Product Safety Engineering, Inc
12955 Bellamy Brothers Blvd.
Dade City, FL 33525
352-588-2209

TEST REPORT

11F244
10/24/2011

Applicant:

Hauppauge Computer Works
91 Cabot Court
Hauppauge, NY 11788

Product:

Model - Broadway
Network TV Tuner

Test dates:

09/12/2011 - 10/11/2011

Receive Date:

09/09/2011

Prepared by: Steven E. Hoke - EMC Site Manager

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Product description: BROADWAY is a network TV tuner. It works as a stand-alone device, using a wired or wireless network connection to be controlled by a PC or other device with web browsing capabilities. It receives digital terrestrial or digital cable television signals over an external antenna connector (F connector). It can stream one television program over the network connection. The wireless connection is achieved with an internal direct sequence spread spectrum transceiver operating in the 2.4 Ghz frequency band.

Test Procedures

Powerline conducted interference: The AC powerline conducted emissions measurements were made in accordance with ANSI C64.3 2003.

Band Edge: The Spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to low, medium and high transmit frequencies. The data rate of the radio was varied to determine the level that produced the worst case. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The channels closest to the band edges were selected. The spectrum was scanned across each band edge from 25 MHz below the band edge to 25 MHz above the band edge.

Power Output: The peak output power was measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting at its maximum output power. The data rate of the radio was varied to determine the level that produced the highest output power. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The following procedure was followed during measurements:
1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set sweep trigger to "free run".
3. Set RBW = 1 MHz. Set VBW = 3 MHz
4. Use linear display mode.
5. Use peak detector mode.
6. Set max hold.
7. Allow max hold to run for 60 seconds.
8. Compute power by integrating the spectrum across the 26 dB EBW.. The integration was performed using the spectrum analyzer's band power measurement function with band limits set equal to the 26 dB down points of the EBW.

Power Spectral Density: The peak power spectral density measurements were measured with the EUT set to low, medium and high transmit frequencies. The data rate of the radio was varied to determine the level that produced the worst case. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer.

Occupied Bandwidth: The occupied bandwidth was measured with the EUT set to low, medium and high transmit frequencies. The data rate of the radio was varied to determine the level that produced the worst case. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer.

Conducted Spurious Emissions: The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The data rate of the radio was varied to determine the level that produced the worst case. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. All emissions up to 25 Ghz were investigated.

Radiated Spurious Emissions: The radiated spurious emissions measurements were measured with the EUT set to low, medium and high transmit frequencies. The data rate of the radio was varied to determine the level that produced the worst case. The measurements were made using our open area test site. All emissions up to 25 Ghz were investigated and those falling into restricted bands were measured for compliance.

TEST EQUIPMENT CALIBRATION INFORMATION

| Manufacturer	Model	Description	Serial Number	Cal Due
Hewlett Packard	8566B	Spectrum Analyzer	2421A00526	02/03/12
Hewlett Packard	85662A	Display	2403A07352	02/03/12
Hewlett Packard	85650A	Quasi-Peak Adapter	2043A00209	02/03/12
Hewlett Packard	8447D	Preamp	1937A03247	09/06/12
Hewlett Packard	8449B	Preamp	3008A00320	04/11/12
Agilent	E7402A	Spectrum Analyzer	US39150137	10/20/12
Electro-Metrics	3115	Double Ridge Guide Ant	3810	05/25/13
Electro-Metrics	LPA 30	Log Periodic Antenna	2280	02/14/12
Electro-Metrics	BIA 30	Biconical Antenna	3852	04/01/12
Electro-Metrics	EMC-30	EMI Receiver	191	07/08/12
Solar	8028	LISN	829012/809022	03/31/12

Test: Band Edge Compliance
Date: 09/13/2011
Requirement: In any (100) kHz bandwidth outside the authorized band, the maximum level of radio frequency power must be at least (20) dB down from the highest emissions level within the authorized band.
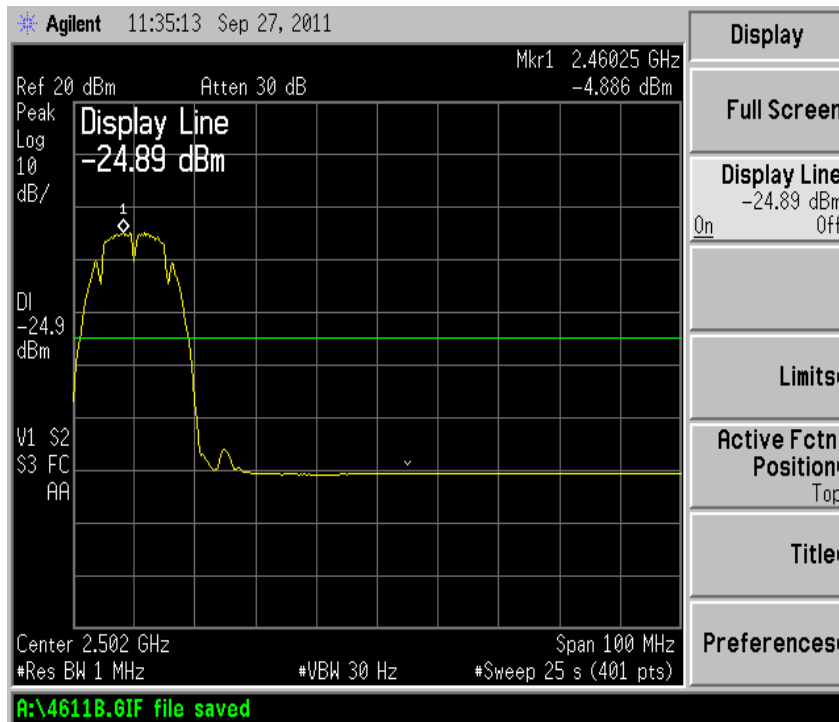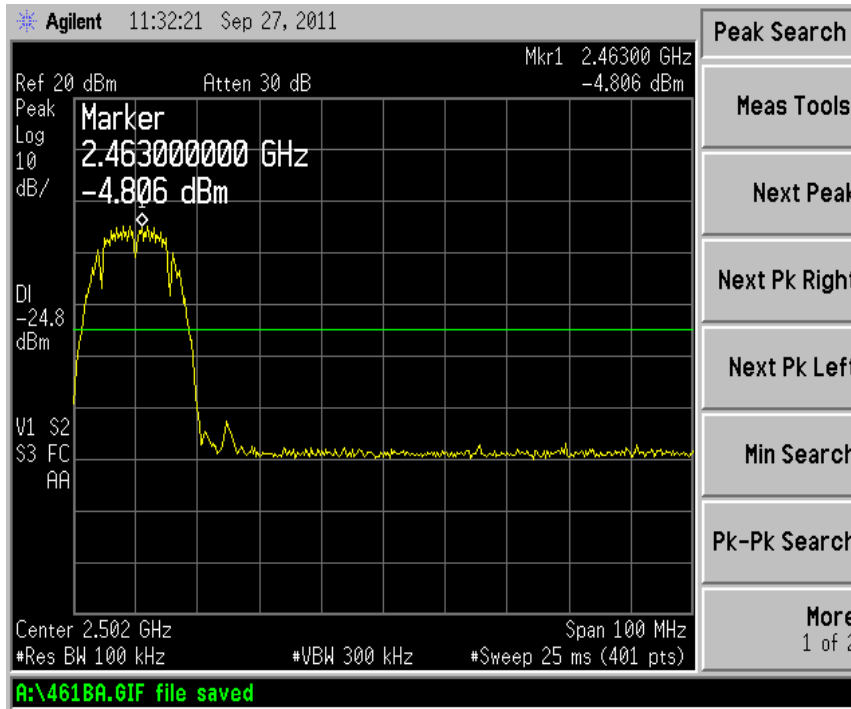RBW: (100) kHz
VBW: (300) kHz

802.11 b
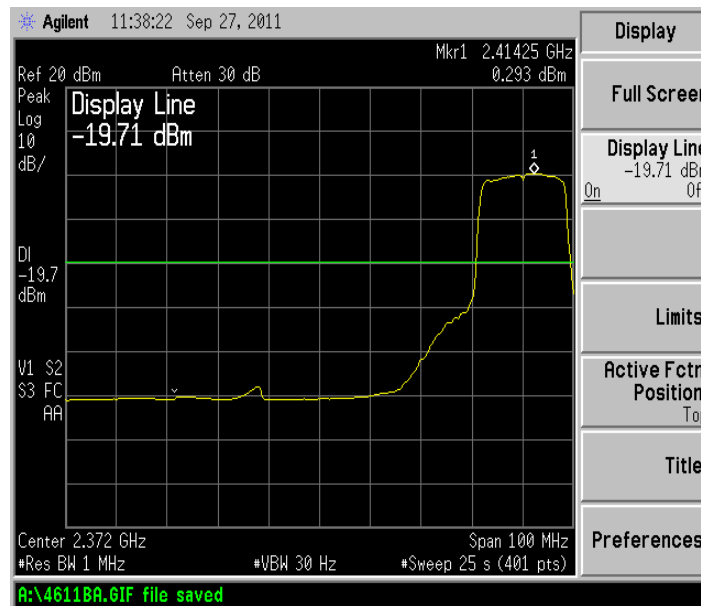
CH 1
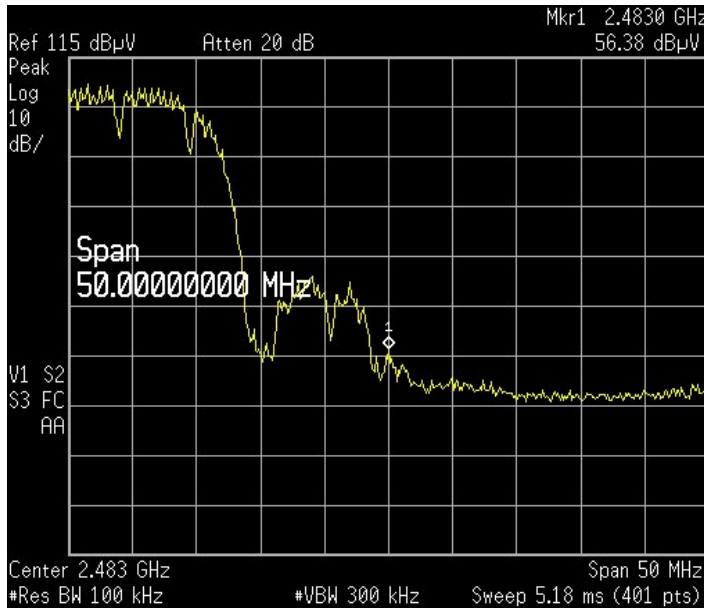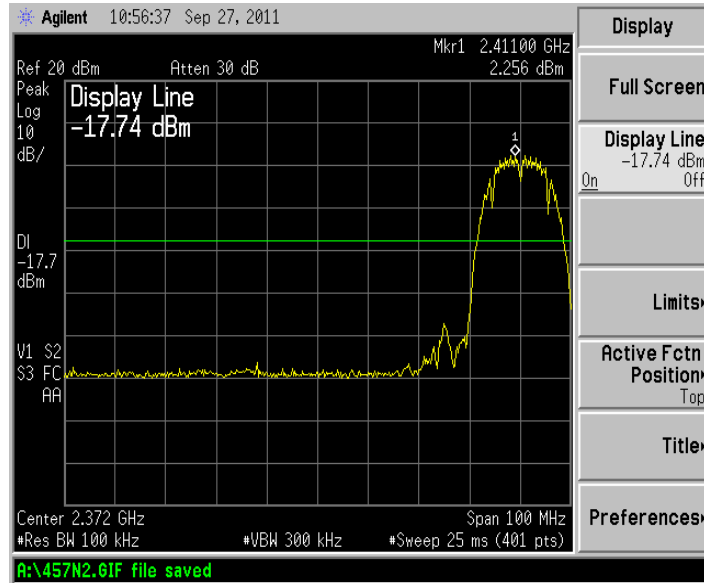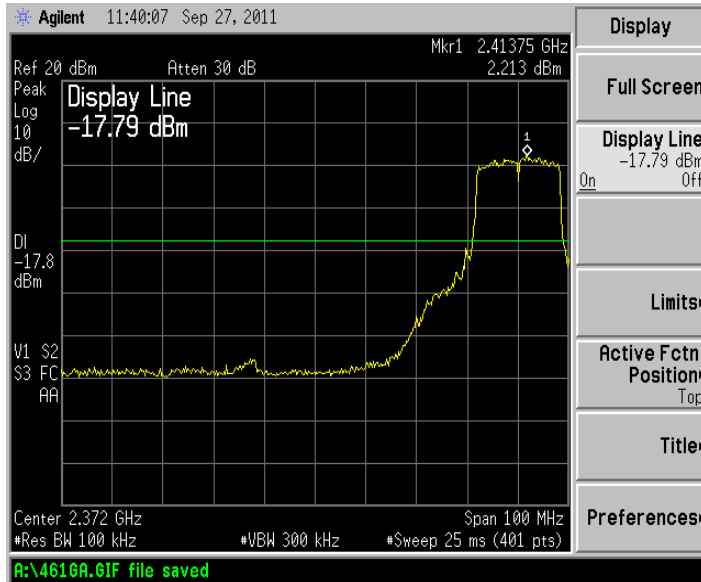
CH 11

