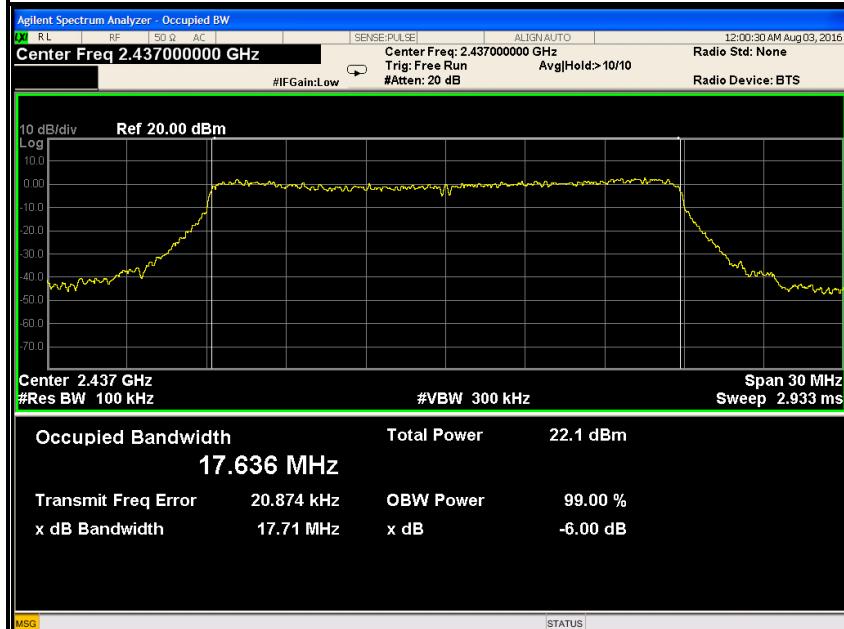
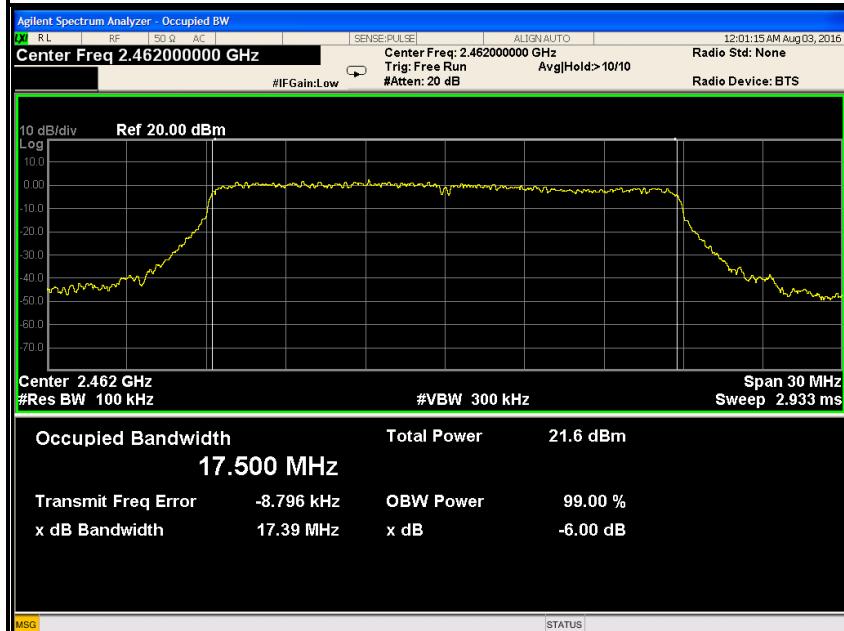


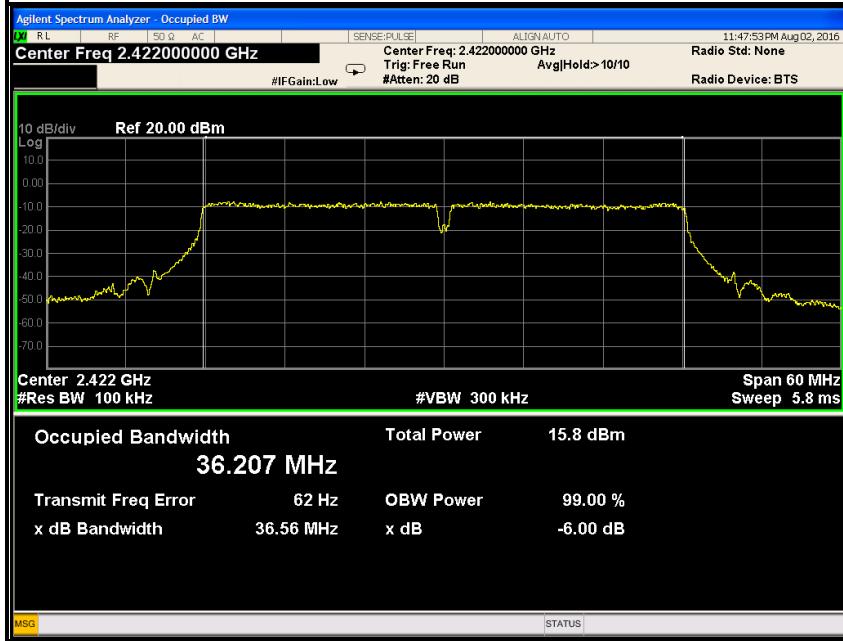
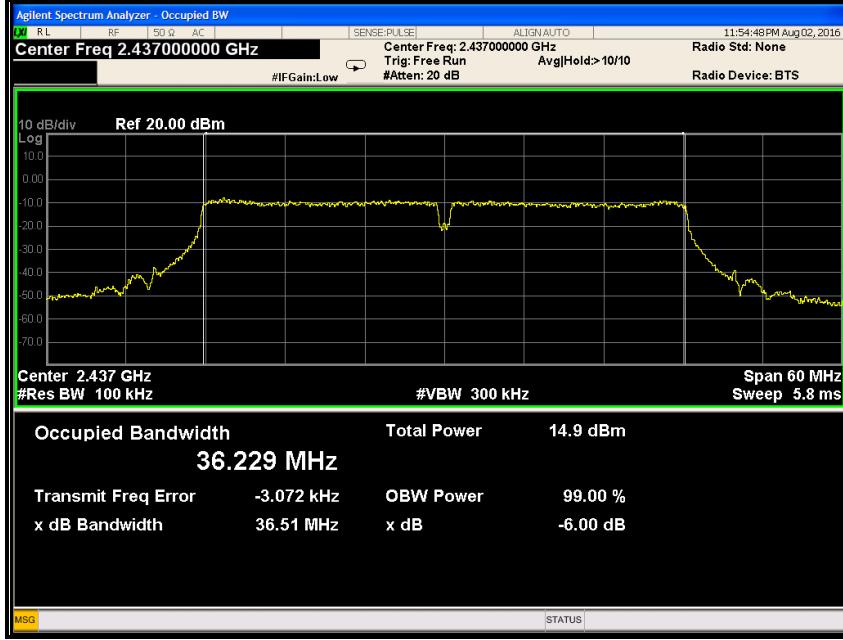


6dB Bandwidth (CH Mid)



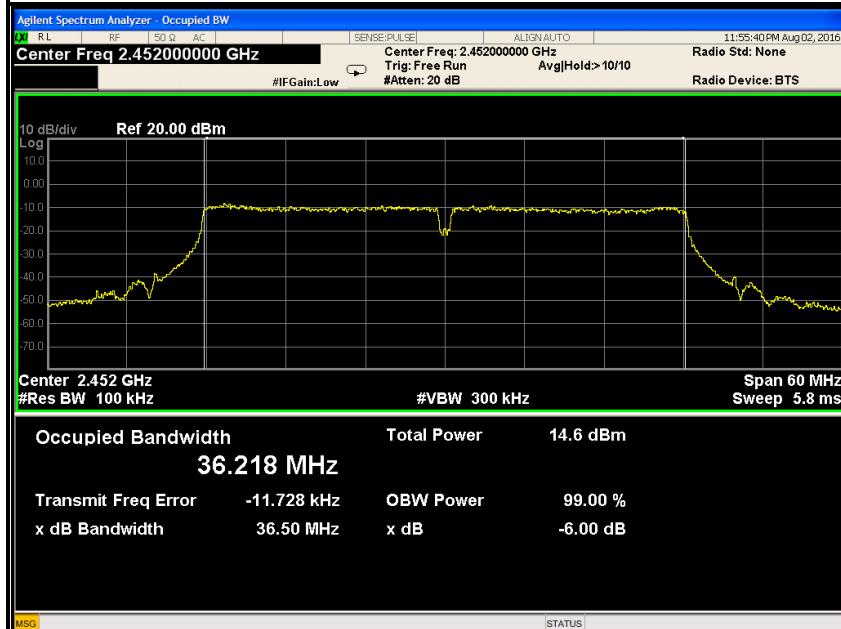
6dB Bandwidth (CH High)



**IEEE 802.11n HT40 MHz mode (Antenna 1)****6dB Bandwidth (CH Low)****6dB Bandwidth (CH Mid)**

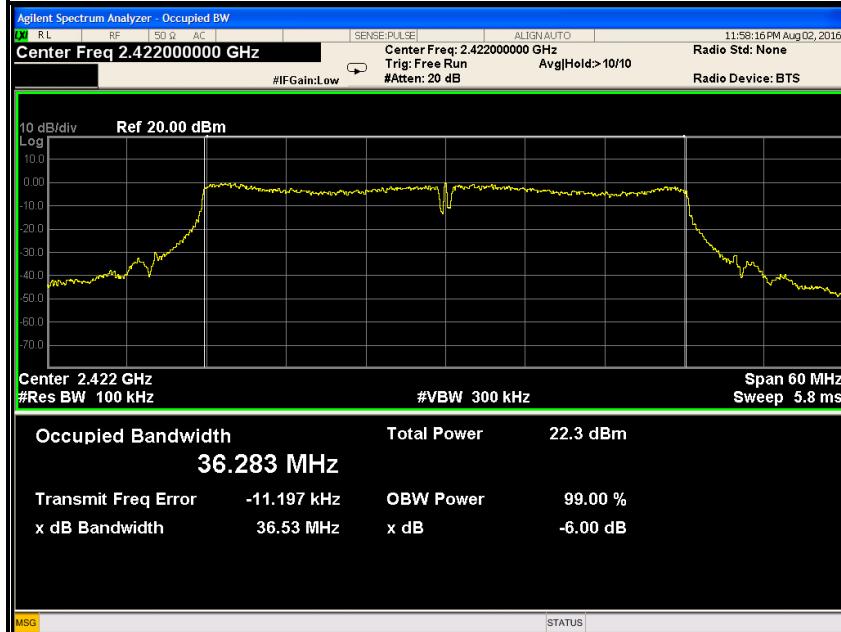


6dB Bandwidth (CH High)



