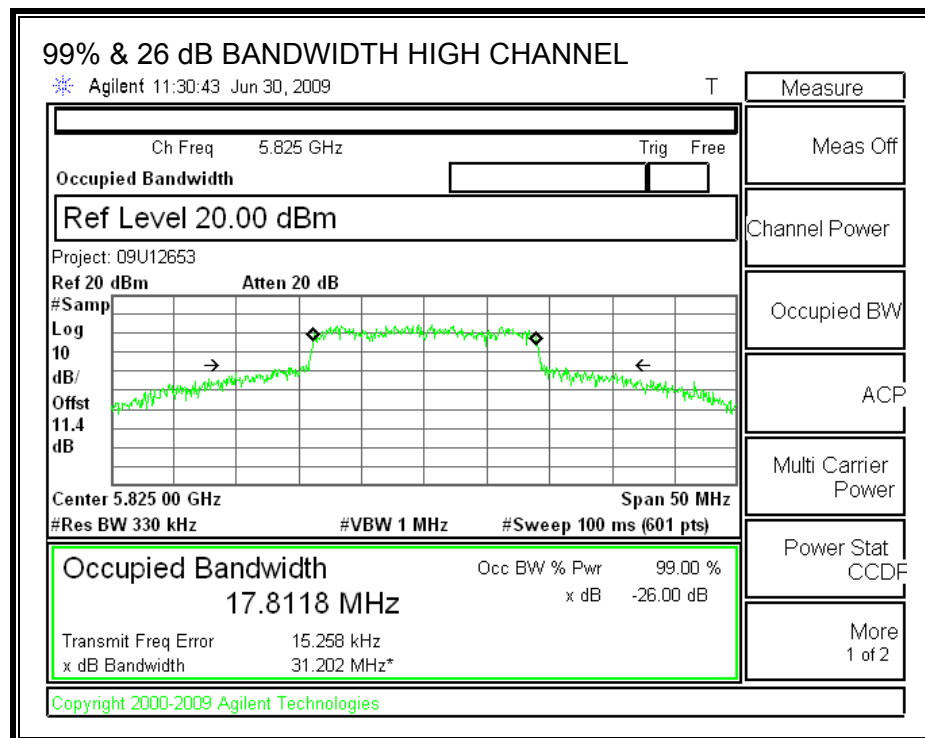
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth measurement function is utilized.

RESULTS

| Channel | Frequency (MHz) | 99% OBW (MHz) | 26 dB BW (MHz) |
|---------|--------------------|------------------|-------------------|
| Low | 5745 | 17.70 | 31.38 |
| Middle | 5785 | 17.70 | 31.96 |
| High | 5825 | 17.81 | 31.20 |

99% & 26 dB BANDWIDTH





7.6.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

TEST PROCEDURE

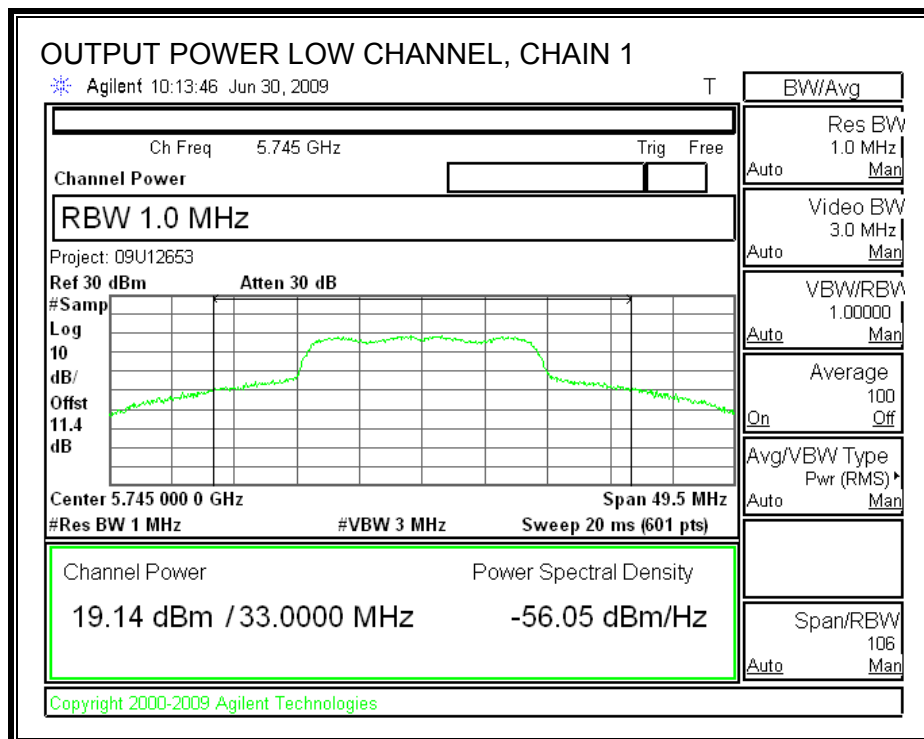
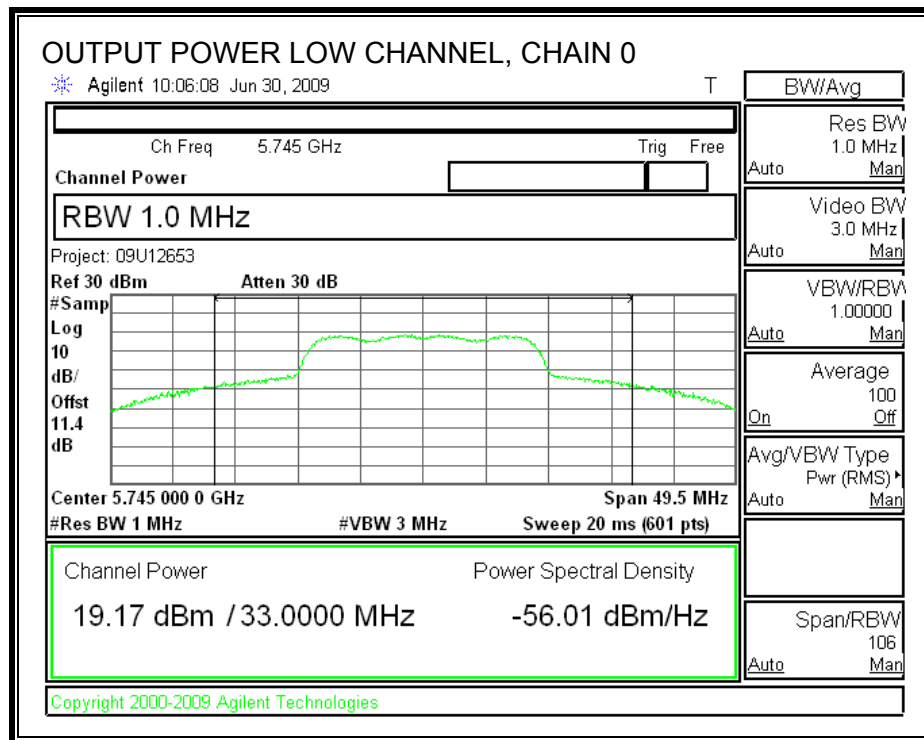
Output power was measured based on the use of RMS averaging over a time interval in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

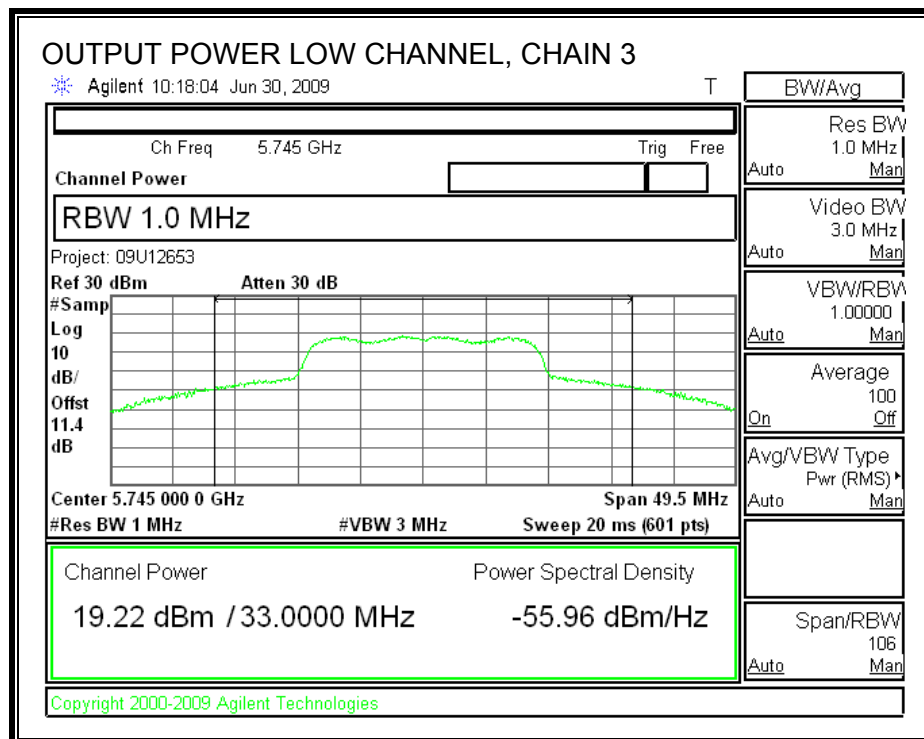
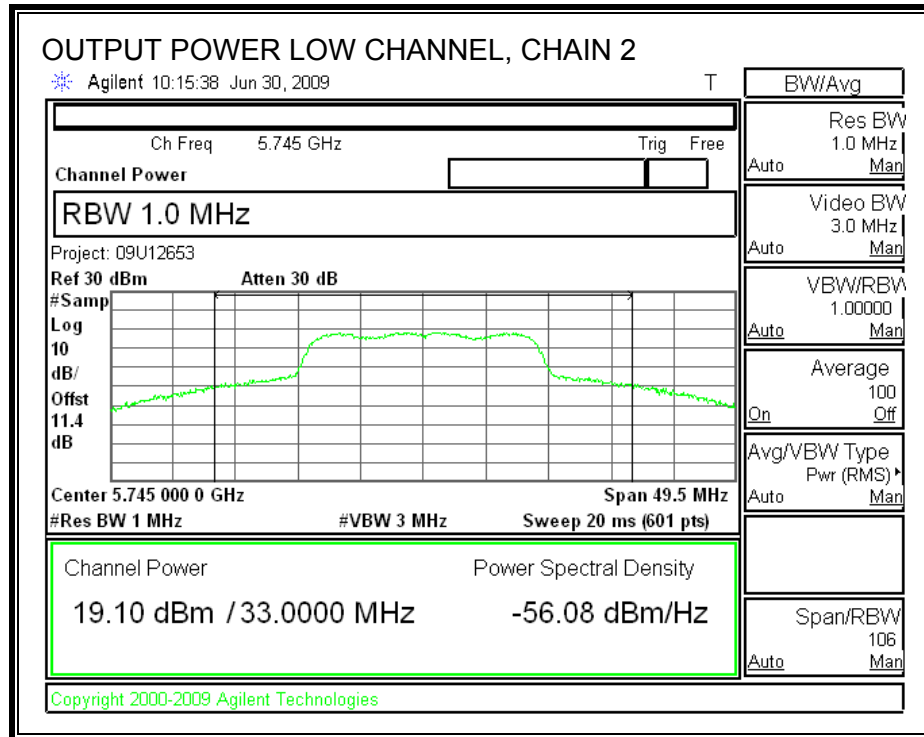
RESULTS

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

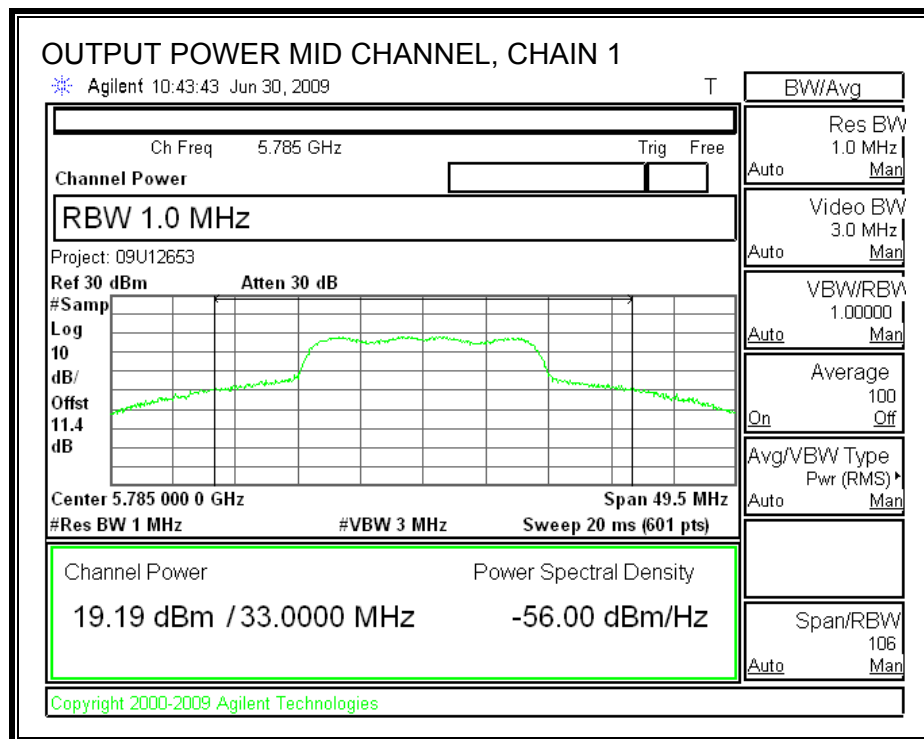
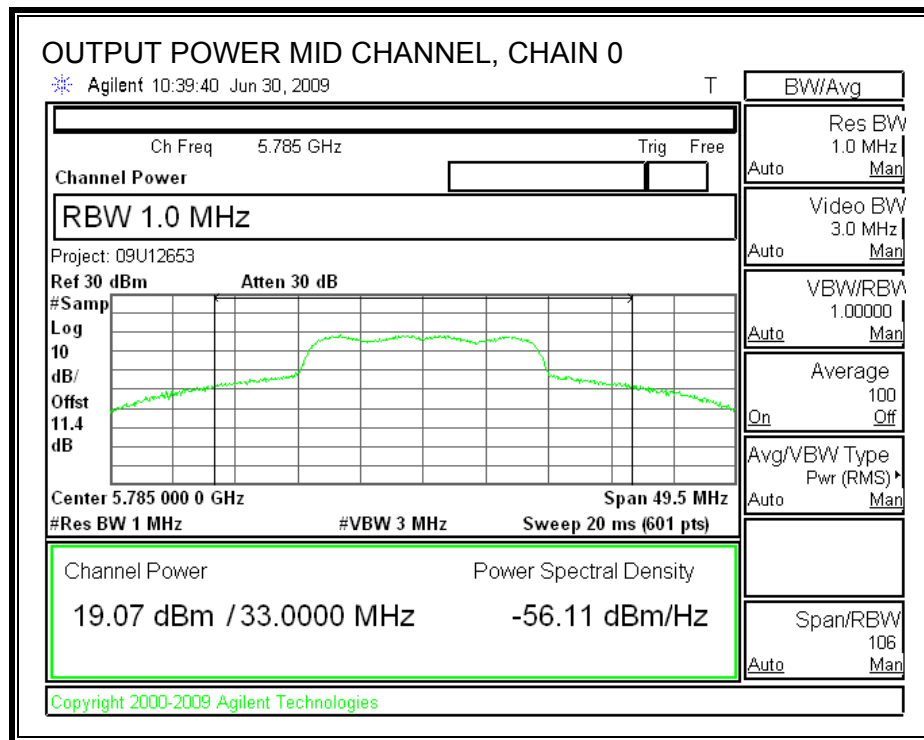
| Channel | Frequency (MHz) | Chain 0 Power (dBm) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Chain 3 Power (dBm) | Total Power (dBm) | Limit (dBm) | Margin (dB) |
|---------|--------------------|---------------------------|---------------------------|---------------------------|---------------------------|-------------------------|----------------|----------------|
| Low | 5745 | 19.17 | 19.14 | 19.10 | 19.22 | 25.18 | 30.00 | -4.82 |
| Mid | 5785 | 19.07 | 19.19 | 19.01 | 19.09 | 25.11 | 30.00 | -4.89 |
| High | 5825 | 19.21 | 19.16 | 19.25 | 19.05 | 25.19 | 30.00 | -4.81 |

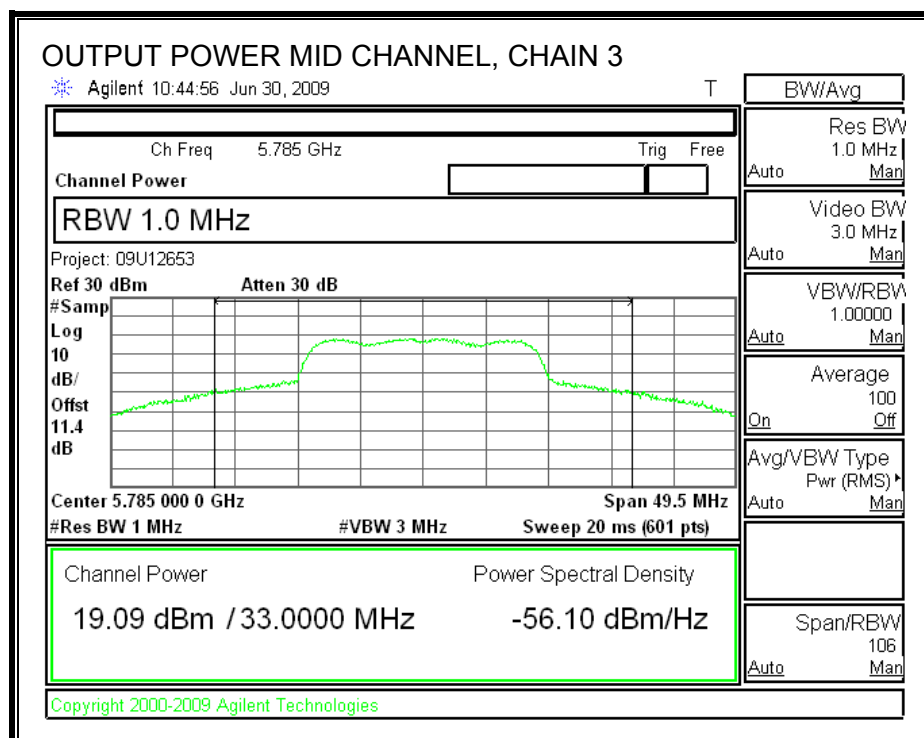
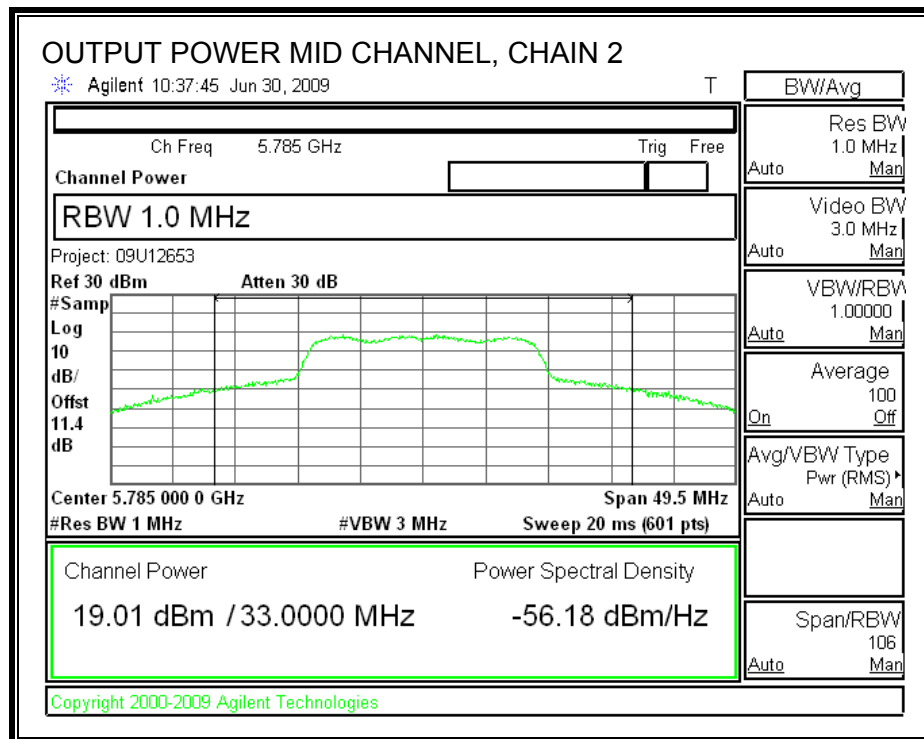
OUTPUT POWER, LOW CHANNEL



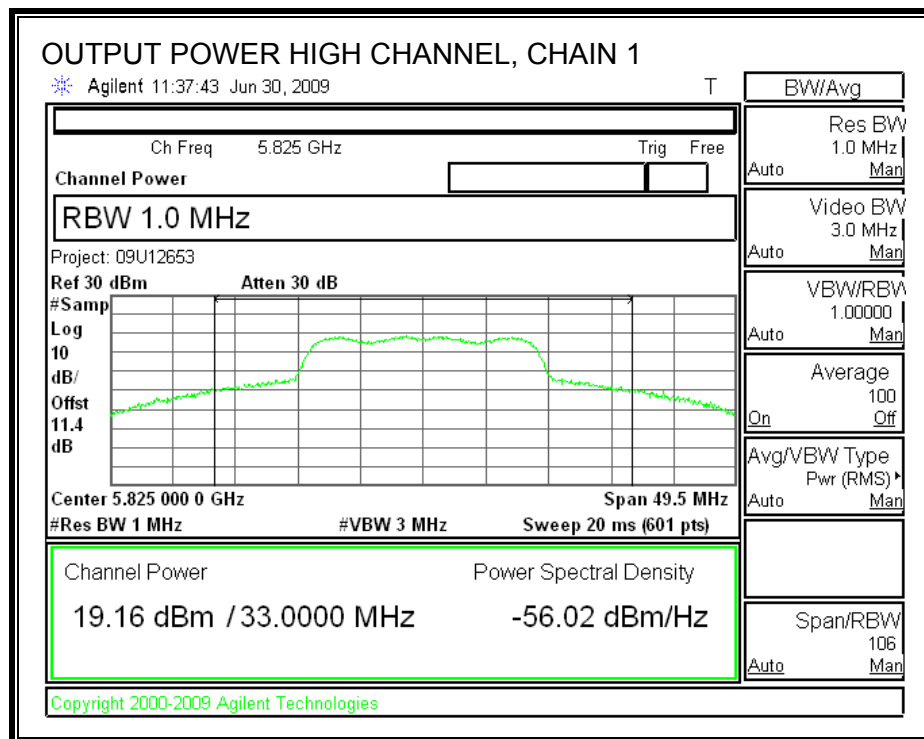
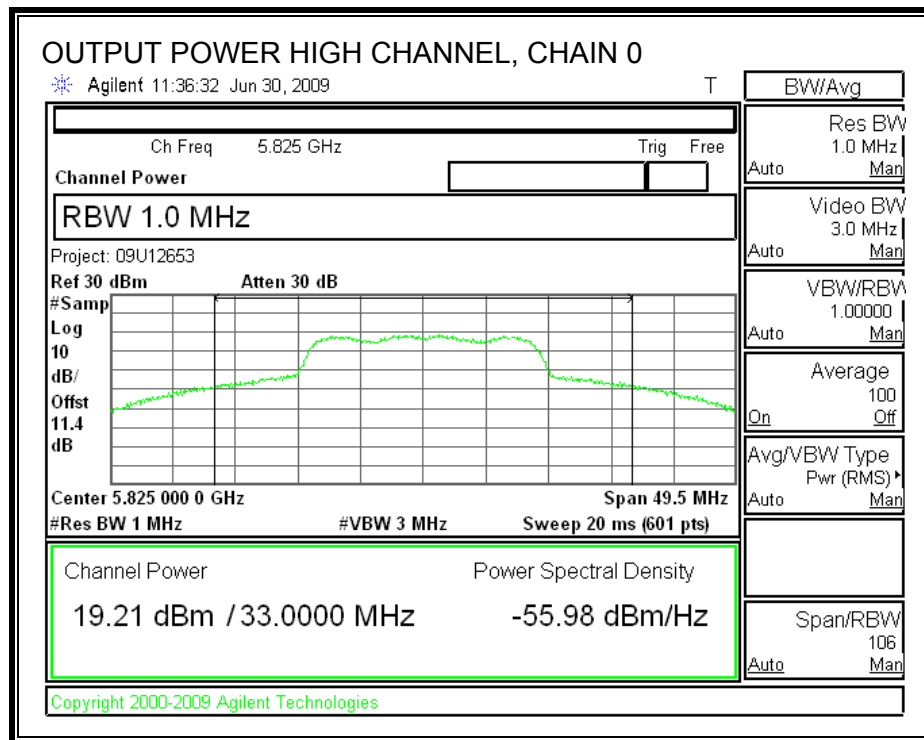


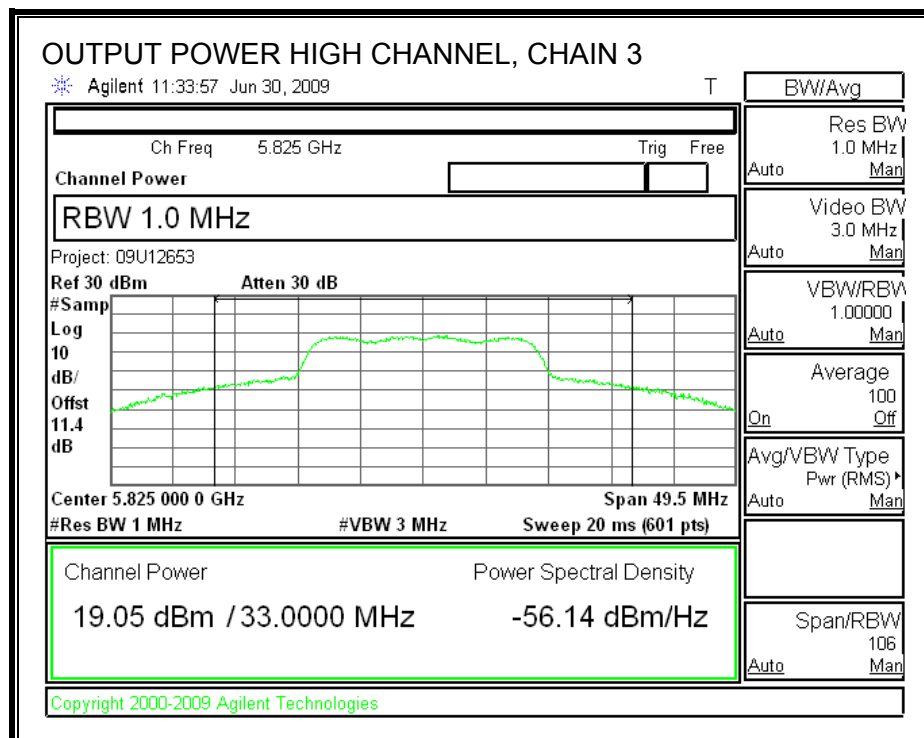
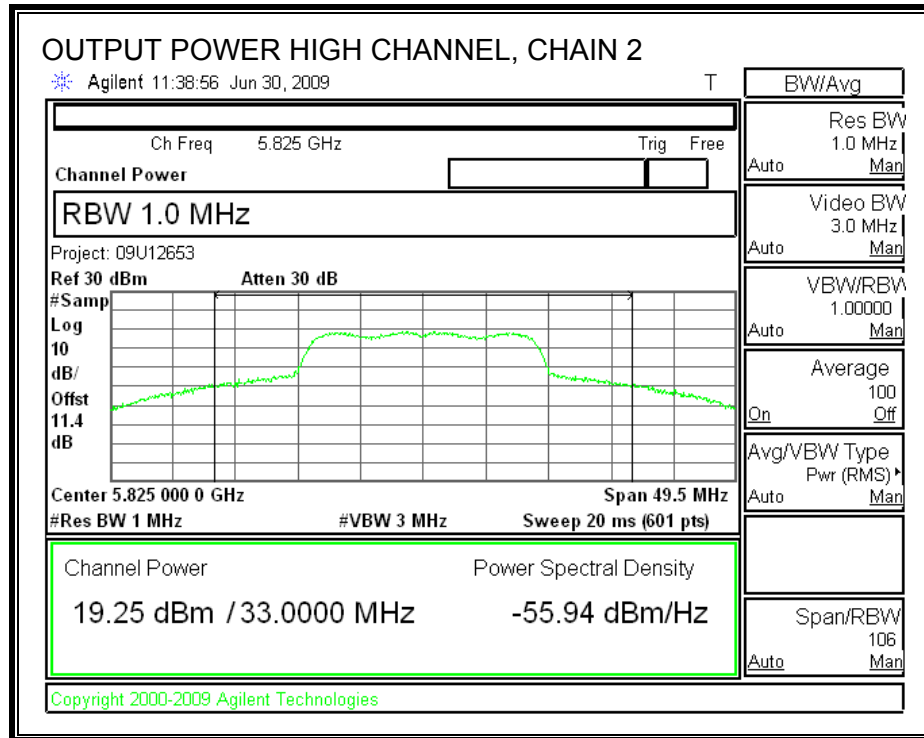
OUTPUT POWER, MID CHANNEL