Test: Band Edge Compliance
Date: 09/13/2011
Requirement: In any (100) kHz bandwidth outside the authorized band, the maximum level of radio frequency power must be at least (20) dB down from the highest emissions level within the authorized band.
RBW: (100) kHz
VBW: (300) kHz

802.11 g

CH 1

CH 11

Test: Band Edge Compliance
Date: 09/13/2011
Requirement: In any (100) kHz bandwidth outside the authorized band, the maximum level of radio frequency power must be at least (20) dB down from the highest emissions level within the authorized band.
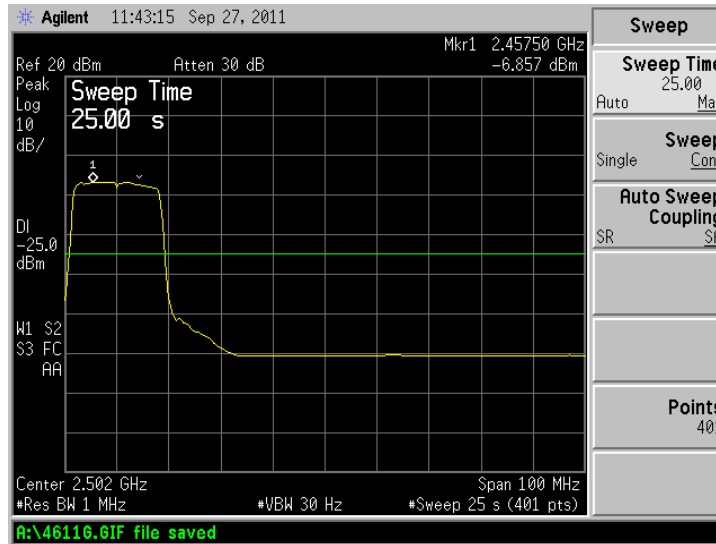RBW: (100) kHz
VBW: (300) kHz

802.11 n

CH 1
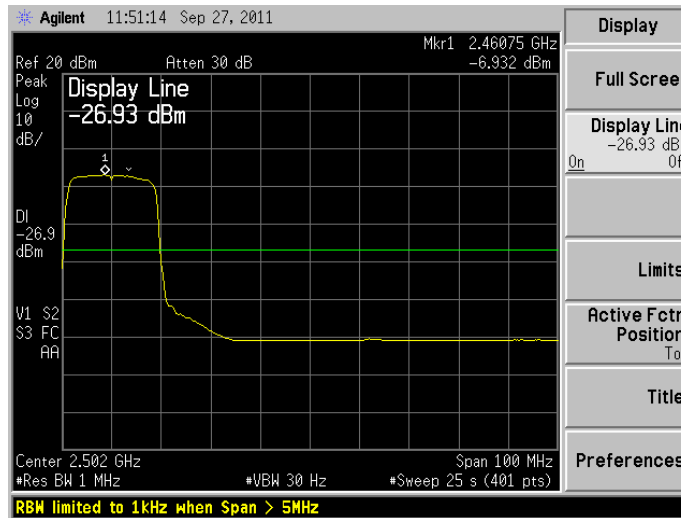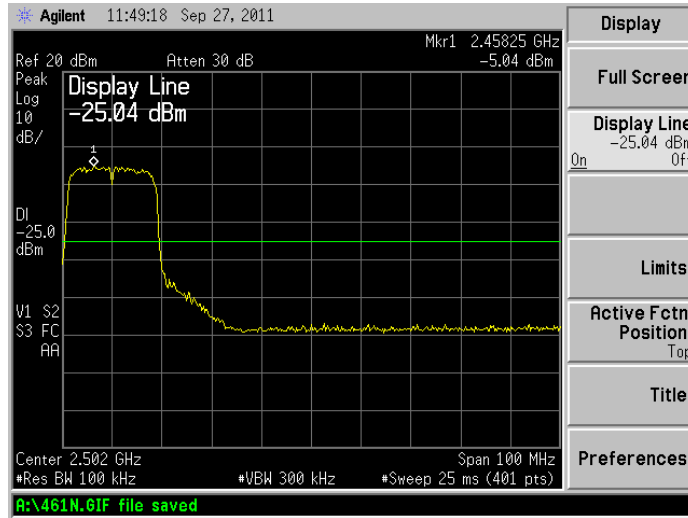
CH 11

Test: Band Edge Compliance
Date: 09/13/2011
Requirement: In any (100) kHz bandwidth outside the authorized band, the maximum level of radio frequency power must be at least (20) dB down from the highest emissions level within the authorized band.
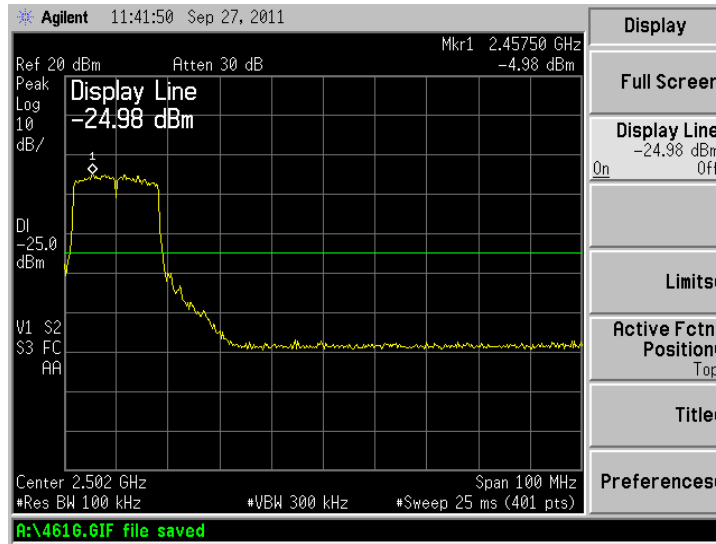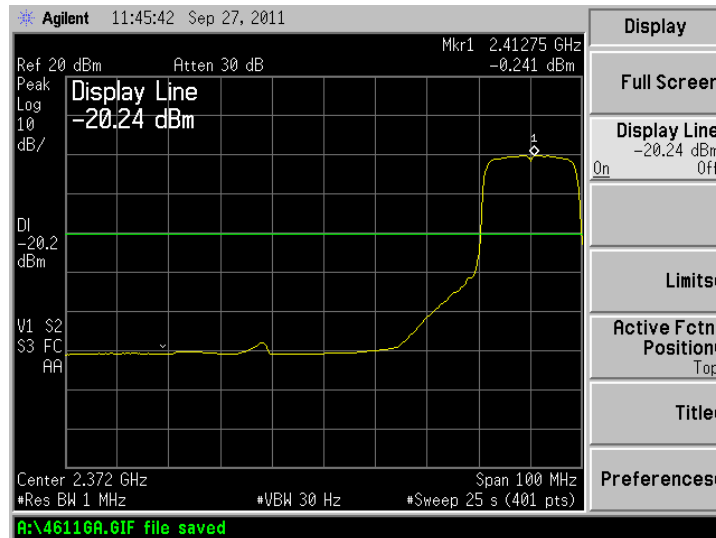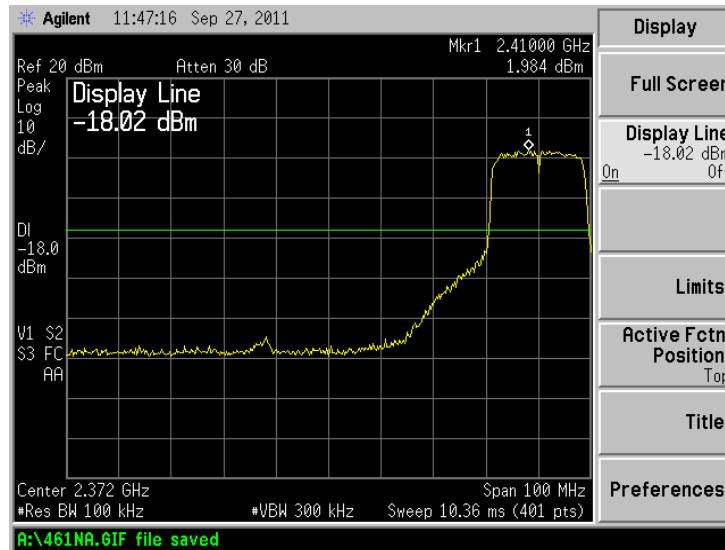RBW: (100) kHz
VBW: (300) kHz