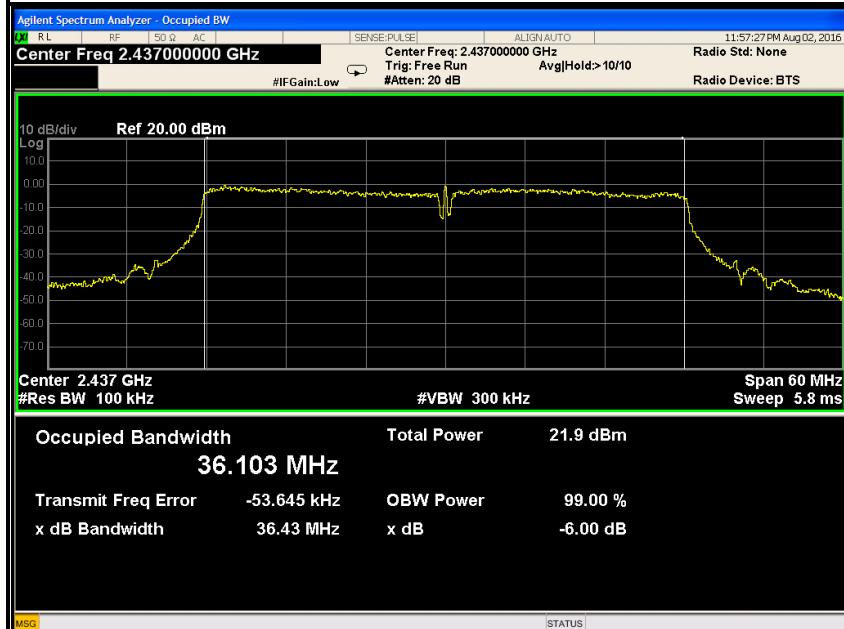
IEEE 802.11n HT40 MHz mode (Antenna 2)

6dB Bandwidth (CH Low)

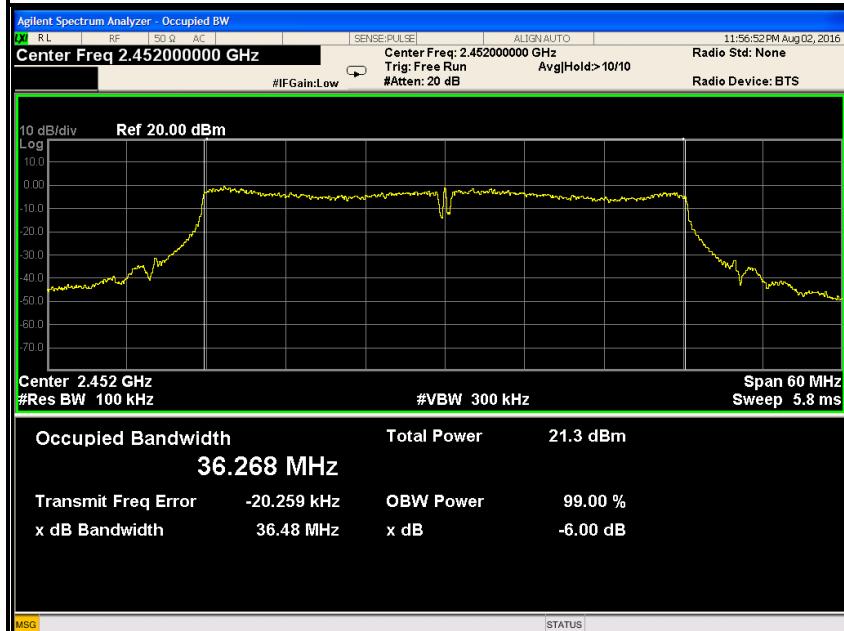




6dB Bandwidth (CH Mid)



6dB Bandwidth (CH High)





7.4. ANTENNA GAIN

MEASUREMENT

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For normal WLAN devices, the DSSS mode is used.

MEASUREMENT PARAMETERS

Measurement parameter	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	3 MHz
Video bandwidth	3 MHz
Trace-Mode	Max hold

LIMITS

FCC	IC
Antenna Gain	
6 dBi	



TEST RESULTS

IEEE 802.11b mode (Antenna 1)

T _{nom}	V _{nom}	Lowest channel 2412MHz	Middle channel 2437MHz	Highest channel 2462MHz
Conducted power [dBm/MHz] Measured with DSSS modulation		7.56	6.88	6.71
Radiated power [dBm/MHz] Measured with DSSS modulation		4.75	3.79	2.82
Gain [dBi] Calculated		-2.81	-3.09	-3.89
Measurement uncertainty	\pm 1.5 dB (cond.) / \pm 3 dB (rad.)			

IEEE 802.11b mode (Antenna 2)

T _{nom}	V _{nom}	Lowest channel 2412MHz	Middle channel 2437MHz	Highest channel 2462MHz
Conducted power [dBm/MHz] Measured with DSSS modulation		14.34	13.35	11.49
Radiated power [dBm/MHz] Measured with DSSS modulation		12.59	11.71	12.82
Gain [dBi] Calculated		1.75	1.64	-1.33
Measurement uncertainty	\pm 1.5 dB (cond.) / \pm 3 dB (rad.)			



7.5. PEAK OUTPUT POWER

7.5.1. LIMITS

The maximum peak output power of the intentional radiator shall not exceed the following:

1. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
2. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.5.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Power Meter	Anritsu	ML2495A	1204003	02/21/2016	02/20/2017
Power Sensor	Anritsu	MA2411B	1126150	02/21/2016	02/20/2017

7.5.3. TEST PROCEDURES (please refer to measurement standard)

9.1.1 RBW \geq DTS bandwidth

This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the *DTS bandwidth*.

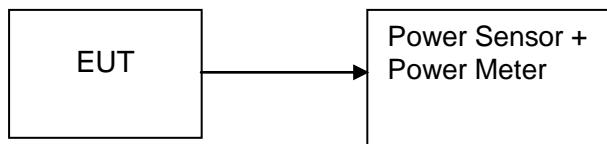
- a) Set the RBW \geq DTS bandwidth.
- b) Set VBW \geq 3 RBW.
- c) Set span \geq 3 x RBW
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.



9.1.2 PKPM1 Peak power meter method

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

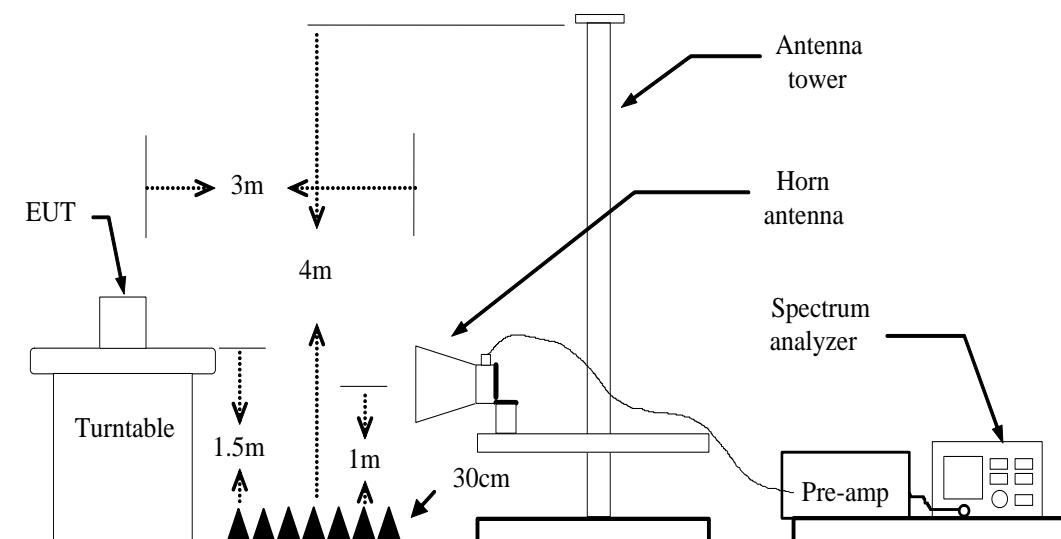
7.5.4. TEST SETUP

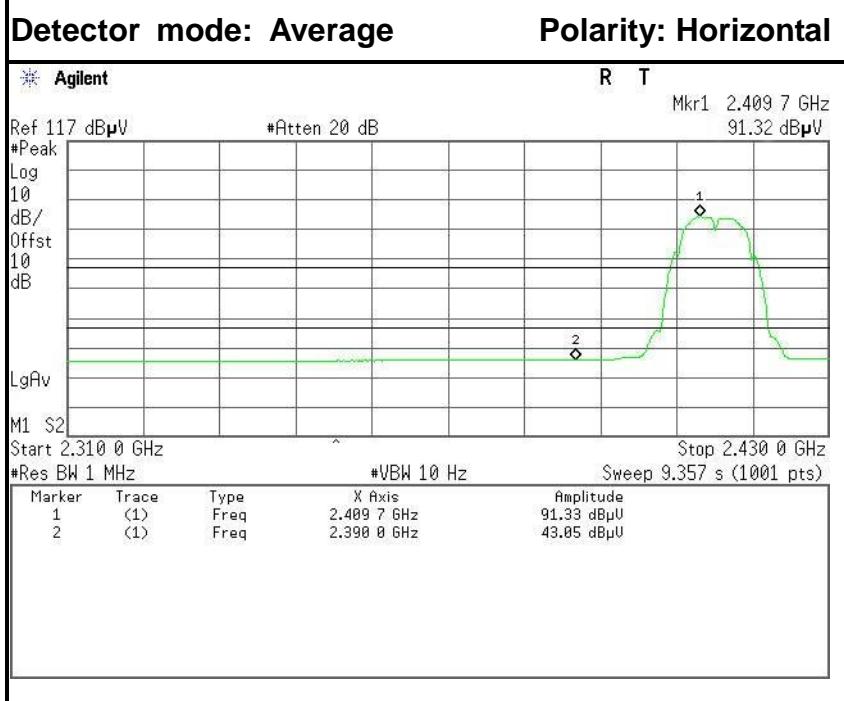
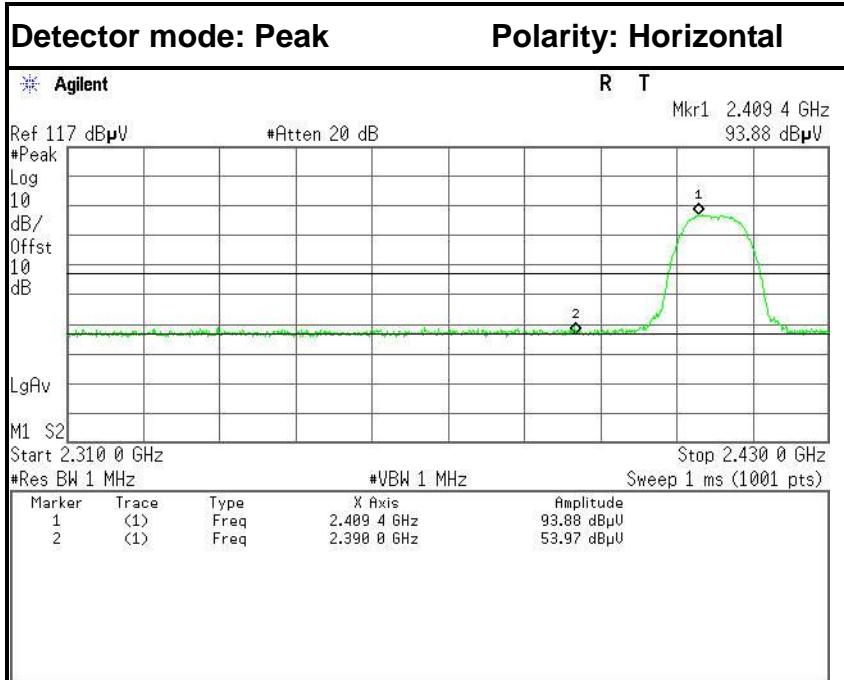