OUTPUT POWER, HIGH CHANNEL





7.6.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

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

RESULTS

| Channel | Frequency (MHz) | Chain 0 Power (dBm) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Chain 3 Power (dBm) |
|---------|--------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Low | 5745 | 19.13 | 19.20 | 19.28 | 19.24 |
| Middle | 5785 | 19.28 | 19.11 | 19.17 | 19.14 |
| High | 5825 | 19.10 | 19.12 | 19.29 | 19.22 |

7.6.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

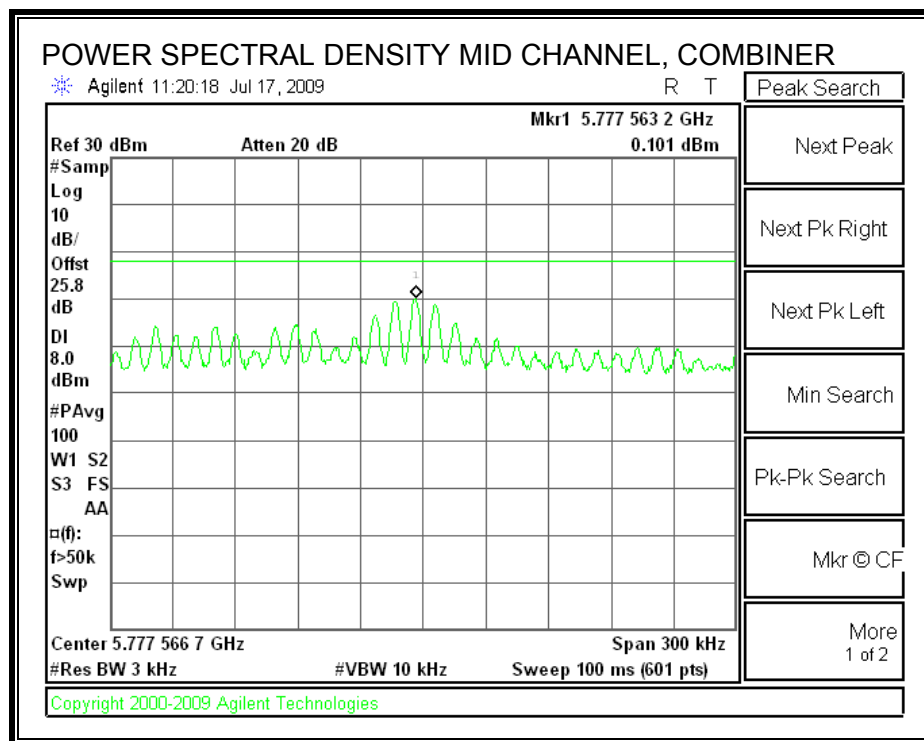
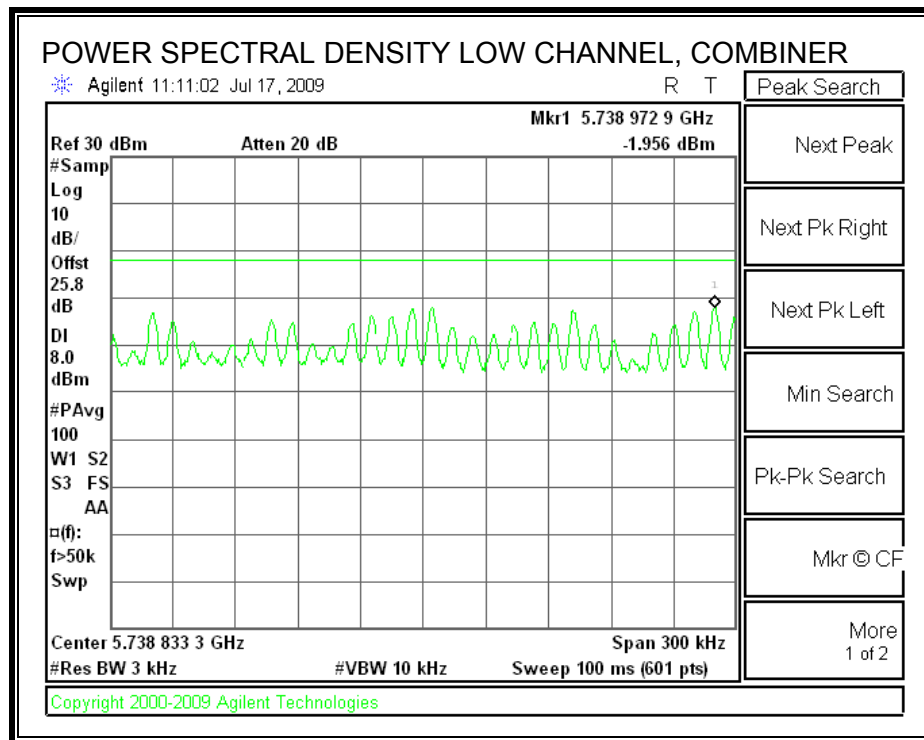
Output power was measured based on the use of RMS averaging over a time interval, therefore the power spectral density was measured using PSD Option 2 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

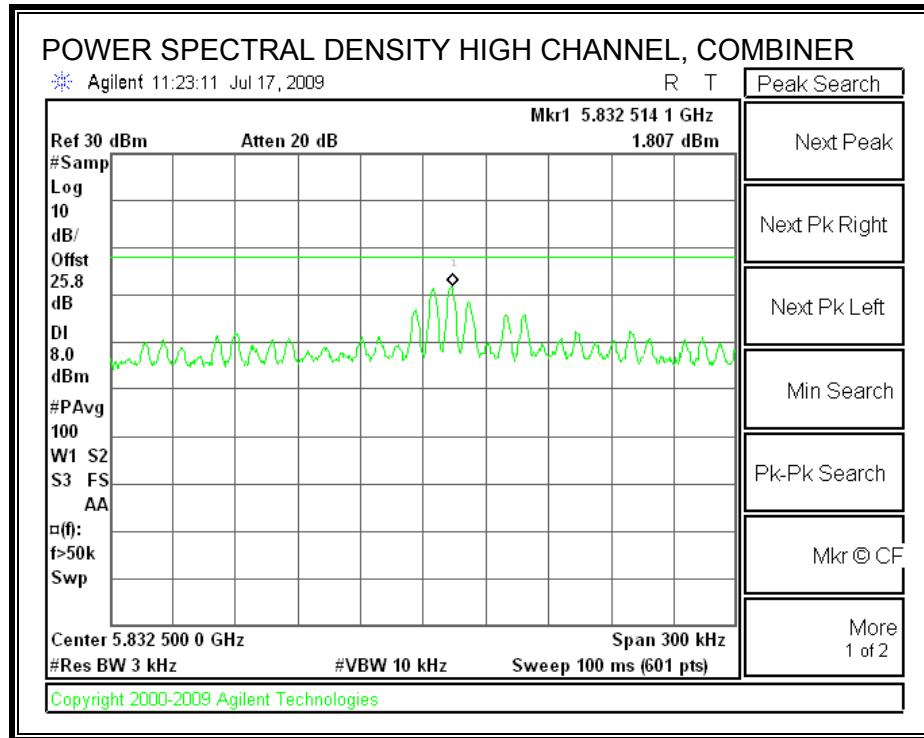
Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

RESULTS

| Channel | Frequency (MHz) | PSD with Combiner (dBm) | Limit (dBm) | Margin (dB) |
|---------|--------------------|----------------------------|----------------|----------------|
| Low | 5745 | -1.956 | 8 | -9.96 |
| Middle | 5785 | 0.101 | 8 | -7.90 |
| High | 5825 | 1.807 | 8 | -6.19 |

POWER SPECTRAL DENSITY





7.6.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dBc.

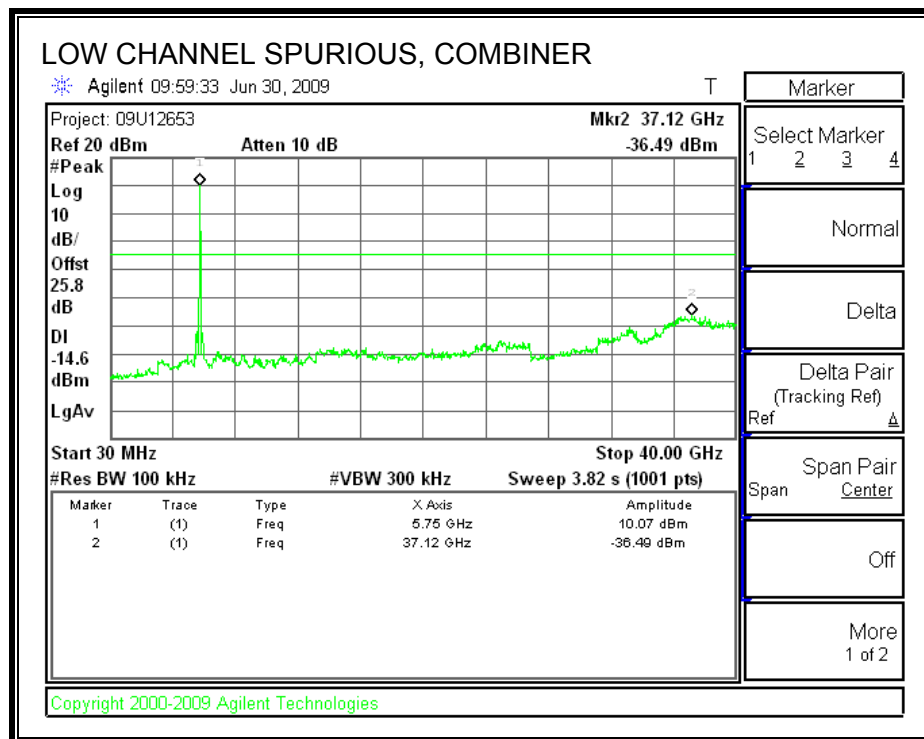
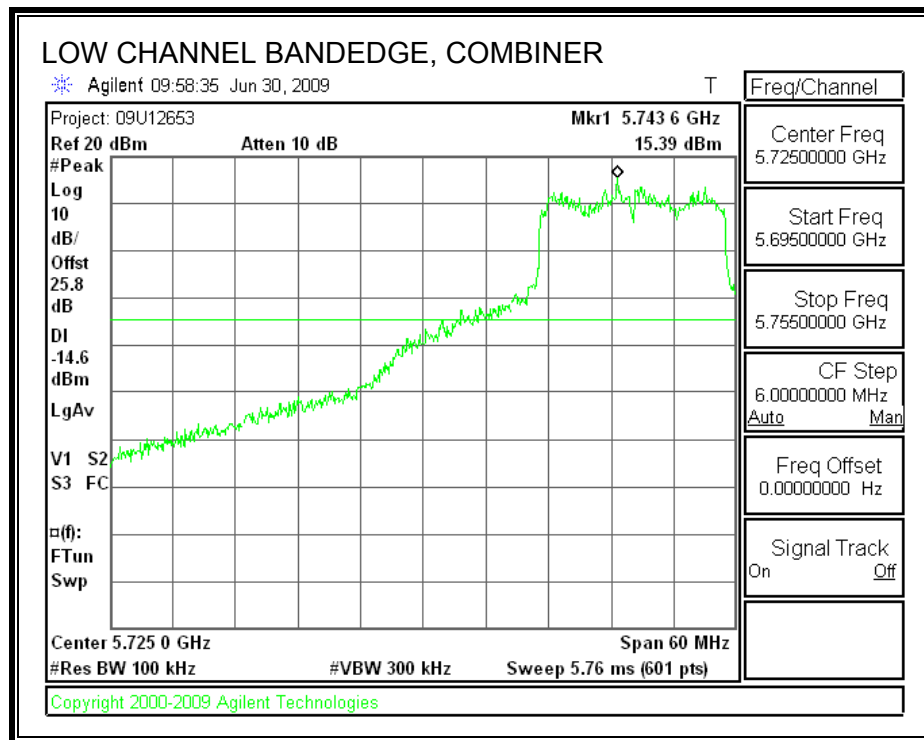
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

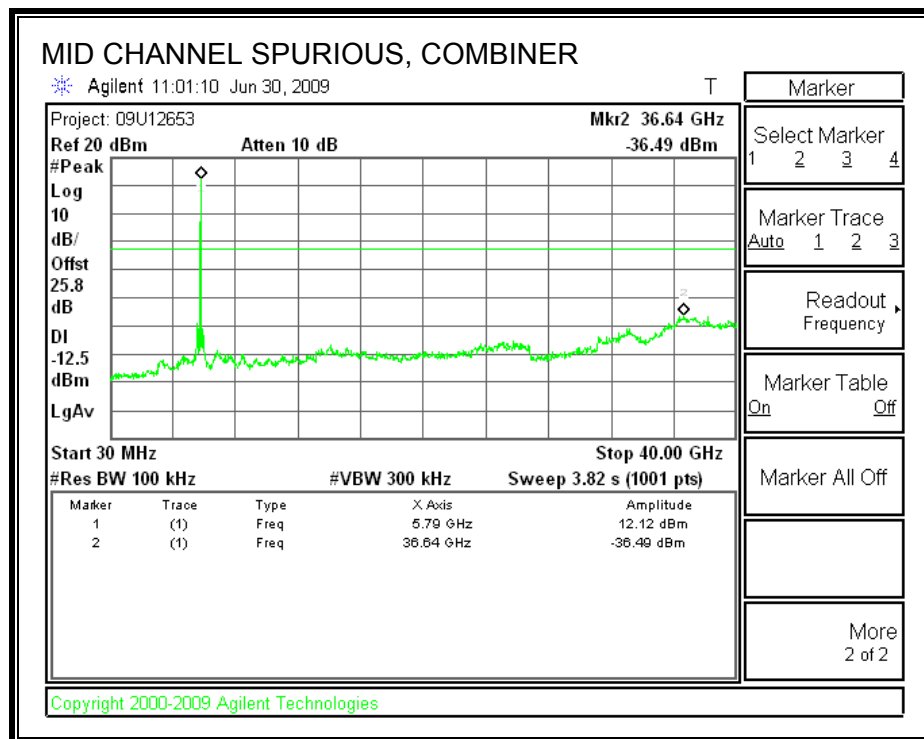
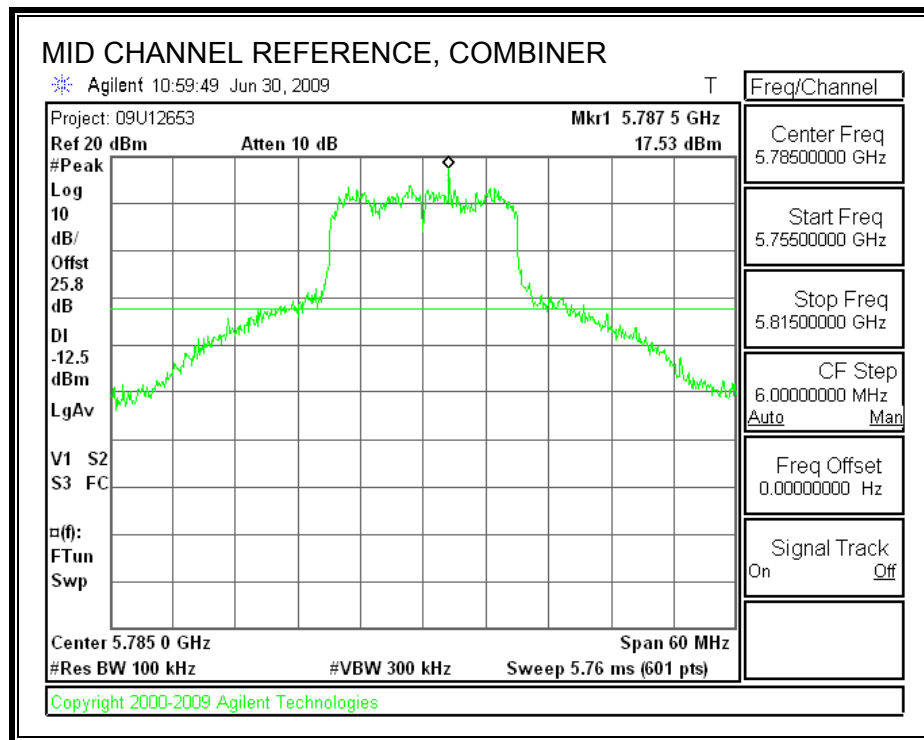
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

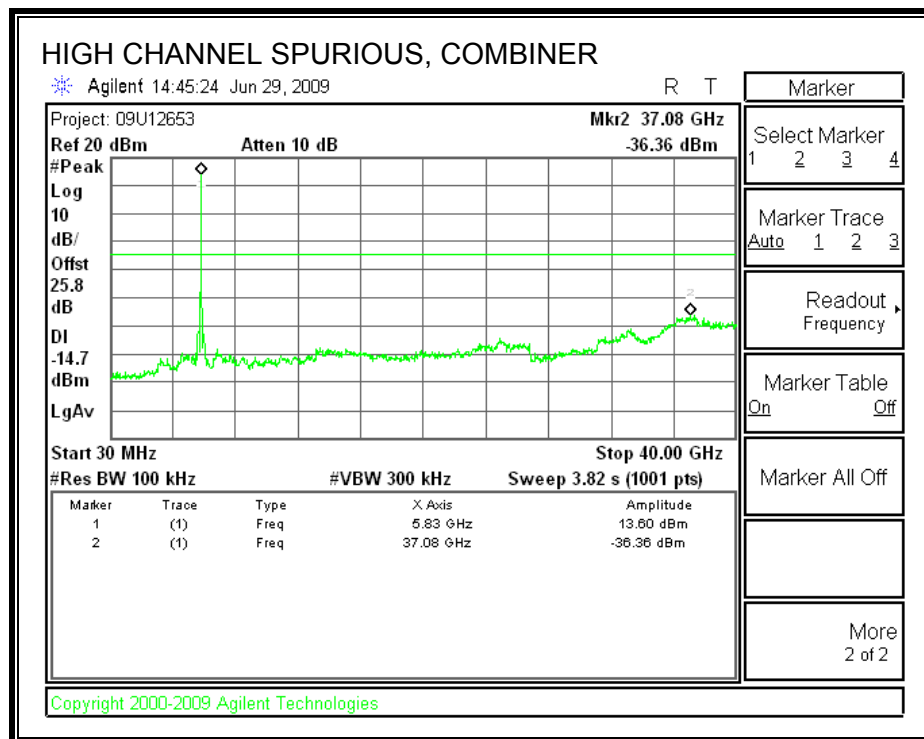
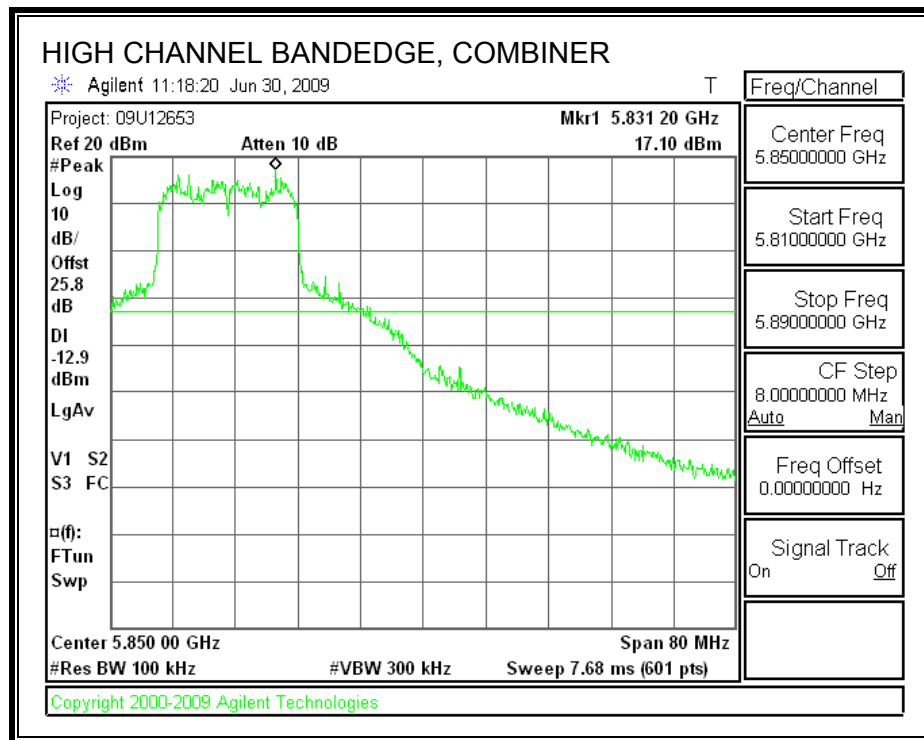
LOW CHANNEL SPURIOUS EMISSIONS



MID CHANNEL SPURIOUS EMISSIONS



HIGH CHANNEL SPURIOUS EMISSIONS



7.7. 5.8 GHz BAND CHANNEL TESTS FOR 802.11n HT40 MODE

7.7.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

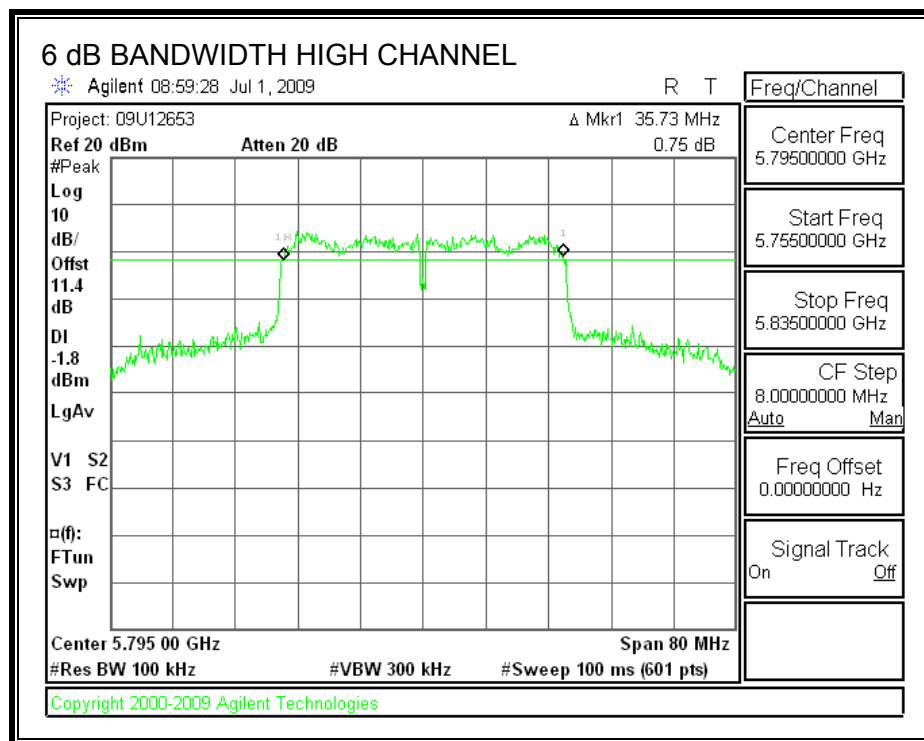
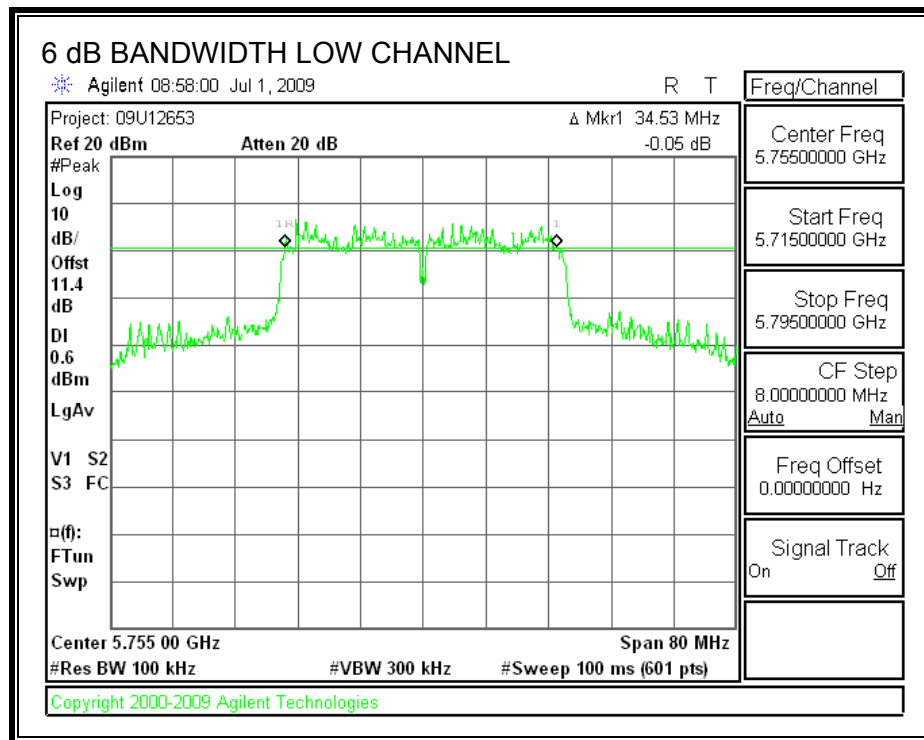
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

| Channel | Frequency (MHz) | 6 dB BW (MHz) | Minimum Limit (MHz) |
|---------|--------------------|------------------|------------------------|
| Low | 5755 | 34.53 | 0.5 |
| High | 5795 | 35.73 | 0.5 |

6 dB BANDWIDTH



7.7.2. 99% & 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

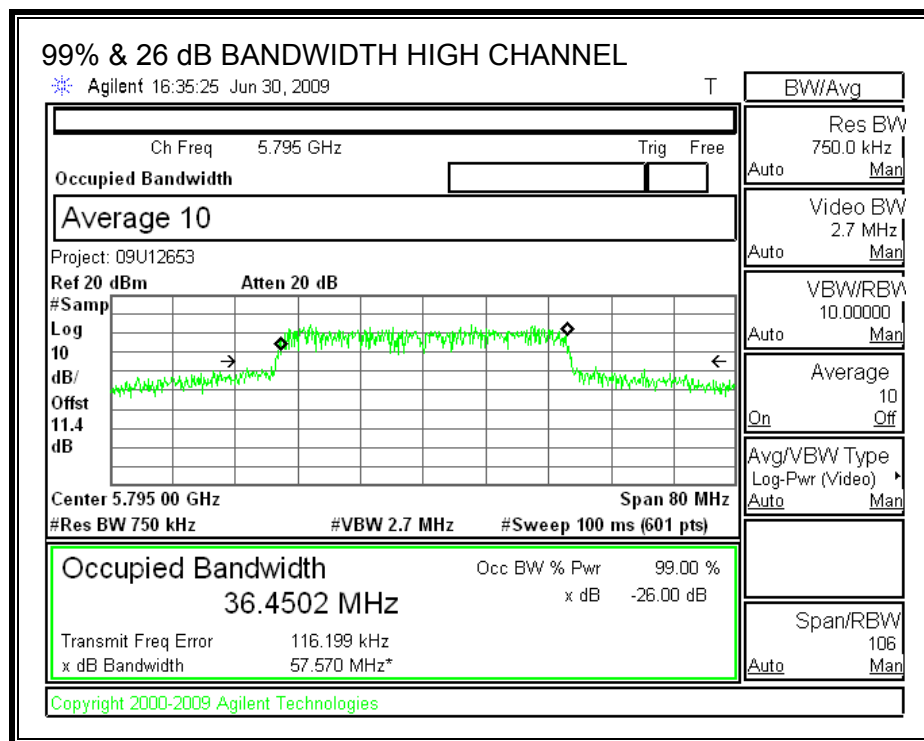
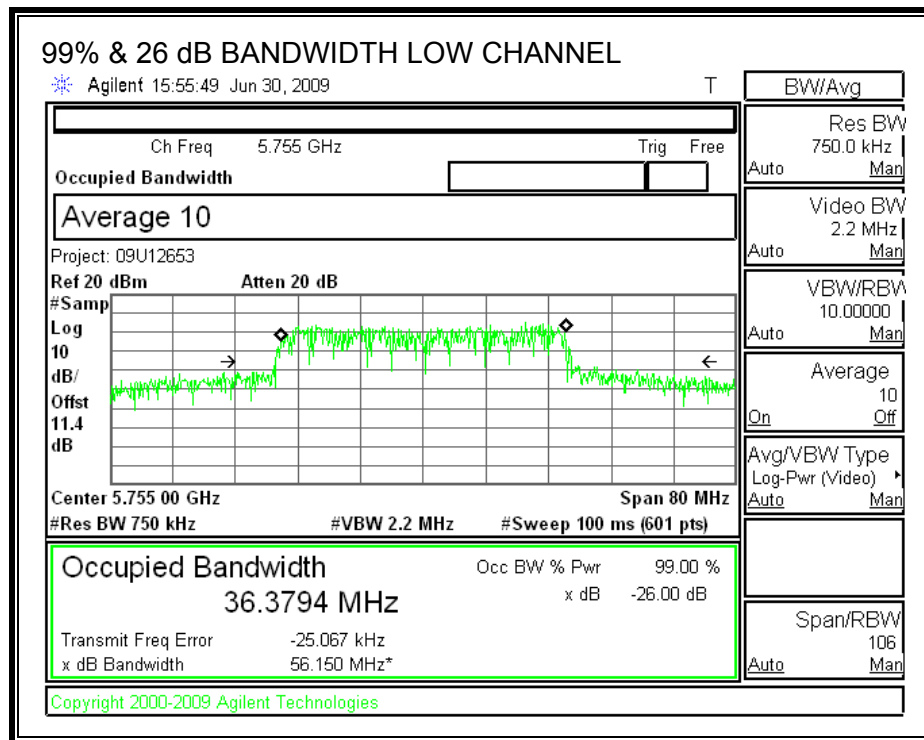
TEST PROCEDURE