802.11 n (40) MHz

   CH 1
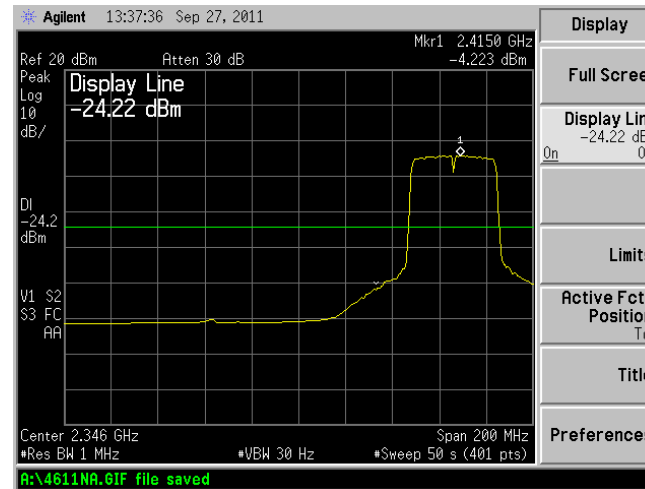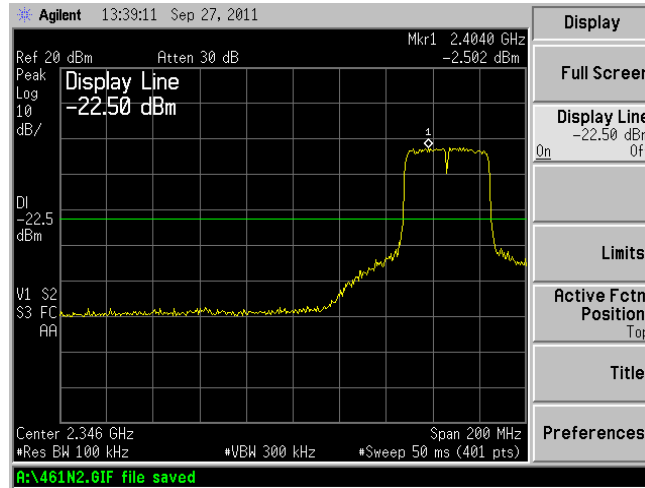
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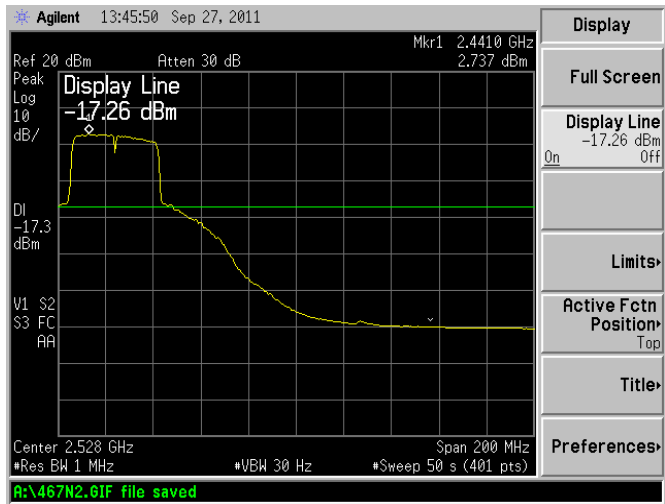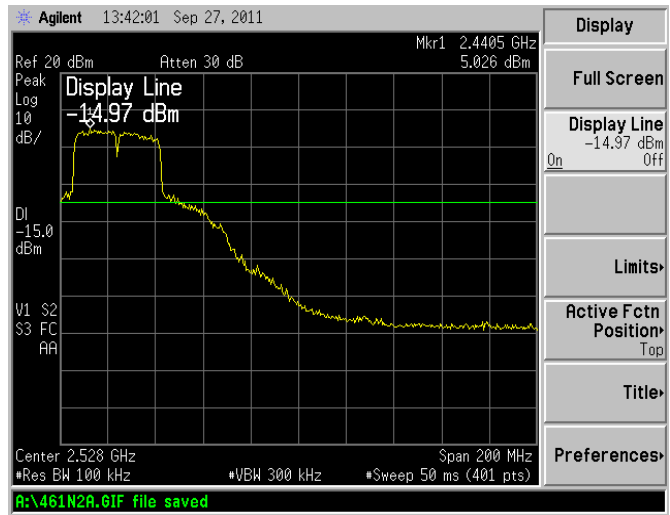
Test: Occupied Bandwidth per 15.247(a2)
Date: 09/13/2011
Modulation:
Data rate:

802.11 b

Channel	Channel Freq (MHz)	6 dB Bandwidth (MHz)	Minimum limit (MHz)	Pass / Fail
1	2412	12.225	0.5	Pass
6	2437	12.225	0.5	Pass
11	2462	12.225	0.5	Pass

CH 1

Ch 6
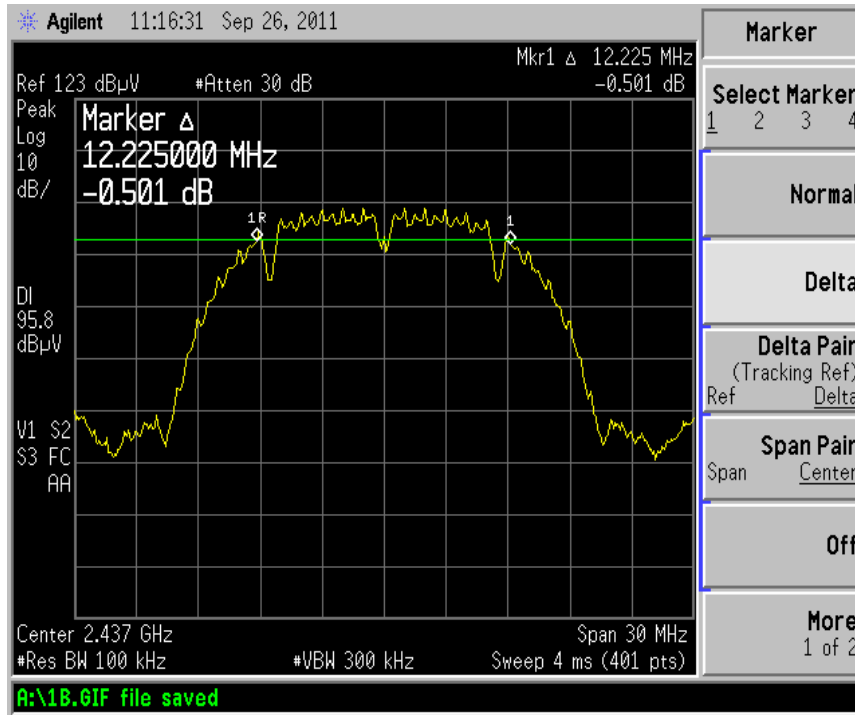
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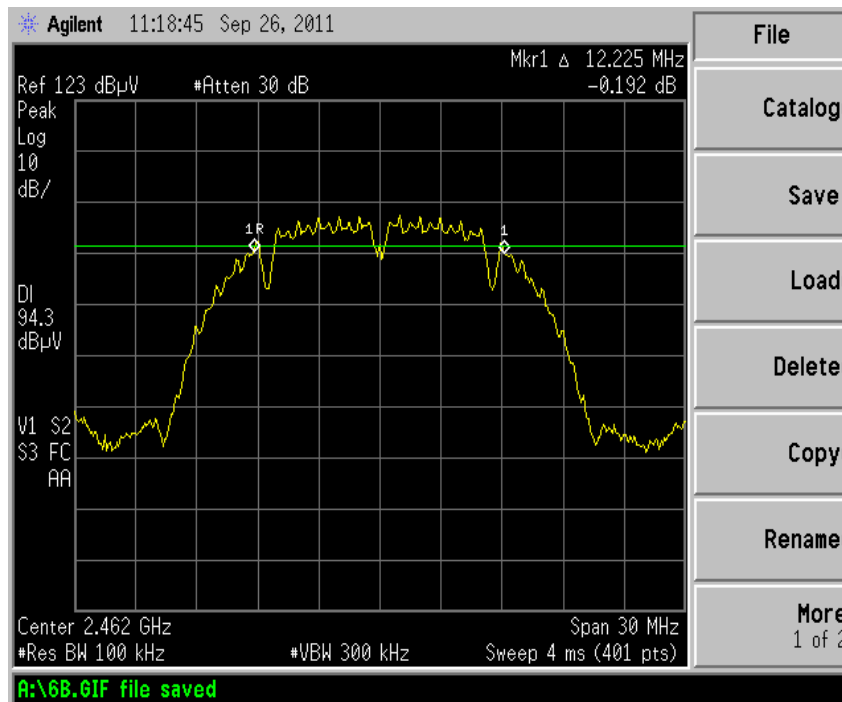
Test: Occupied Bandwidth per 15.247(a2)
Date: 09/13/2011
Modulation:
Data rate:

802.11 g

Channel	Channel Freq (MHz)	6 dB Bandwidth (MHz)	Minimum limit (MHz)	Pass / Fail
1	2412	16.575	0.5	Pass
6	2437	18.5	0.5	Pass
11	2462	16.725	0.5	Pass