7.6.3. TEST PROCEDURES (please refer to measurement standard)

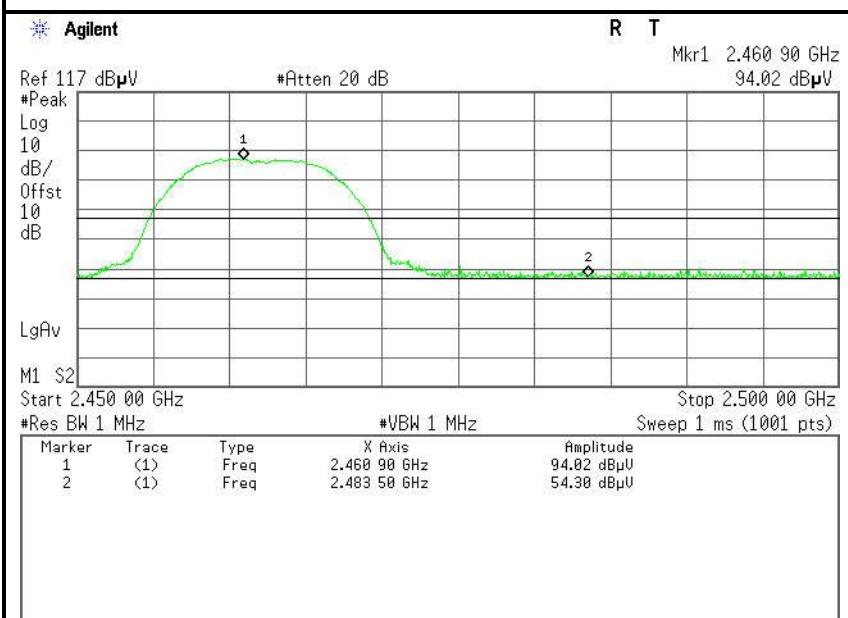
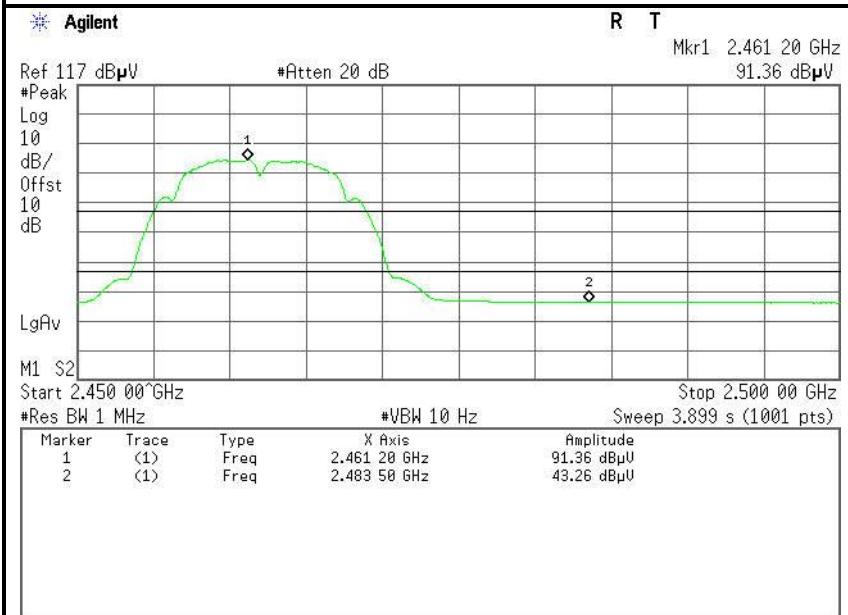
1. The EUT is placed on a turntable, which is 1.5m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
 - (a) PEAK: RBW=1MHz / VBW=3MHz / Sweep=AUTO
 - (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are

7.6.4. TEST SETUP

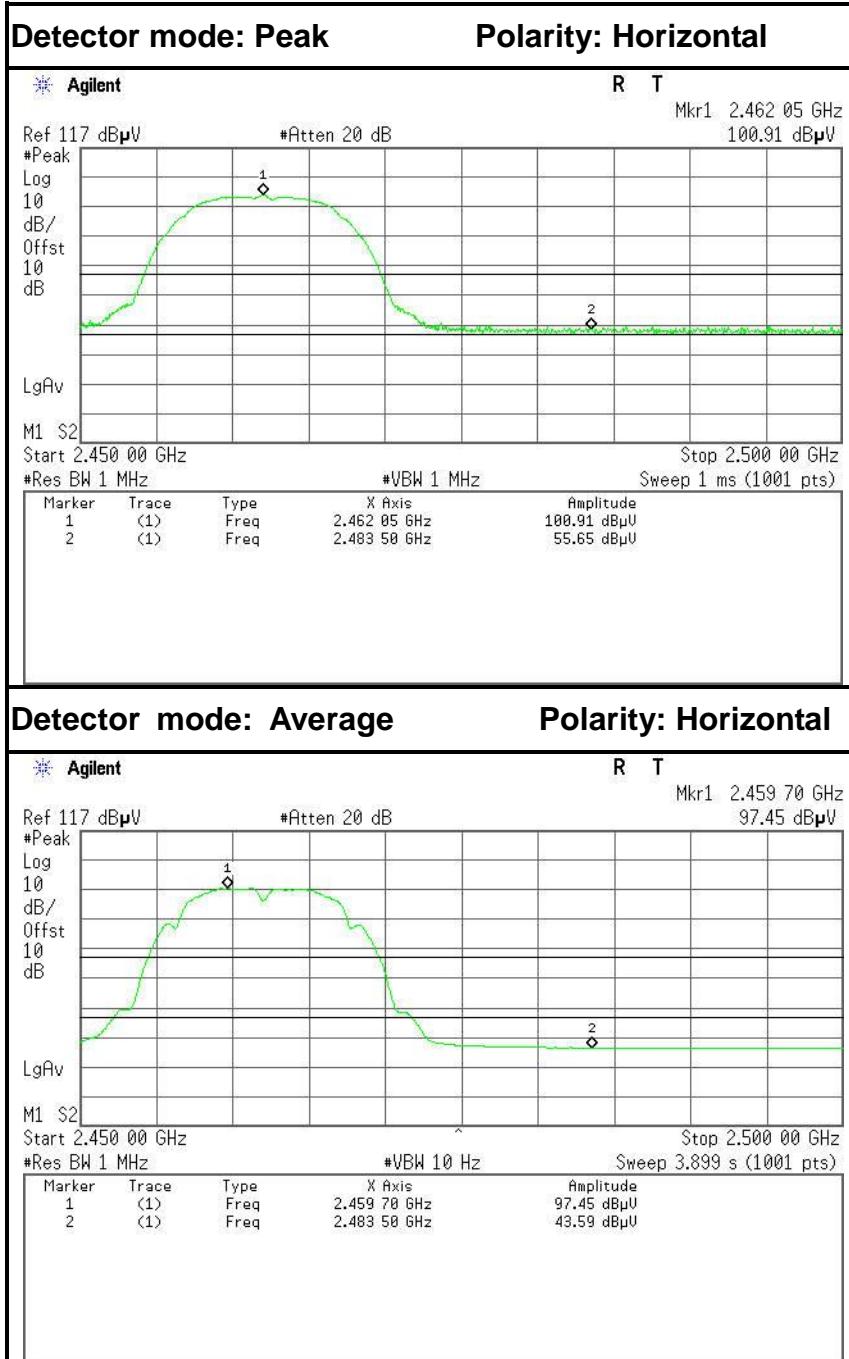




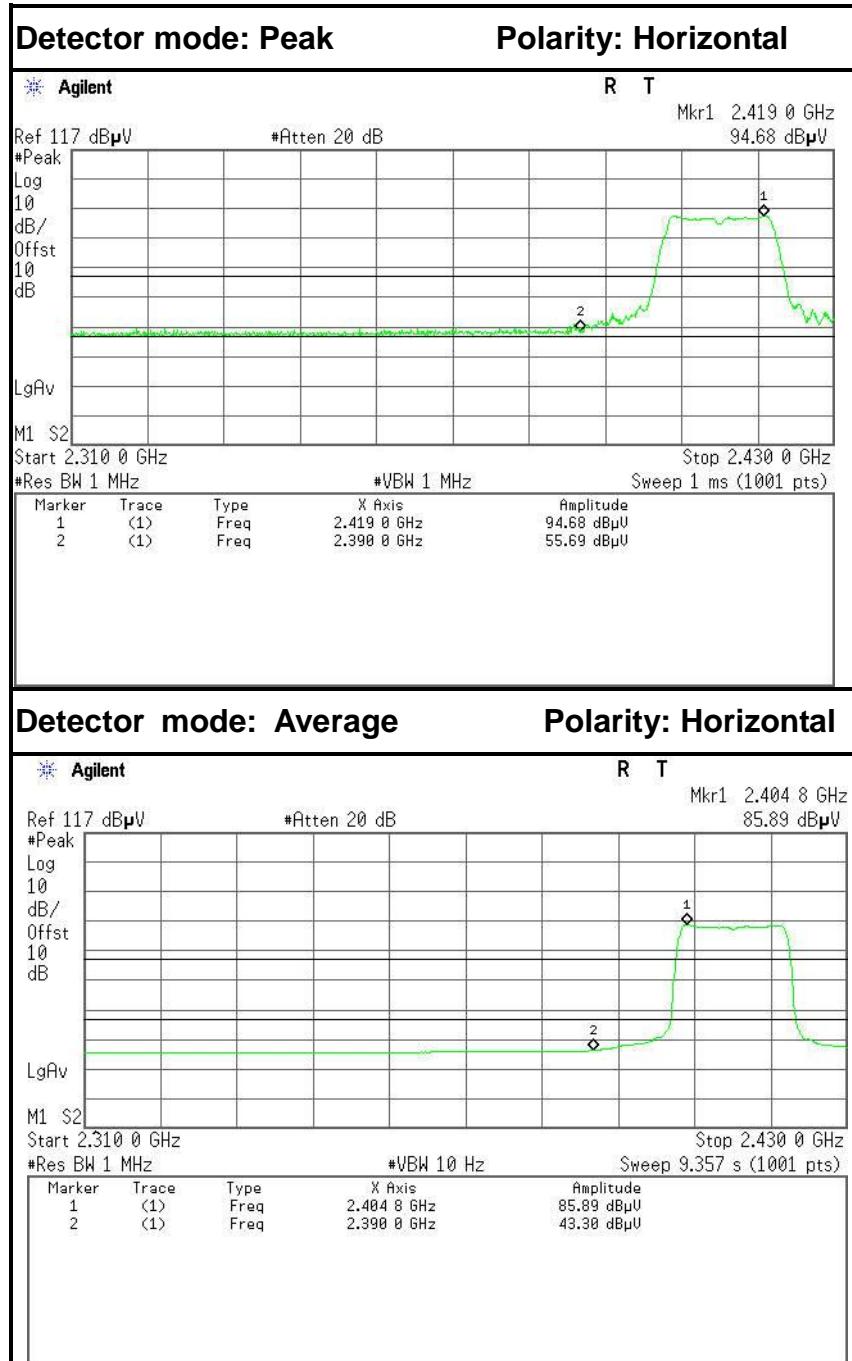
No.	Frequency (MHz)	Reading (dB μ V)	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	47.37	-6.60	53.97	74.00	-20.03	Peak	Horizontal
2	2390.0000	36.45	-6.60	43.05	54.00	-10.95	Average	Horizontal