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

RESULTS

| Channel | Frequency (MHz) | 99% OBW (MHz) | 26 dB BW (MHz) |
|---------|--------------------|------------------|-------------------|
| Low | 5755 | 36.3794 | 56.15 |
| High | 5795 | 36.4502 | 57.57 |

99% & 26 dB BANDWIDTH



7.7.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

TEST PROCEDURE

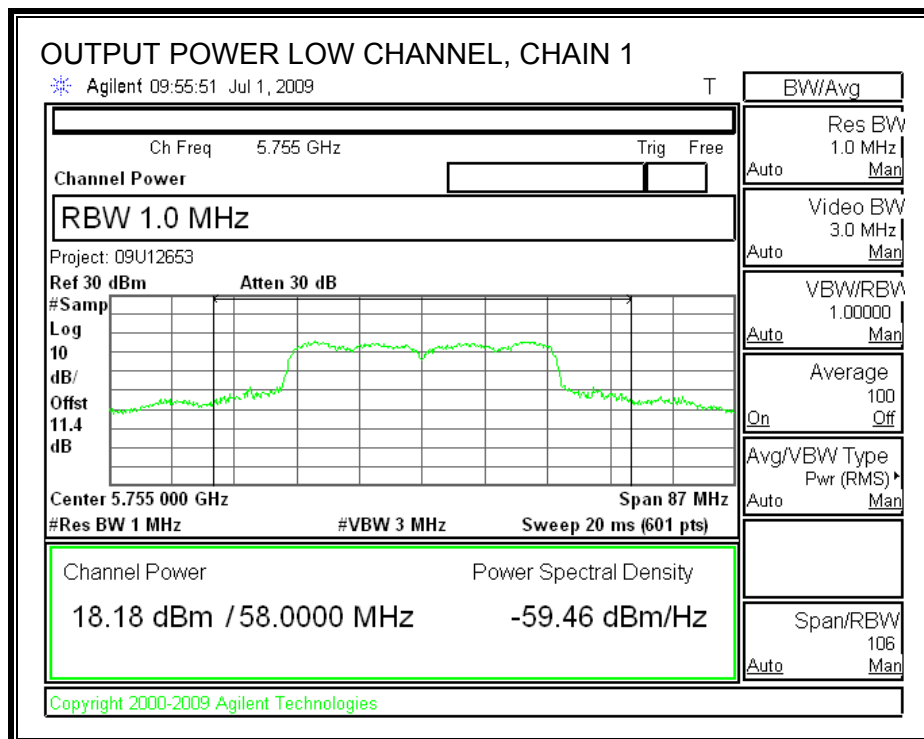
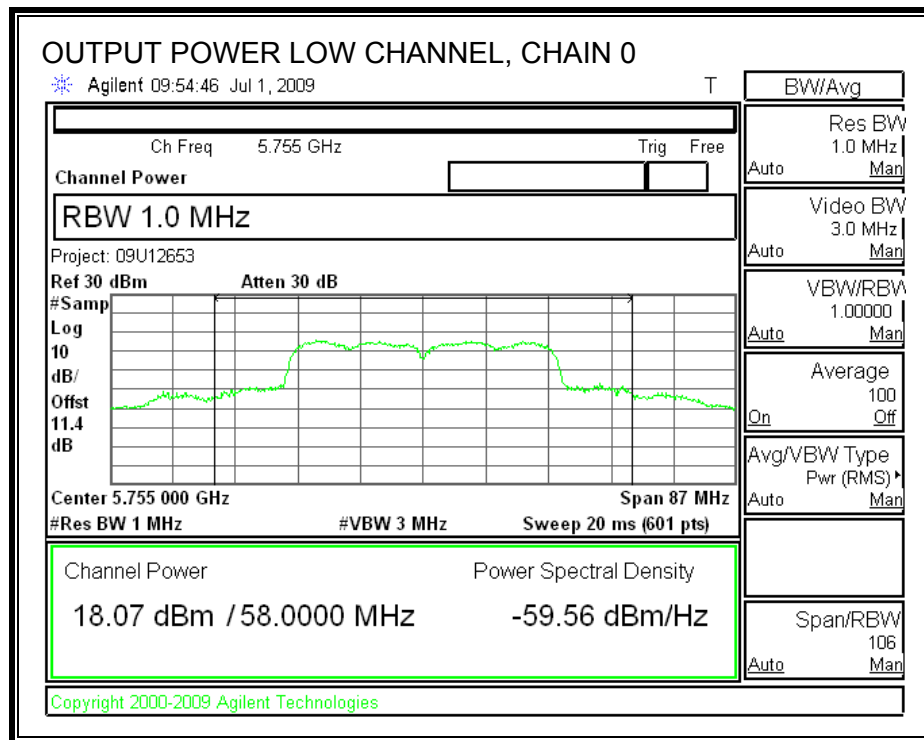
Output power was measured based on the use of RMS averaging over a time interval in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

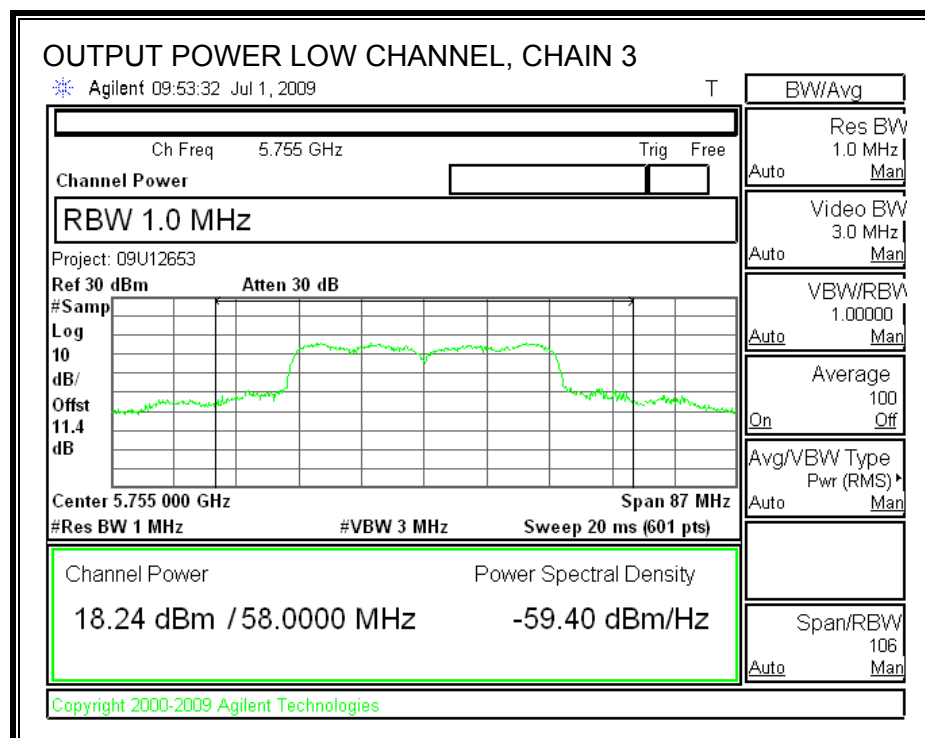
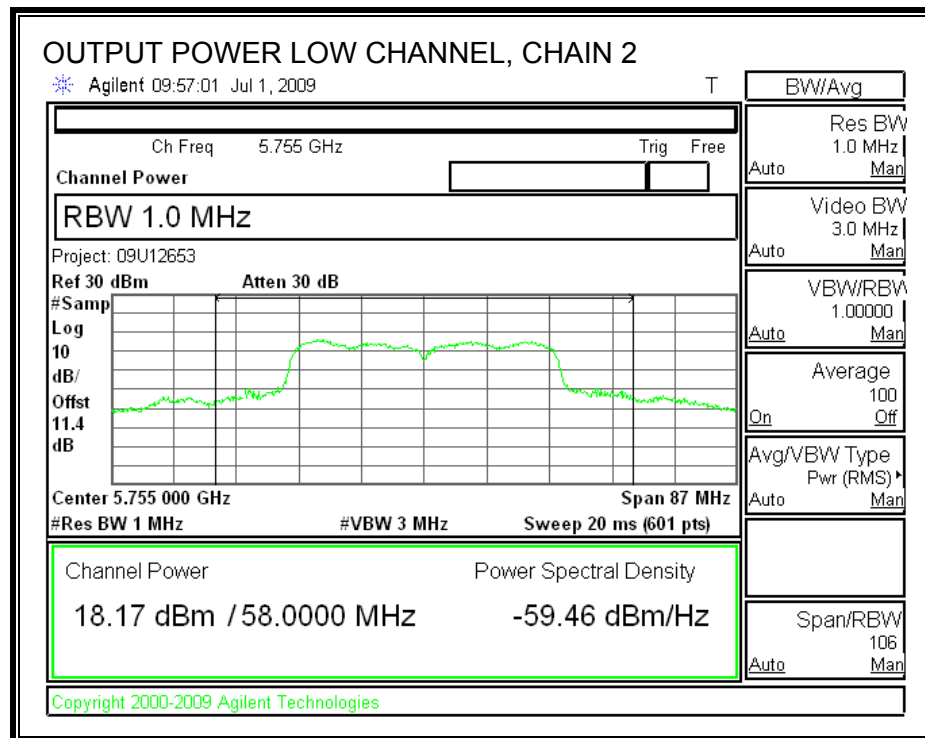
RESULTS

The maximum antenna gain is less than 6 dBi; therefore the limit is 30 dBm.

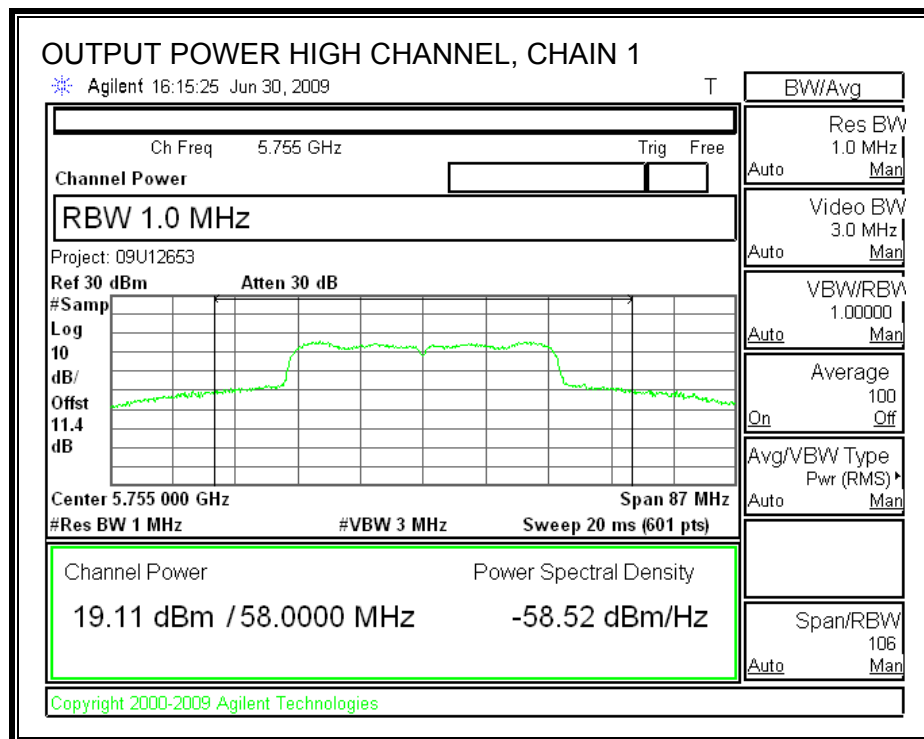
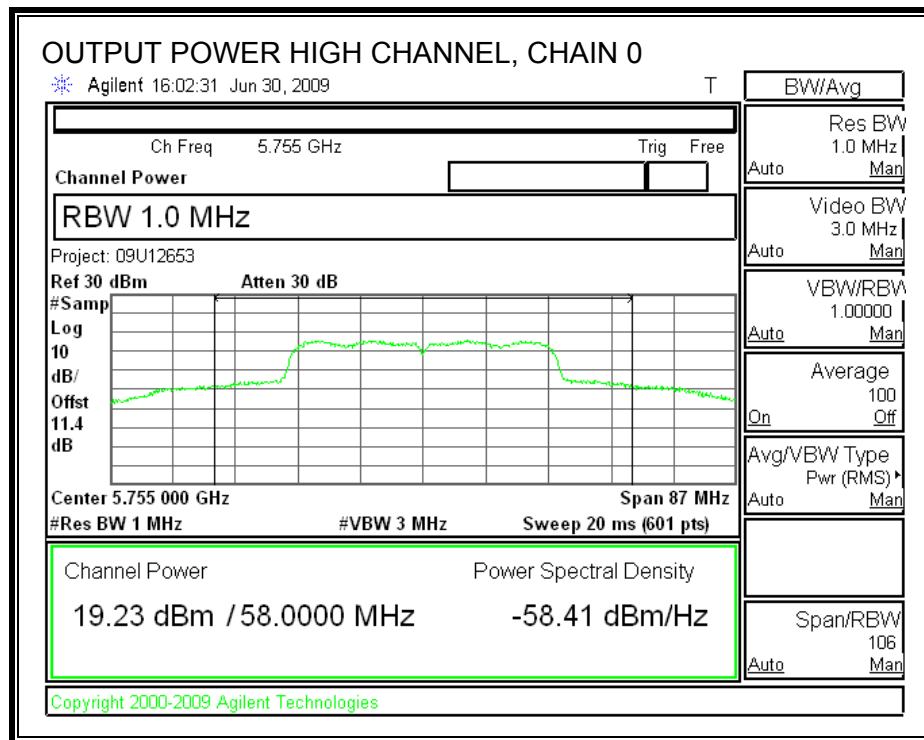
| Channel | Frequency (MHz) | Chain 0 Power (dBm) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Chain 3 Power (dBm) | Total Power (dBm) | Limit (dBm) | Margin (dB) |
|---------|--------------------|---------------------------|---------------------------|---------------------------|---------------------------|-------------------------|----------------|----------------|
| Low | 5755 | 18.07 | 18.18 | 18.17 | 18.24 | 24.19 | 30.00 | -5.81 |
| High | 5795 | 19.23 | 19.11 | 18.96 | 19.17 | 25.14 | 30.00 | -4.86 |

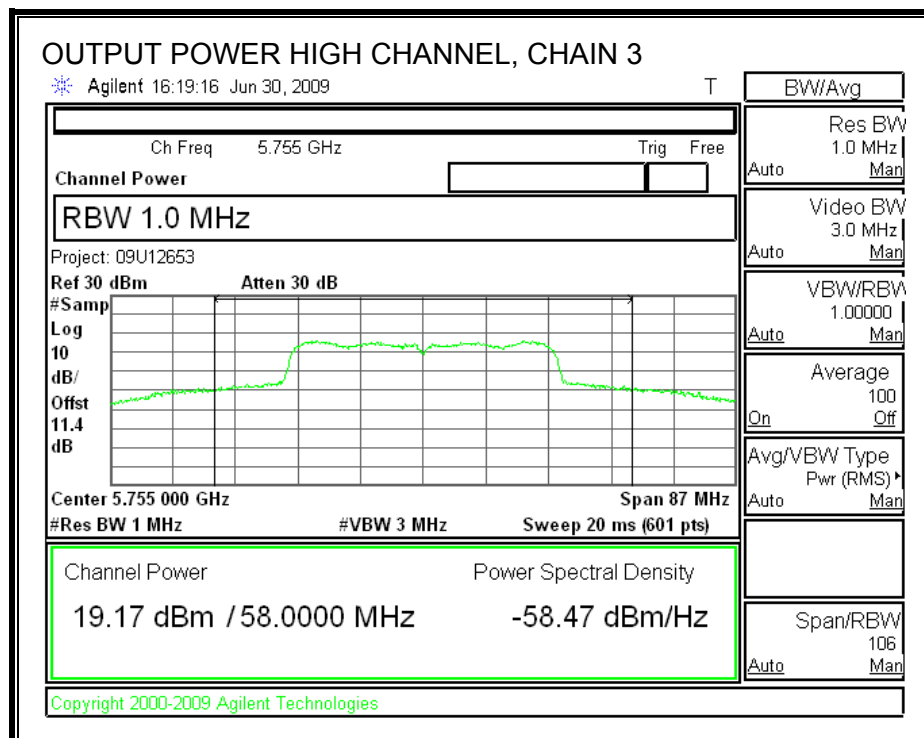
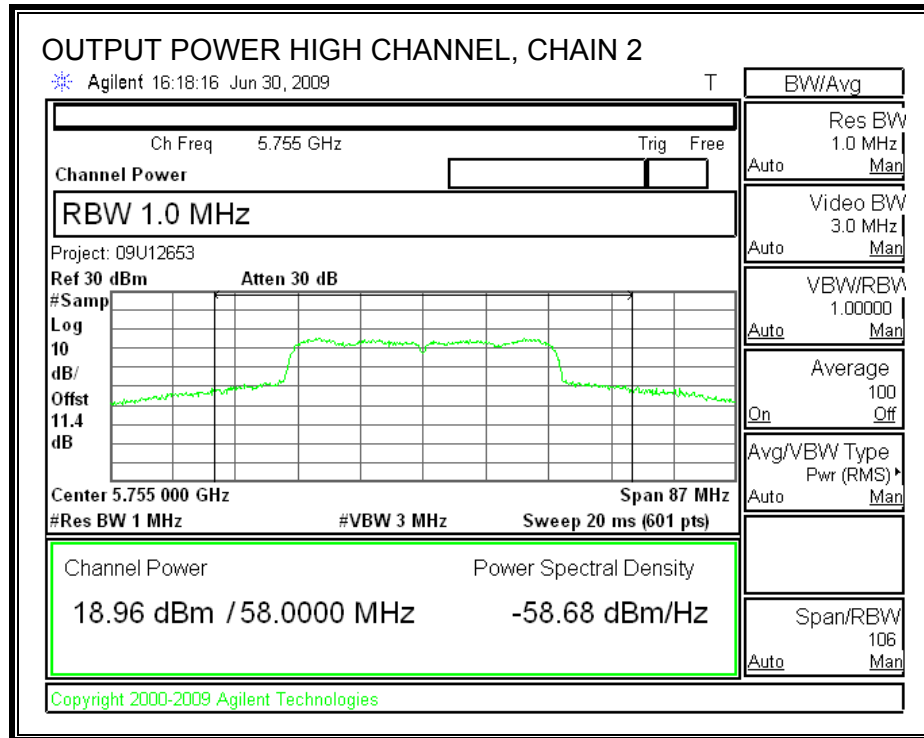
OUTPUT POWER, LOW CHANNEL





OUTPUT POWER, HIGH CHANNEL





7.7.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

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

RESULTS

| Channel | Frequency (MHz) | Chain 0 Power (dBm) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Chain 3 Power (dBm) |
|---------|--------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Low | 5755 | 18.30 | 18.11 | 18.15 | 18.04 |
| High | 5795 | 19.11 | 19.25 | 19.09 | 19.27 |

7.7.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

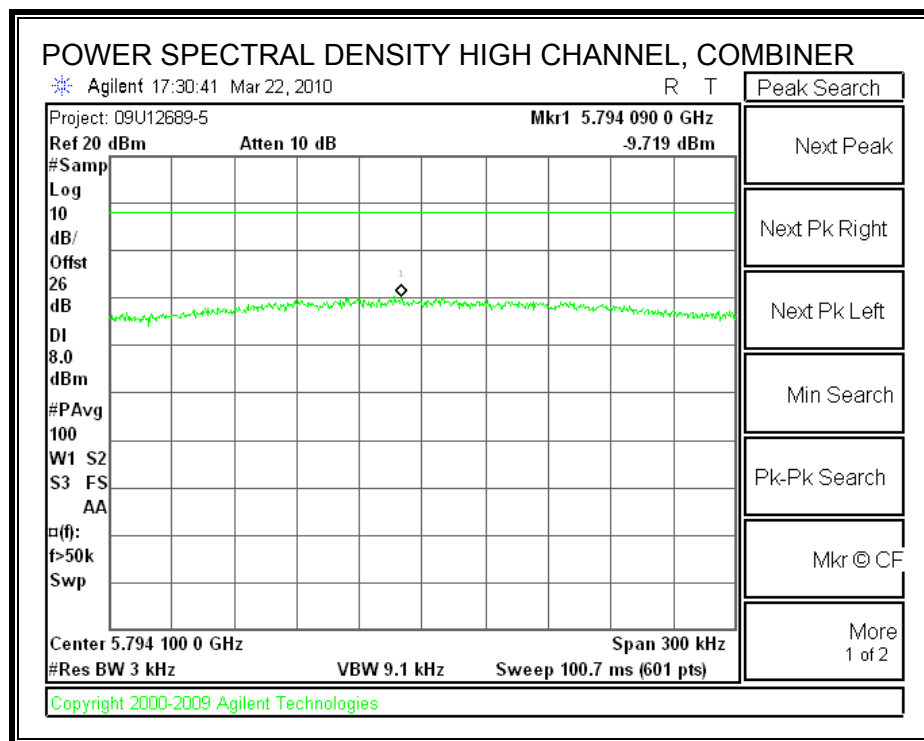
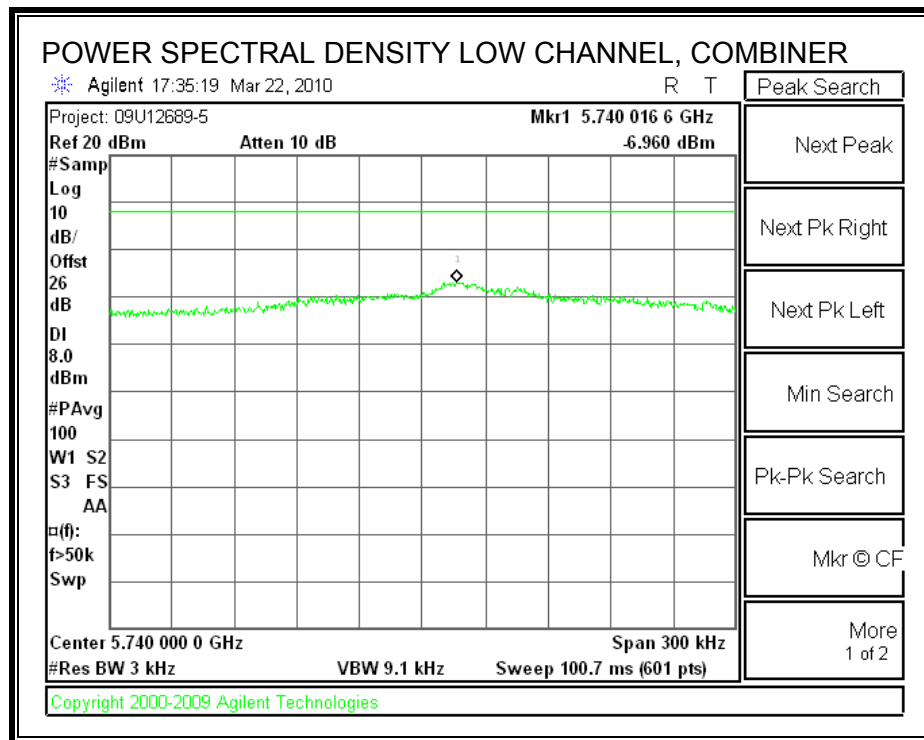
Output power was measured based on the use of RMS averaging over a time interval, therefore the power spectral density was measured using PSD Option 2 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

RESULTS

| Channel | Frequency (MHz) | PSD with Combiner (dBm) | Limit (dBm) | Margin (dB) |
|---------|--------------------|----------------------------|----------------|----------------|
| Low | 5755 | -6.960 | 8 | -14.96 |
| High | 5795 | -9.719 | 8 | -17.72 |

POWER SPECTRAL DENSITY



7.7.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dBc.