CH 1

CH 6
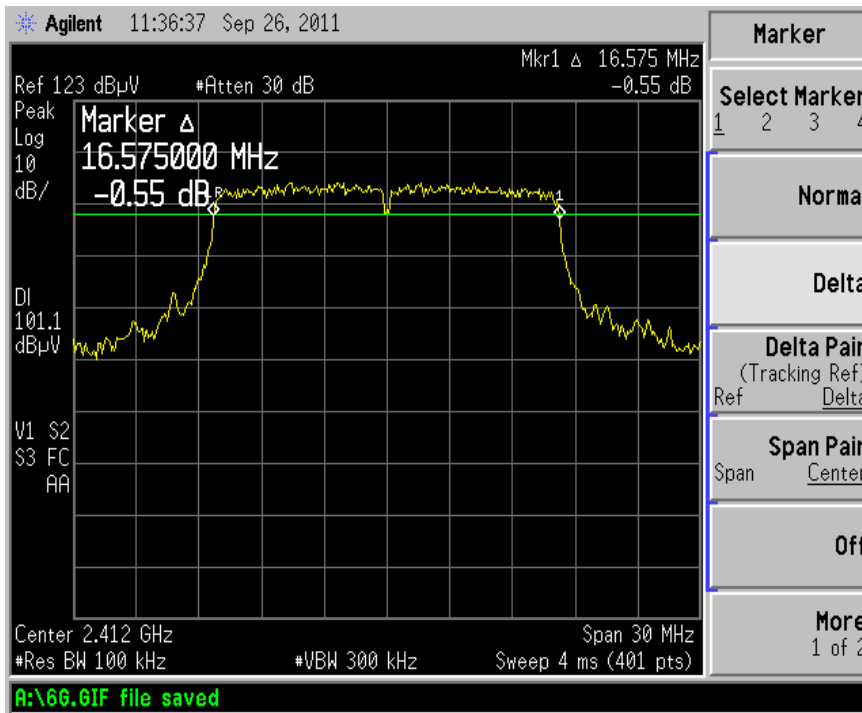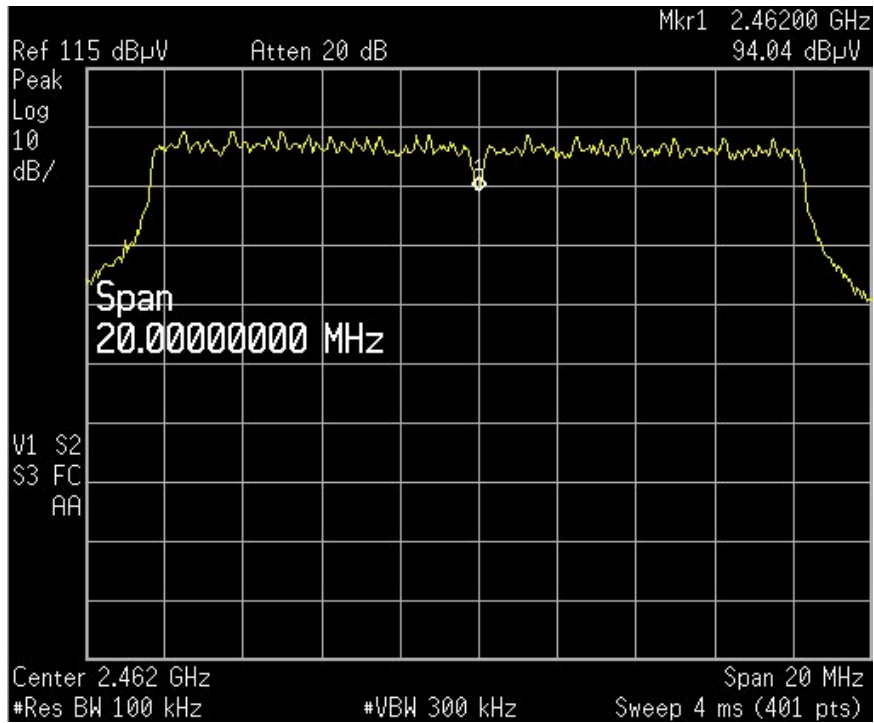
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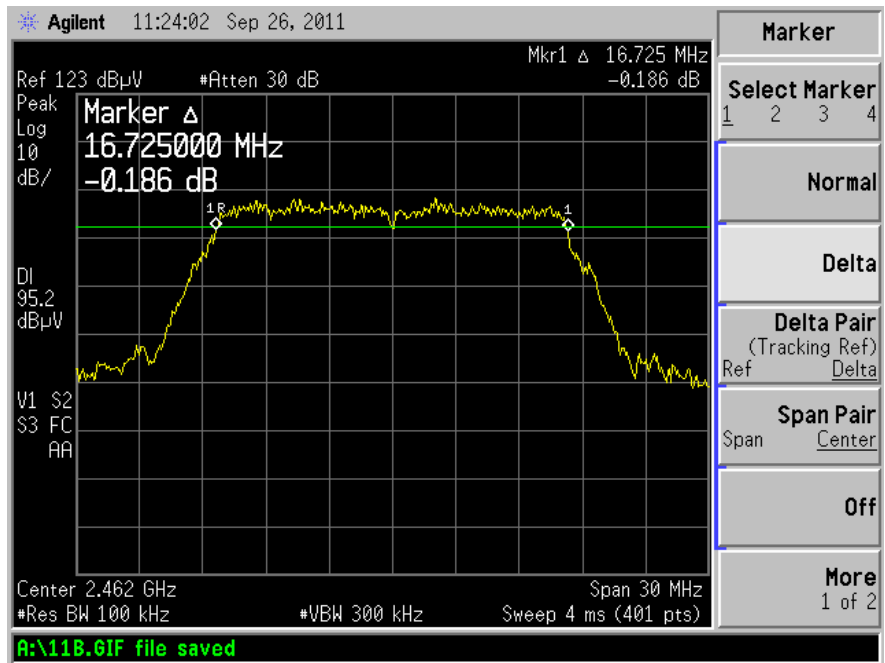
Test: Occupied Bandwidth per 15.247(a2)
Date: 09/13/2011
Modulation:
Data rate:

802.11 n

Channel	Channel Freq (MHz)	6 dB Bandwidth (MHz)	Minimum limit (MHz)	Pass / Fail
1	2412	17.7	0.5	Pass
6	2437	17.625	0.5	Pass
11	2462	17.625	0.5	Pass

CH 1

CH 6
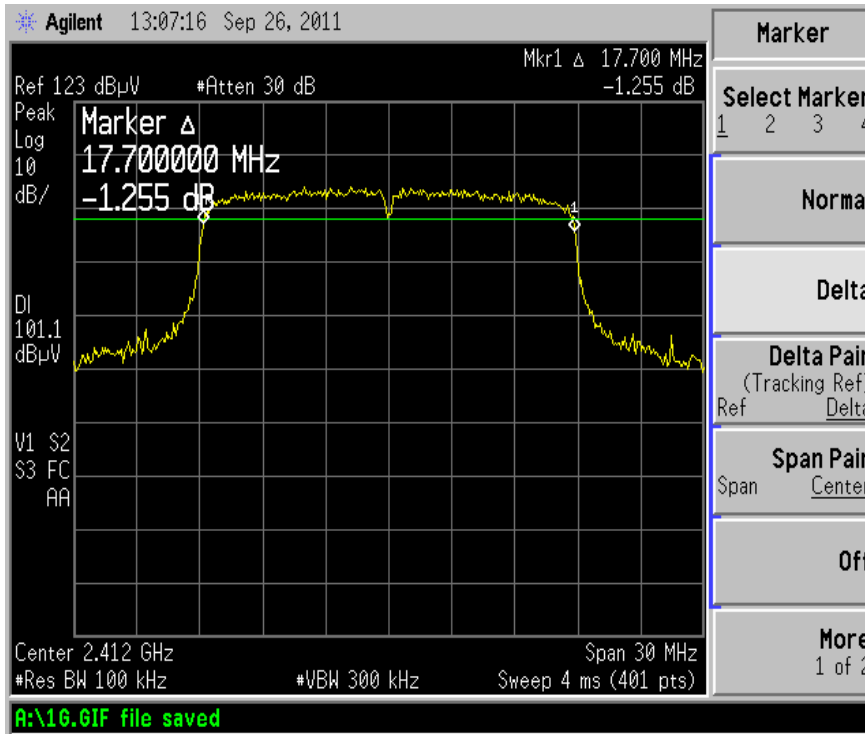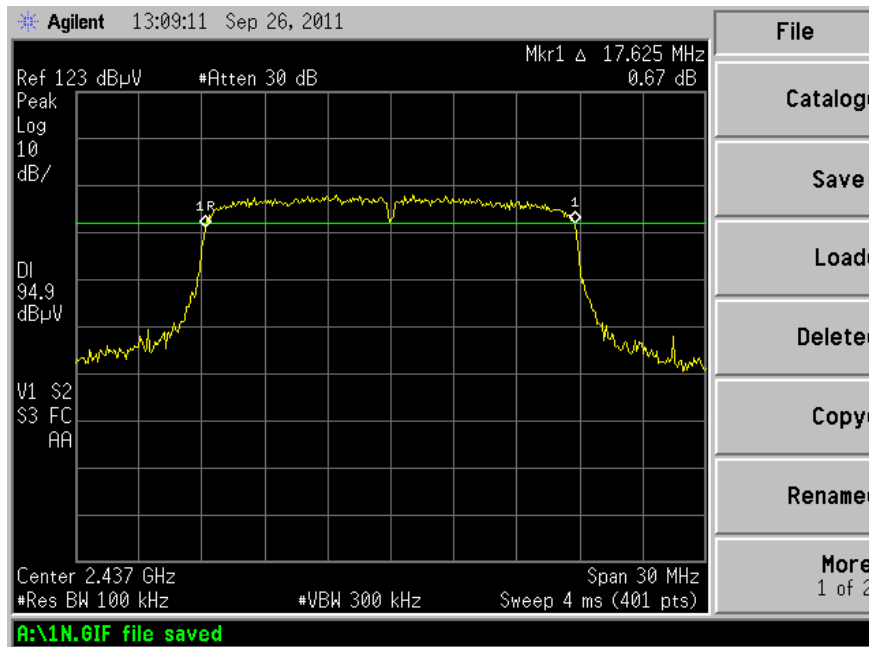
CH 11

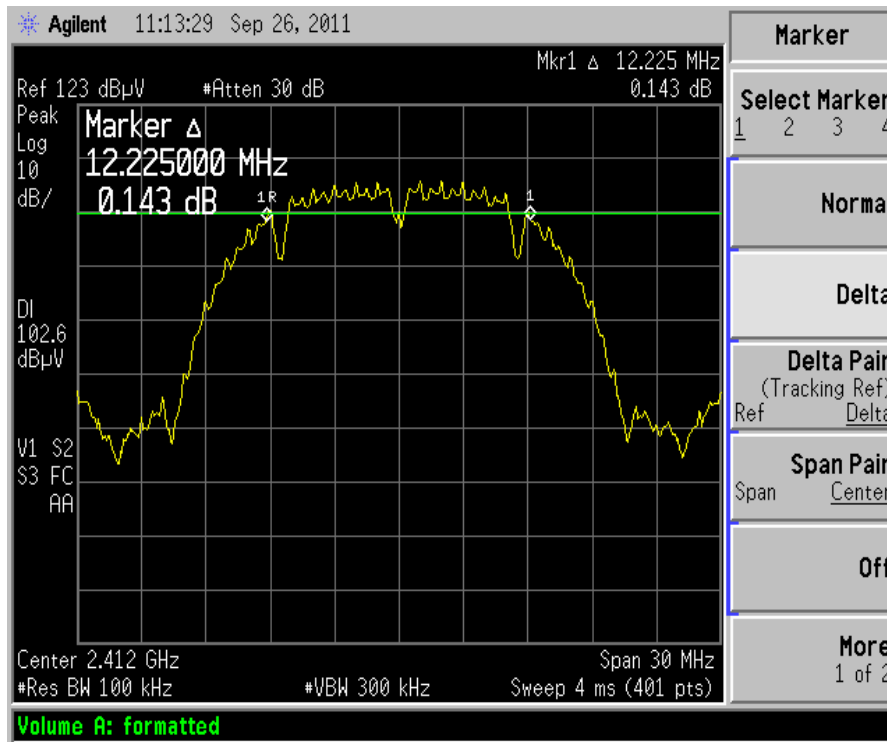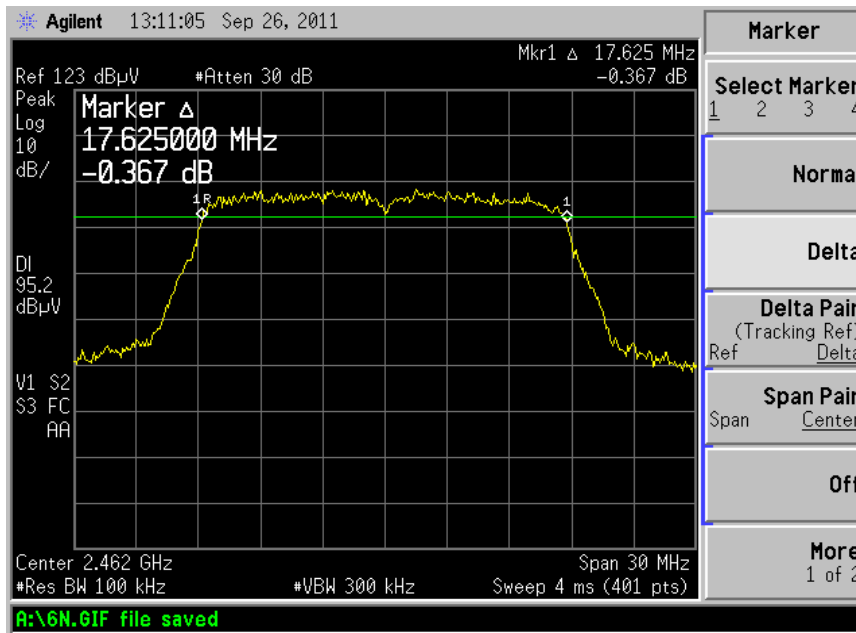Test: Occupied Bandwidth per 15.247(a2)
Date: 09/13/2011
Modulation:
Data rate:

802.11 N (40) MHz

Channel	Channel Freq (MHz)	6 dB Bandwidth (MHz)	Minimum limit (MHz)	Pass / Fail
1	2422	36.250	0.5	Pass
6	2437	36.375	0.5	Pass
11	2452	36.250	0.5	Pass

CH 1
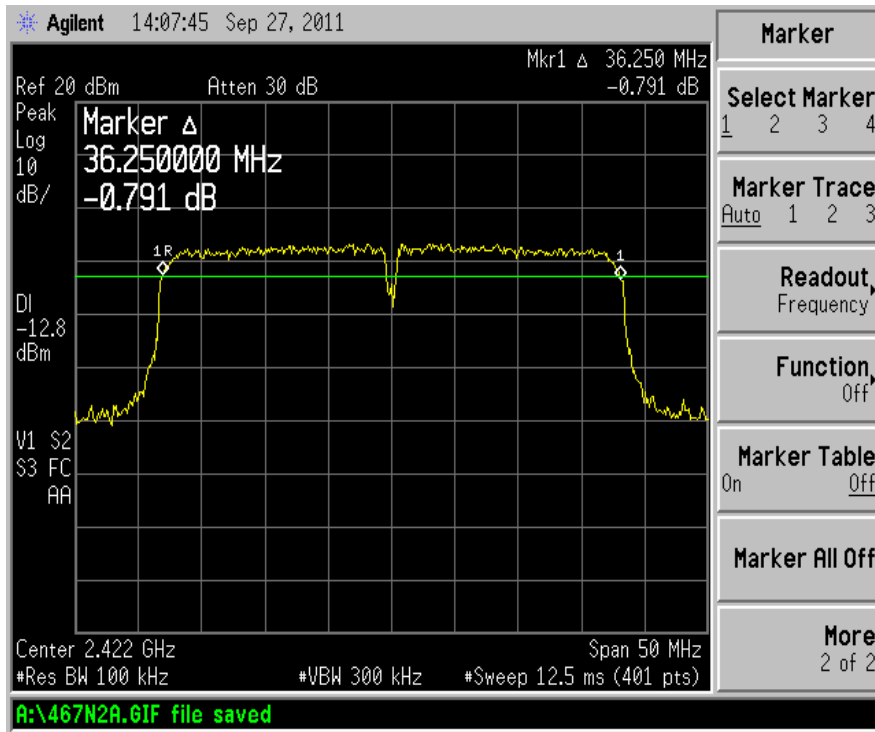
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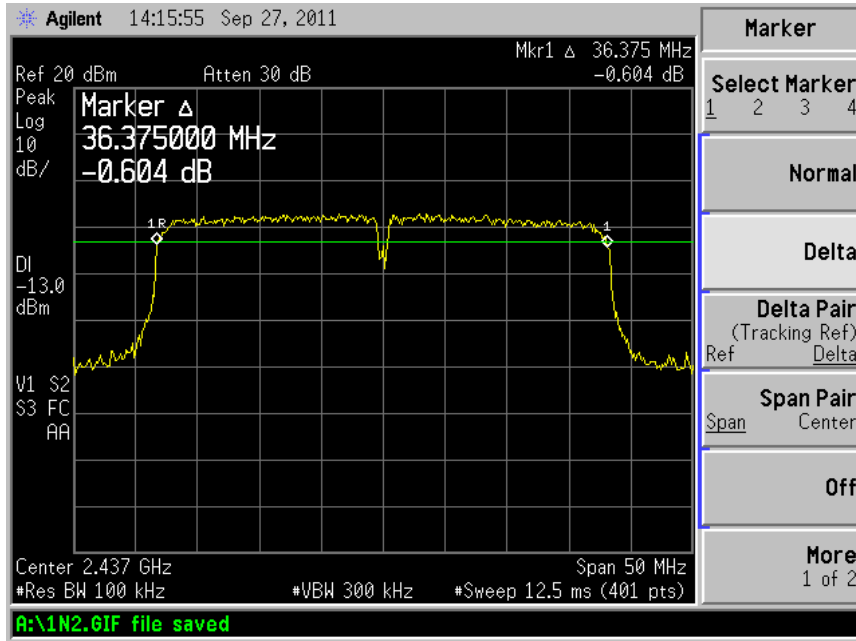
CH 7
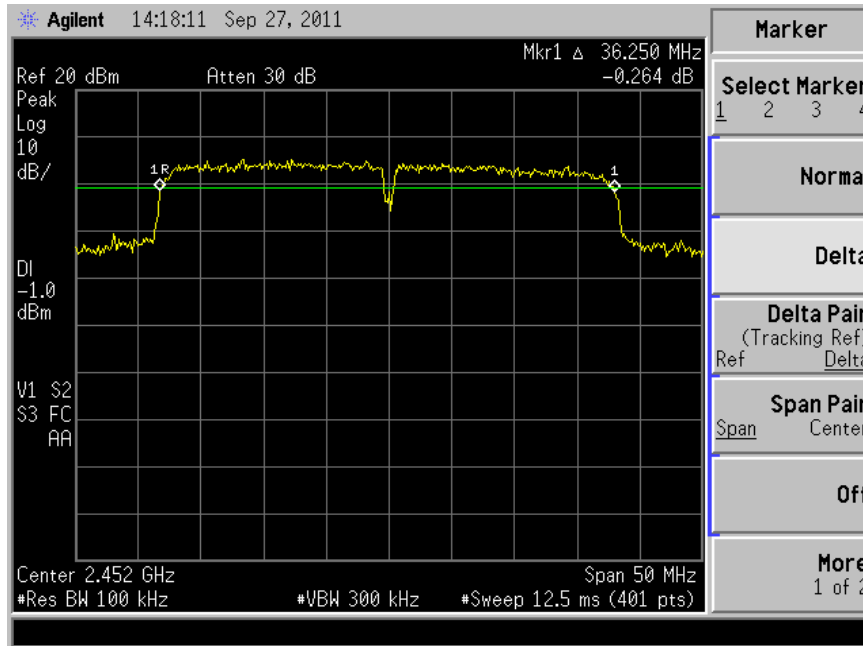
Test: Power Spectral Density per 15.247(e)
Date: 11/03/2005
Requirement: The peak power spectral density conducted from the antenna port of a direct
sequencr transmitter must not be greater than (+8) dBm in any (3) kHz band during any time
interval of continuous transmission.
RBW: (3) kHz
VBW: (10) kHz

802.11 b

Channel	Channel Freq (MHz)	RF Power Level in (3) kHz BW dBm	Maximum limit (dBm)	Pass / Fail
1	2412	-12.45	8	Pass
6	2437	-17.11	8	Pass
11	2462	-22.53	8	Pass

CH 1
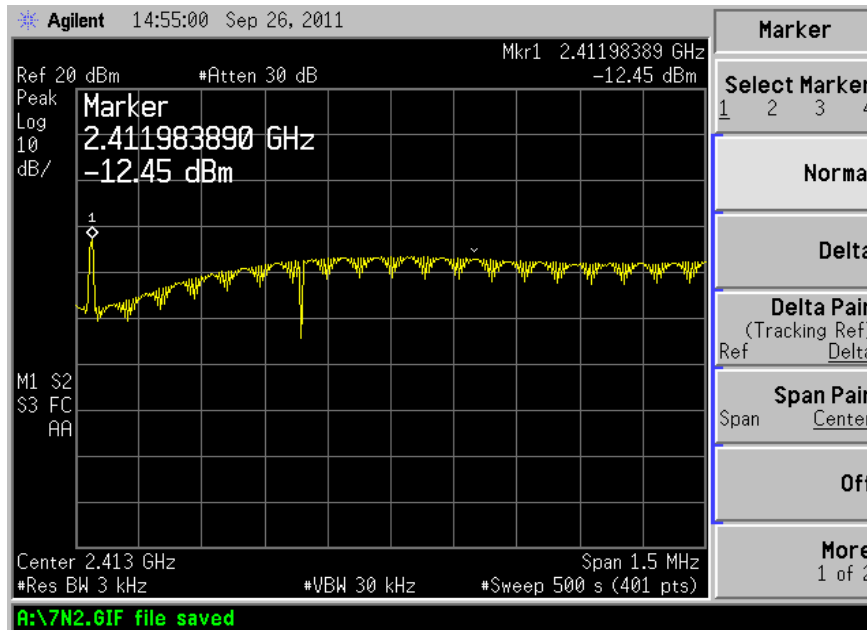
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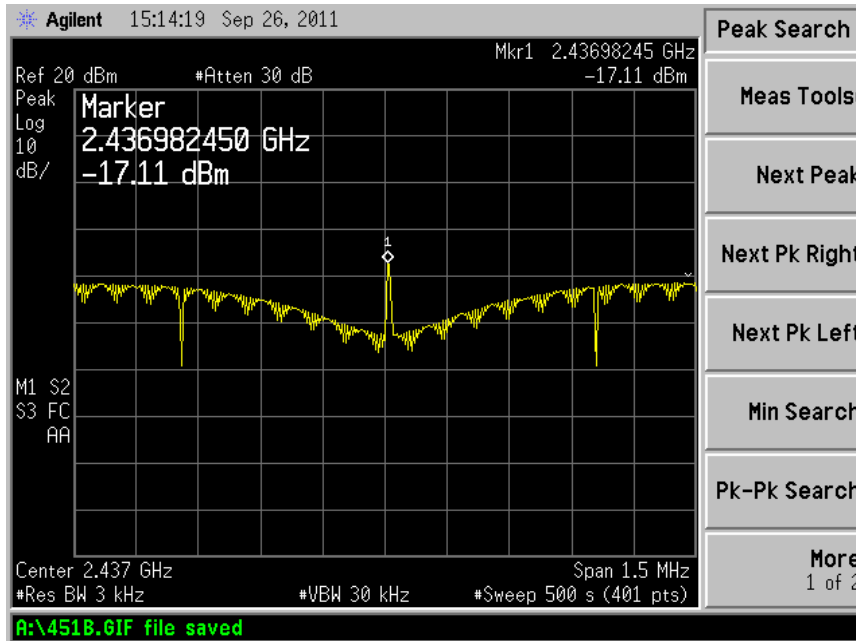
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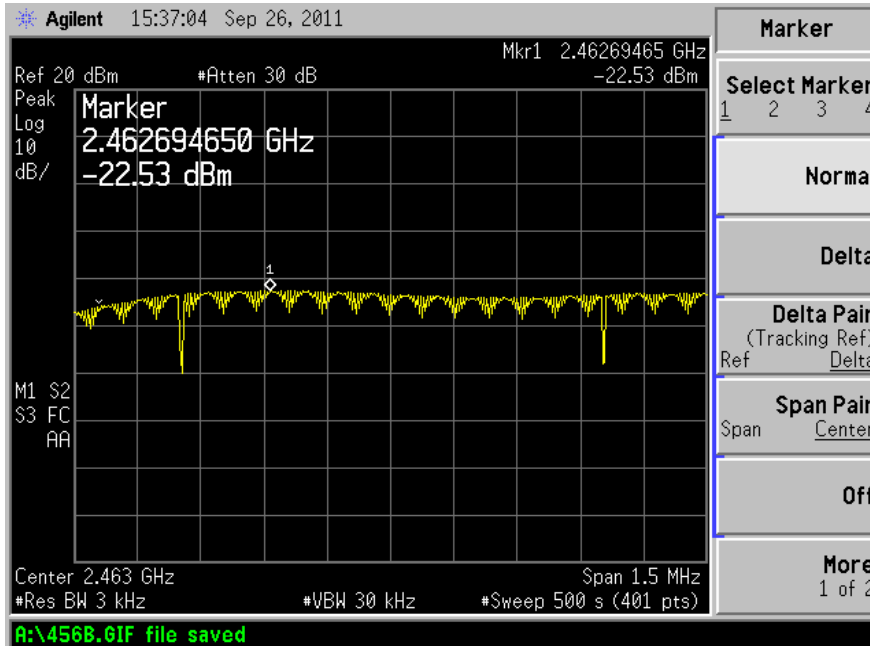
802.11 g