**Detector mode: Peak****Polarity: Horizontal****Detector mode: Average****Polarity: Horizontal**

No.	Frequency (MHz)	Reading (dB μ V)	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	48.06	-6.24	54.30	74.00	-19.70	Peak	Horizontal
2	2483.5000	37.02	-6.24	43.26	54.00	-10.74	Average	Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	49.41	-6.24	55.65	74.00	-18.35	Peak	Horizontal
2	2483.5000	37.35	-6.24	43.59	54.00	-10.41	Average	Horizontal

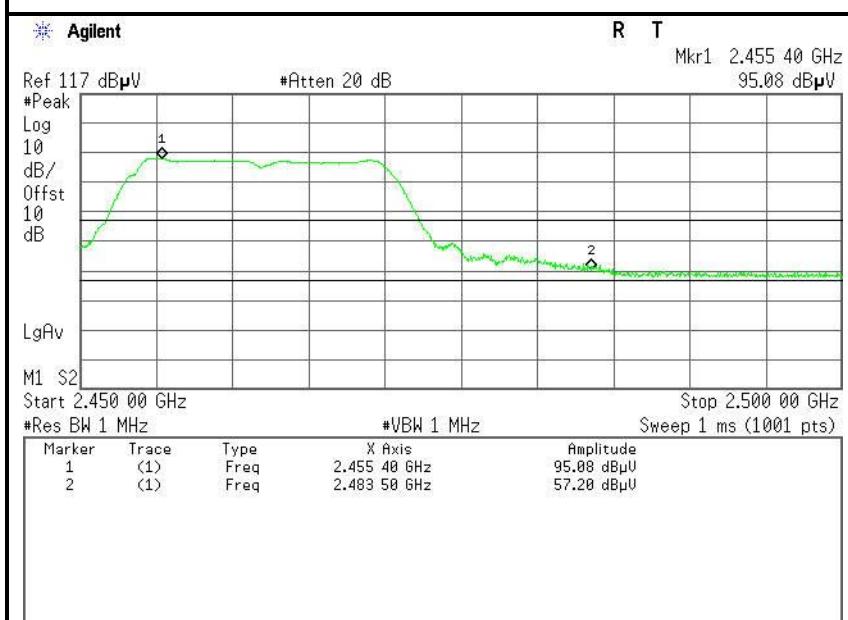


No.	Frequency (MHz)	Reading (dB μ V)	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	49.09	-6.60	55.69	74.00	-18.31	Peak	Horizontal
2	2390.0000	36.70	-6.60	43.30	54.00	-10.70	Average	Horizontal



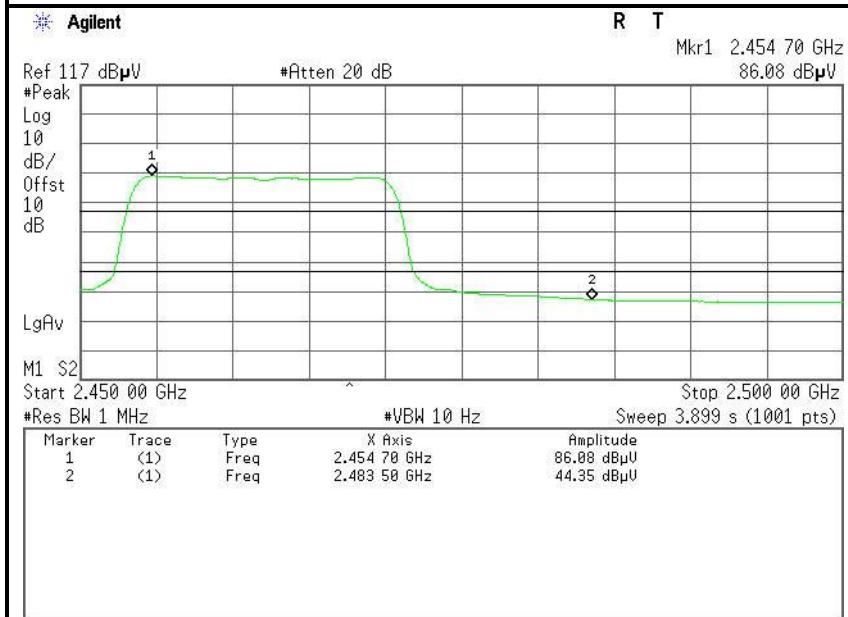
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

Polarity: Horizontal

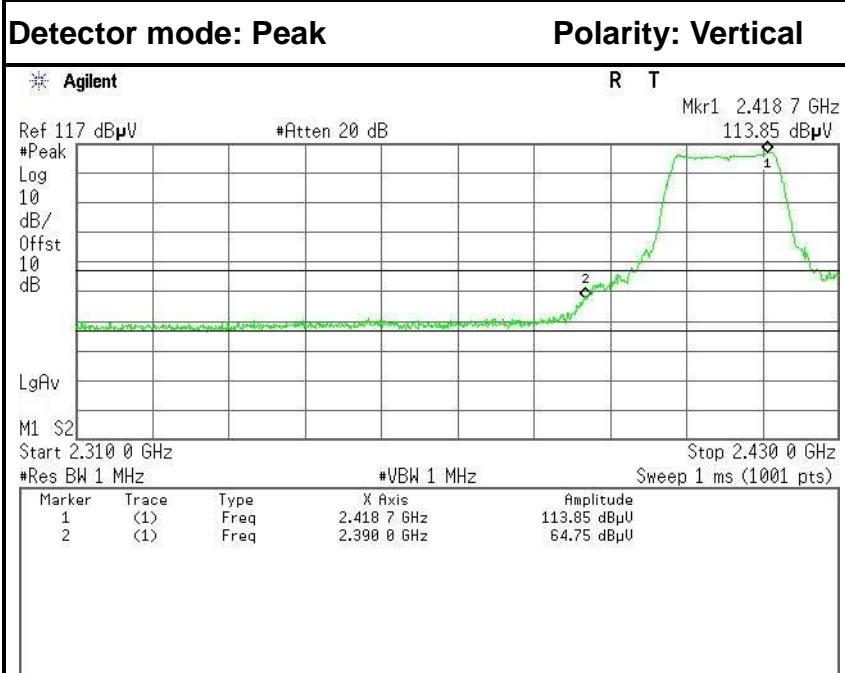


No.	Frequency (MHz)	Reading (dB μ V)	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	50.96	-6.24	57.20	74.00	-16.80	Peak	Horizontal
2	2483.5000	38.11	-6.24	44.35	54.00	-9.65	Average	Horizontal

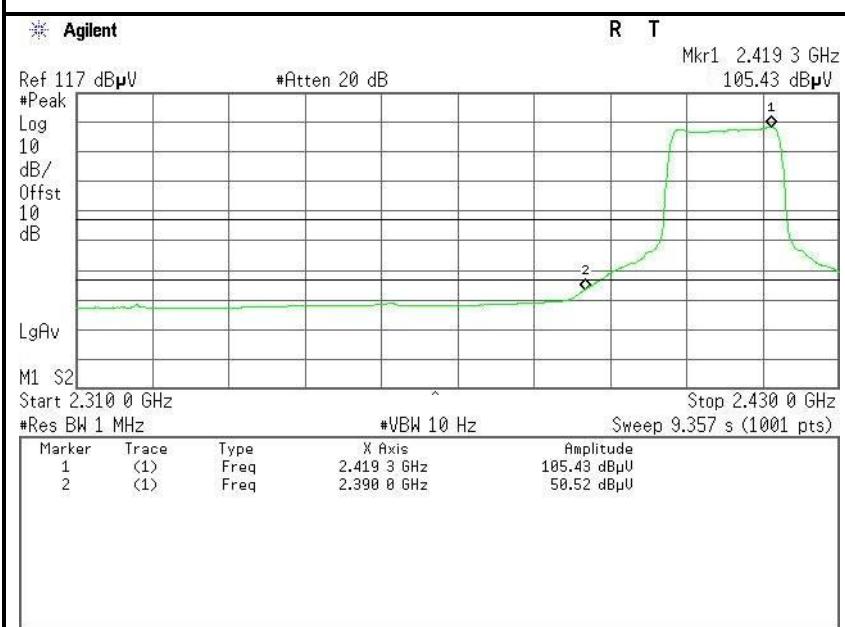


IEEE 802.11g mode (Antenna 2)

Band Edges (CH Low)



Detector mode: Average Polarity: Vertical

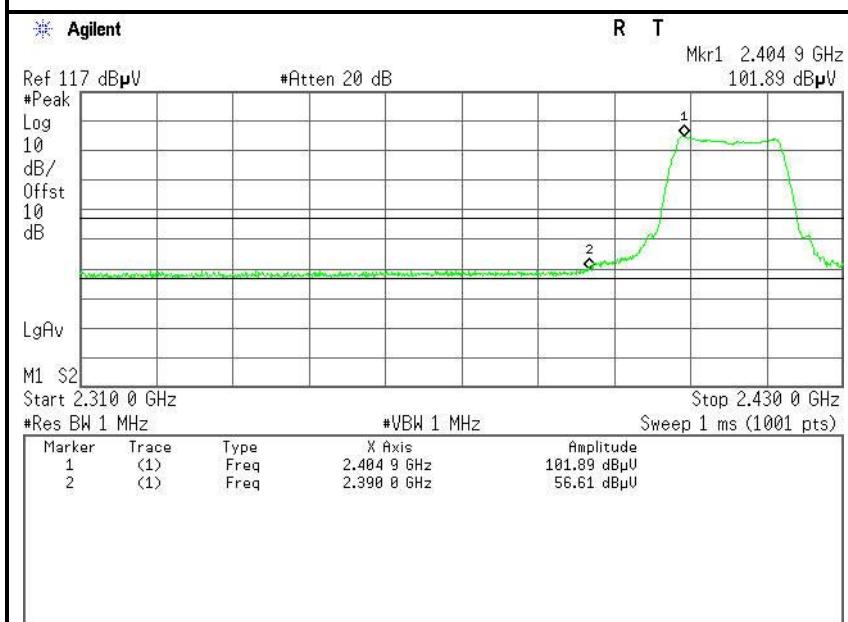


No.	Frequency (MHz)	Reading (dB μ V)	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	58.15	-6.60	64.75	74.00	-9.25	Peak	Vertical
2	2390.0000	43.92	-6.60	50.52	54.00	-3.48	Average	Vertical



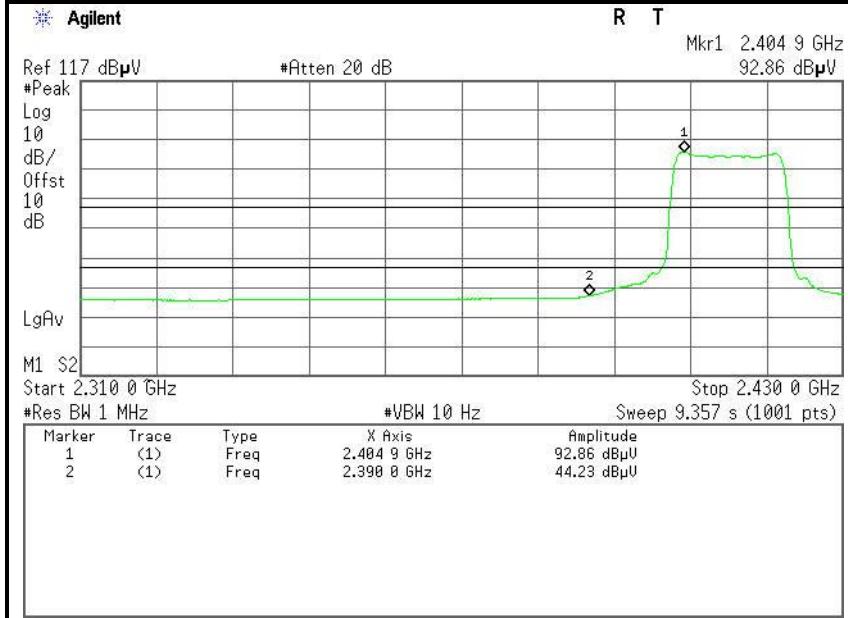
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