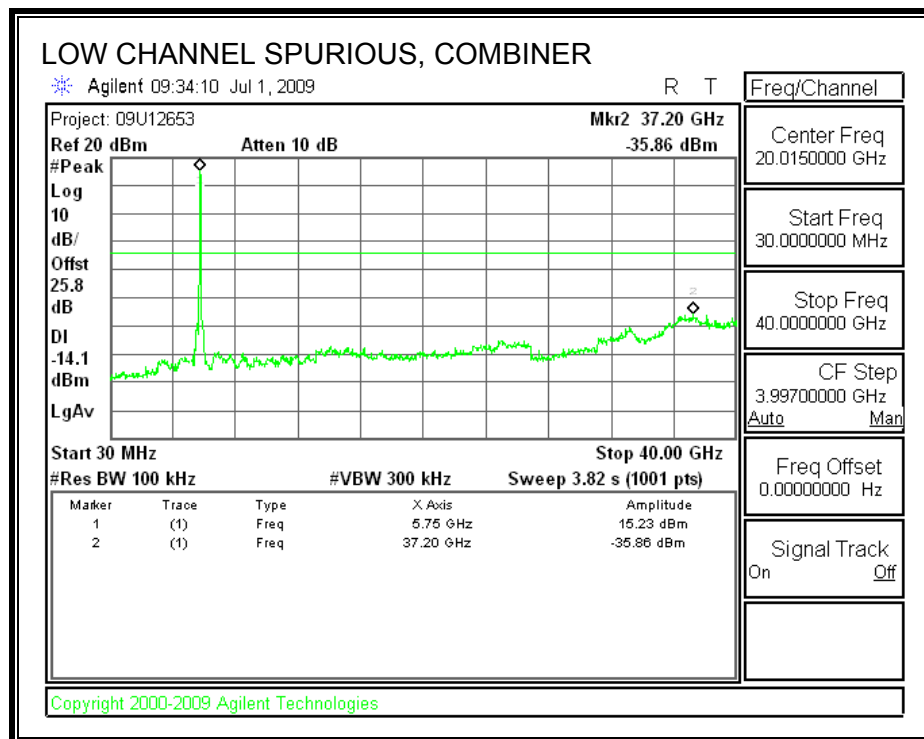
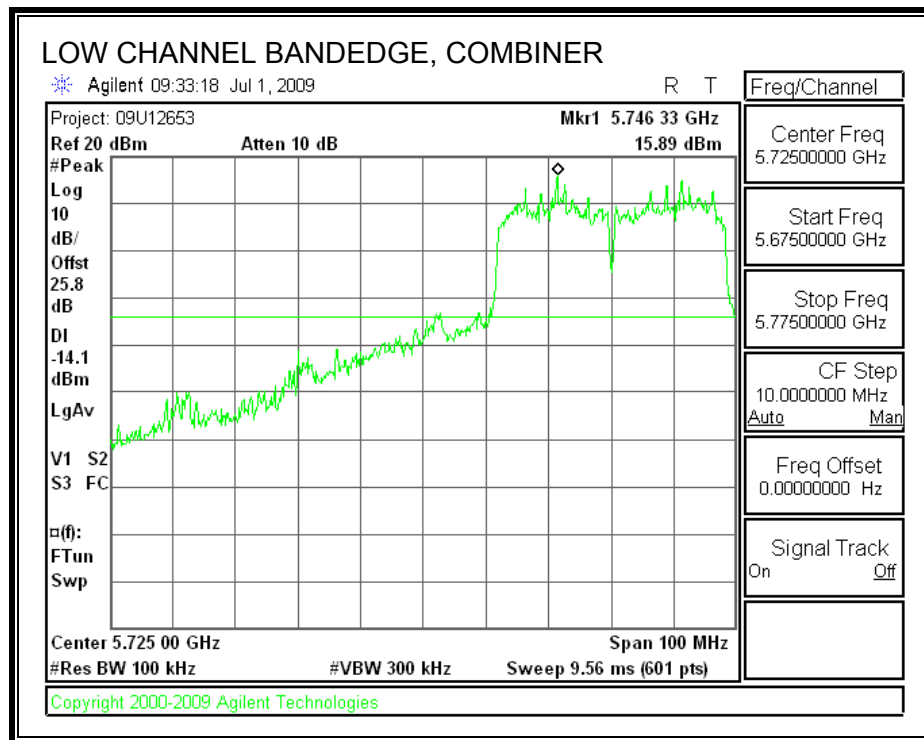
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

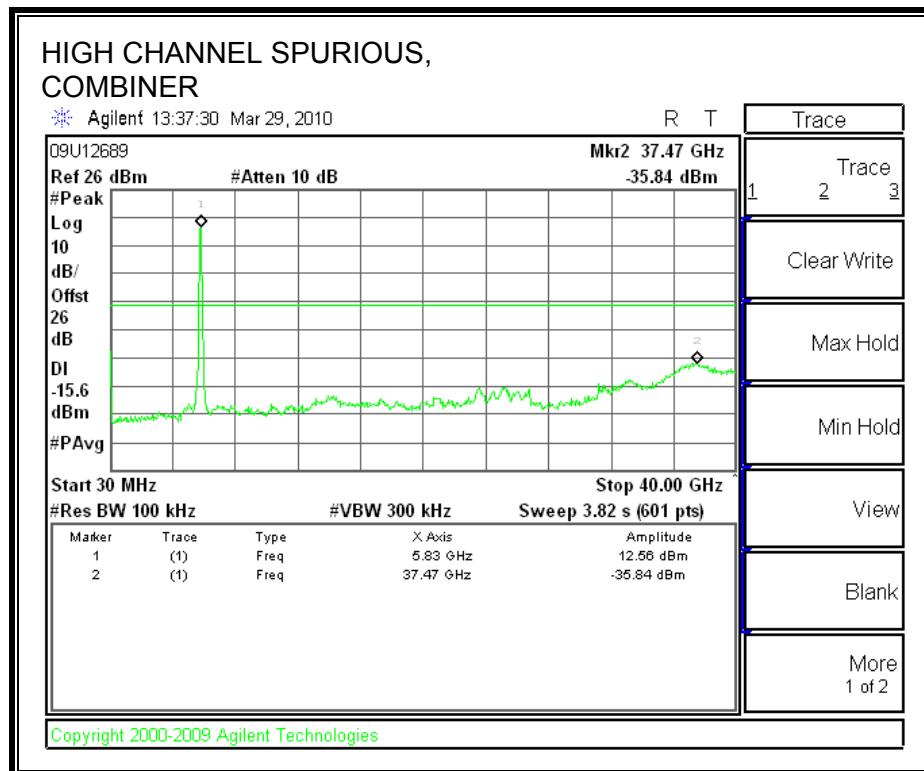
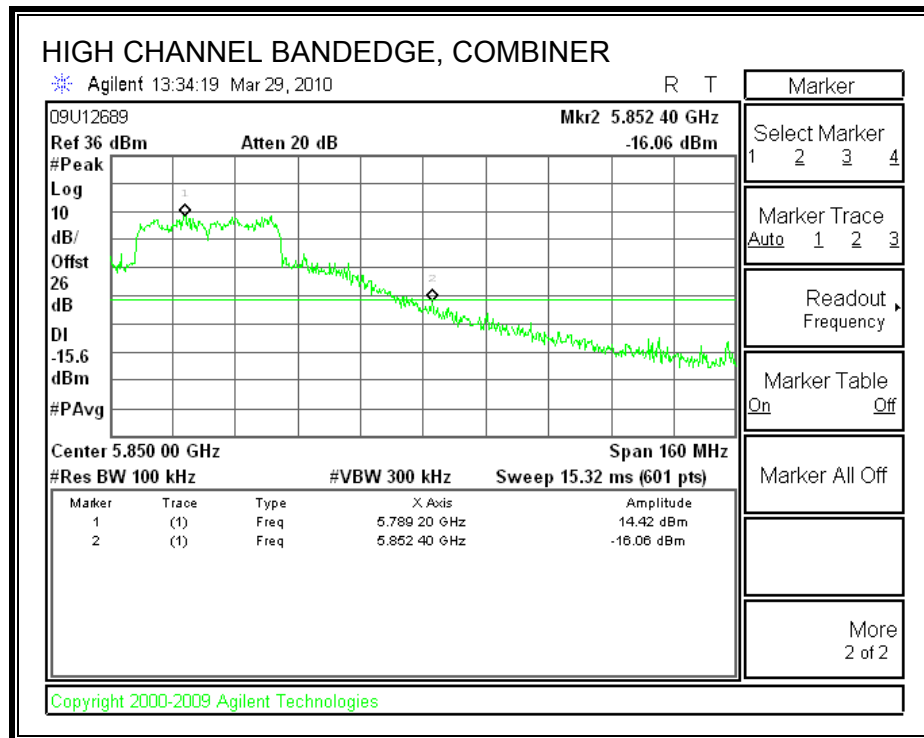
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

LOW CHANNEL SPURIOUS EMISSIONS



HIGH CHANNEL SPURIOUS EMISSIONS



7.8. RECEIVER CONDUCTED SPURIOUS EMISSIONS

LIMITS

IC RSS-GEN 7.2.3.1

Antenna Conducted Measurement: Receiver spurious emissions at any discrete frequency shall not exceed 2 nanowatts (-57 dBm) in the band 30-1000 MHz, or 5 nanowatts (-53 dBm) above 1 GHz.

TEST PROCEDURE

IC RSS-GEN 4.10, Conducted Method

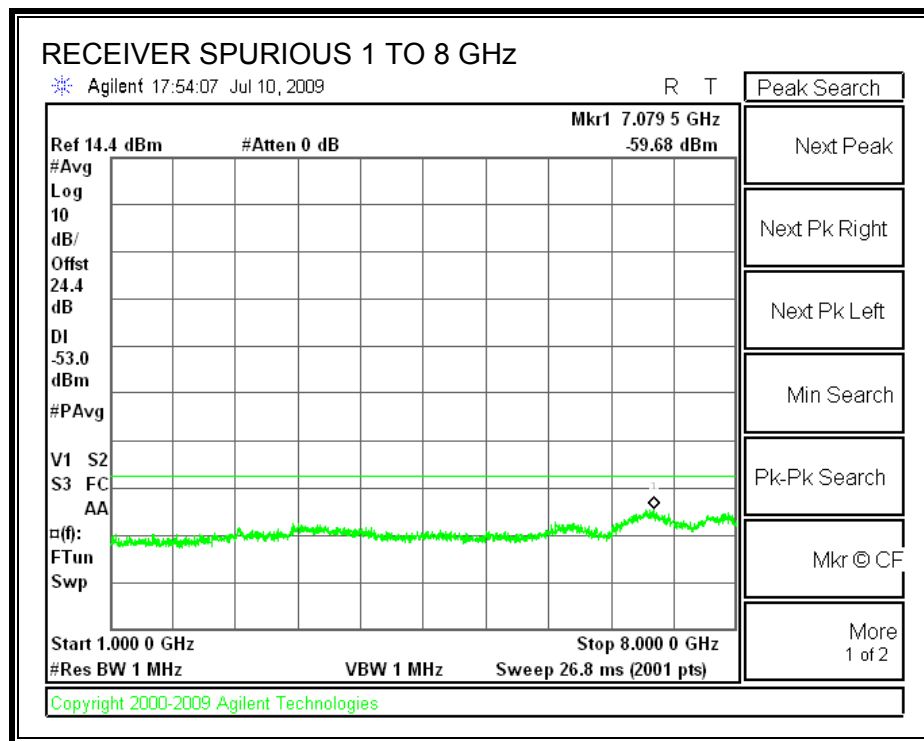
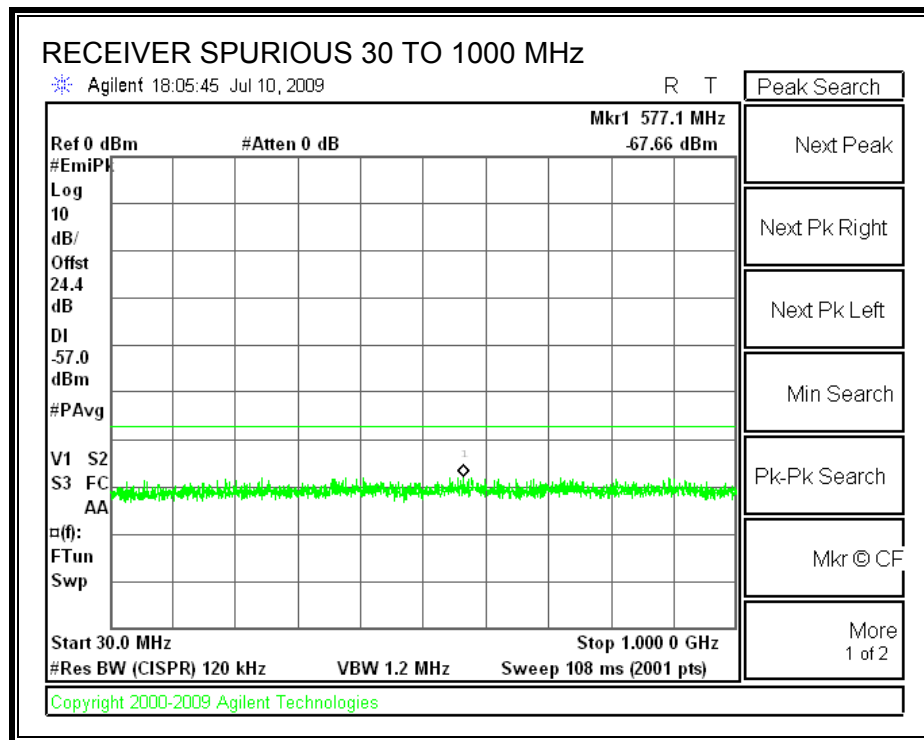
The receiver antenna port is connected to a spectrum analyzer.

The spectrum from 30 MHz to 8 GHz is investigated with the receiver set to the middle channel of the 2.4 GHz band.

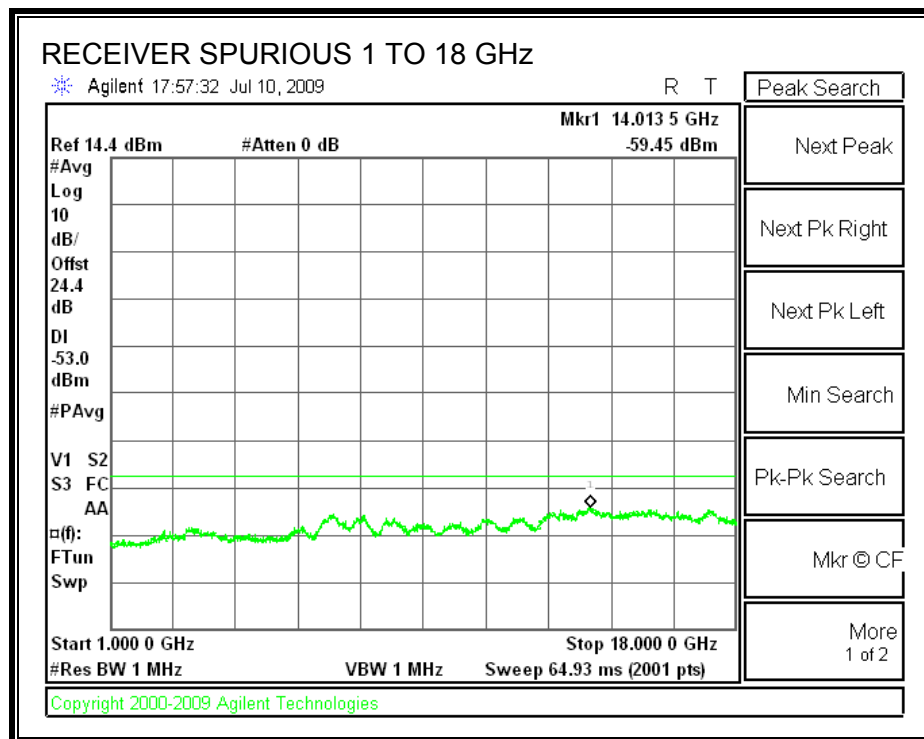
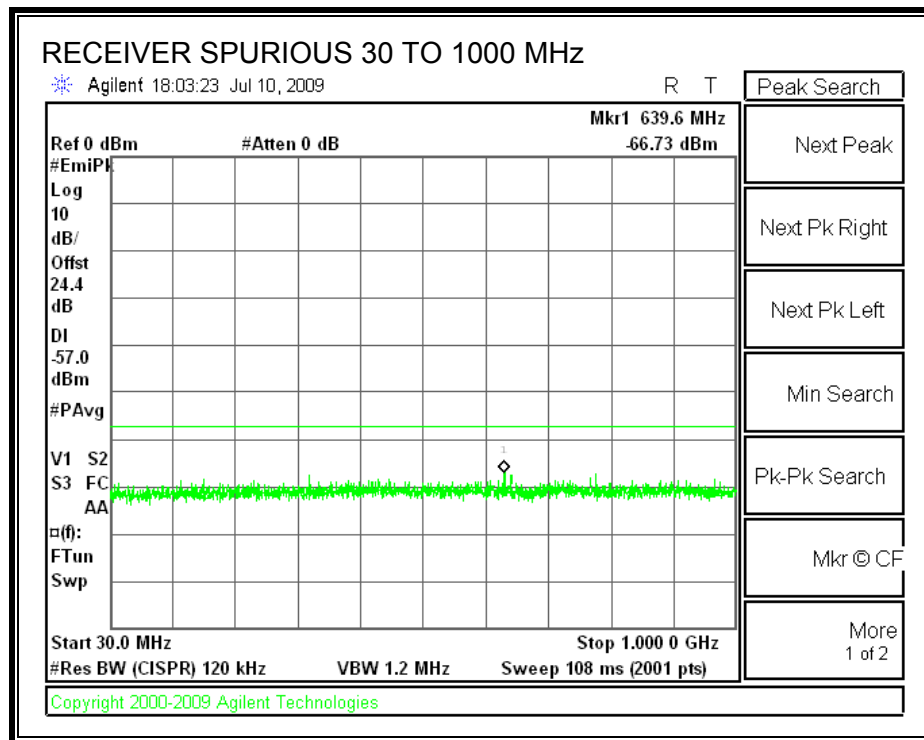
The spectrum from 30 MHz to 18 GHz is investigated with the receiver set to the middle channel of each 5 GHz band.

Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

RECEIVER SPURIOUS EMISSIONS IN THE 2.4 GHz BAND



RECEIVER SPURIOUS EMISSIONS IN THE 5.8 GHz BAND



8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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

TEST PROCEDURE

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

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

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

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

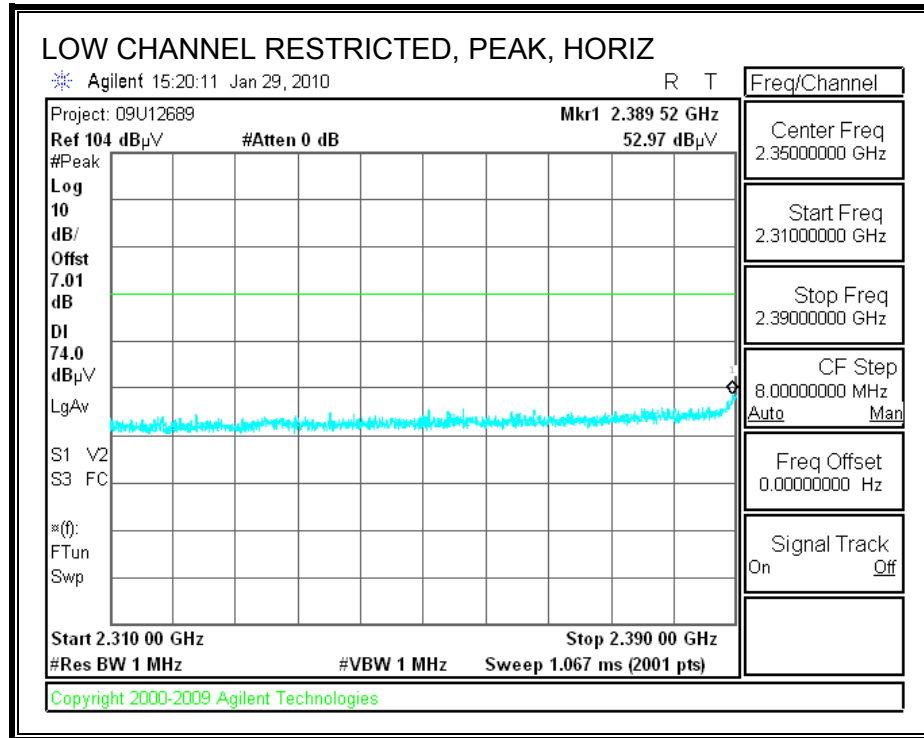
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

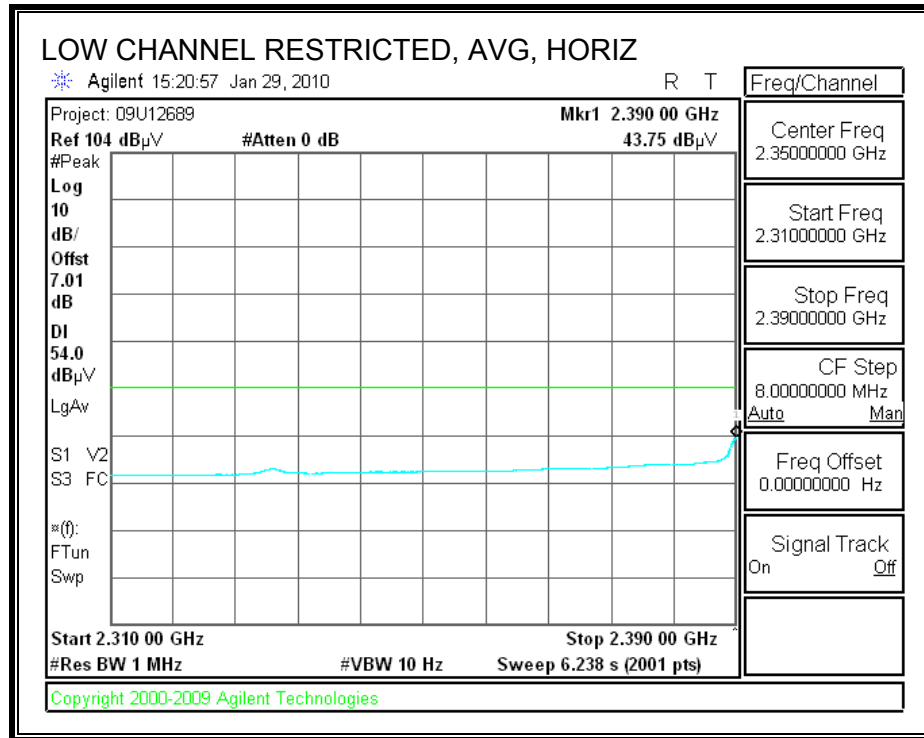
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

8.2. TRANSMITTER ABOVE 1 GHz

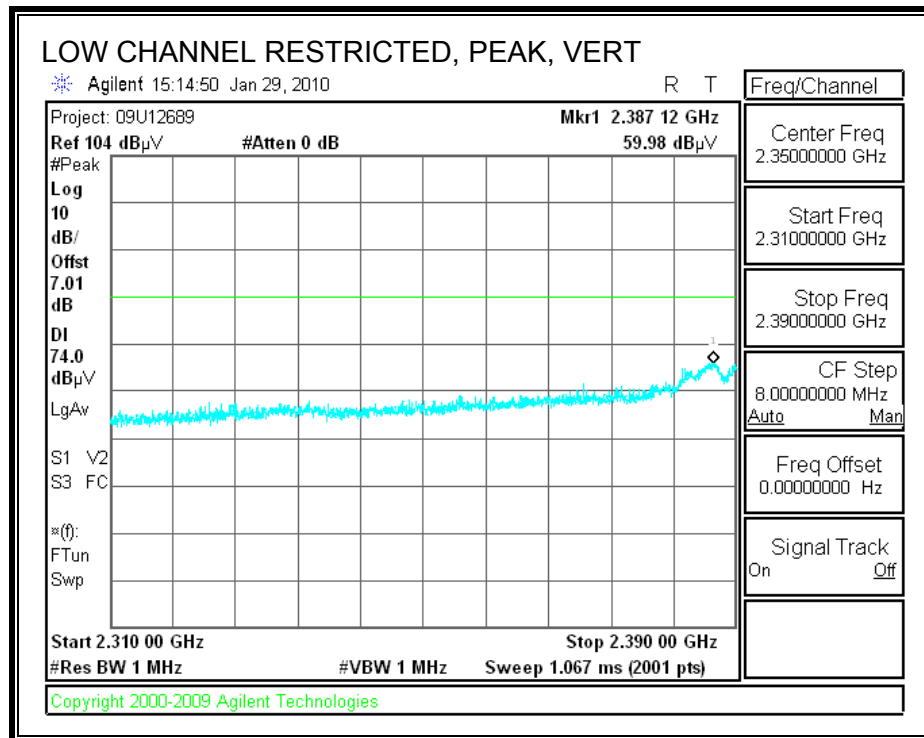
8.2.1. TX ABOVE 1 GHz FOR 802.11b MODE IN THE 2.4 GHz BAND

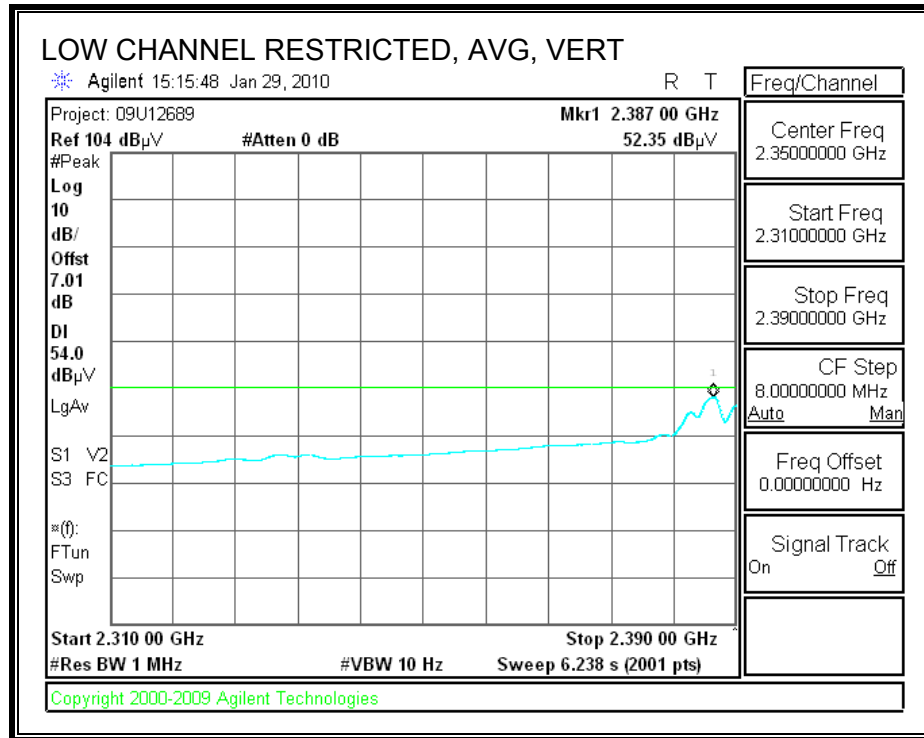
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



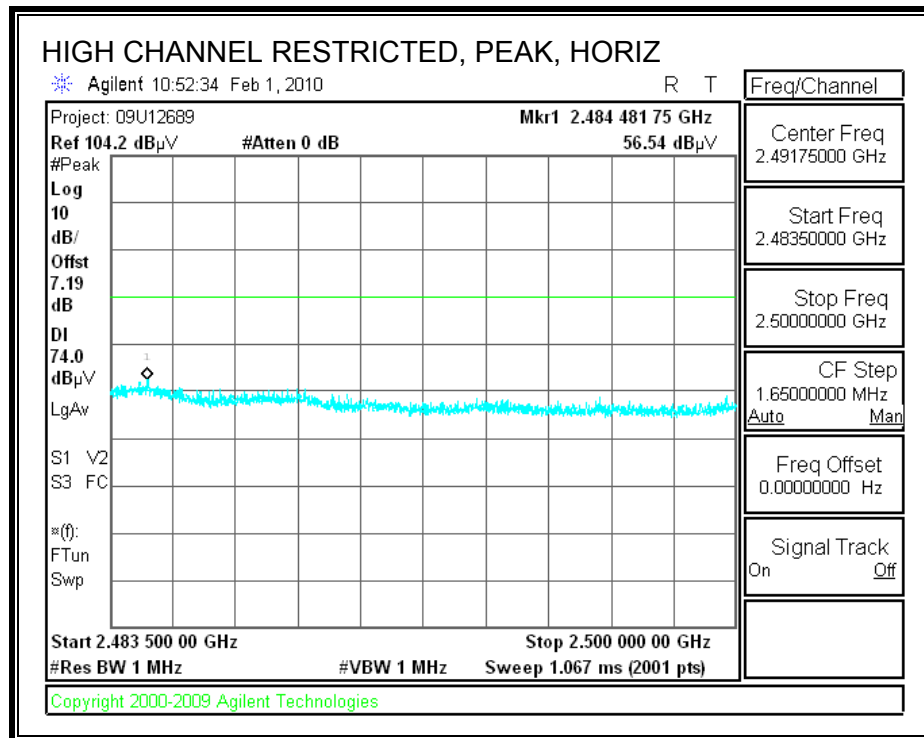


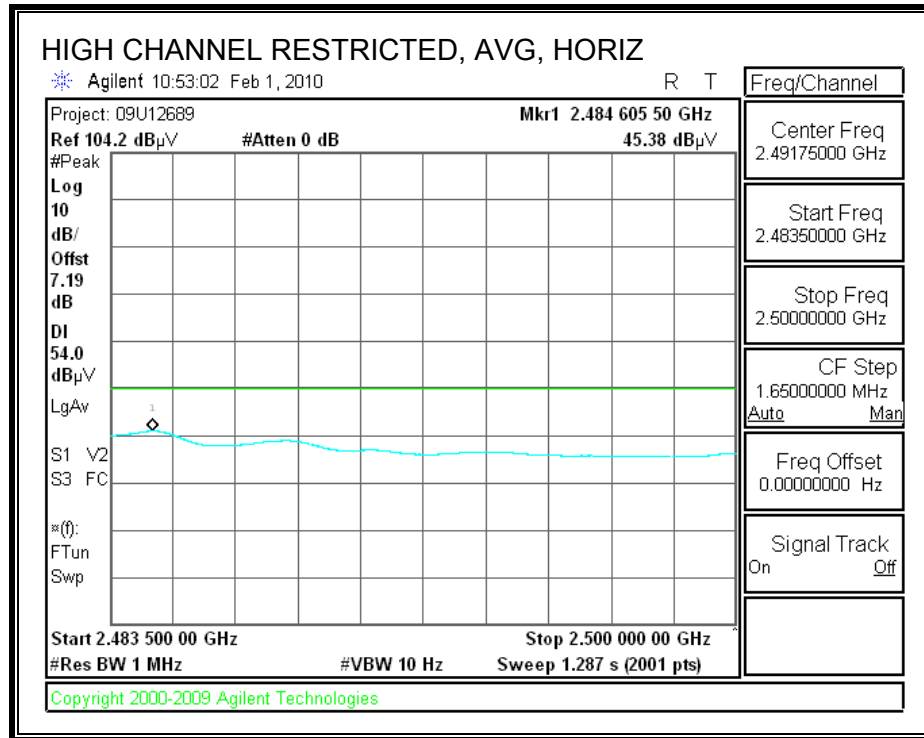
RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)