	Channel	Channel Freq (MHz)	RF Power Level in (3) kHz BW dBm	Maximum limit (dBm)	Pass / Fail
1		2412	-12.71	8	Pass
6		2437	-17.81	8	Pass
11		2462	-18.69	8	Pass

CH 1
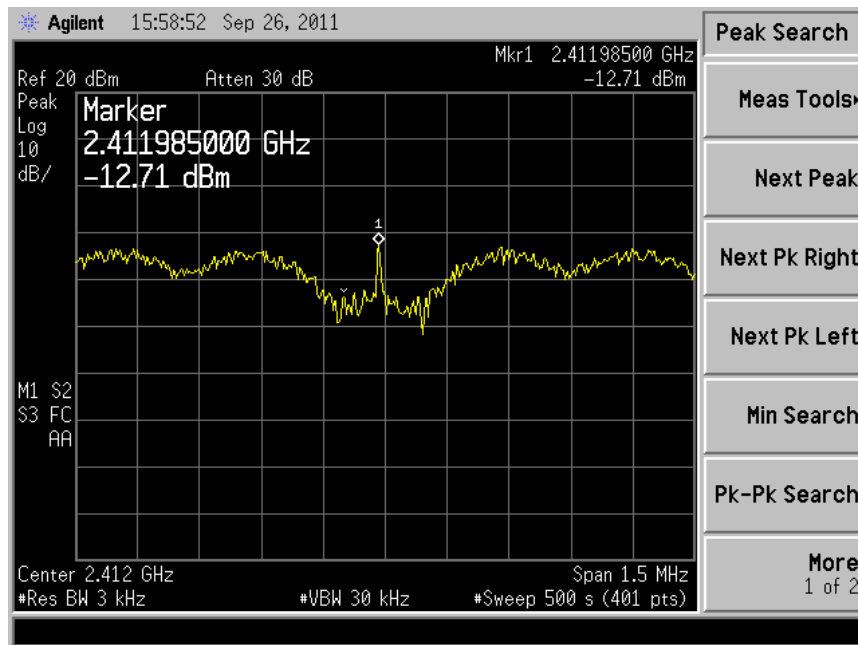
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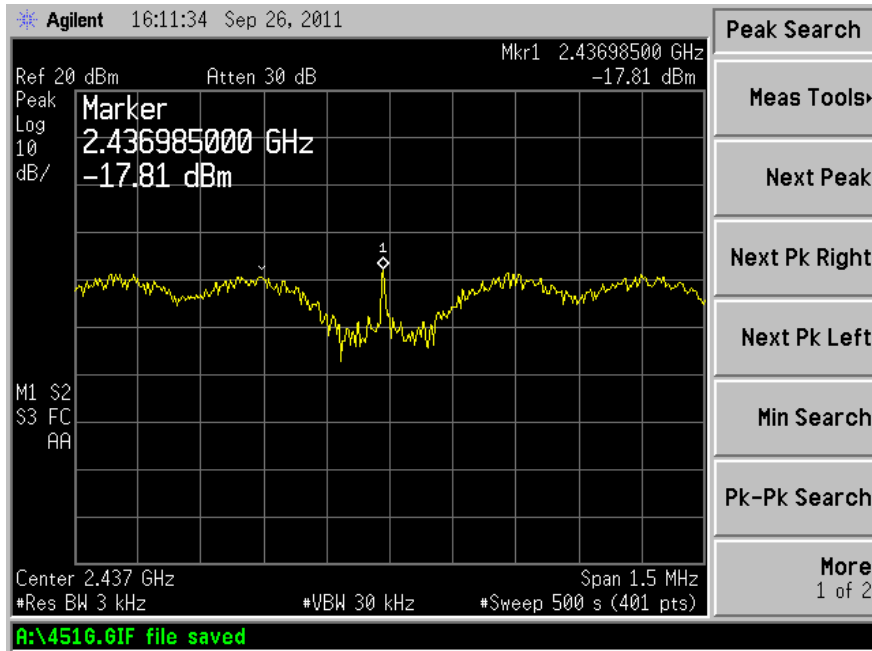
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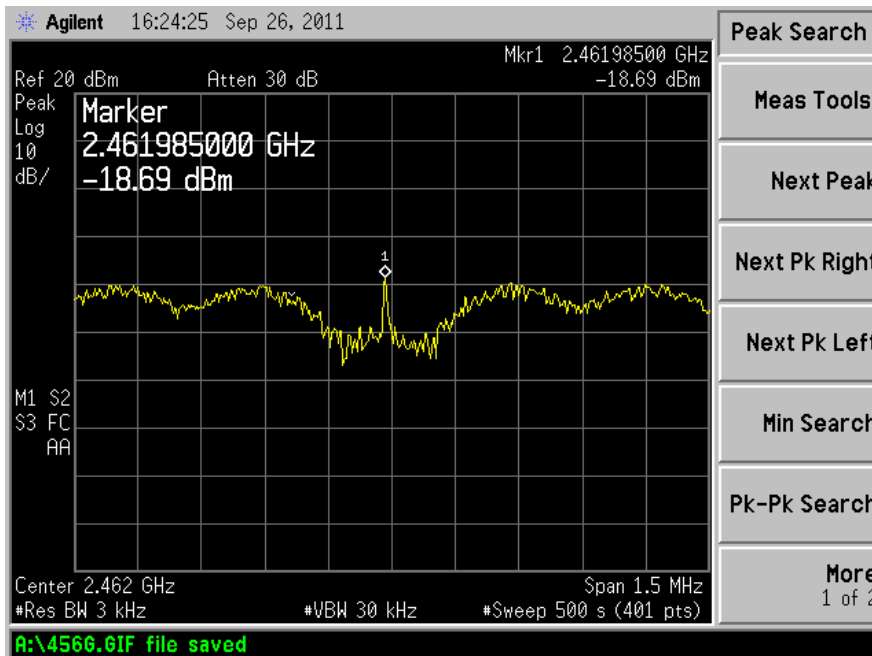
802.11 n

Channel	Channel Freq (MHz)	RF Power Level in (3) kHz BW dBm	Maximum limit (dBm)	Pass / Fail
1	2412	-13.18	8	Pass
6	2437	-17.85	8	Pass
11	2462	-19.26	8	Pass

CH 1
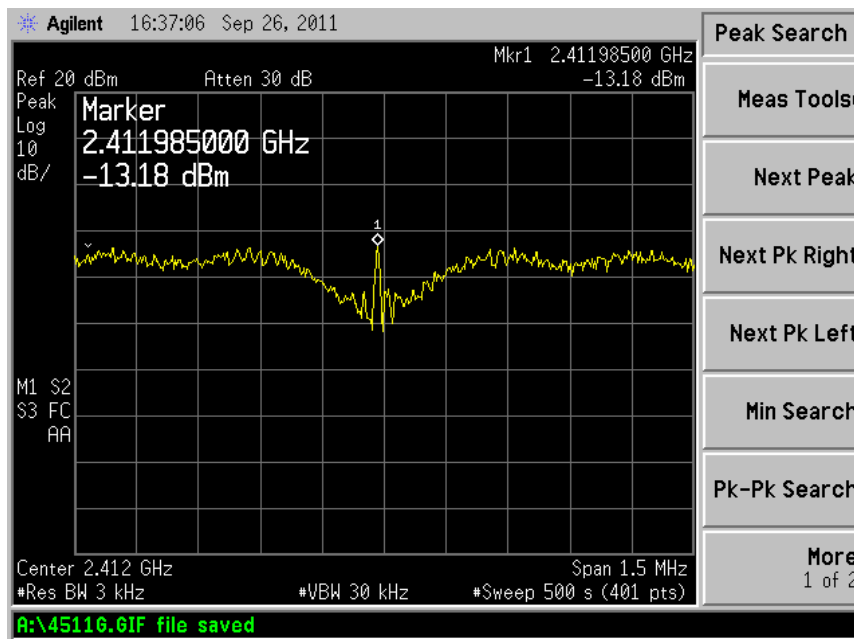
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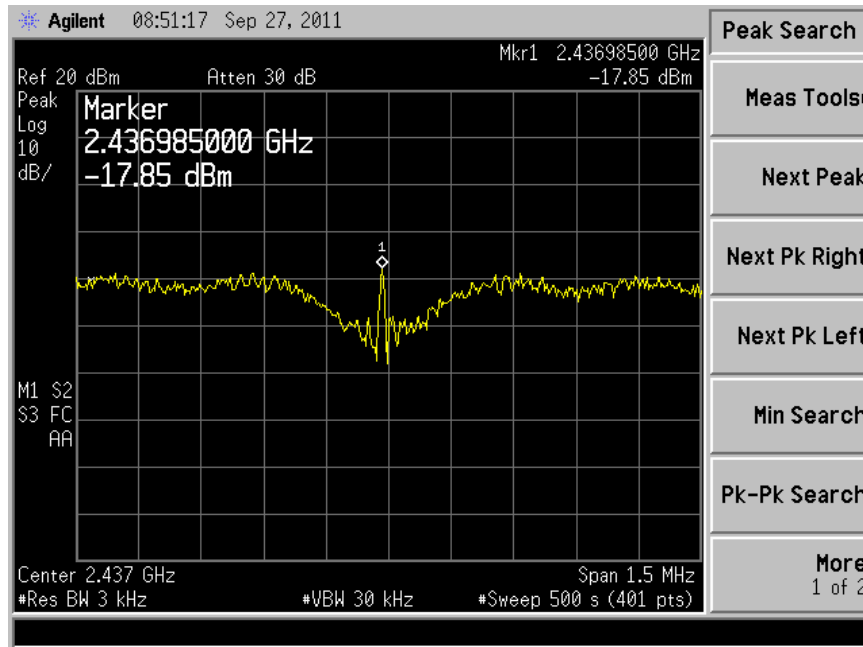
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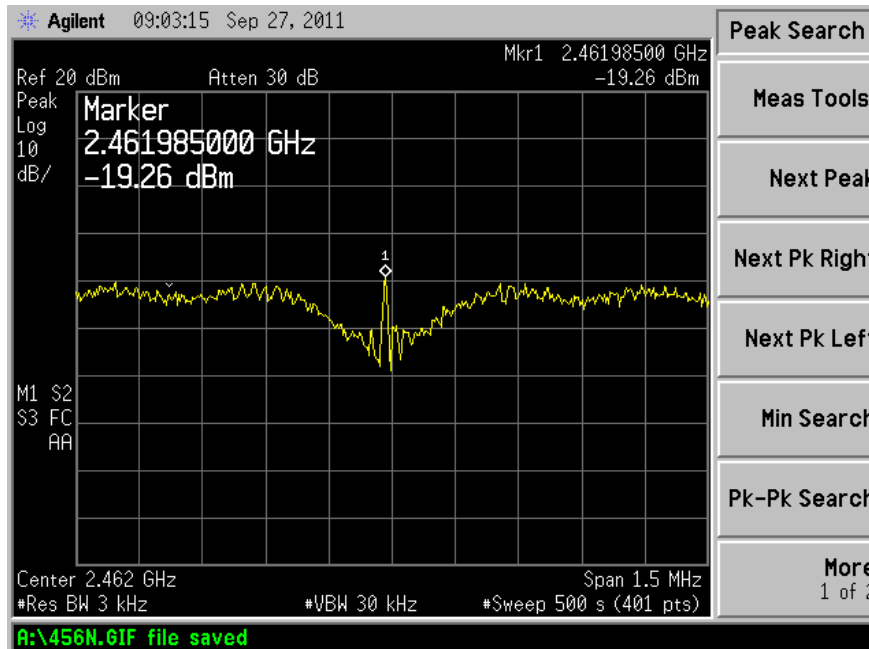
802.11 n (40 MHz)