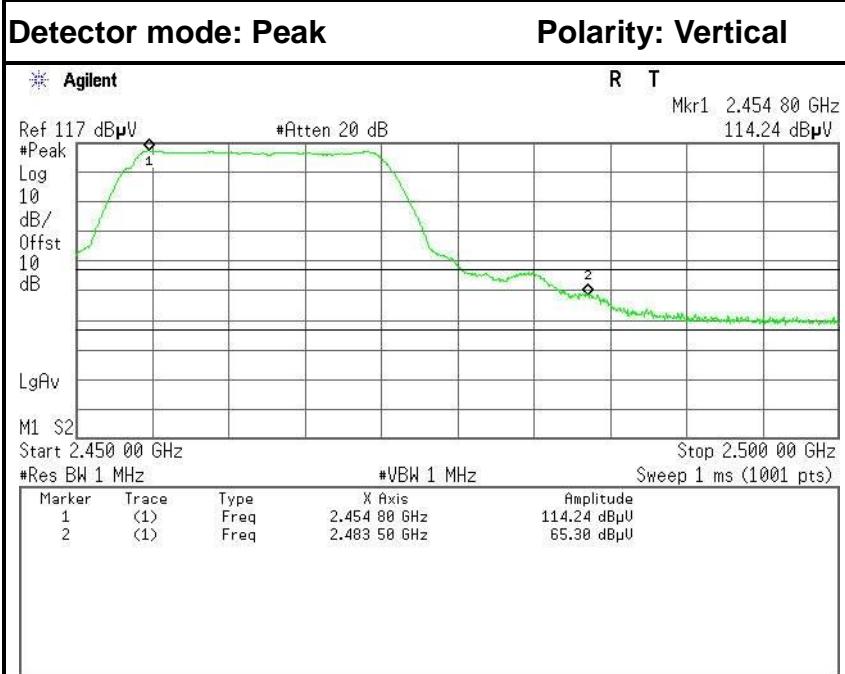
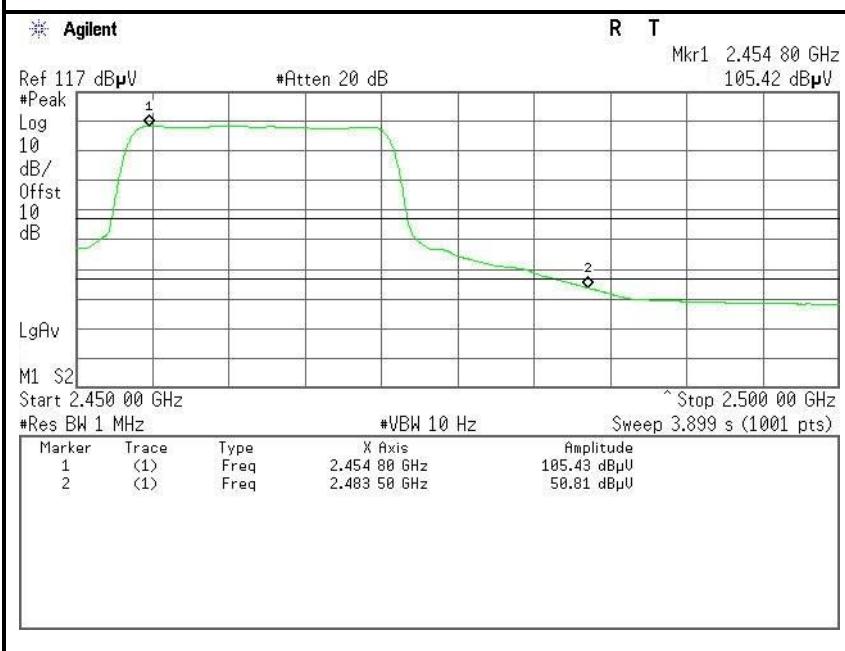
Polarity: Horizontal



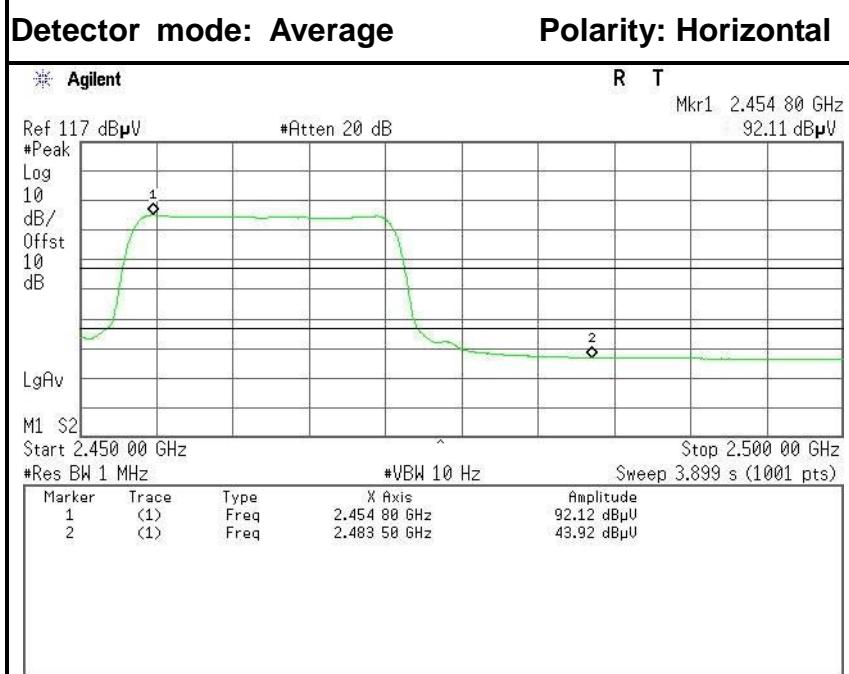
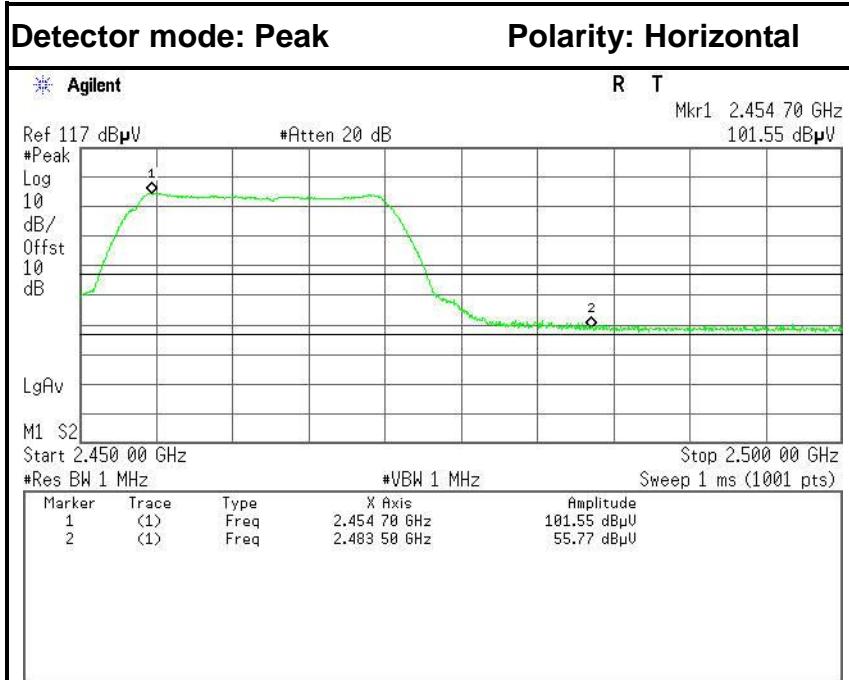
No.	Frequency (MHz)	Reading (dB μ V)	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	50.01	-6.60	56.61	74.00	-17.39	Peak	Horizontal
2	2390.0000	37.63	-6.60	44.23	54.00	-9.77	Average	Horizontal



Band Edges (CH High)

**Detector mode: Average** **Polarity: Vertical**

No.	Frequency (MHz)	Reading (dB μ V)	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	59.06	-6.24	65.30	74.00	-8.70	Peak	Vertical
2	2483.5000	44.57	-6.24	50.81	54.00	-3.19	Average	Vertical

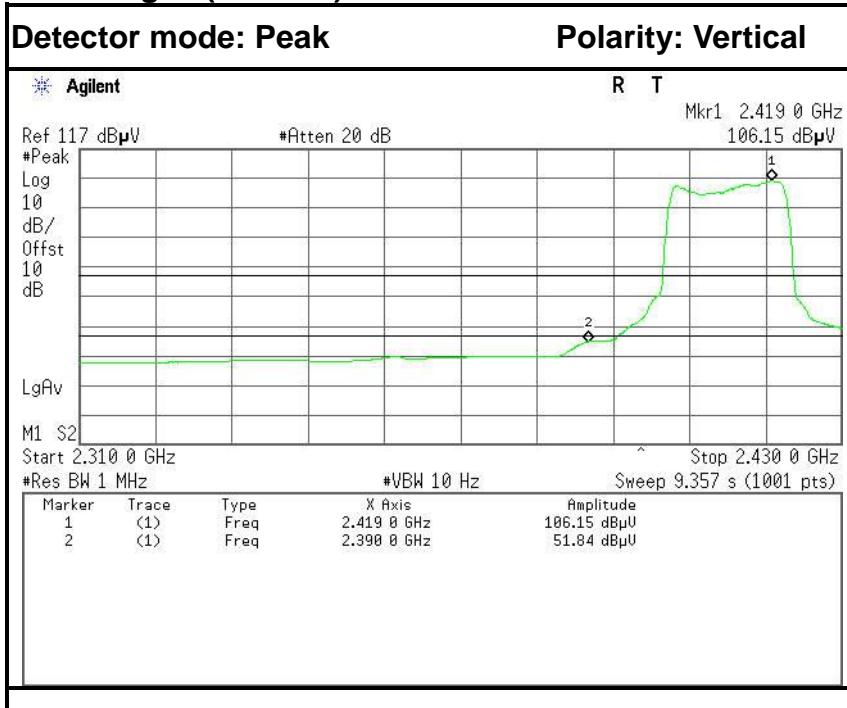


No.	Frequency (MHz)	Reading (dB μ V)	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	49.53	-6.24	55.77	74.00	-18.23	Peak	Horizontal
2	2483.5000	37.68	-6.24	43.92	54.00	-10.08	Average	Horizontal