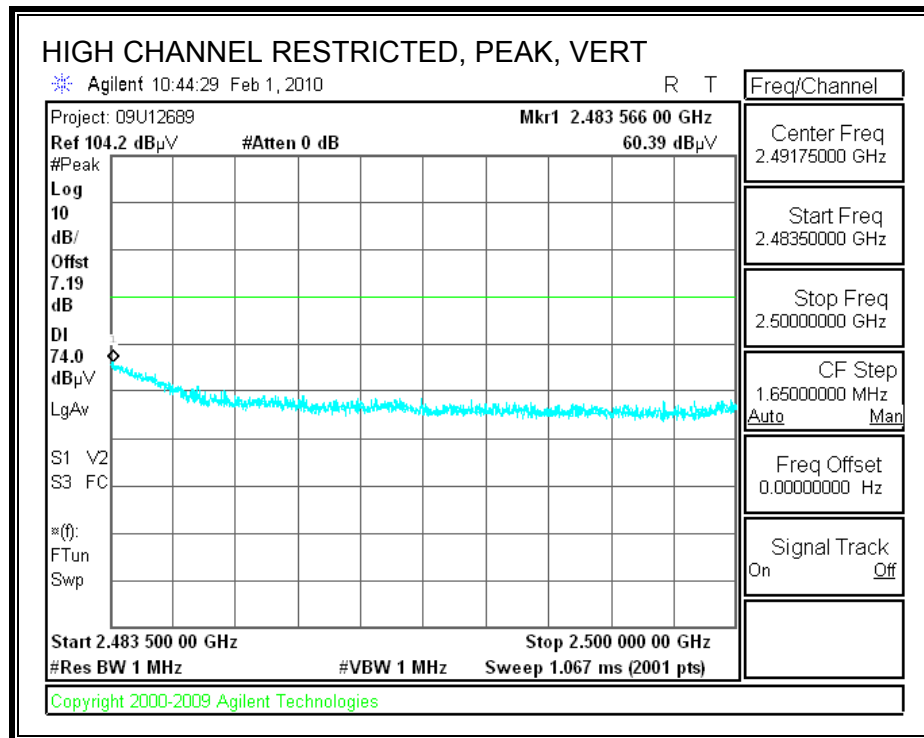


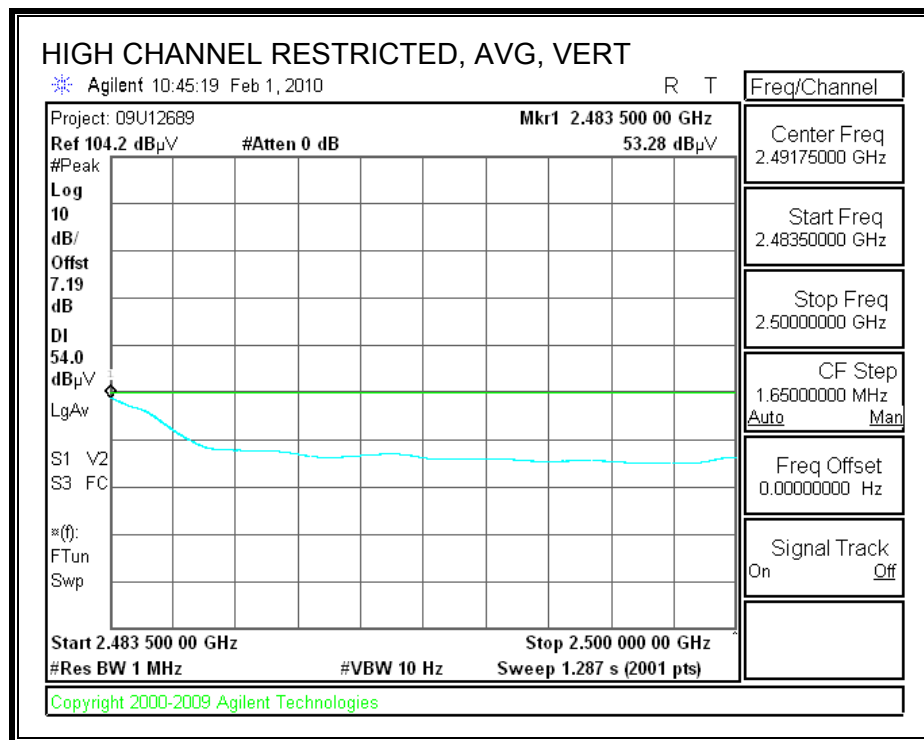
RESTRICTED BANEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: William Zhuang

Date: 02/02/10

Project #: 09U12689

Company: Qualcomm Wireless

EUT Description: Ethernet Card

EUT M/N: Card SN:9067

Test Target: FCC 15.247

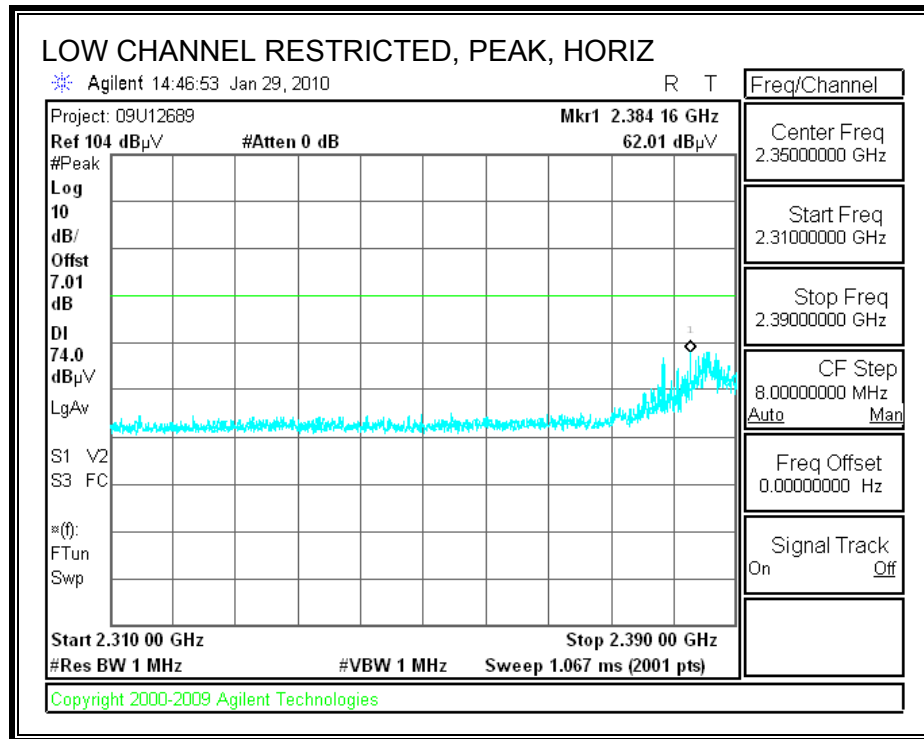
Mode Oper: T0T1T2T3 On, b Mode

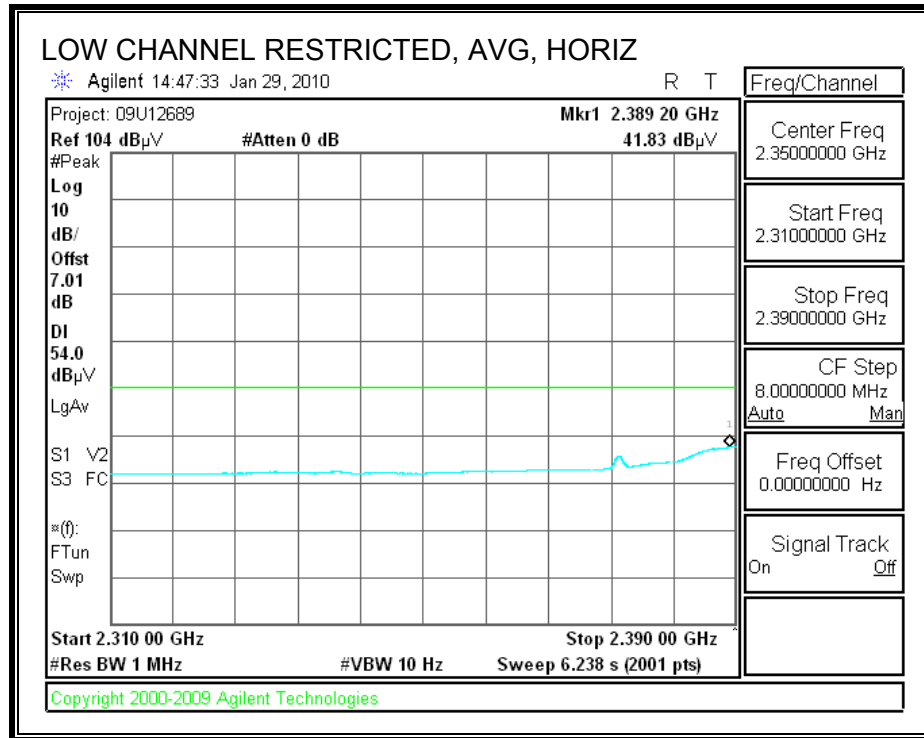
| | | | | |
|------|-----------------------|--------|--------------------------------|------------------------------|
| f | Measurement Frequency | Amp | Preamp Gain | Average Field Strength Limit |
| Dist | Distance to Antenna | D Corr | Distance Correct to 3 meters | Peak Field Strength Limit |
| Read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

| f GHz | Dist (m) | Read dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fitr dB | Corr. dBuV/m | Limit dBuV/m | Margin dB | Ant. Pol. V/H | Det. P/A/QP | Ant.High cm | Table Angle Degree | Notes |
|--|-------------|--------------|------------|----------|-----------|--------------|------------|-----------------|-----------------|--------------|------------------|----------------|----------------|-----------------------|-------|
| Low Ch. 2412MHz, power setting = 15.0 dBm | | | | | | | | | | | | | | | |
| 4.824 | 3.0 | 46.0 | 32.8 | 5.8 | -34.8 | 0.0 | 0.6 | 50.4 | 74.0 | -23.6 | V | P | 123.6 | 288.2 | |
| 4.824 | 3.0 | 42.6 | 32.8 | 5.8 | -34.8 | 0.0 | 0.6 | 47.0 | 54.0 | -7.0 | V | A | 123.6 | 288.2 | |
| 4.824 | 3.0 | 38.8 | 32.8 | 5.8 | -34.8 | 0.0 | 0.6 | 43.1 | 74.0 | -30.9 | H | P | 100.7 | 69.3 | |
| 4.824 | 3.0 | 30.3 | 32.8 | 5.8 | -34.8 | 0.0 | 0.6 | 34.6 | 54.0 | -19.4 | H | A | 100.7 | 69.3 | |
| Mid Ch. 2437MHz, power setting = 19.0 dBm | | | | | | | | | | | | | | | |
| 4.874 | 3.0 | 50.4 | 32.8 | 5.8 | -34.9 | 0.0 | 0.6 | 54.8 | 74.0 | -19.2 | V | P | 103.5 | 282.9 | |
| 4.874 | 3.0 | 48.5 | 32.8 | 5.8 | -34.9 | 0.0 | 0.6 | 52.9 | 54.0 | -1.1 | V | A | 103.5 | 282.9 | |
| 4.874 | 3.0 | 41.9 | 32.8 | 5.8 | -34.9 | 0.0 | 0.6 | 46.3 | 74.0 | -27.7 | H | P | 138.8 | 244.5 | |
| 4.874 | 3.0 | 37.2 | 32.8 | 5.8 | -34.9 | 0.0 | 0.6 | 41.6 | 54.0 | -12.4 | H | A | 138.8 | 244.5 | |
| 7.311 | 3.0 | 46.4 | 35.2 | 7.3 | -34.7 | 0.0 | 0.6 | 54.8 | 74.0 | -19.2 | V | P | 100.2 | 238.6 | |
| 7.311 | 3.0 | 41.9 | 35.2 | 7.3 | -34.7 | 0.0 | 0.6 | 50.3 | 54.0 | -3.7 | V | A | 100.2 | 238.6 | |
| 7.311 | 3.0 | 42.8 | 35.2 | 7.3 | -34.7 | 0.0 | 0.6 | 51.3 | 74.0 | -22.7 | H | P | 101.4 | 51.4 | |
| 7.311 | 3.0 | 35.9 | 35.2 | 7.3 | -34.7 | 0.0 | 0.6 | 44.3 | 54.0 | -9.7 | H | A | 101.4 | 51.4 | |
| High Ch. 2462MHz, power setting = 16.0 dBm | | | | | | | | | | | | | | | |
| 4.924 | 3.0 | 50.0 | 32.8 | 5.9 | -34.9 | 0.0 | 0.6 | 54.5 | 74.0 | -19.5 | V | P | 105.2 | 3.0 | |
| 4.924 | 3.0 | 47.8 | 32.8 | 5.9 | -34.9 | 0.0 | 0.6 | 52.3 | 54.0 | -1.7 | V | A | 105.2 | 3.0 | |
| 4.924 | 3.0 | 40.9 | 32.8 | 5.9 | -34.9 | 0.0 | 0.6 | 45.4 | 74.0 | -28.6 | H | P | 100.1 | 215.9 | |
| 4.924 | 3.0 | 35.0 | 32.8 | 5.9 | -34.9 | 0.0 | 0.6 | 39.5 | 54.0 | -14.5 | H | A | 100.1 | 215.9 | |
| 7.386 | 3.0 | 40.1 | 35.3 | 7.3 | -34.6 | 0.0 | 0.6 | 48.7 | 74.0 | -25.3 | V | P | 100.0 | 180.9 | |
| 7.386 | 3.0 | 32.5 | 35.3 | 7.3 | -34.6 | 0.0 | 0.6 | 41.1 | 54.0 | -12.9 | V | A | 100.0 | 180.9 | |
| 7.386 | 3.0 | 38.6 | 35.3 | 7.3 | -34.6 | 0.0 | 0.6 | 47.2 | 74.0 | -26.8 | H | P | 117.1 | 70.8 | |
| 7.386 | 3.0 | 28.4 | 35.3 | 7.3 | -34.6 | 0.0 | 0.6 | 37.0 | 54.0 | -17.0 | H | A | 117.1 | 70.8 | |
| Rev. 4.1.2.7 | | | | | | | | | | | | | | | |
| Note: No other emissions were detected above the system noise floor. | | | | | | | | | | | | | | | |

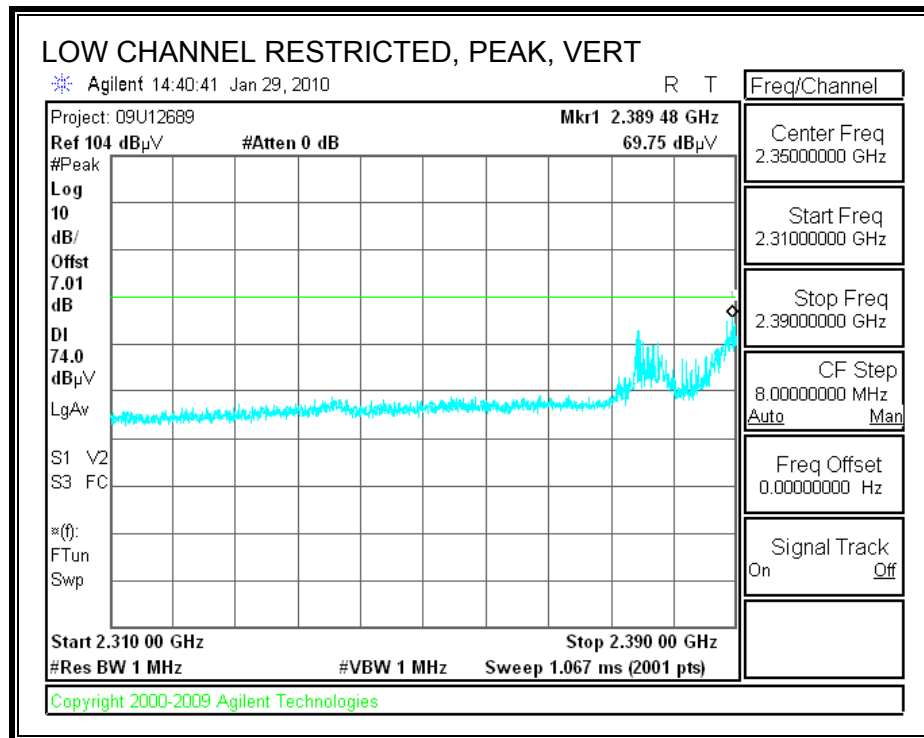
8.2.2. TX ABOVE 1 GHz FOR 802.11g MODE IN THE 2.4 GHz BAND

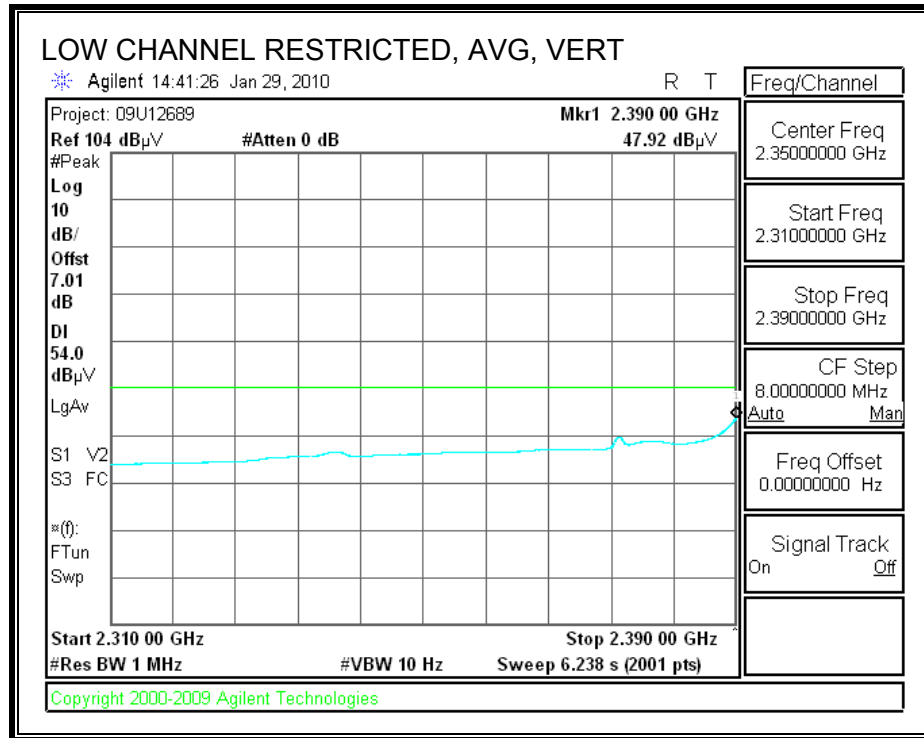
RESTRICTED BANEDGE (LOW CHANNEL, HORIZONTAL)



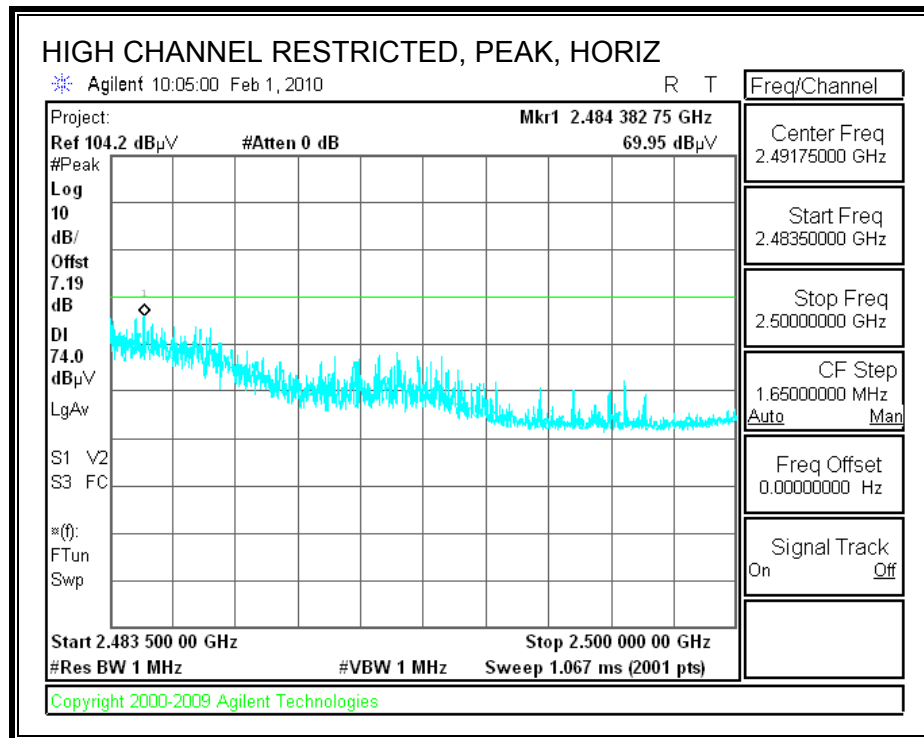


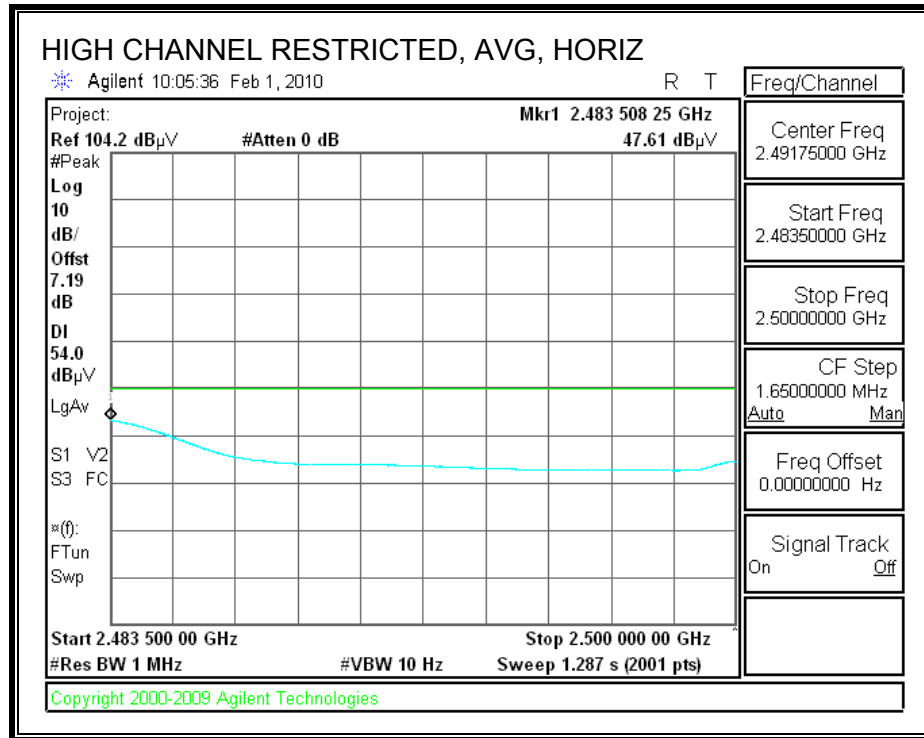
RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)



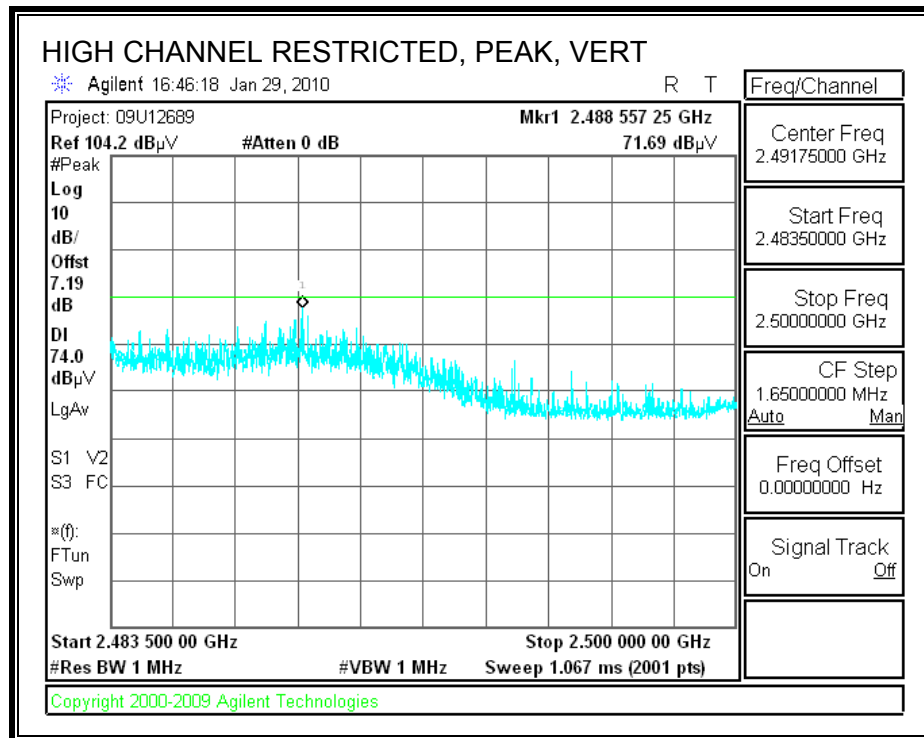


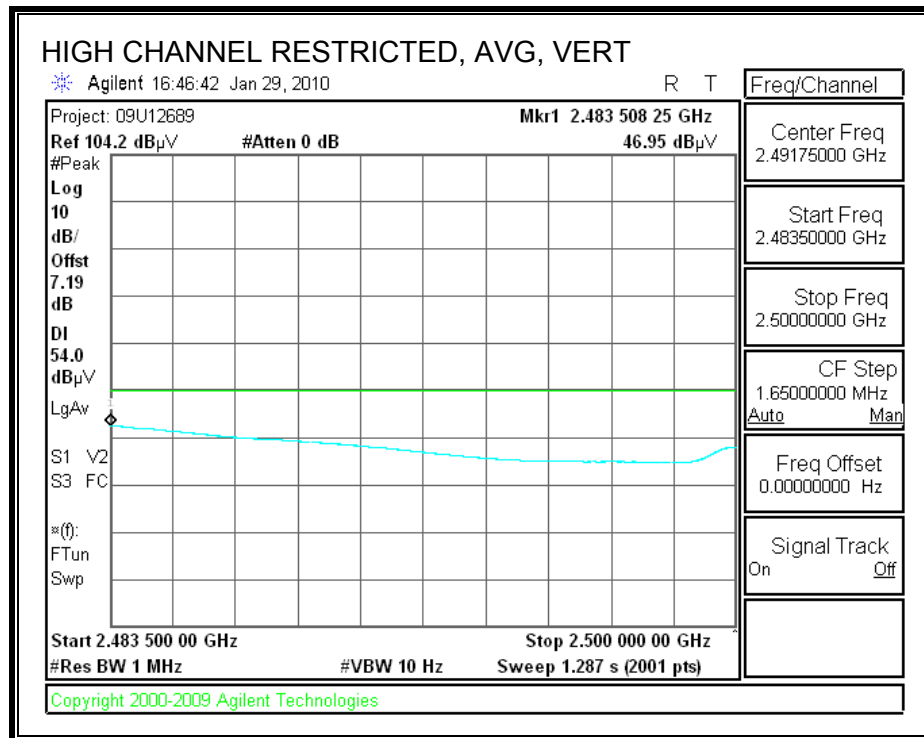
RESTRICTED BANEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: William Zhuang