Channel	Channel Freq (MHz)	RF Power Level in (3) kHz BW dBm	Maximum limit (dBm)	Pass / Fail
1	2412	-17.28	8	Pass
6	2437	-18.23	8	Pass
11	2462	-15.87	8	Pass

CH 1
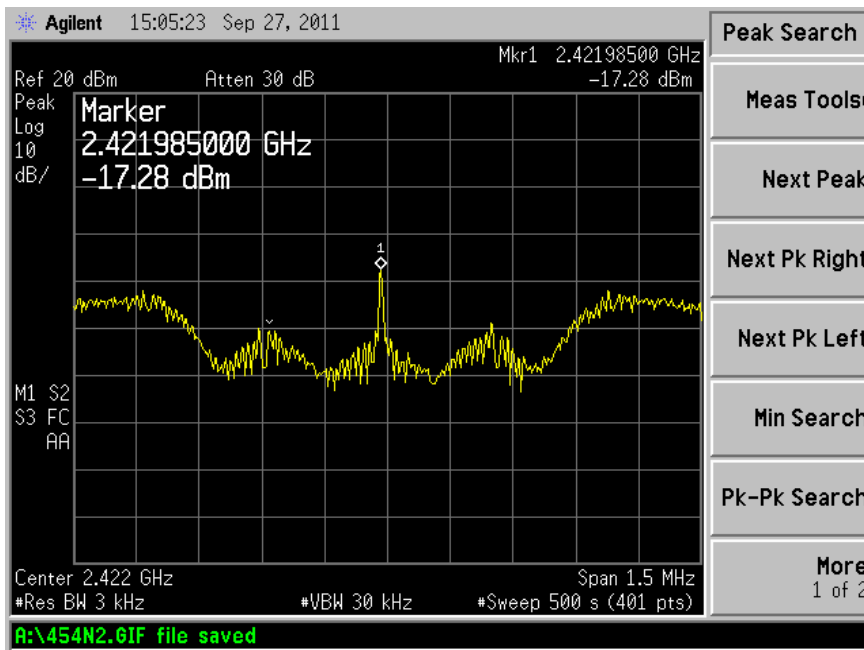
CH 4
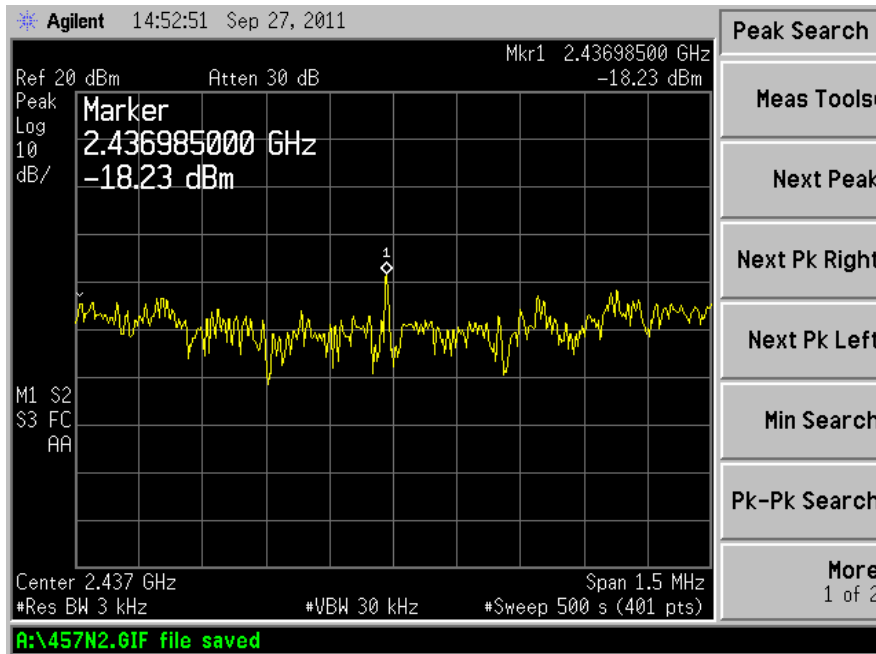
CH 7
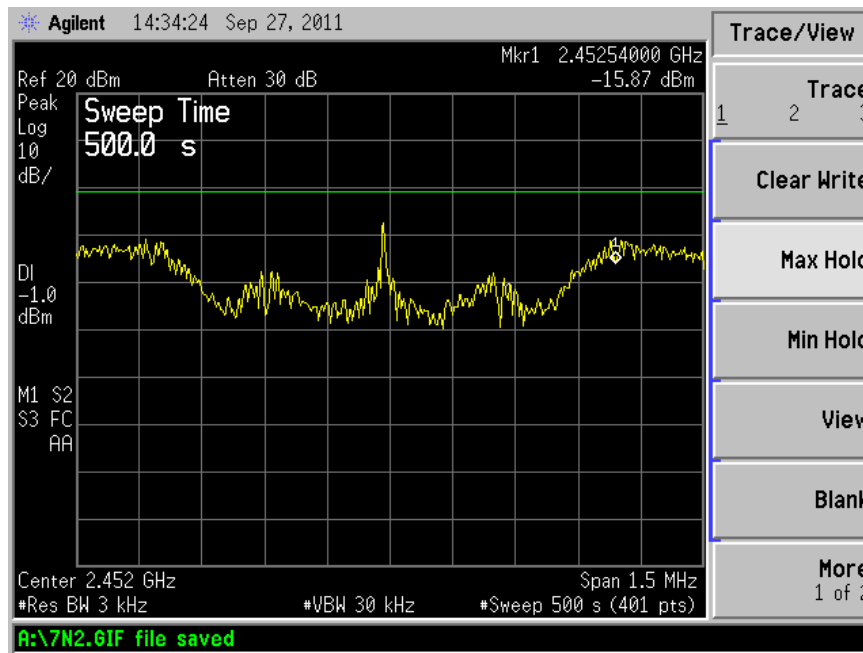
Test: Output Power per 15.247(b)(3)
Date: 09/13/2011
Requirement: The maximum peak output power must not exceed 1 watt.
RBW: (1) MHz
VBW: (3) MHz
Channel: See Table
Mode: See table
Peak Output Power = (147.91) mW

Channel	Mode		Level dBuV	Cable Loss dB	Adj. Level	dBm	Watts mW
1	B		119.8	2.0	121.8	14.8	30.2
6	B		113.7	2.0	115.7	8.7	7.41
11	B		112.3	2.0	114.3	7.3	5.37
1	G		125.4	2.0	127.4	20.4	109.65
6	G		191.6	2.0	121.6	14.6	28.84
11	G		117.7	2.0	119.7	12.7	18.62
1	N		126.7	2.0	128.7	21.7	**147.91**
6	N		120.3	2.0	122.3	15.3	33.88
11	N		118.4	2.0	120.4	13.4	21.88
1	N (40)MHz		121.6	2.0	123.6	16.6	45.71
4	N (40)MHz		121.2	2.0	122.2	15.2	33.11
7	N (40)MHz		119.4	2.0	121.4	14.4	27.54

Test: Spurious Conducted Emissions per 15.247(d)
Date: 11/03/2005
Requirement: In any 100 kHz bandwidth outside the authorized band, the maximum level of radio frequency power must be at least 20 dB down from the highest emissions level within the authorized band.

RBW: (100) kHz
VBW: (300) kHz
Channel: 1, 6, & 11
Data Rate: 1, 5.5, 11, 24, 36, & 54 Mbps
Modulation: OFDM, DBPSK/DQPSK, CCK & PBCC
Maximum Conducted Spurious Emissions = **Greater than (40) dB down**

Test: Radiated Spurious Emissions per 15.205
Date: 09/13/2011
Requirement: The field strength of any spurious emissions or modulation products that fall in a restricted band, as defined in 47 CFR 15.205, is measured. The peak level must comply with the limits specified in 47 CFR 15.35(b). The average level (taken with a 10 Hz VBW) must comply with the limits specified in 15.209.

Chan.	Restricted Band Freq. (GHz)	Mode	POL V/H	Frequency GHz	DET	FS (dBuV/m) @ 3m	Limit (dBuV/m)	Margin (dB)
1	2.310 - 2.390	B	V	2.358	PK	48.5	74	-25.5
1	2.310 - 2.390	B	V	2.358	AVG	36.6	54	-17.4
1	2.310 - 2.390	G	V	2.389	PK	54.2	74	-19.8
1	2.310 - 2.390	G	V	2.389	AVG	41.2	54	-12.8
1	2.310 - 2.390	N	V	2.390	PK	61.0	74	-13.0
1	2.310 - 2.390	N	V	2.390	AVG	53.3	54	-0.7
1	2.310 - 2.390	N40	V	2.385	PK	67.0	74	-7.0
1	2.310 - 2.390	N40	V	2.385	AVG	51.9	54	-2.1
11	2.483.5 - 2.500	B	V	2.4835	PK	50.6	74	-23.4
11	2.483.5 - 2.500	B	V	2.4835	AVG	38.3	54	-15.7
11	2.483.5 - 2.500	G	V	2.4836	PK	62.6	74	-11.4
11	2.483.5 - 2.500	G	V	2.4836	AVG	47.9	54	-6.1
11	2.483.5 - 2.500	N	V	2.484	PK	61.8	74	-12.2
11	2.483.5 - 2.500	N	V	2.484	AVG	47.2	54	-6.8
11	2.483.5 - 2.500	N40	V	2.484	PK	60.4	74	-13.6
11	2.483.5 - 2.500	N40	V	2.484	AVG	48.3	54	-5.7