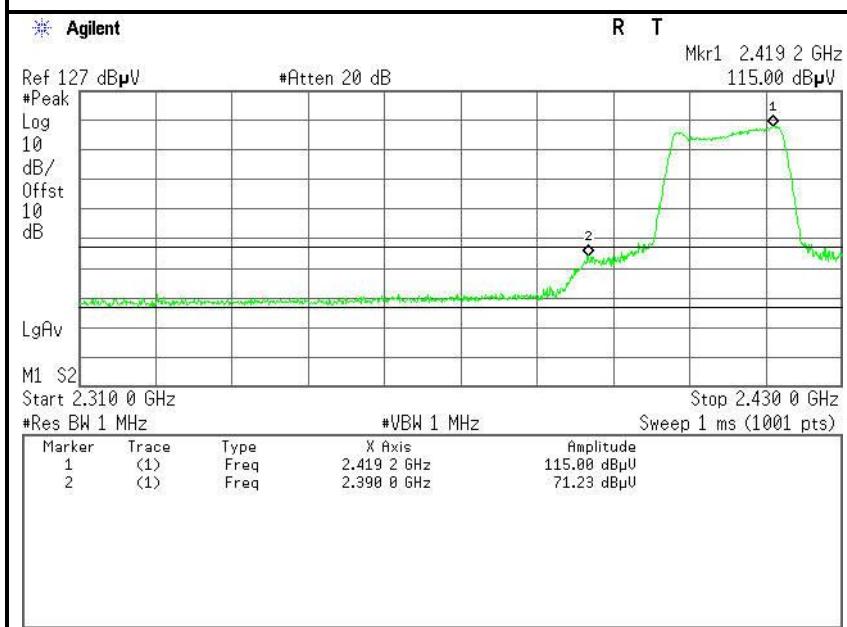


IEEE 802.11n HT20 MHz mode (Combine with Antenna 1 and Antenna 2)

Band Edges (CH Low)



Detector mode: Average Polarity: Vertical

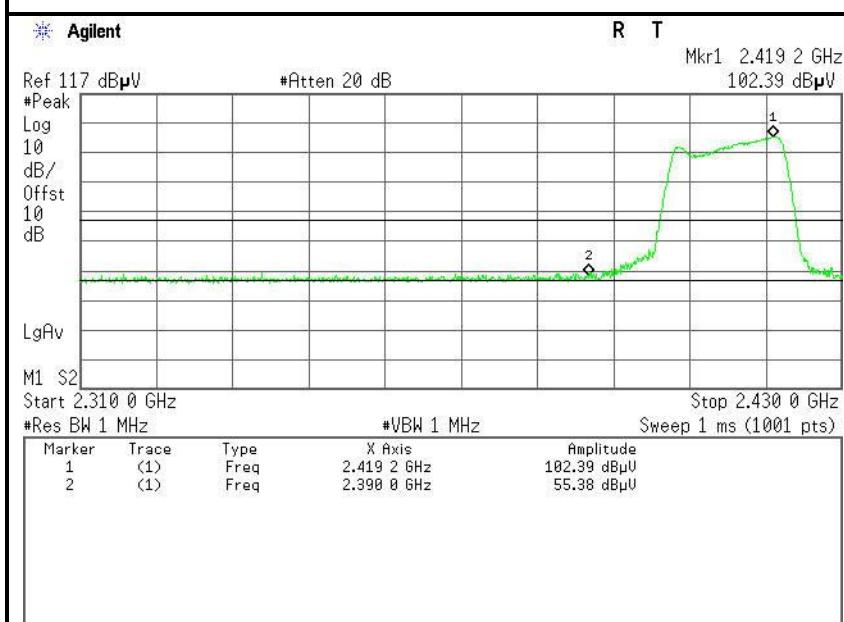


No.	Frequency (MHz)	Reading (dB μ V)	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	45.24	-6.60	51.84	74.00	-22.16	Peak	Vertical
2	2390.0000	64.63	-6.60	71.23	54.00	17.23	Average	Vertical



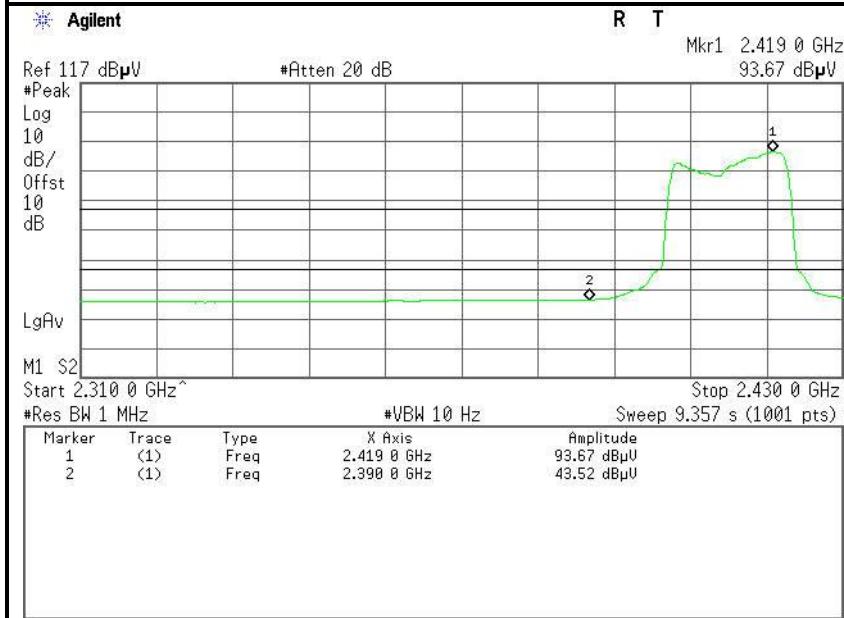
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

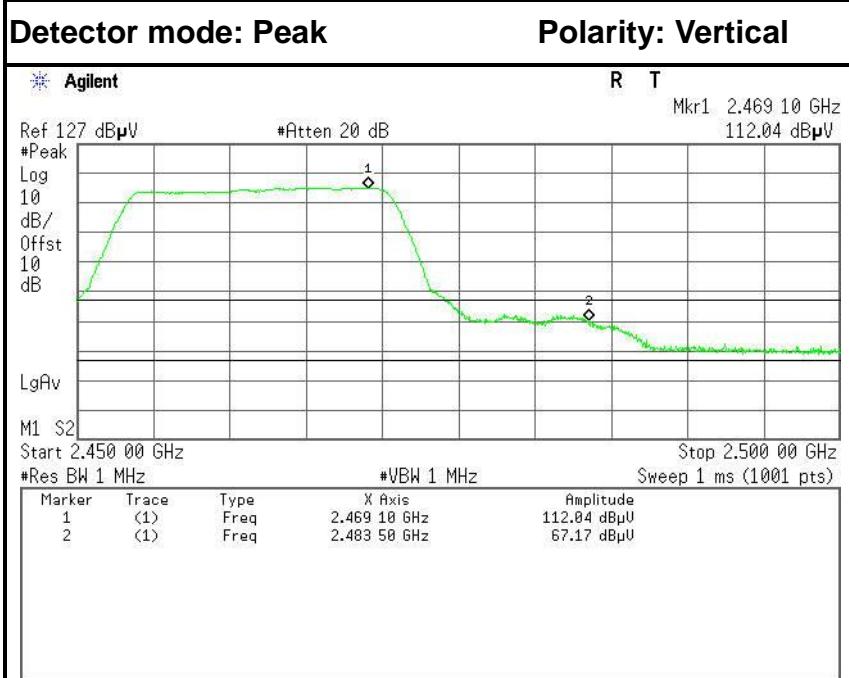
Polarity: Horizontal



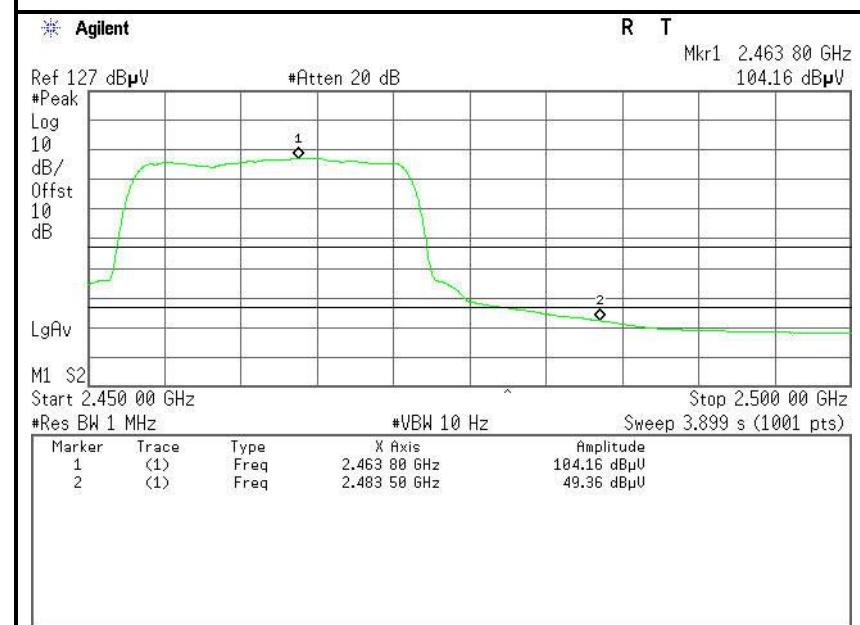
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	48.78	-6.60	55.38	74.00	-18.62	Peak	Horizontal
2	2390.0000	37.92	-6.60	44.52	54.00	-9.48	Average	Horizontal



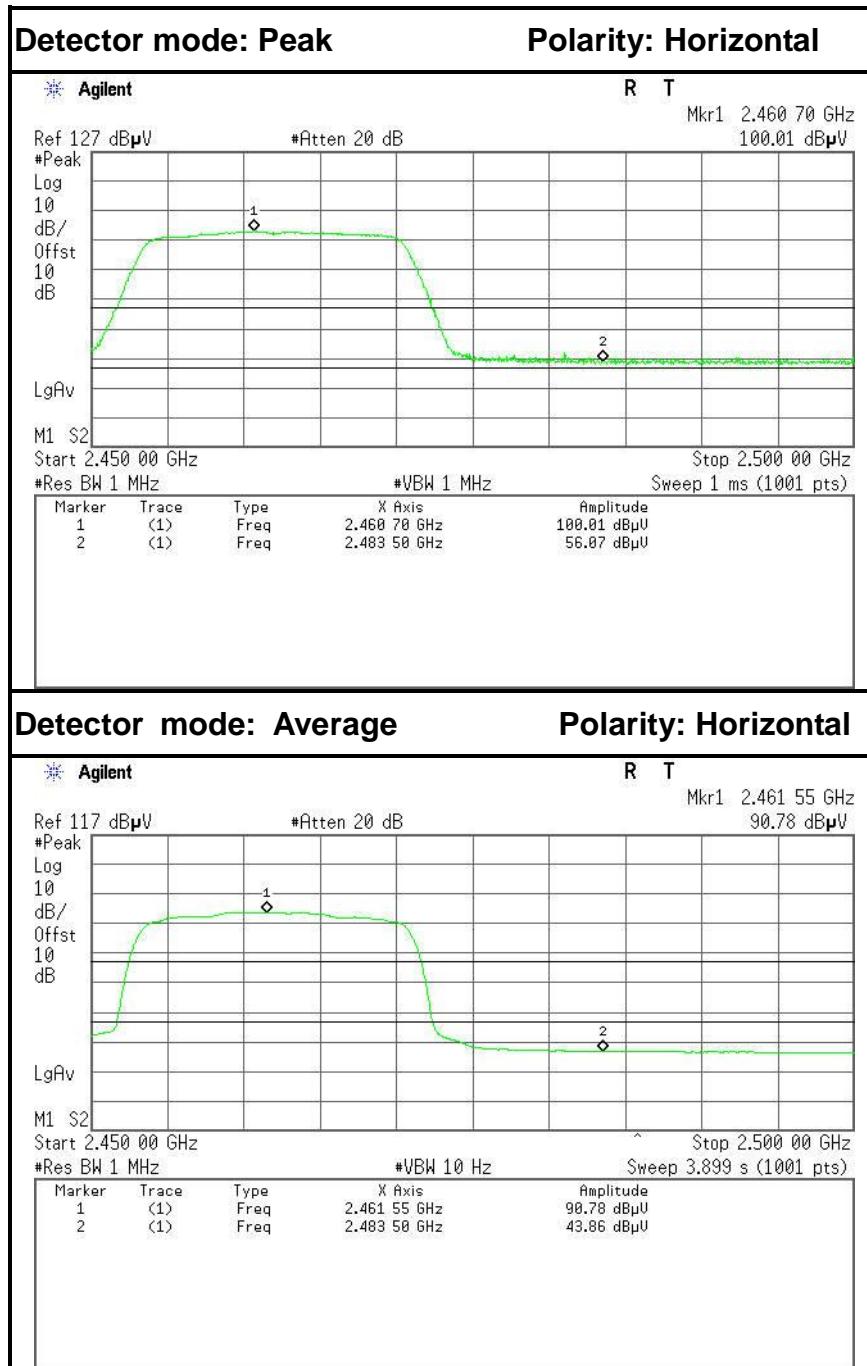
Band Edges (CH High)