Date: 02/02/10

Project #: 09U12689

Company: Qualcomm Wireless

EUT Description: Ethernet Card

EUT M/N: Card SN:9067

Test Target: FCC 15.247

Mode Oper: T011T2T3 On, g Mode

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

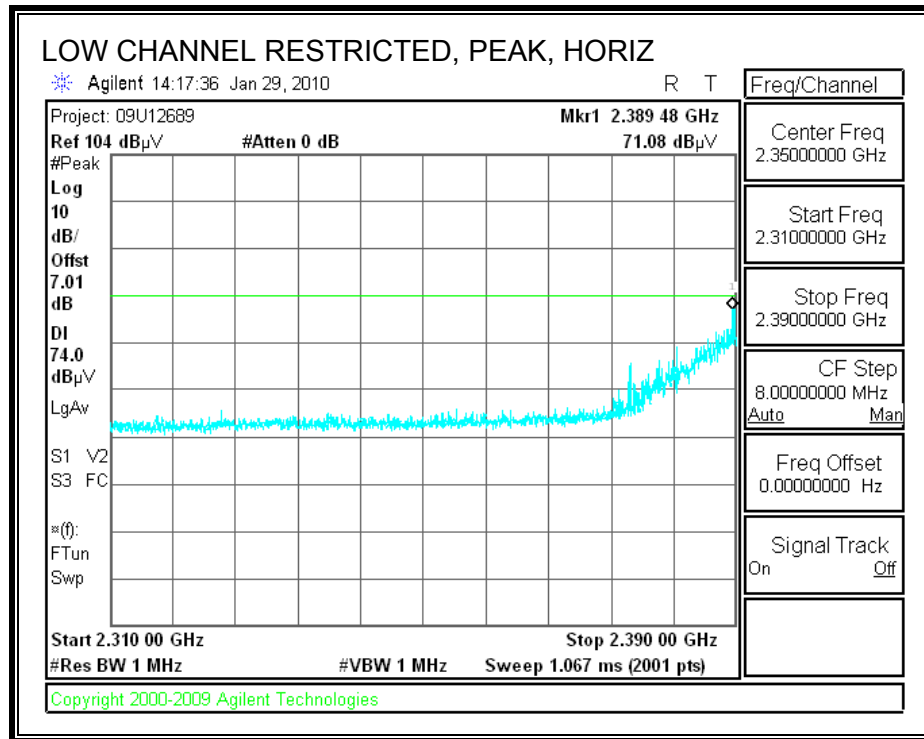
| f GHz | Dist (m) | Read dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Filt dB | Corr. dBuV/m | Limit dBuV/m | Margin dB | Ant. Pol. V/H | Det. P/A/QP | Ant.High cm | Table Angle Degree | Notes |
|---|-------------|--------------|------------|----------|-----------|--------------|------------|-----------------|-----------------|--------------|------------------|----------------|----------------|-----------------------|-------|
| Low Ch. 2412MHz, power setting = 13.5 dBm | | | | | | | | | | | | | | | |
| 4.824 | 3.0 | 43.5 | 32.8 | 5.8 | -34.8 | 0.0 | 0.6 | 47.8 | 74.0 | -26.2 | V | P | 121.9 | 289.2 | |
| 4.824 | 3.0 | 29.6 | 32.8 | 5.8 | -34.8 | 0.0 | 0.6 | 33.9 | 54.0 | -20.1 | V | A | 121.9 | 289.2 | |
| 4.824 | 3.0 | 37.5 | 32.8 | 5.8 | -34.8 | 0.0 | 0.6 | 41.8 | 74.0 | -32.2 | H | P | 122.2 | 286.3 | |
| 4.824 | 3.0 | 25.5 | 32.8 | 5.8 | -34.8 | 0.0 | 0.6 | 29.8 | 54.0 | -24.2 | H | A | 122.2 | 286.3 | |
| Mid Ch. 2437MHz, power setting = 20.0 dBm | | | | | | | | | | | | | | | |
| 4.874 | 3.0 | 50.8 | 32.8 | 5.8 | -34.9 | 0.0 | 0.6 | 55.2 | 74.0 | -18.8 | V | P | 105.0 | 235.8 | |
| 4.874 | 3.0 | 38.5 | 32.8 | 5.8 | -34.9 | 0.0 | 0.6 | 42.9 | 54.0 | -11.1 | V | A | 105.0 | 235.8 | |
| 4.874 | 3.0 | 41.4 | 32.8 | 5.8 | -34.9 | 0.0 | 0.6 | 45.8 | 74.0 | -28.2 | H | P | 147.6 | 300.2 | |
| 4.874 | 3.0 | 29.0 | 32.8 | 5.8 | -34.9 | 0.0 | 0.6 | 33.4 | 54.0 | -20.6 | H | A | 147.6 | 300.2 | |
| 7.311 | 3.0 | 52.4 | 35.2 | 7.3 | -34.7 | 0.0 | 0.6 | 60.9 | 74.0 | -13.1 | V | P | 103.1 | 72.0 | |
| 7.311 | 3.0 | 38.1 | 35.2 | 7.3 | -34.7 | 0.0 | 0.6 | 46.6 | 54.0 | -7.4 | V | A | 103.1 | 72.0 | |
| 7.311 | 3.0 | 44.3 | 35.2 | 7.3 | -34.7 | 0.0 | 0.6 | 52.7 | 74.0 | -21.3 | H | P | 101.7 | 60.2 | |
| 7.311 | 3.0 | 29.8 | 35.2 | 7.3 | -34.7 | 0.0 | 0.6 | 38.2 | 54.0 | -15.8 | H | A | 101.7 | 60.2 | |
| High Ch. 2462MHz, power setting = 12.5 dBm | | | | | | | | | | | | | | | |
| 4.924 | 3.0 | 42.2 | 32.8 | 5.9 | -34.9 | 0.0 | 0.6 | 46.7 | 74.0 | -27.3 | V | P | 101.2 | 70.4 | |
| 4.924 | 3.0 | 30.8 | 32.8 | 5.9 | -34.9 | 0.0 | 0.6 | 35.3 | 54.0 | -18.7 | V | A | 101.2 | 70.4 | |
| 4.924 | 3.0 | 38.6 | 32.8 | 5.9 | -34.9 | 0.0 | 0.6 | 43.0 | 74.0 | -31.0 | H | P | 175.4 | 56.8 | |
| 4.924 | 3.0 | 25.6 | 32.8 | 5.9 | -34.9 | 0.0 | 0.6 | 30.0 | 54.0 | -24.0 | H | A | 175.4 | 56.8 | |
| 7.386 | 3.0 | 38.8 | 35.3 | 7.3 | -34.6 | 0.0 | 0.6 | 47.4 | 74.0 | -26.6 | V | P | 149.9 | 139.1 | |
| 7.386 | 3.0 | 26.1 | 35.3 | 7.3 | -34.6 | 0.0 | 0.6 | 34.7 | 54.0 | -19.3 | V | A | 149.9 | 139.1 | |
| 7.386 | 3.0 | 37.3 | 35.3 | 7.3 | -34.6 | 0.0 | 0.6 | 45.9 | 74.0 | -28.1 | H | P | 158.6 | 185.2 | |
| 7.386 | 3.0 | 24.9 | 35.3 | 7.3 | -34.6 | 0.0 | 0.6 | 33.5 | 54.0 | -20.5 | H | A | 158.6 | 185.2 | |

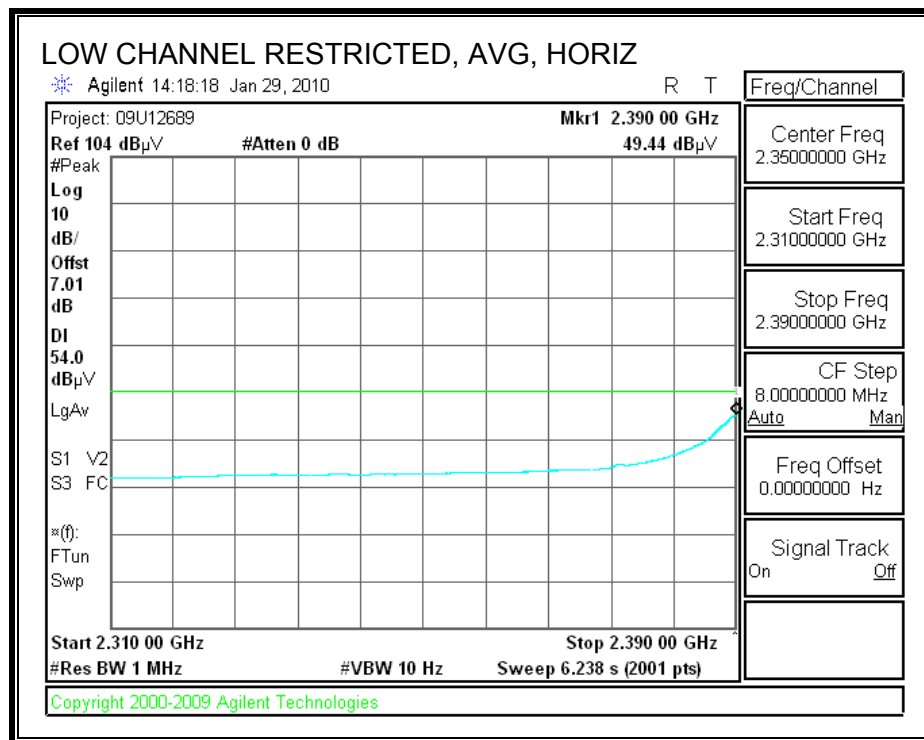
Rev. 4.1.2.7

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

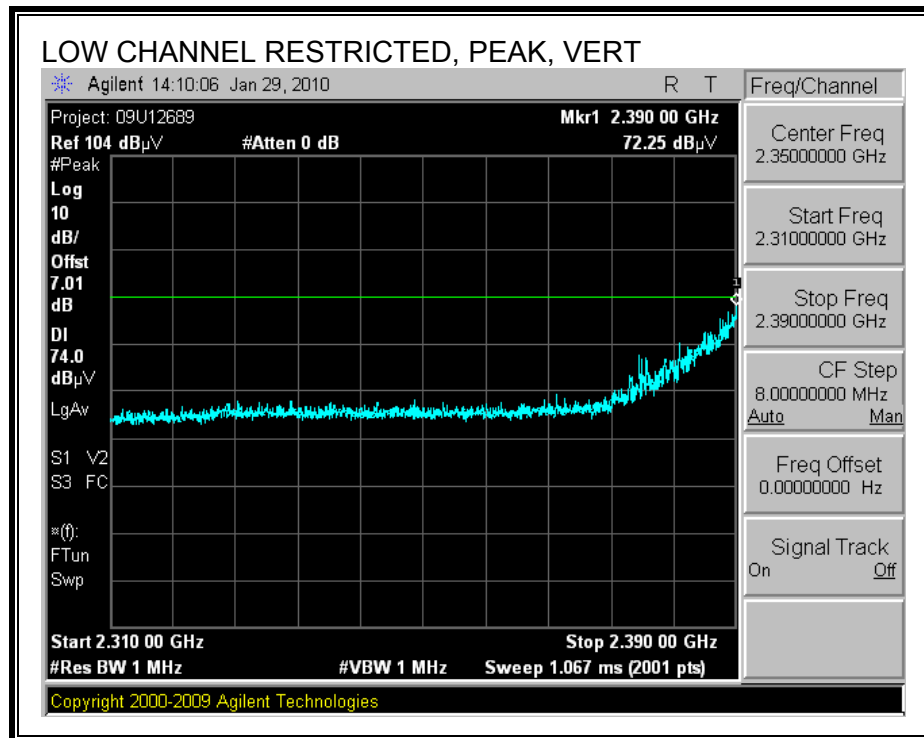
8.2.3. TX ABOVE 1 GHz FOR 802.11n HT20 MODE IN THE 2.4 GHz BAND

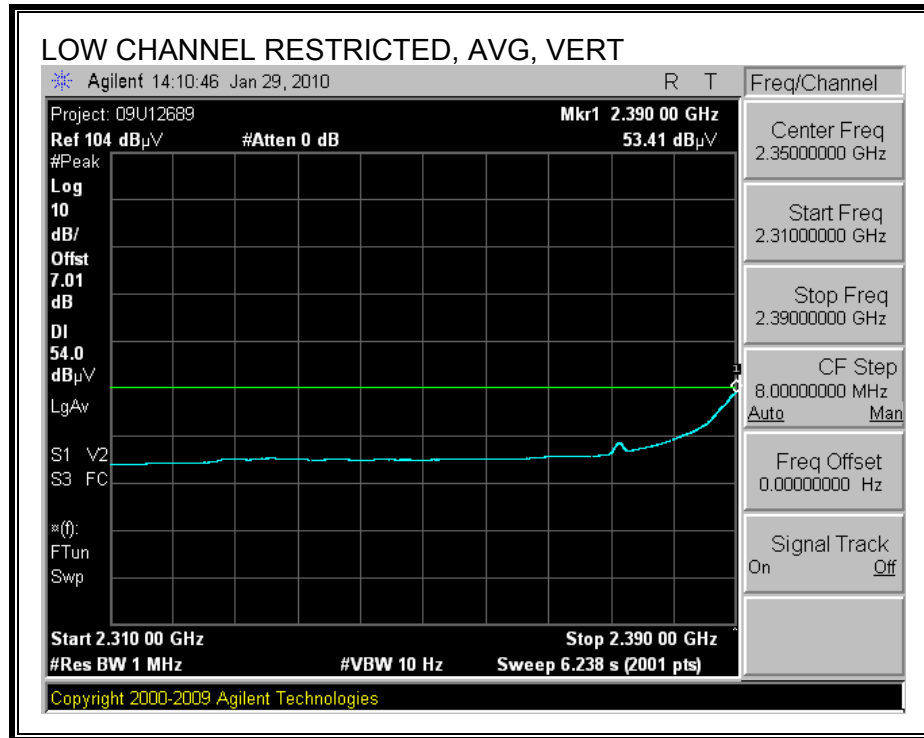
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



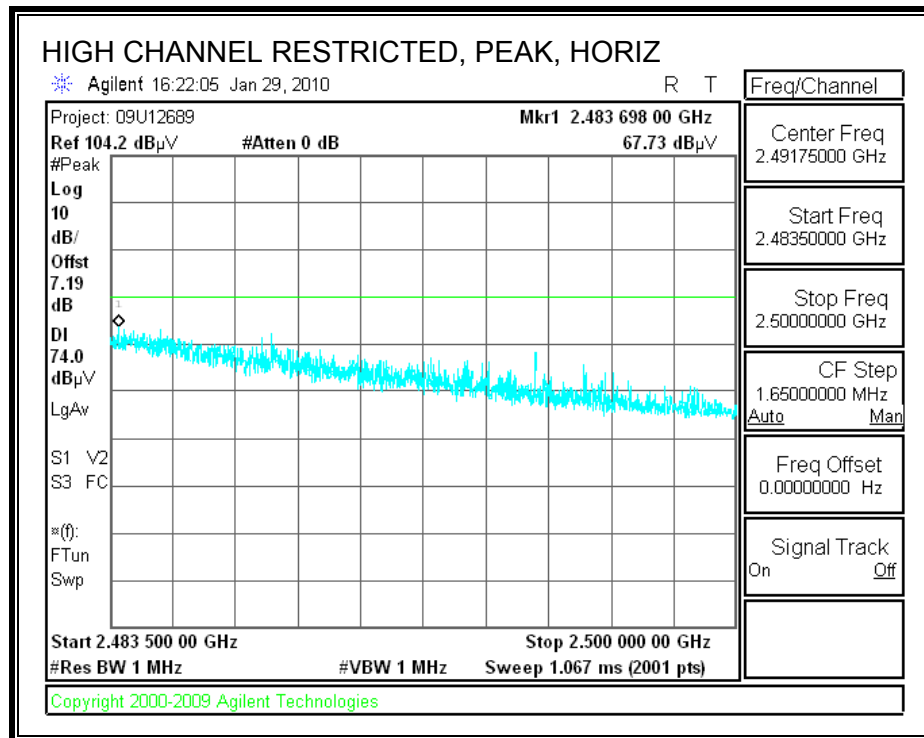


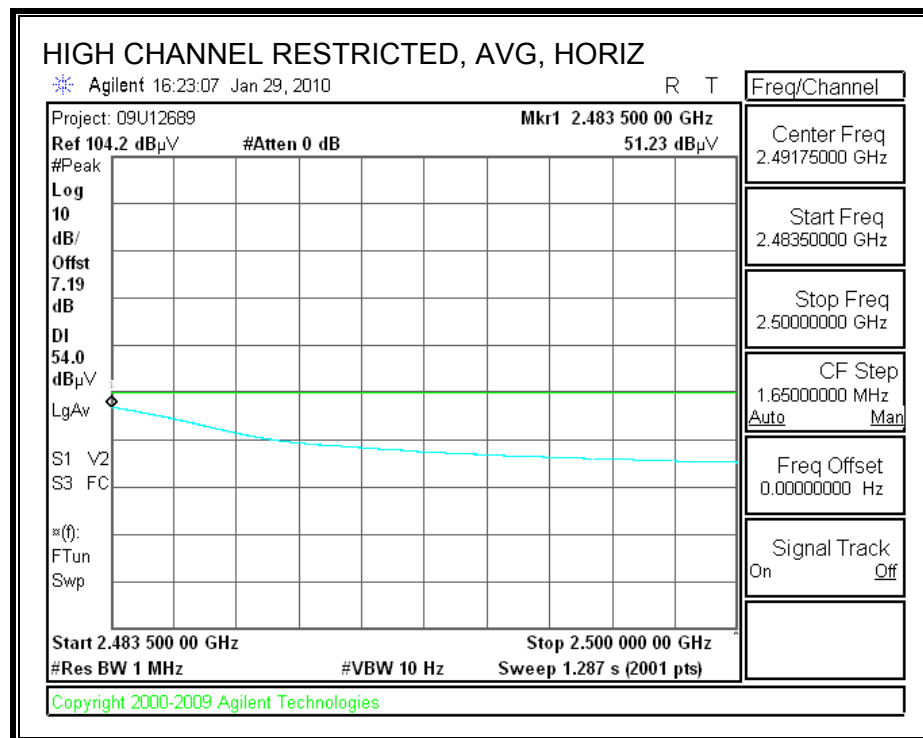
RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)



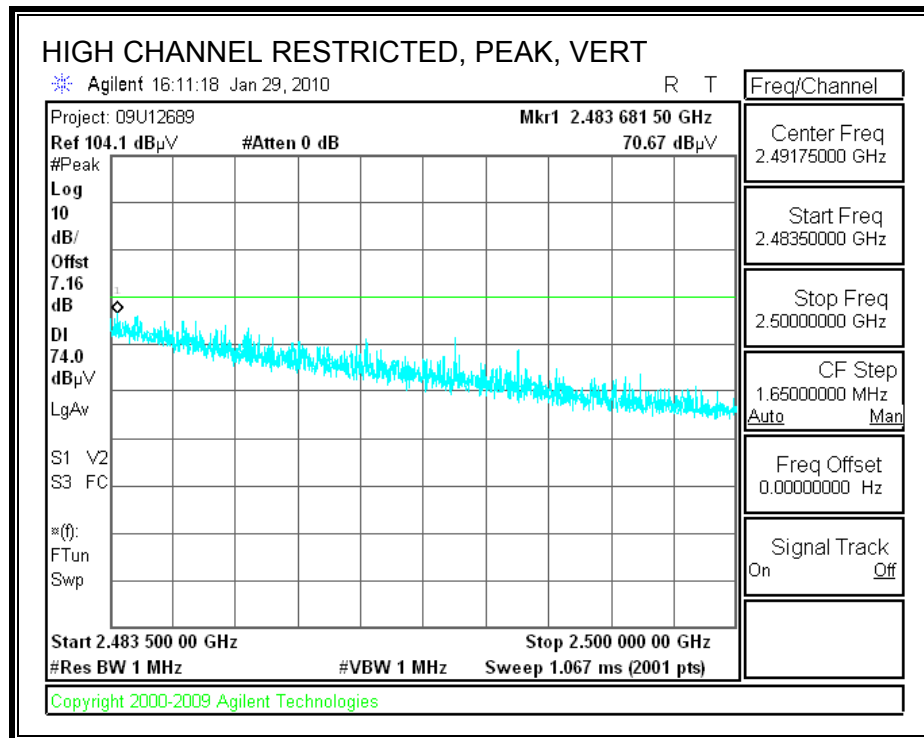


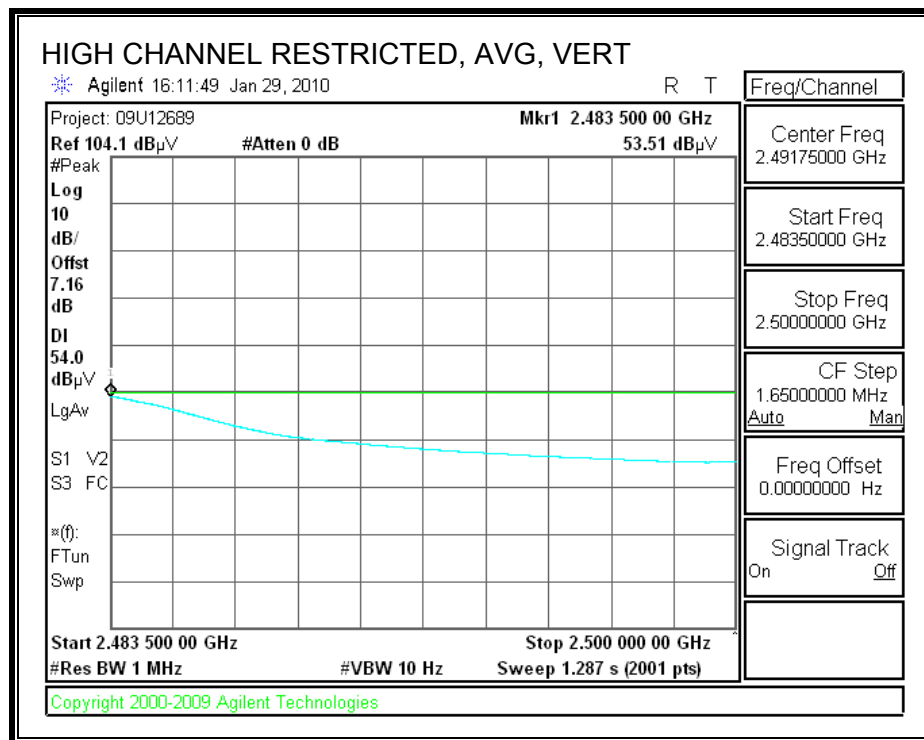
RESTRICTED BANEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: William Zhuang

Date: 02/02/10

Project #: 09U12689

Company: Qualcomm Wireless

EUT Description: Ethernet Card

EUT M/N: Card SN:9067

Test Target: FCC 15.247

Mode Oper: T011T2T3 On, HI20 Mode

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

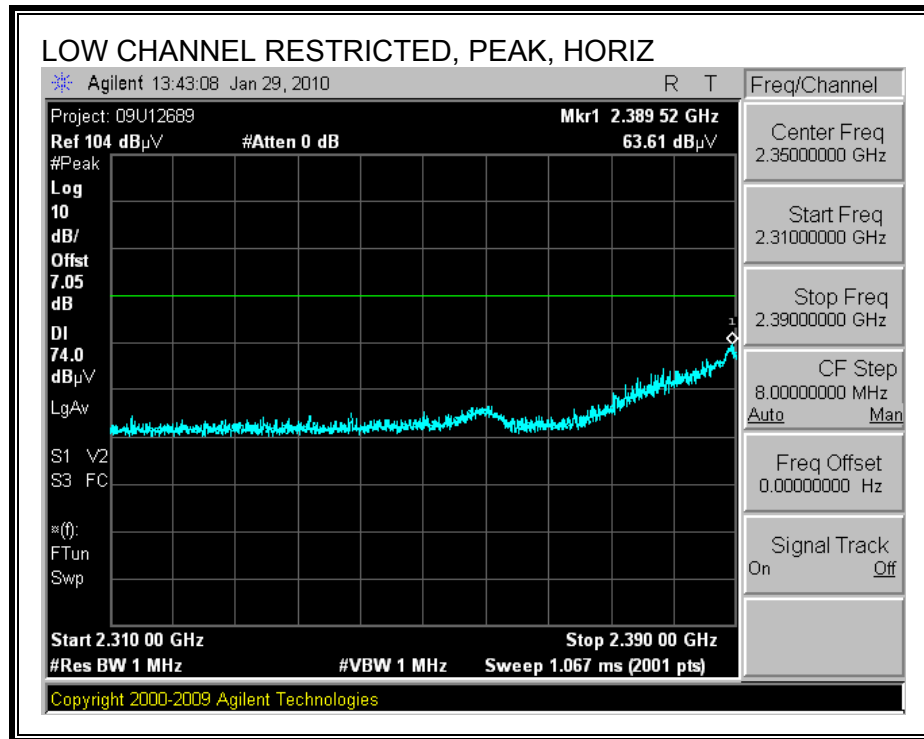
| f GHz | Dist (m) | Read dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fitr dB | Corr. dBuV/m | Limit dBuV/m | Margin dB | Ant. Pol. V/H | Det. P/A/QP | Ant.High cm | Table Angle Degree | Notes |
|---|-------------|--------------|------------|----------|-----------|--------------|------------|-----------------|-----------------|--------------|------------------|----------------|----------------|-----------------------|-------|
| Low Ch. 2412MHz, power setting = 14.5 dBm | | | | | | | | | | | | | | | |
| 4.824 | 3.0 | 42.2 | 32.8 | 5.8 | -34.8 | 0.0 | 0.6 | 46.5 | 74.0 | -27.5 | V | P | 103.4 | 236.0 | |
| 4.824 | 3.0 | 29.1 | 32.8 | 5.8 | -34.8 | 0.0 | 0.6 | 33.4 | 54.0 | -20.6 | V | A | 103.4 | 236.0 | |
| 4.824 | 3.0 | 37.9 | 32.8 | 5.8 | -34.8 | 0.0 | 0.6 | 42.2 | 74.0 | -31.8 | H | P | 103.3 | 356.9 | |
| 4.824 | 3.0 | 25.4 | 32.8 | 5.8 | -34.8 | 0.0 | 0.6 | 29.7 | 54.0 | -24.3 | H | A | 103.3 | 356.9 | |
| Mid Ch. 2437MHz, power setting = 20.0 dBm | | | | | | | | | | | | | | | |
| 4.874 | 3.0 | 50.0 | 32.8 | 5.8 | -34.9 | 0.0 | 0.6 | 54.4 | 74.0 | -19.6 | V | P | 103.9 | 230.0 | |
| 4.874 | 3.0 | 36.6 | 32.8 | 5.8 | -34.9 | 0.0 | 0.6 | 41.0 | 54.0 | -13.0 | V | A | 103.9 | 230.0 | |
| 4.874 | 3.0 | 42.0 | 32.8 | 5.8 | -34.9 | 0.0 | 0.6 | 46.4 | 74.0 | -27.6 | H | P | 124.7 | 217.1 | |
| 4.874 | 3.0 | 27.7 | 32.8 | 5.8 | -34.9 | 0.0 | 0.6 | 32.1 | 54.0 | -21.9 | H | A | 124.7 | 217.1 | |
| 7.311 | 3.0 | 50.9 | 35.2 | 7.3 | -34.7 | 0.0 | 0.6 | 59.3 | 74.0 | -14.7 | V | P | 100.0 | 60.0 | |
| 7.311 | 3.0 | 33.6 | 35.2 | 7.3 | -34.7 | 0.0 | 0.6 | 42.0 | 54.0 | -12.0 | V | A | 100.0 | 60.0 | |
| 7.311 | 3.0 | 43.3 | 35.2 | 7.3 | -34.7 | 0.0 | 0.6 | 51.7 | 74.0 | -22.3 | H | P | 100.3 | 40.8 | |
| 7.311 | 3.0 | 27.8 | 35.2 | 7.3 | -34.7 | 0.0 | 0.6 | 36.2 | 54.0 | -17.8 | H | A | 100.3 | 40.8 | |
| High Ch. 2462MHz, power setting = 13.5 dBm | | | | | | | | | | | | | | | |
| 4.924 | 3.0 | 42.9 | 32.8 | 5.9 | -34.9 | 0.0 | 0.6 | 47.4 | 74.0 | -26.6 | V | P | 101.6 | 233.9 | |
| 4.924 | 3.0 | 29.6 | 32.8 | 5.9 | -34.9 | 0.0 | 0.6 | 34.1 | 54.0 | -19.9 | V | A | 101.6 | 233.9 | |
| 4.924 | 3.0 | 37.8 | 32.8 | 5.9 | -34.9 | 0.0 | 0.6 | 42.3 | 74.0 | -31.7 | H | P | 114.8 | 50.1 | |
| 4.924 | 3.0 | 25.6 | 32.8 | 5.9 | -34.9 | 0.0 | 0.6 | 30.1 | 54.0 | -23.9 | H | A | 114.8 | 50.1 | |
| 7.386 | 3.0 | 38.1 | 35.3 | 7.3 | -34.6 | 0.0 | 0.6 | 46.7 | 74.0 | -27.3 | V | P | 100.0 | 51.6 | |
| 7.386 | 3.0 | 26.0 | 35.3 | 7.3 | -34.6 | 0.0 | 0.6 | 34.6 | 54.0 | -19.4 | V | A | 100.0 | 51.6 | |
| 7.386 | 3.0 | 38.0 | 35.3 | 7.3 | -34.6 | 0.0 | 0.6 | 46.6 | 74.0 | -27.4 | H | P | 152.3 | 22.2 | |
| 7.386 | 3.0 | 24.8 | 35.3 | 7.3 | -34.6 | 0.0 | 0.6 | 33.4 | 54.0 | -20.6 | H | A | 152.3 | 22.2 | |