* Worse case polarity recorded above

Test: AC powerline Conducted Emissions per15.207
Date: 10/19/2005
Requirement: If the EUT is connected to the AC power, it must meet the limits set forth from (150) kHz to (30) MHz.
RBW: (9) kHz
VBW: (10) kHz
Channel: 1,6,11 (worst case shown below)
Detector: Quasi-Peak
Line Side: QP Margin = 11.8 dB at 0.173 MHz / Average Margin = 1.8 dB
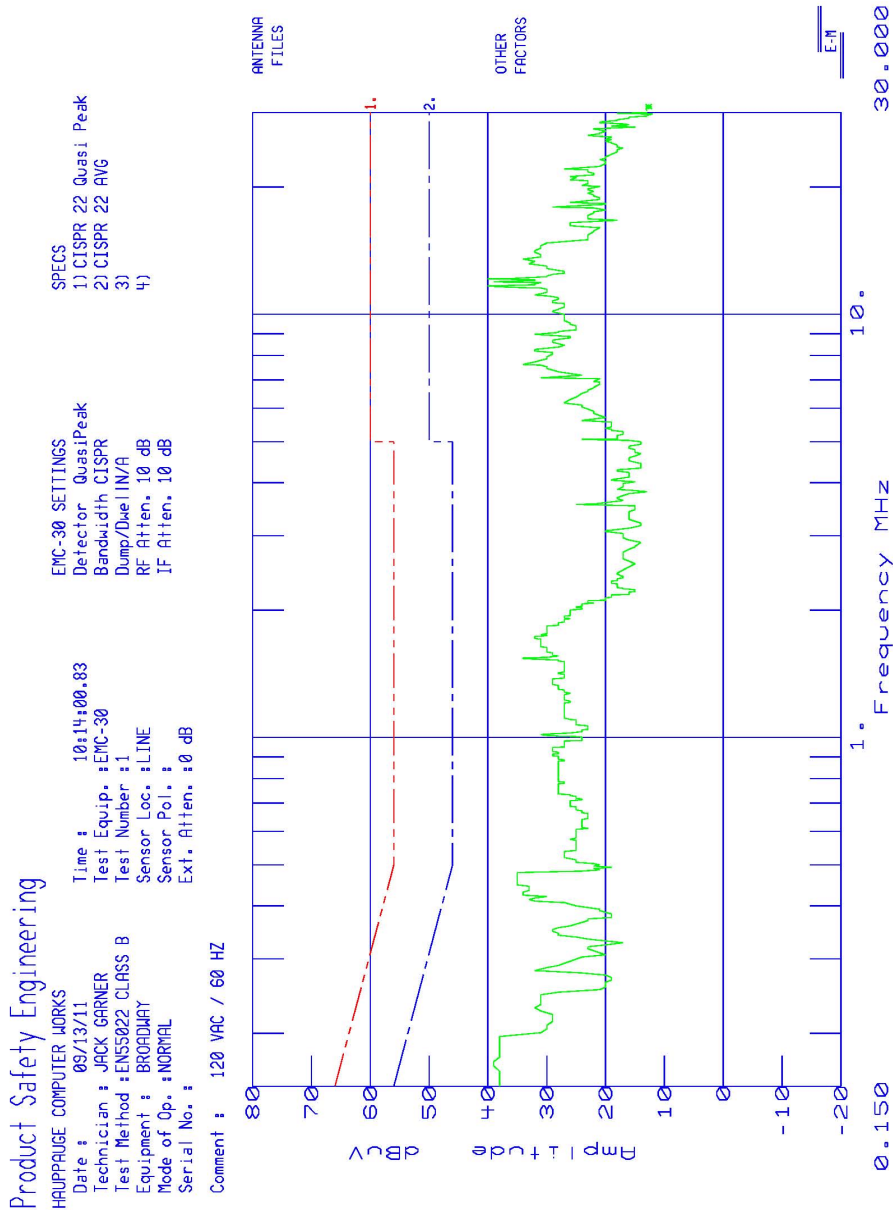
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-------------------------------------------------------------------------
¦ TEST TITLE:HAUPPAUGE COMPUTER WORKS        ¦         PAGE   1           ¦
¦ DATA FILE :244_L.D30                       ¦        Freq.(MHz)          ¦
¦ Amplitude Units : dBuV        Threshold  -12 dB ¦      0.1500           ¦
-------------------------------------------------------------------------
                                      C22BQP.S30   C22BAVG.S30¦
              ¦ Freq(MHz)      Amp    vs Spec(dB)  vs Spec(dB) ¦
              ---------------------------------------------------------
              ¦   0.4486   ¦  35.0  ¦          ¦    -11.901  * ¦
              ¦   0.4520   ¦  35.0  ¦          ¦    -11.838  * ¦
              ¦   0.4555   ¦  35.0  ¦          ¦    -11.774  * ¦
              ¦   0.4590   ¦  35.0  ¦          ¦    -11.711  * ¦
              ¦   0.4624   ¦  35.0  ¦          ¦    -11.649  * ¦
              ¦   0.4659   ¦  35.0  ¦          ¦    -11.587  * ¦
              ¦   0.4692   ¦  35.0  ¦          ¦    -11.528  * ¦
              ¦   0.4727   ¦  35.0  ¦          ¦    -11.466  * ¦
              ¦   0.4762   ¦  35.0  ¦          ¦    -11.405  * ¦
              ¦   0.4797   ¦  35.0  ¦          ¦    -11.344  * ¦
              ¦   1.5365   ¦  34.0  ¦          ¦    -12.000  * ¦
              ¦   1.5398   ¦  34.0  ¦          ¦    -12.000  * ¦
              ¦  11.6558   ¦  40.0  ¦          ¦    -10.000  * ¦
              ¦  11.9251   ¦  39.0  ¦          ¦    -11.000  * ¦
              ¦  12.1405   ¦  40.0  ¦          ¦    -10.000  * ¦
              ---------------------------------------------------------
```

Test: AC powerline Conducted Emissions per15.207
Date: 10/19/2005
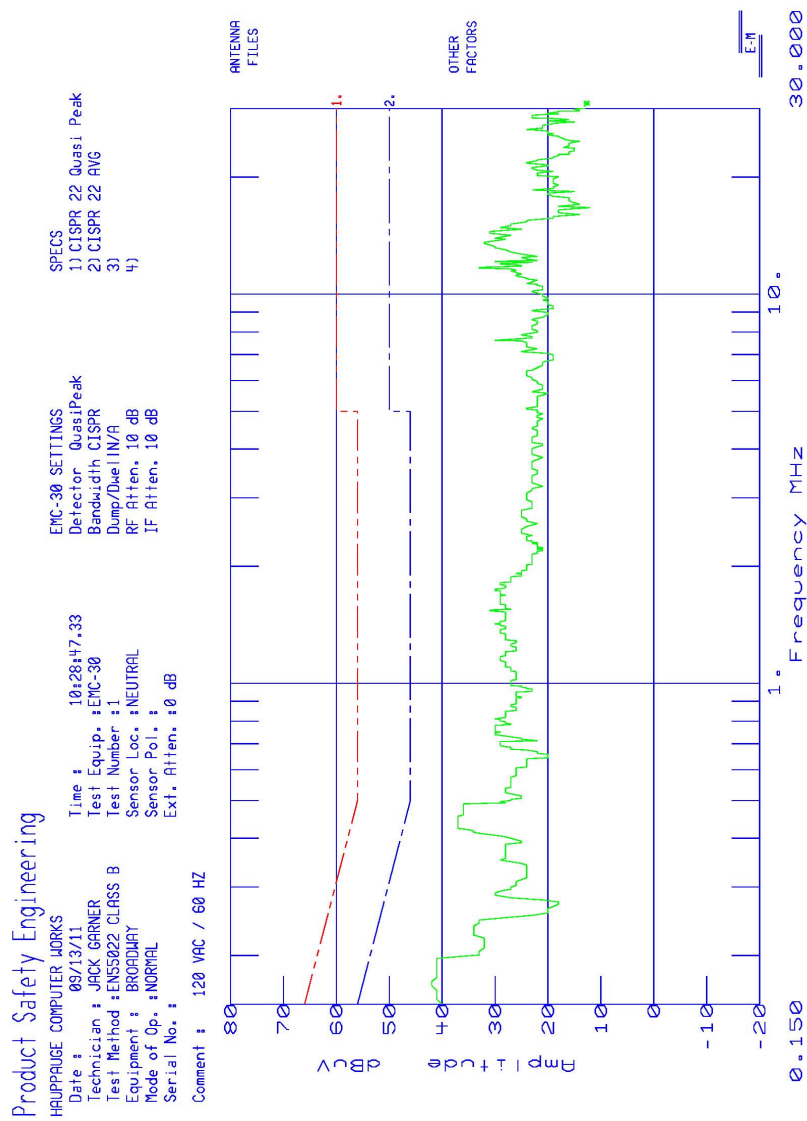Requirement: If the EUT is connected to the AC power, it must meet the limits set forth from (150) kHz to (30) MHz.

RBW: (9) kHz
VBW: (10) kHz
Channel: 1,6,11 (worst case shown below)
Detector: Quasi-Peak
Neutral Side: QP Margin = 6.8 dB at 0.173 MHz / AVG Margin = +3.2 dB

```
-------------------------------------------------------------------------
| TEST TITLE:HAUPPAUGE COMPUTER WORKS         |        PAGE   1          |
| DATA FILE :244_N.D30                        |      Freq.(MHz)          |
| Amplitude Units : dBuV        Threshold  -12 dB |      0.1500          |
-------------------------------------------------------------------------
                                         C22BQP.S30   C22BAVG.S30|
            Freq(MHz)      Amp          vs Spec(dB)   vs Spec(dB) |
         ----------------------------------------------------------------
            0.4243    |    37.0    |                 -10.364  *  |
            0.4277    |    37.0    |                 -10.297  *  |
            0.4312    |    37.0    |                 -10.230  *  |
            0.4347    |    37.0    |                 -10.162  *  |
            0.4381    |    37.0    |                 -10.098  *  |
            0.4416    |    37.0    |                 -10.032  *  |
            0.4451    |    37.0    |                  -9.966  *  |
            0.4486    |    37.0    |                  -9.901  *  |
            0.4520    |    37.0    |                  -9.838  *  |
            0.4555    |    37.0    |                  -9.774  *  |
            0.4590    |    36.0    |                 -10.711  *  |
            0.4624    |    36.0    |                 -10.649  *  |
            0.4659    |    36.0    |                 -10.587  *  |
            0.4692    |    36.0    |                 -10.528  *  |
            0.4727    |    36.0    |                 -10.466  *  |
            0.4762    |    36.0    |                 -10.405  *  |
            0.4797    |    36.0    |                 -10.344  *  |
            0.4831    |    36.0    |                 -10.286  *  |
            0.4866    |    36.0    |                 -10.226  *  |
            0.4901    |    36.0    |                 -10.166  *  |
         ----------------------------------------------------------------
```

RF Exposure - Power Density Compliance Calculation

15.247(I) - Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

Compliance is based upon section CFR 47 section 1.1310, Table (1) Limits for Maximum Permissible Exposure (MPE), (b) Limits for General Population/Uncontrolled Exposure. The stated limit is (1.0) mW/cm2 and compliance was calculated using the following formula:

$$S = (P\ G) / (4\ \pi\ r^2)$$

Where:

S = Power density in mW/cm2
P = Power in mW
G = Numerical antenna gain
r = Distance in cm

Maximum output power = (147.91) mW
Antenna gain (isotropic) = 2.14 dB
Antenna gain (numeric) = 1.64 dB
Distance = 20 cm

S = (147.91 * 1.64) / (12.57 * 400)
S = (242.57) / (5,028)

S = (0.048244) mW / cm^2

Limit = (1.0) mW / cm^2