Detector mode: Average Polarity: Vertical



No.	Frequency (MHz)	Reading (dB μ V)	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	60.93	-6.24	67.17	74.00	-6.83	Peak	Vertical
2	2483.5000	43.12	-6.24	49.36	54.00	-4.64	Average	Vertical

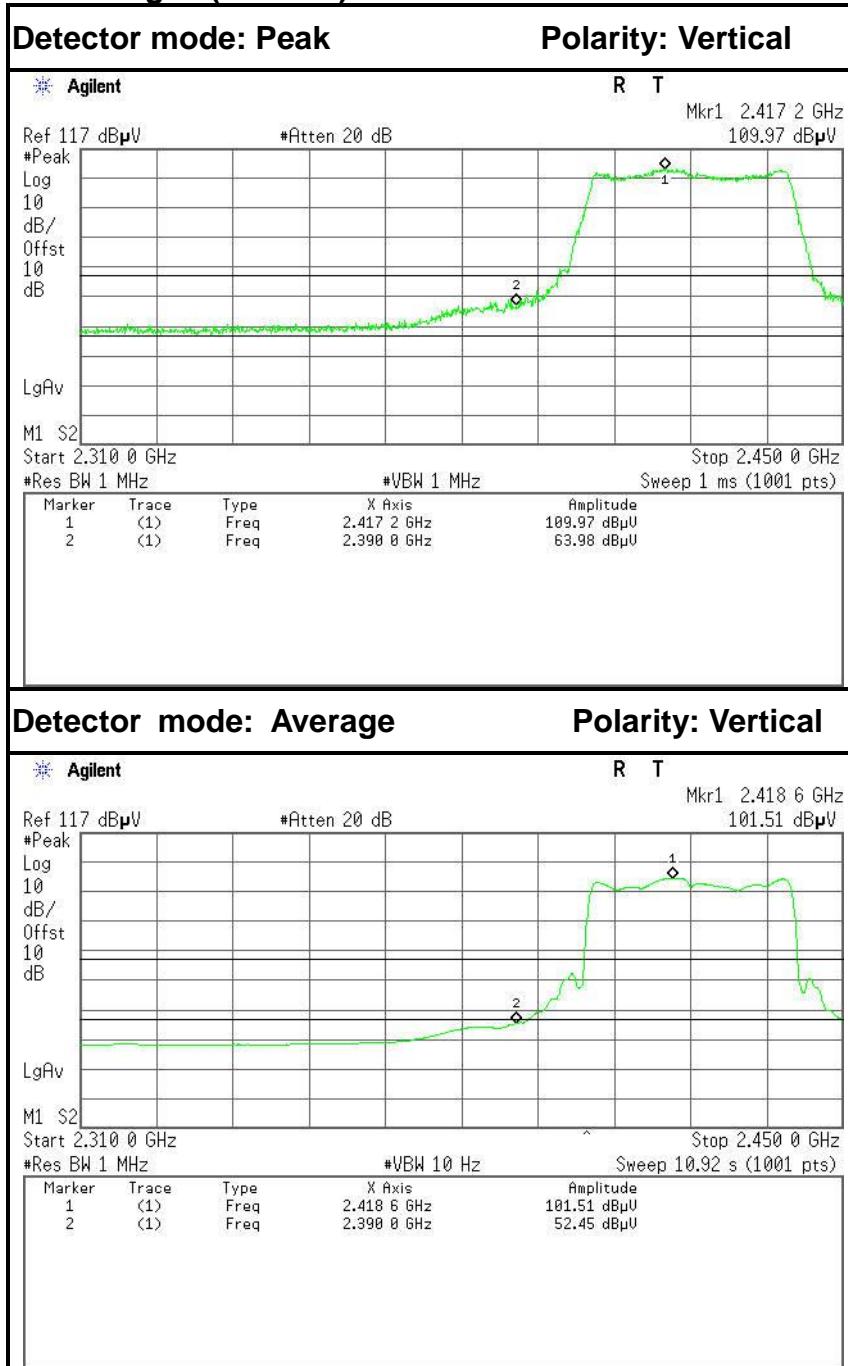


No.	Frequency (MHz)	Reading (dB μ V)	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	49.83	-6.24	56.07	74.00	-17.93	Peak	Horizontal
2	2483.5000	37.62	-6.24	43.86	54.00	-10.14	Average	Horizontal

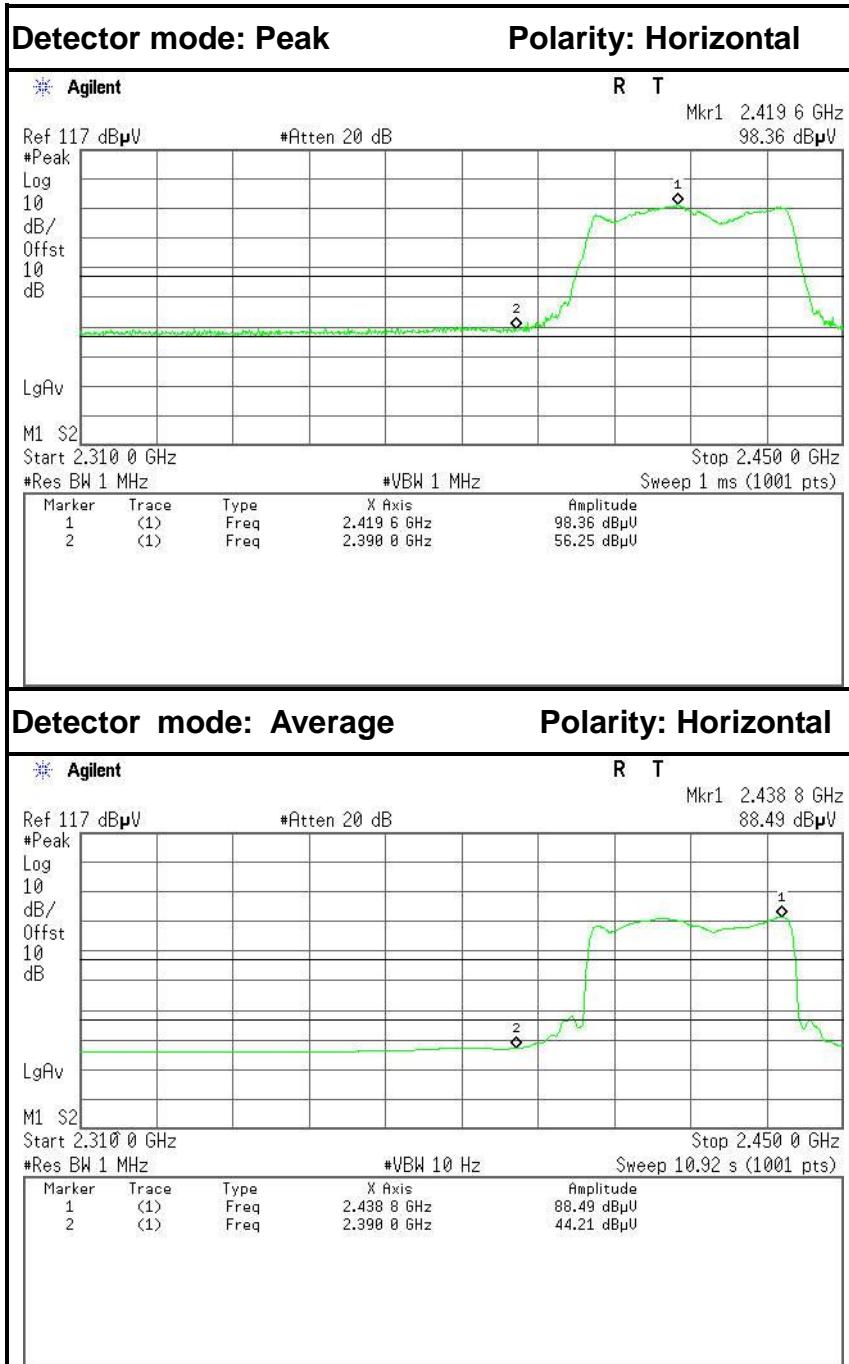


IEEE 802.11n HT40 MHz mode (Combine with Antenna 1 and Antenna 2)

Band Edges (CH Low)



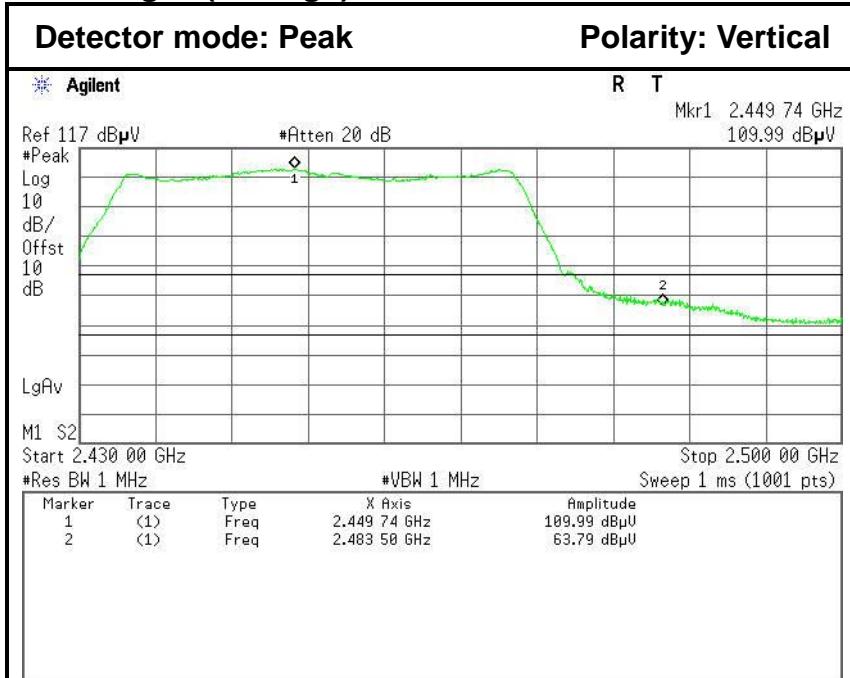
No.	Frequency (MHz)	Reading (dBuV)	Corrected (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	57.38	-6.60	63.98	74.00	-10.02	Peak	Vertical
2	2390.0000	45.85	-6.60	52.45	54.00	-1.55	Average	Vertical