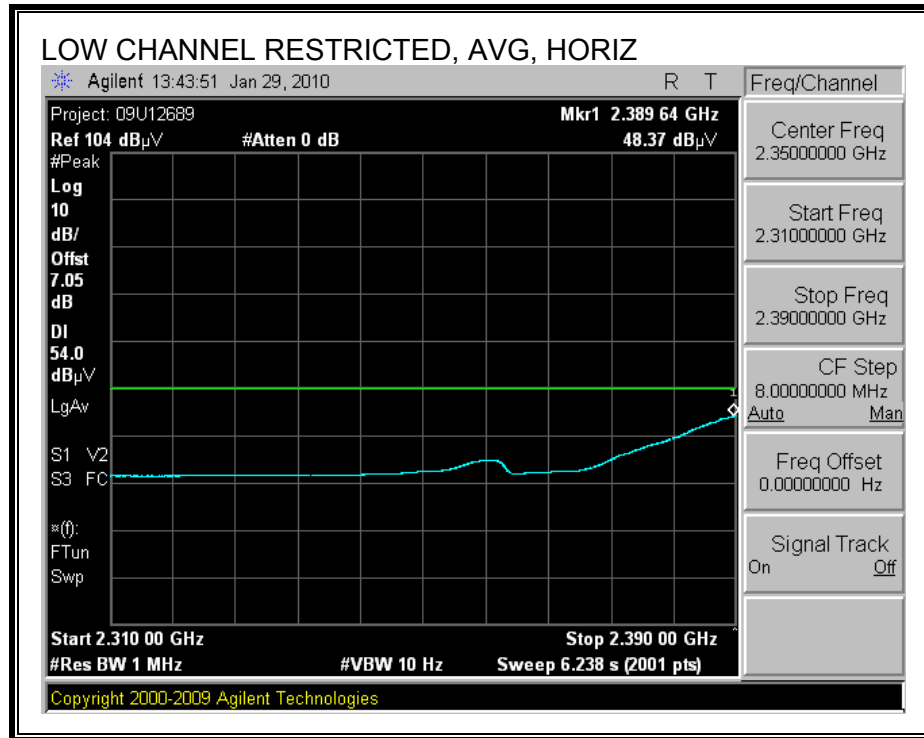
Rev. 4.1.2.7

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

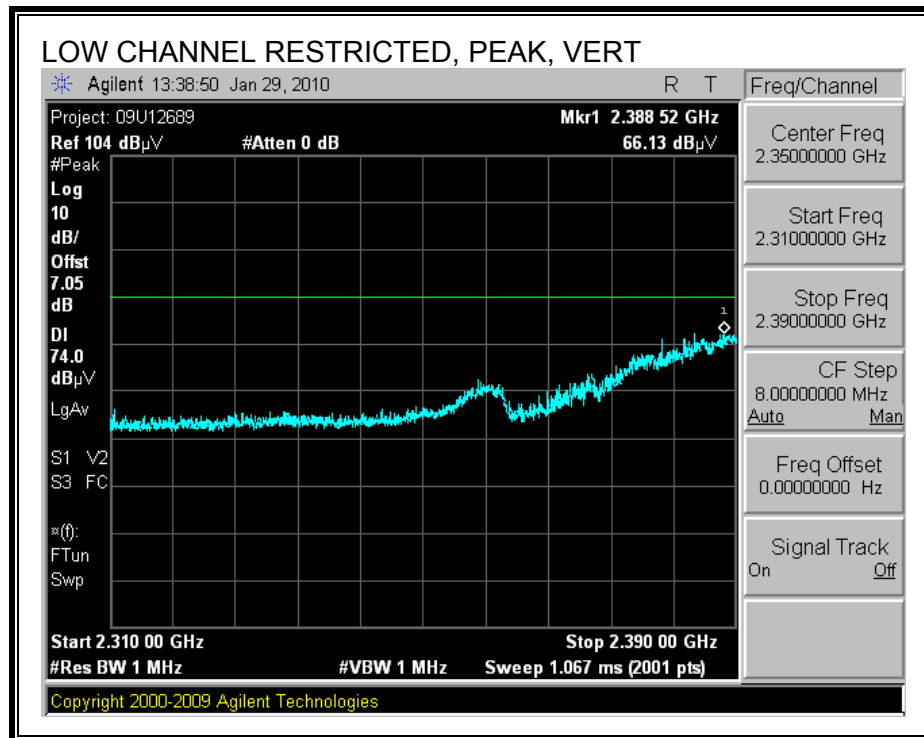
8.2.4. TX ABOVE 1 GHz FOR 802.11n HT40 MODE IN THE 2.4 GHz BAND

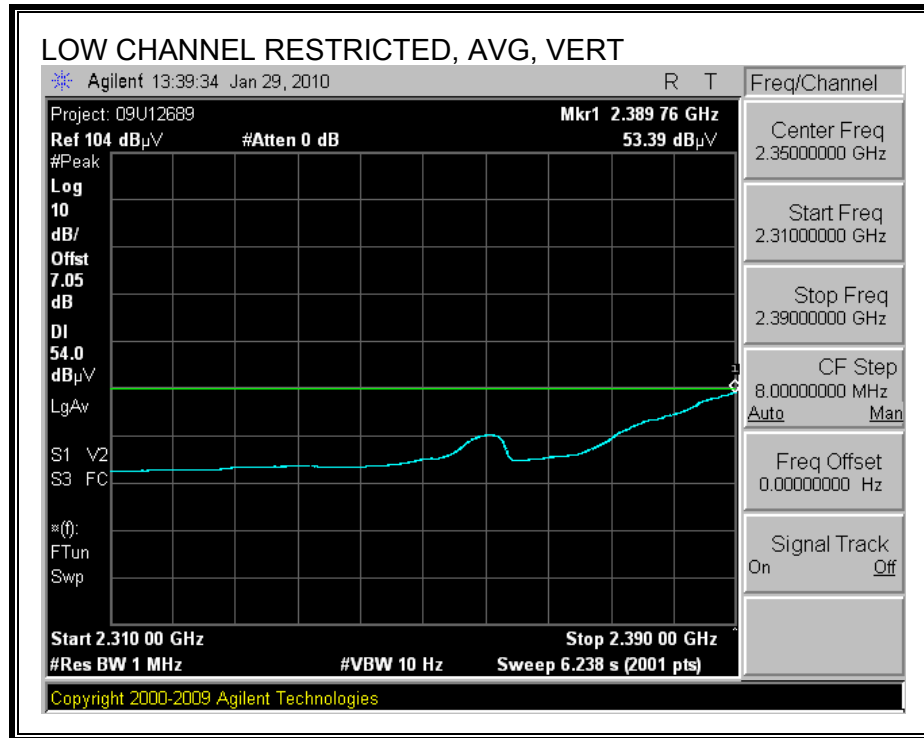
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



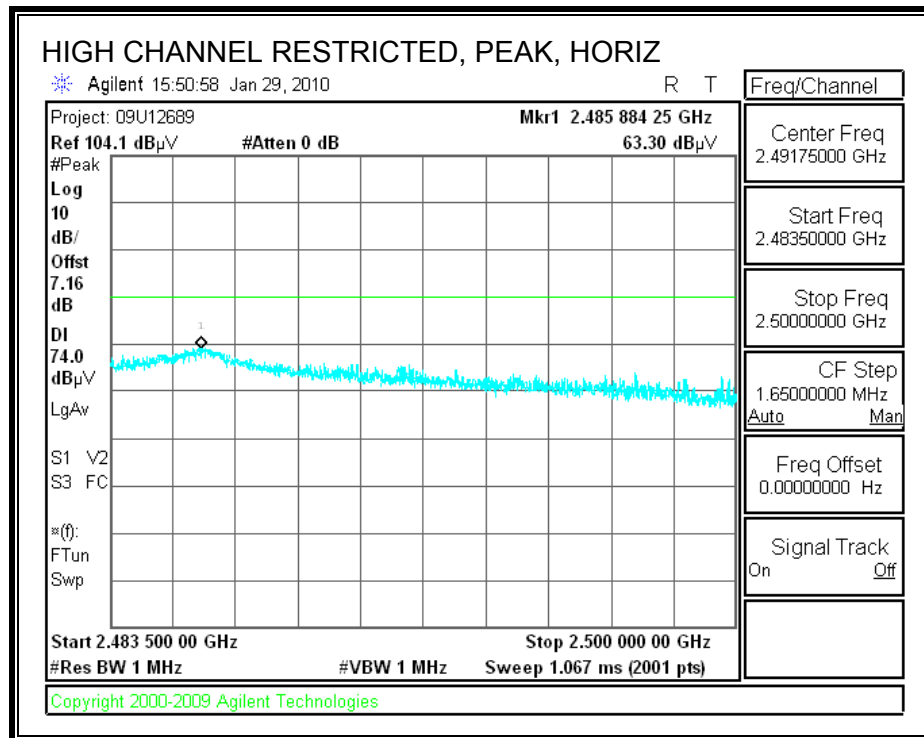


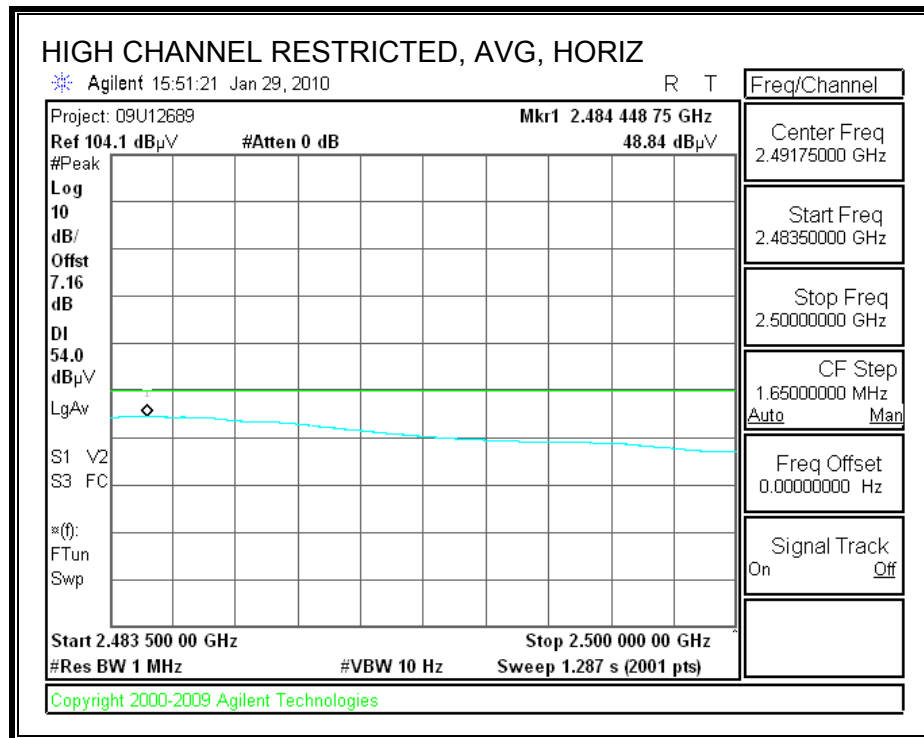
RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)



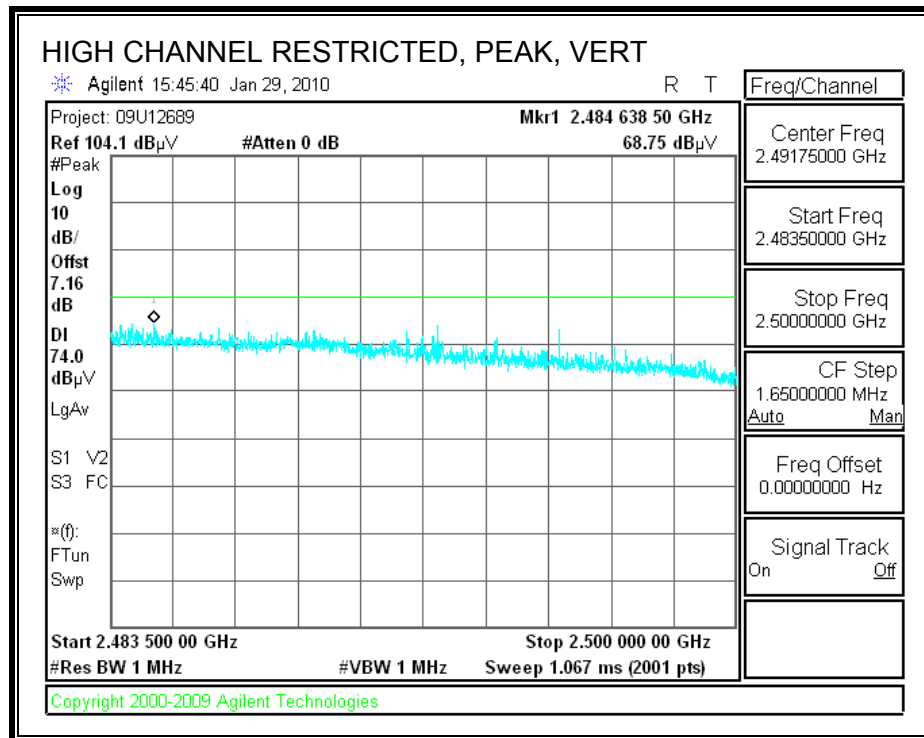


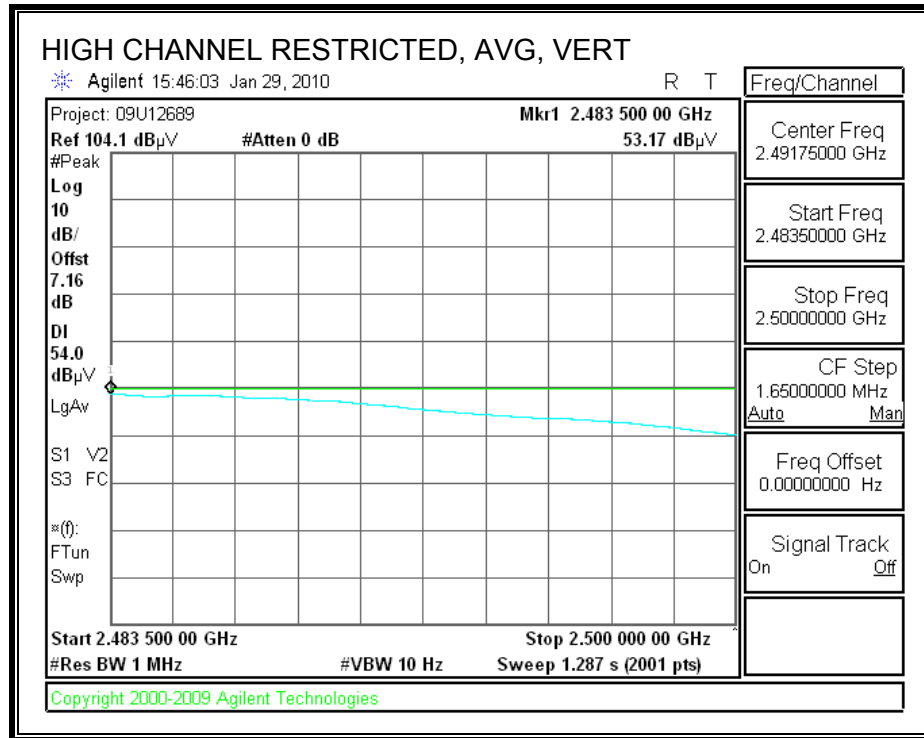
RESTRICTED BANEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: William Zhuang

Date: 02/02/10

Project #: 09U12689

Company: Qualcomm Wireless

EUT Description: Ethernet Card

EUT M/N: Card SN:9067

Test Target: FCC 15.247

Mode Oper: T011T2T3 On, HI40 Mode

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

| f GHz | Dist (m) | Read dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fitr dB | Corr. dBuV/m | Limit dBuV/m | Margin dB | Ant. Pol. V/H | Det. P/A/QP | Ant.High cm | Table Angle Degree | Notes |
|--|-------------|--------------|------------|----------|-----------|--------------|------------|-----------------|-----------------|--------------|------------------|----------------|----------------|-----------------------|-------|
| Low Ch. 2422MHz, power setting = 11.0 dBm | | | | | | | | | | | | | | | |
| 4.844 | 3.0 | 38.6 | 32.8 | 5.8 | -34.8 | 0.0 | 0.6 | 42.9 | 74.0 | -31.1 | V | P | 199.5 | 199.0 | |
| 4.844 | 3.0 | 27.9 | 32.8 | 5.8 | -34.8 | 0.0 | 0.6 | 32.2 | 54.0 | -21.8 | V | A | 199.5 | 199.0 | |
| 4.844 | 3.0 | 38.1 | 32.8 | 5.8 | -34.8 | 0.0 | 0.6 | 42.4 | 74.0 | -31.6 | H | P | 100.8 | 40.8 | |
| 4.844 | 3.0 | 25.4 | 32.8 | 5.8 | -34.8 | 0.0 | 0.6 | 29.8 | 54.0 | -24.2 | H | A | 100.8 | 40.8 | |
| 7.266 | 3.0 | 37.3 | 35.1 | 7.2 | -34.7 | 0.0 | 0.6 | 45.6 | 74.0 | -28.4 | V | P | 163.5 | 354.9 | |
| 7.266 | 3.0 | 25.0 | 35.1 | 7.2 | -34.7 | 0.0 | 0.6 | 33.4 | 54.0 | -20.6 | V | A | 163.5 | 354.9 | |
| 7.266 | 3.0 | 37.6 | 35.1 | 7.2 | -34.7 | 0.0 | 0.6 | 45.9 | 74.0 | -28.1 | H | P | 141.4 | 77.4 | |
| 7.266 | 3.0 | 25.0 | 35.1 | 7.2 | -34.7 | 0.0 | 0.6 | 33.4 | 54.0 | -20.6 | H | A | 141.4 | 77.4 | |
| Mid Ch. 2437MHz, power setting = 20.0 dBm | | | | | | | | | | | | | | | |
| 4.874 | 3.0 | 45.0 | 32.8 | 5.8 | -34.9 | 0.0 | 0.6 | 49.4 | 74.0 | -24.6 | V | P | 105.2 | 235.9 | |
| 4.874 | 3.0 | 32.6 | 32.8 | 5.8 | -34.9 | 0.0 | 0.6 | 37.0 | 54.0 | -17.0 | V | A | 105.2 | 235.9 | |
| 4.874 | 3.0 | 38.4 | 32.8 | 5.8 | -34.9 | 0.0 | 0.6 | 42.8 | 74.0 | -31.2 | H | P | 117.3 | 229.5 | |
| 4.874 | 3.0 | 26.4 | 32.8 | 5.8 | -34.9 | 0.0 | 0.6 | 30.8 | 54.0 | -23.2 | H | A | 117.3 | 229.5 | |
| 7.311 | 3.0 | 51.6 | 35.2 | 7.3 | -34.7 | 0.0 | 0.6 | 60.1 | 74.0 | -13.9 | V | P | 106.5 | 71.3 | |
| 7.311 | 3.0 | 33.2 | 35.2 | 7.3 | -34.7 | 0.0 | 0.6 | 41.6 | 54.0 | -12.4 | V | A | 106.5 | 71.3 | |
| 7.311 | 3.0 | 43.4 | 35.2 | 7.3 | -34.7 | 0.0 | 0.6 | 51.9 | 74.0 | -22.1 | H | P | 131.4 | 120.4 | |
| 7.311 | 3.0 | 26.8 | 35.2 | 7.3 | -34.7 | 0.0 | 0.6 | 35.2 | 54.0 | -18.8 | H | A | 131.4 | 120.4 | |
| High Ch. 2452MHz, power setting = 11.0 dBm | | | | | | | | | | | | | | | |
| 4.904 | 3.0 | 37.7 | 32.8 | 5.9 | -34.9 | 0.0 | 0.6 | 42.1 | 74.0 | -31.9 | V | P | 156.4 | 197.5 | |
| 4.904 | 3.0 | 27.4 | 32.8 | 5.9 | -34.9 | 0.0 | 0.6 | 31.8 | 54.0 | -22.2 | V | A | 156.4 | 197.5 | |
| 4.904 | 3.0 | 38.2 | 32.8 | 5.9 | -34.9 | 0.0 | 0.6 | 42.6 | 74.0 | -31.4 | H | P | 134.2 | 14.1 | |
| 4.904 | 3.0 | 25.3 | 32.8 | 5.9 | -34.9 | 0.0 | 0.6 | 29.7 | 54.0 | -24.3 | H | A | 134.2 | 14.1 | |
| 7.356 | 3.0 | 38.0 | 35.3 | 7.3 | -34.6 | 0.0 | 0.6 | 46.6 | 74.0 | -27.4 | V | P | 100.0 | 228.2 | |
| 7.356 | 3.0 | 25.0 | 35.3 | 7.3 | -34.6 | 0.0 | 0.6 | 33.5 | 54.0 | -20.5 | V | A | 100.0 | 228.2 | |
| 7.356 | 3.0 | 37.8 | 35.3 | 7.3 | -34.6 | 0.0 | 0.6 | 46.3 | 74.0 | -27.7 | H | P | 104.8 | 117.0 | |
| 7.356 | 3.0 | 24.7 | 35.3 | 7.3 | -34.6 | 0.0 | 0.6 | 33.2 | 54.0 | -20.8 | H | A | 104.8 | 117.0 | |
| Rev. 4.1.2.7 | | | | | | | | | | | | | | | |
| Note: No other emissions were detected above the system noise floor. | | | | | | | | | | | | | | | |

8.2.5. 802.11a MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Thanh Nguyen

Date: 07/01/09

Project #: 09U12653

Company: Qualcomm Inc.

EUT Description: 5000 series Ethernet Adapter card

EUT M/N: 65-VN663-P2

Test Target: FCC15.407

Mode Oper: Transmit a mode

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

| f GHz | Dist (m) | Read dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fitr dB | Corr. dBuV/m | Limit dBuV/m | Margin dB | Ant. Pol. V/H | Det. P/A/QP | Ant.High cm | Table Angle Degree | Notes |
|------------------------------|-------------|--------------|------------|----------|-----------|--------------|------------|-----------------|-----------------|--------------|------------------|----------------|----------------|-----------------------|-------------|
| Low 5745Mhz 19dbm | | | | | | | | | | | | | | | |
| 11.490 | 3.0 | 45.5 | 38.4 | 9.5 | -35.9 | 0.0 | 0.0 | 57.6 | 74.0 | -16.4 | V | P | 144.7 | 14.0 | |
| 11.490 | 3.0 | 33.5 | 38.4 | 9.5 | -35.9 | 0.0 | 0.7 | 45.3 | 54.0 | -8.7 | V | A | 144.7 | 14.0 | |
| 11.490 | 3.0 | 36.8 | 38.4 | 9.5 | -35.9 | 0.0 | 0.7 | 49.5 | 74.0 | -24.5 | H | P | 158.3 | 295.5 | |
| 11.490 | 3.0 | 24.3 | 38.4 | 9.5 | -35.9 | 0.0 | 0.7 | 37.0 | 54.0 | -17.0 | H | A | 158.3 | 295.5 | |
| 22.980 | 3.0 | 35.2 | 36.1 | 14.6 | -34.3 | 0.0 | 0.0 | 51.5 | 74.0 | -22.5 | H | P | 107.8 | 117.1 | Noise floor |
| 22.980 | 3.0 | 22.2 | 36.1 | 14.6 | -34.3 | 0.0 | 0.0 | 38.6 | 54.0 | -15.4 | H | A | 107.8 | 117.1 | Noise floor |
| 22.980 | 3.0 | 34.7 | 36.1 | 14.6 | -34.3 | 0.0 | 0.0 | 51.0 | 74.0 | -23.0 | V | P | 100.8 | 357.2 | Noise floor |
| 22.980 | 3.0 | 22.4 | 36.1 | 14.6 | -34.3 | 0.0 | 0.0 | 38.7 | 54.0 | -15.3 | V | A | 100.8 | 357.2 | Noise floor |
| Mid ch 5785Mhz 19dbm | | | | | | | | | | | | | | | |
| 11.570 | 3.0 | 43.8 | 38.5 | 9.5 | -35.8 | 0.0 | 0.7 | 56.0 | 74.0 | -18.0 | V | P | 158.4 | 23.6 | |
| 11.570 | 3.0 | 37.9 | 38.5 | 9.5 | -35.8 | 0.0 | 0.7 | 50.2 | 54.0 | -3.8 | V | A | 158.4 | 23.6 | |
| 11.570 | 3.0 | 39.4 | 38.5 | 9.5 | -35.8 | 0.0 | 0.7 | 51.7 | 74.0 | -22.3 | H | P | 149.9 | 298.2 | |
| 11.570 | 3.0 | 33.0 | 38.5 | 9.5 | -35.8 | 0.0 | 0.7 | 45.2 | 54.0 | -8.8 | H | A | 149.9 | 298.2 | |
| High ch 5825Mhz 19dbm | | | | | | | | | | | | | | | |
| 11.650 | 3.0 | 47.2 | 38.6 | 9.6 | -35.7 | 0.0 | 0.7 | 59.6 | 74.0 | -14.4 | V | P | 141.6 | 22.0 | |
| 11.650 | 3.0 | 31.0 | 38.6 | 9.6 | -35.7 | 0.0 | 0.7 | 43.4 | 54.0 | -10.6 | V | A | 141.6 | 22.0 | |
| 11.650 | 3.0 | 36.9 | 38.6 | 9.6 | -35.7 | 0.0 | 0.7 | 49.3 | 74.0 | -24.7 | H | P | 164.1 | 192.8 | |
| 11.650 | 3.0 | 24.7 | 38.6 | 9.6 | -35.7 | 0.0 | 0.7 | 37.1 | 54.0 | -16.9 | H | A | 164.1 | 192.8 | |

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

8.2.6. 802.11n HT20 MODE IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Thanh Nguyen
Date: 07/01/09
Project #: 09U12653
Company: Qualcomm Inc.
EUT Description: 5000 series Ethernet Adapter card
EUT M/N: 65-VN663-P2
Test Target: FCC15.407
Mode Oper: Transmit HT20 mode

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

| f GHz | Dist (m) | Read dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Filtr dB | Corr. dBuV/m | Limit dBuV/m | Margin dB | Ant. Pol. V/H | Det. P/A/QP | Ant.High cm | Table Angle Degree | Notes |
|----------------------------------|-------------|--------------|------------|----------|-----------|--------------|-------------|-----------------|-----------------|--------------|------------------|----------------|----------------|-----------------------|-------|
| Low Ch 5745MHz, set 19dbm | | | | | | | | | | | | | | | |
| 11.490 | 3.0 | 42.4 | 38.4 | 9.5 | -35.9 | 0.0 | 0.7 | 54.4 | 74.0 | -19.6 | V | P | 118.5 | 27.3 | |
| 11.490 | 3.0 | 37.5 | 38.4 | 9.5 | -35.9 | 0.0 | 0.7 | 49.6 | 54.0 | -4.4 | V | A | 118.5 | 27.3 | |
| 11.490 | 3.0 | 39.1 | 38.4 | 9.5 | -35.9 | 0.0 | 0.7 | 51.1 | 74.0 | -22.9 | H | P | 128.7 | 309.9 | |
| 11.490 | 3.0 | 31.9 | 38.4 | 9.5 | -35.9 | 0.0 | 0.7 | 43.9 | 54.0 | -10.1 | H | A | 128.7 | 309.9 | |
| Mid Ch 5785MHz, set 19dbm | | | | | | | | | | | | | | | |
| 11.570 | 3.0 | 43.1 | 38.5 | 9.5 | -35.8 | 0.0 | 0.7 | 55.3 | 74.0 | -18.7 | V | P | 119.1 | 25.5 | |
| 11.570 | 3.0 | 38.5 | 38.5 | 9.5 | -35.8 | 0.0 | 0.7 | 50.7 | 54.0 | -3.3 | V | A | 119.1 | 25.5 | |
| 11.570 | 3.0 | 37.8 | 38.5 | 9.5 | -35.8 | 0.0 | 0.7 | 50.1 | 74.0 | -23.9 | H | P | 162.2 | 130.3 | |
| 11.570 | 3.0 | 29.5 | 38.5 | 9.5 | -35.8 | 0.0 | 0.7 | 41.7 | 54.0 | -12.3 | H | A | 162.2 | 130.3 | |
| High 5825MHz, set 19dbm | | | | | | | | | | | | | | | |
| 11.650 | 3.0 | 49.4 | 38.6 | 9.6 | -35.7 | 0.0 | 0.7 | 61.9 | 74.0 | -12.1 | V | P | 149.3 | 35.4 | |
| 11.650 | 3.0 | 30.4 | 38.6 | 9.6 | -35.7 | 0.0 | 0.7 | 42.8 | 54.0 | -11.2 | V | A | 149.3 | 35.4 | |
| 11.650 | 3.0 | 37.6 | 38.6 | 9.6 | -35.7 | 0.0 | 0.7 | 50.7 | 74.0 | -23.3 | H | P | 199.0 | 226.8 | |
| 11.650 | 3.0 | 24.1 | 38.6 | 9.6 | -35.7 | 0.0 | 0.7 | 37.3 | 54.0 | -16.7 | H | A | 199.0 | 226.8 | |

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

8.2.7. 802.11n HT40 MODE IN THE 5.8 GHz BAND

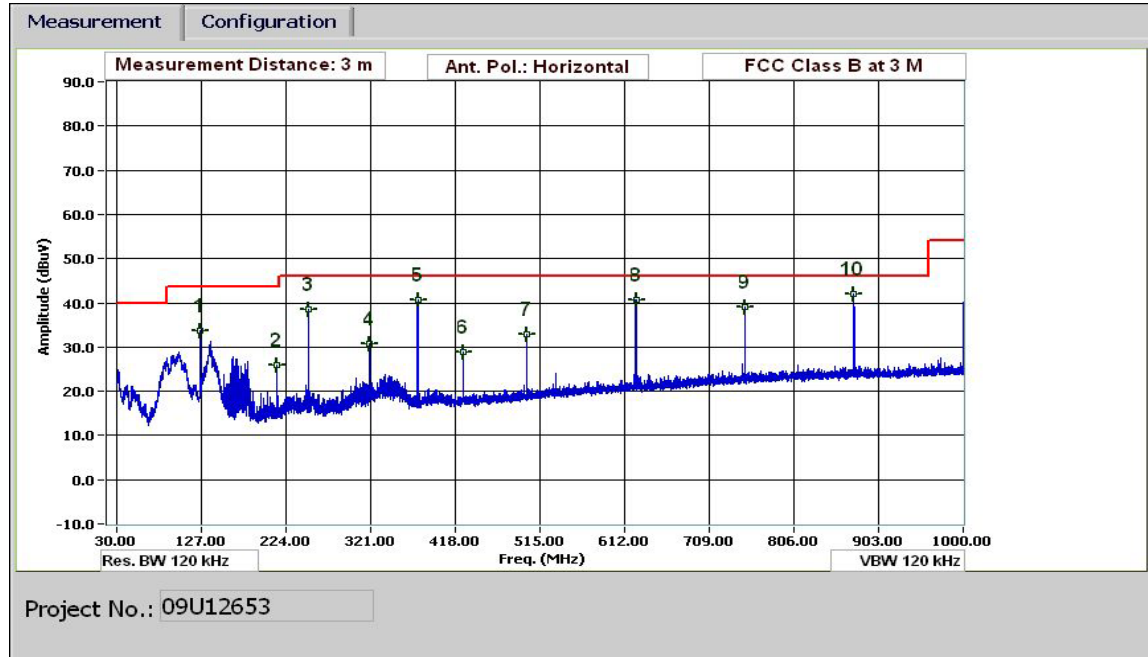
HARMONICS AND SPURIOUS EMISSIONS

| High Frequency Measurement | | | | | | | | | | | | | | | | |
|---|-----------------------|-------------------------------|-----------------------|------------|--------------------------------|------------------------|--------------|------------|------------------------------|---------------|------------------|-------------------|--------------|---------------|--|--|
| Compliance Certification Services, Fremont 5m Chamber | | | | | | | | | | | | | | | | |
| Company: | | QualCom | | | | | | | | | | | | | | |
| Project #: | | 09U12689 | | | | | | | | | | | | | | |
| Date: | | 03/23/10 | | | | | | | | | | | | | | |
| Test Engineer: | | Thanh Nguyen | | | | | | | | | | | | | | |
| Configuration: | | EUT and remote support Laptop | | | | | | | | | | | | | | |
| Mode: | | Tx HT 40 | | | | | | | | | | | | | | |
| Test Equipment: | | | | | | | | | | | | | | | | |
| Horn 1-18GHz | | | Pre-amplifier 1-26GHz | | | Pre-amplifier 26-40GHz | | | Horn > 18GHz | | | Limit | | | | |
| T60; S/N: 2238 @3m | | | T144 Miteq 3008A00931 | | | | | | | | | FCC 15.209 | | | | |
| Hi Frequency Cables | | | | | | | | | | | | | | | | |
| 3' cable 22807700 | | | 12' cable 22807600 | | | 20' cable 22807500 | | | HPF | | | Reject Filter | | | Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz | |
| 3' cable 22807700 | | | 12' cable 22807600 | | | 20' cable 22807500 | | | | | | R_002 | | | | |
| f GHz | Dist (m) | Read Pk dBuV | Read Avg. dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fldr dB | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes (V/H) | |
| Low Ch 5755MHz | | | | | | | | | | | | | | | | |
| 11.510 | 3.0 | 42.9 | 34.9 | 38.1 | 9.5 | -35.8 | 0.0 | 0.0 | 54.6 | 46.6 | 74 | 54 | -19.4 | -7.4 | V | |
| 11.510 | 3.0 | 37.0 | 26.2 | 38.1 | 9.5 | -35.8 | 0.0 | 0.0 | 48.7 | 37.9 | 74 | 54 | -25.3 | -16.1 | Noise floor | |
| High Ch 5795GHz | | | | | | | | | | | | | | | | |
| 11.590 | 3.0 | 42.9 | 35.8 | 38.1 | 9.5 | -35.8 | 0.0 | 0.0 | 54.8 | 47.7 | 74 | 54 | -19.2 | -6.3 | V | |
| 17.385 | 3.0 | 35.8 | 25.6 | 42.5 | 12.3 | -33.8 | 0.0 | 0.0 | 56.7 | 46.5 | 74 | 54 | -17.3 | -7.5 | Noise floor | |
| Rev. 07.22.09 | | | | | | | | | | | | | | | | |
| f | Measurement Frequency | | | Amp | Preamp Gain | | | Avg Lim | Average Field Strength Limit | | | | | | | |
| Dist | Distance to Antenna | | | D Corr | Distance Correct to 3 meters | | | Pk Lim | Peak Field Strength Limit | | | | | | | |
| Read | Analyzer Reading | | | Avg | Average Field Strength @ 3 m | | | Avg Mar | Margin vs. Average Limit | | | | | | | |
| AF | Antenna Factor | | | Peak | Calculated Peak Field Strength | | | Pk Mar | Margin vs. Peak Limit | | | | | | | |
| CL | Cable Loss | | | HPF | High Pass Filter | | | | | | | | | | | |

8.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL



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

Test Engr: Vien Tran
Date: 06/26/09
Project #: 09U12689
Company: Qualcomm
EUT Description: 802.11n 4x4 WLAN Ethernet Adapter
EUT M/N: Non-DFS:65-VN663-P1
Test Target: FCC Class B
Mode Oper: Tx Worst-Case

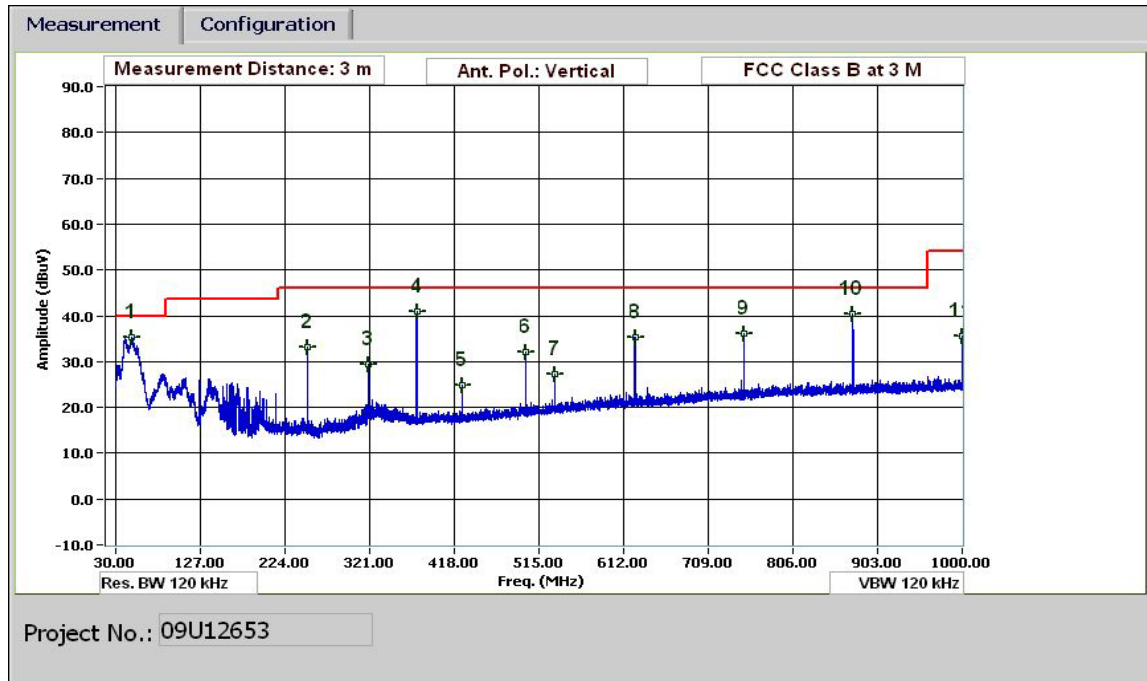
| | | | | | |
|------|-----------------------|--------|------------------------------|--------|------------------|
| f | Measurement Frequency | Amp | Preamp Gain | Margin | Margin vs. Limit |
| Dist | Distance to Antenna | D Corr | Distance Correct to 3 meters | | |
| Read | Analyzer Reading | Filter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

| f MHz | Dist (m) | Read dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Filter dB | Corr. dBuV/m | Limit dBuV/m | Margin dB | Ant. Pol. V/H | Det. P/A/QP | Notes |
|----------|-------------|--------------|------------|----------|-----------|--------------|--------------|-----------------|-----------------|--------------|------------------|----------------|-------|
| 125.044 | 3.0 | 47.3 | 13.7 | 1.1 | 28.3 | 0.0 | 0.0 | 33.7 | 43.5 | -9.8 | H | EP | |
| 213.368 | 3.0 | 40.9 | 11.9 | 1.3 | 28.2 | 0.0 | 0.0 | 25.9 | 43.5 | -17.6 | H | EP | |
| 249.969 | 3.0 | 53.5 | 11.8 | 1.4 | 28.2 | 0.0 | 0.0 | 38.5 | 46.0 | -7.5 | H | EP | |
| 319.932 | 3.0 | 43.6 | 13.7 | 1.6 | 28.1 | 0.0 | 0.0 | 30.8 | 46.0 | -15.2 | H | EP | |
| 375.014 | 3.0 | 52.5 | 14.5 | 1.7 | 28.1 | 0.0 | 0.0 | 40.7 | 46.0 | -5.3 | H | EP | |
| 426.616 | 3.0 | 39.5 | 15.4 | 1.9 | 28.0 | 0.0 | 0.0 | 28.8 | 46.0 | -17.2 | H | EP | |
| 499.939 | 3.0 | 41.9 | 16.7 | 2.0 | 27.8 | 0.0 | 0.0 | 32.9 | 46.0 | -13.1 | H | EP | |
| 624.985 | 3.0 | 47.2 | 18.7 | 2.3 | 27.4 | 0.0 | 0.0 | 40.7 | 46.0 | -5.3 | H | EP | |
| 749.910 | 3.0 | 43.5 | 20.3 | 2.5 | 27.3 | 0.0 | 0.0 | 39.0 | 46.0 | -7.0 | H | EP | |
| 874.955 | 3.0 | 45.4 | 21.6 | 2.8 | 27.7 | 0.0 | 0.0 | 42.1 | 46.0 | -3.9 | H | EP | |

Rev. 1.27.09

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

VERTICAL



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

Test Engr: Vien Tran
Date: 06/26/09
Project #: 09U12689
Company: Qualcomm
EUT Description: 802.11n 4x4 WLAN Ethernet Adapter
EUT M/N: Non-DFS:65-VN663-P1
Test Target: FCC Class B
Mode Oper: Tx Worst-Case

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

| f MHz | Dist (m) | Read dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Filter dB | Corr. dBuV/m | Limit dBuV/m | Margin dB | Ant. Pol. V/H | Det. P/A/QP | Notes |
|----------|-------------|--------------|------------|----------|-----------|--------------|--------------|-----------------|-----------------|--------------|------------------|----------------|-------|
| 48.001 | 3.0 | 53.6 | 9.3 | 0.6 | 28.4 | 0.0 | 0.0 | 35.2 | 40.0 | -4.8 | V | EP | |
| 249.969 | 3.0 | 48.3 | 11.8 | 1.4 | 28.2 | 0.0 | 0.0 | 33.2 | 46.0 | -12.8 | V | EP | |
| 320.052 | 3.0 | 42.2 | 13.7 | 1.6 | 28.1 | 0.0 | 0.0 | 29.4 | 46.0 | -16.6 | V | EP | |
| 375.014 | 3.0 | 52.8 | 14.5 | 1.7 | 28.1 | 0.0 | 0.0 | 41.0 | 46.0 | -5.0 | V | EP | |
| 426.736 | 3.0 | 35.5 | 15.4 | 1.9 | 28.0 | 0.0 | 0.0 | 24.8 | 46.0 | -21.2 | V | EP | |
| 499.939 | 3.0 | 41.2 | 16.7 | 2.0 | 27.8 | 0.0 | 0.0 | 32.1 | 46.0 | -13.9 | V | EP | |
| 533.301 | 3.0 | 35.7 | 17.3 | 2.1 | 27.7 | 0.0 | 0.0 | 27.3 | 46.0 | -18.7 | V | EP | |
| 624.985 | 3.0 | 41.8 | 18.7 | 2.3 | 27.4 | 0.0 | 0.0 | 35.4 | 46.0 | -10.6 | V | EP | |
| 749.910 | 3.0 | 40.6 | 20.3 | 2.5 | 27.3 | 0.0 | 0.0 | 36.1 | 46.0 | -9.9 | V | EP | |
| 874.955 | 3.0 | 43.7 | 21.6 | 2.8 | 27.7 | 0.0 | 0.0 | 40.4 | 46.0 | -5.6 | V | EP | |
| 999.880 | 3.0 | 37.9 | 22.5 | 3.0 | 27.9 | 0.0 | 0.0 | 35.4 | 54.0 | -18.6 | V | EP | |

Rev. 1.27.09

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

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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

^{*} Decreases with the logarithm of the frequency.

TEST PROCEDURE

ANSI C63.4

RESULTS

2.4 GHz BAND

6 WORST EMISSIONS

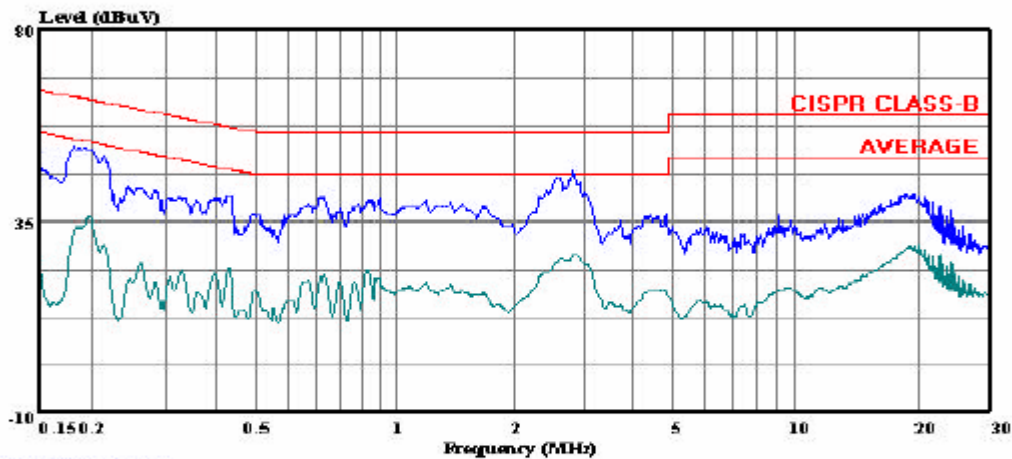
| CONDUCTED EMISSIONS DATA (115VAC 60Hz) | | | | | | | | | |
|--|-----------|-----------|-----------|-------|-------|-------|---------|---------|---------|
| Freq. | Reading | | | Class | Limit | FCC B | Margin | | Remark |
| (MHz) | PK (dBuV) | QP (dBuV) | AV (dBuV) | (dB) | QP | AV | QP (dB) | AV (dB) | L1 / L2 |
| 0.19 | 51.85 | -- | 36.05 | 0.00 | 63.86 | 53.86 | -12.01 | -17.81 | L1 |
| 2.95 | 46.98 | -- | 27.25 | 0.00 | 56.00 | 46.00 | -9.02 | -18.75 | L1 |
| 19.12 | 41.29 | -- | 28.92 | 0.00 | 60.00 | 50.00 | -18.71 | -21.08 | L1 |
| 0.19 | 51.41 | -- | 35.46 | 0.00 | 63.86 | 53.86 | -12.45 | -18.40 | L2 |
| 2.95 | 45.71 | -- | 26.96 | 0.00 | 56.00 | 46.00 | -10.29 | -19.04 | L2 |
| 19.12 | 41.90 | -- | 29.16 | 0.00 | 60.00 | 50.00 | -18.10 | -20.84 | L2 |
| 6 Worst Data | | | | | | | | | |

LINE 1 RESULTS



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

Data#: 21 File#: Qualcomm_09U12653_LC.EMI
Date: 06-26-2009 Time: 12:10:00



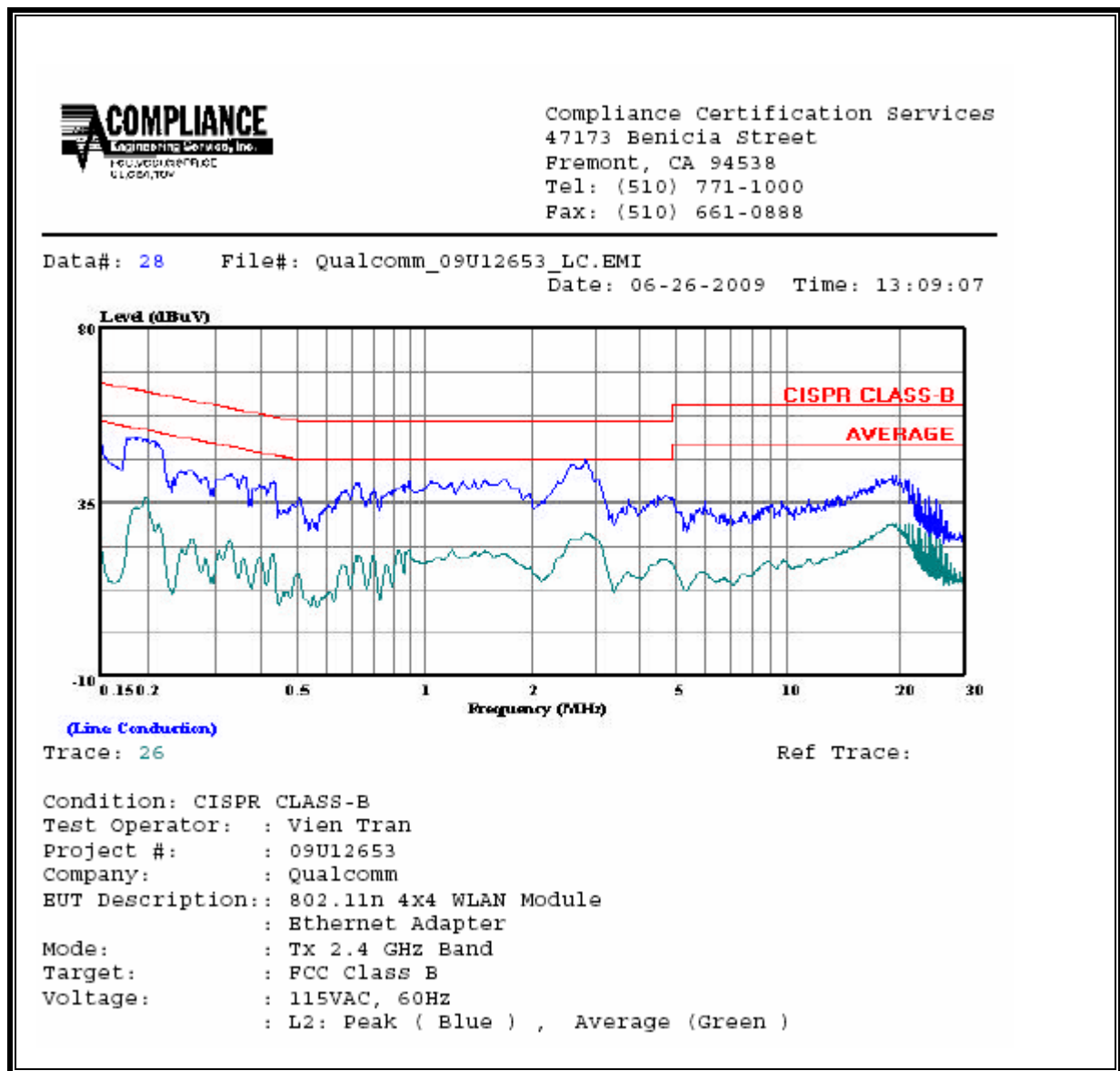
(Line Conduction)

Trace: 19

Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Vien Tran
Project #: : 09U12653
Company: : Qualcomm
EUT Description: : 802.11n 4x4 WLAN Module
: Ethernet Adapter
Mode: : Tx 2.4 GHz Band
Target: : FCC Class B
Voltage: : 115VAC, 60Hz
: L1: Peak (Blue) , Average (Green)

LINE 2 RESULTS



5.8 GHz BAND

6 WORST EMISSIONS

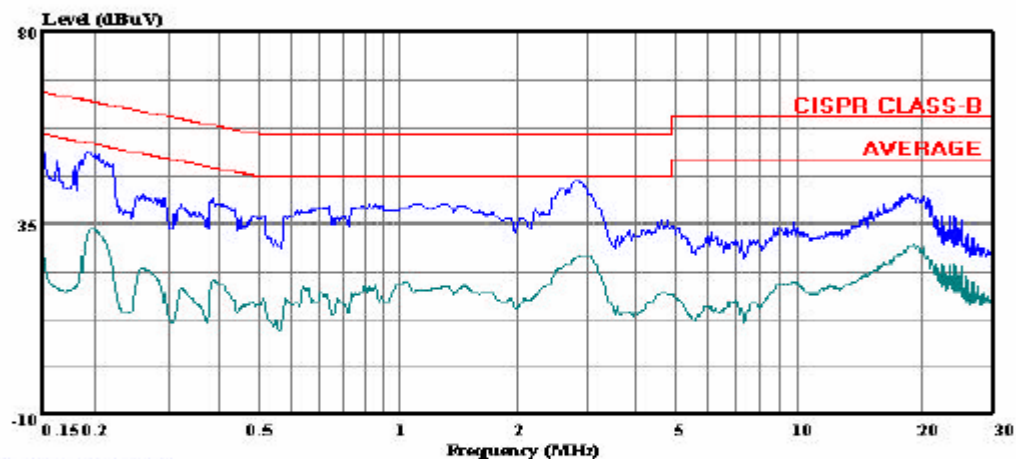
| CONDUCTED EMISSIONS DATA (115VAC 60Hz) | | | | | | | | | |
|--|-----------|-----------|-----------|-------|-------|-------|---------|---------|---------|
| Freq. | Reading | | | Closs | Limit | FCC_B | Margin | | Remark |
| (MHz) | PK (dBuV) | QP (dBuV) | AV (dBuV) | (dB) | QP | AV | QP (dB) | AV (dB) | L1 / L2 |
| 0.19 | 51.41 | -- | 33.87 | 0.00 | 63.86 | 53.86 | -12.45 | -19.99 | L1 |
| 2.95 | 44.80 | -- | 27.60 | 0.00 | 56.00 | 46.00 | -11.20 | -18.40 | L1 |
| 19.12 | 41.71 | -- | 30.40 | 0.00 | 60.00 | 50.00 | -18.29 | -19.60 | L1 |
| 0.19 | 51.34 | -- | 33.94 | 0.00 | 63.86 | 53.86 | -12.52 | -19.92 | L2 |
| 2.95 | 44.13 | -- | 27.56 | 0.00 | 56.00 | 46.00 | -11.87 | -18.44 | L2 |
| 19.12 | 40.89 | -- | 29.56 | 0.00 | 60.00 | 50.00 | -19.11 | -20.44 | L2 |
| 6 Worst Data | | | | | | | | | |

LINE 1 RESULTS



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

Data#: 7 File#: Qualcomm_09U12653_LC.EMI
Date: 06-26-2009 Time: 11:52:34



(Line Conduction)

Trace: 5

Ref Trace:

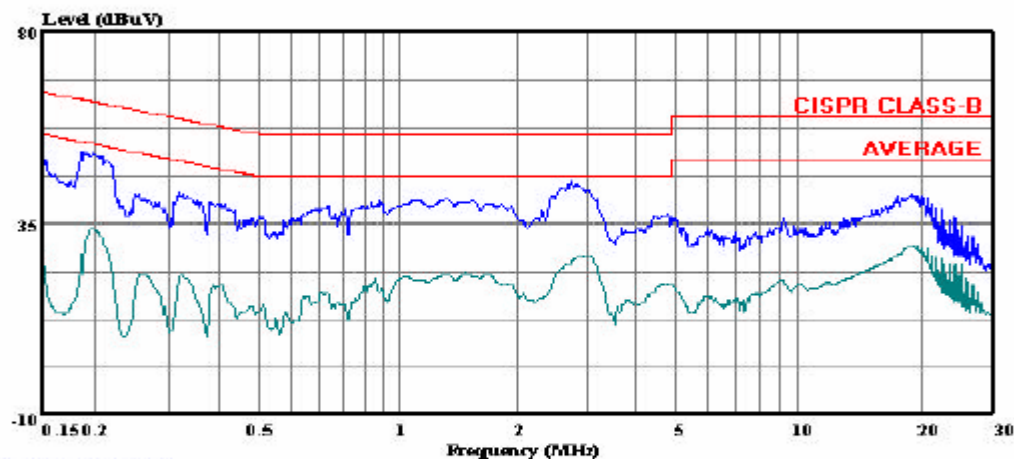
Condition: CISPR CLASS-B
Test Operator: : Vien Tran
Project #: : 09U12653
Company: : Qualcomm
BUT Description: : 802.11n 4x4 WLAN Module
: Ethernet Adapter
Mode: : Tx 5.8GHz Band
Target: : FCC Class B
Voltage: : 115VAC, 60Hz
: L1: Peak (Blue) , Average (Green)

LINE 2 RESULTS



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

Data#: 14 File#: Qualcomm_09U12653_LC.EMI
Date: 06-26-2009 Time: 12:02:29



(Line Conduction)

Trace: 12

Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Vien Tran
Project #: : 09U12653
Company: : Qualcomm
EUT Description: : 802.11n 4x4 WLAN Module
: Ethernet Adapter
Mode: : Tx 5.8GHz Band
Target: : FCC Class B
Voltage: : 115VAC, 60Hz
: L2: Peak (Blue) , Average (Green)

10. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

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

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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

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

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

f = frequency in MHz

* = Plane-wave equivalent power density

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

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

IC RULES

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

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

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

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

- Notes:**
1. Frequency, *f*, is in MHz.
 2. A power density of 10 W/m² is equivalent to 1 mW/cm².
 3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

EQUATIONS

Power density is given by:

$$S = \text{EIRP} / (4 * \pi * D^2)$$

where

S = Power density in W/m²

EIRP = Equivalent Isotropic Radiated Power in W

D = Separation distance in m

Power density in units of W/m² is converted to units of mW/cm² by dividing by 10.

Distance is given by:

$$D = \text{SQRT} (\text{EIRP} / (4 * \pi * S))$$

where

D = Separation distance in m

EIRP = Equivalent Isotropic Radiated Power in W

S = Power density in W/m²

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

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm²

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m²

RESULTS

(MPE distance equals 20 cm)

| Band | Mode | Separation Distance (m) | Output Power (dBm) | Antenna Gain (dBi) | IC Power Density (W/m ²) | FCC Power Density (mW/cm ²) |
|---------|--------|-------------------------|--------------------|--------------------|--------------------------------------|---|
| 2.4 GHz | Legacy | 0.20 | 26.62 | 8.02 | 5.79 | 0.579 |
| 2.4 GHz | MIMO | 0.20 | 26.09 | 2 | 1.28 | 0.128 |
| 5.8 GHz | Legacy | 0.20 | 25.22 | 9.02 | 5.28 | 0.528 |
| 5.8 GHz | MIMO | 0.20 | 25.19 | 3 | 1.31 | 0.131 |