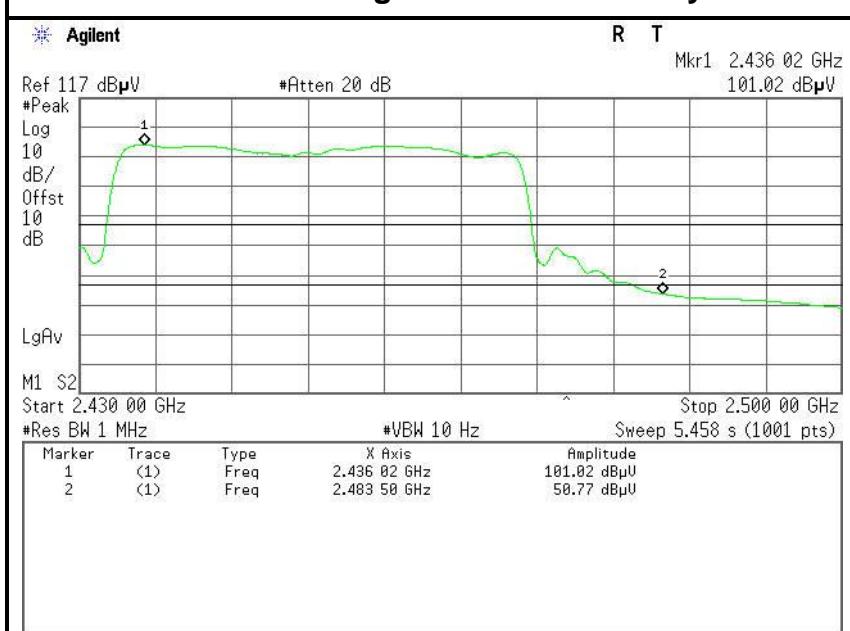
No.	Frequency (MHz)	Reading (dB μ V)	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Antenna Pole
1	2390.0000	49.65	-6.60	56.25	74.00	-17.75	Peak	Horizontal
2	2390.0000	37.61	-6.60	44.21	54.00	-9.79	Average	Horizontal



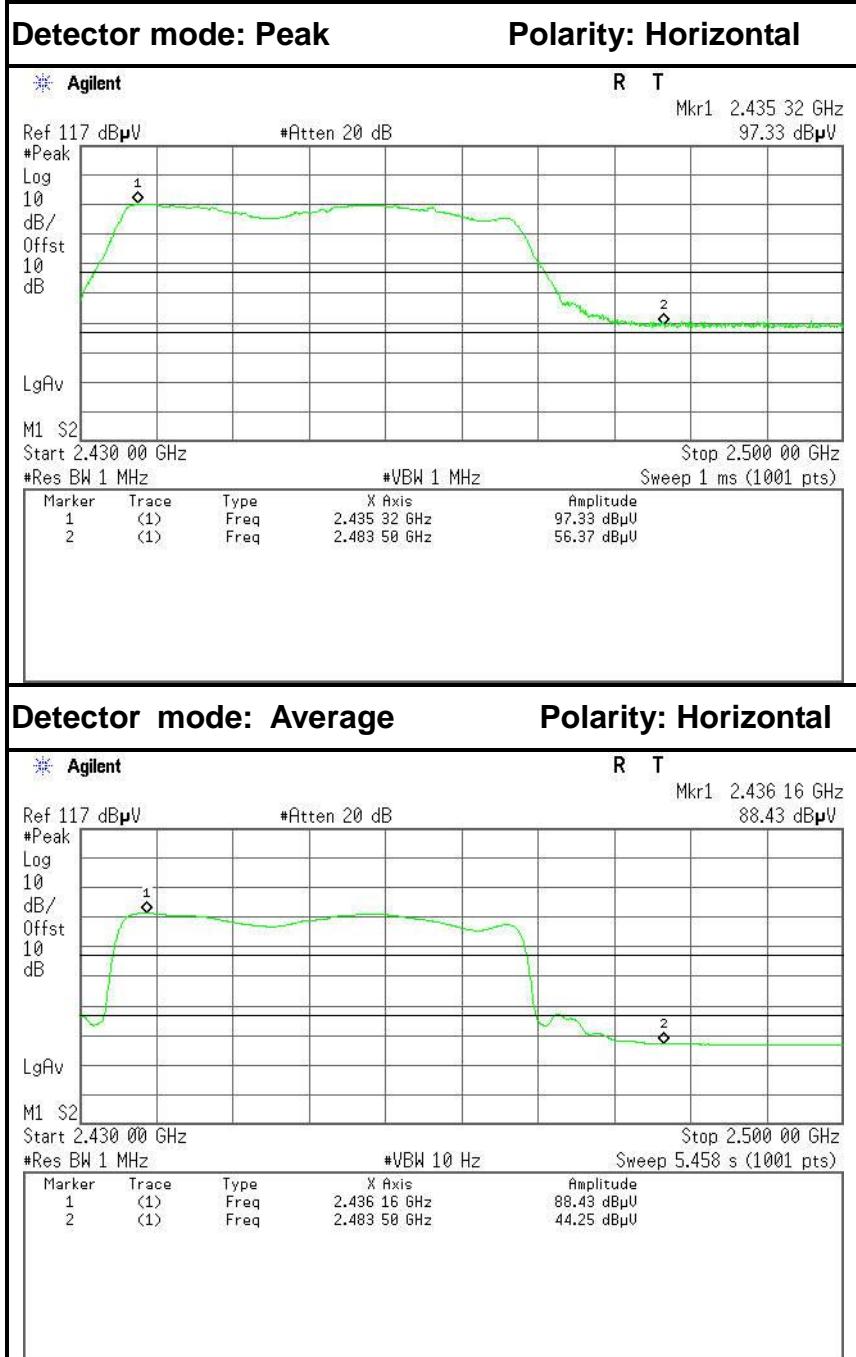
Band Edges (CH High)



Detector mode: Average Polarity: Vertical



No.	Frequency (MHz)	Reading (dB μ V)	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	57.55	-6.24	63.79	74.00	-10.21	Peak	Vertical
2	2483.5000	44.53	-6.24	50.77	54.00	-3.23	Average	Vertical



No.	Frequency (MHz)	Reading (dB μ V)	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Antenna Pole
1	2483.5000	50.13	-6.24	56.37	74.00	-17.63	Peak	Horizontal
2	2483.5000	38.01	-6.24	44.25	54.00	-9.75	Average	Horizontal



7.7. PEAK POWER SPECTRAL DENSITY MEASUREMENT

7.7.1. LIMITS

According to §15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

According to §15.247(f), the digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

7.7.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US44300399	02/21/2016	02/20/2017

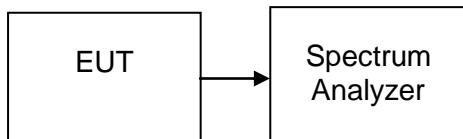
7.7.3. TEST PROCEDURES (please refer to measurement standard)

§15.247(e) specifies a conducted power spectral density (PSD) limit of 8 dBm in any 3 kHz band segment within the fundamental EBW during any time interval of continuous transmission. The same method as used to determine the conducted output power shall be used to determine the power spectral density (i.e., if peak-detected fundamental power was measured then use the peak PSD procedure and if average fundamental power was measured then use the average PSD procedure).

10.2 Method PKPSD (peak PSD)

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

7.7.4. TEST SETUP





7.7.5. TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b (Antenna 1)

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-16.053	8	PASS
Mid	2437	-15.184		PASS
High	2462	-16.027		PASS

Test mode: IEEE 802.11b (Antenna 2)

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-1.786	8	PASS
Mid	2437	-2.462		PASS
High	2462	-3.004		PASS

Test mode: IEEE 802.11g (Antenna 1)

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-15.195	8	PASS
Mid	2437	-15.903		PASS
High	2462	-14.948		PASS

Test mode: IEEE 802.11g (Antenna 2)

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-1.777	8	PASS
Mid	2437	-2.670		PASS
High	2462	-2.171		PASS

**Test mode: IEEE 802.11n HT20 MHz (Combine with Antenna 1 and Antenna 2)**

Channel	Frequency (MHz)	PPSD (dBm)			Limit (dBm)	Test Result
		Antenna 1	Antenna 2	Total		
Low	2412	-15.873	-2.230	-2.046	8	PASS
Mid	2437	-15.662	-2.645	-2.433		PASS
High	2462	-17.819	-3.666	-3.502		PASS

Test mode: IEEE 802.11n HT40 MHz (Combine with Antenna 1 and Antenna 2)

Channel	Frequency (MHz)	PPSD (dBm)			Limit (dBm)	Test Result
		Antenna 1	Antenna 2	Total		
Low	2422	-20.943	-1.942	-1.888	8	PASS
Mid	2437	-21.951	-2.431	-2.383		PASS
High	2452	-20.536	-2.767	-2.695		PASS



Test Plot

IEEE 802.11b mode (Antenna 1)

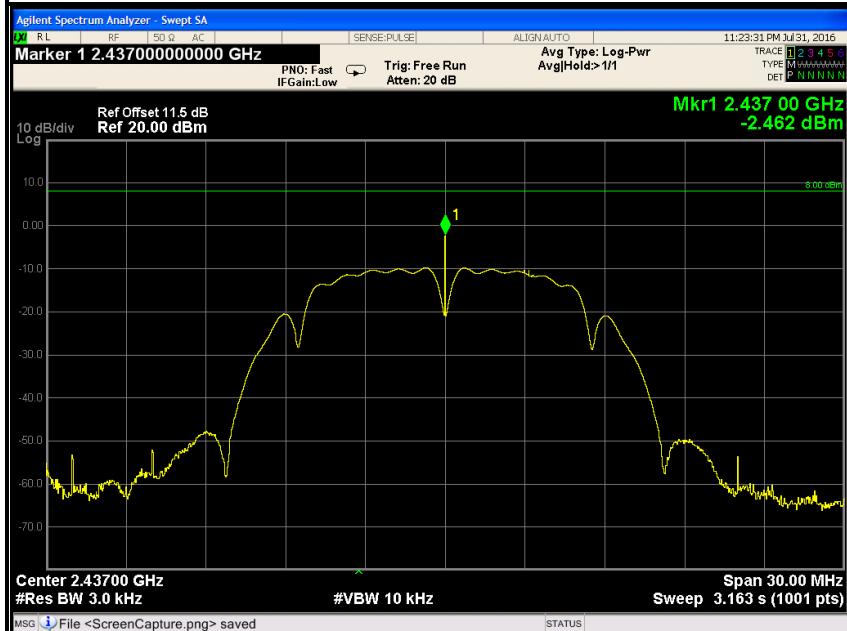
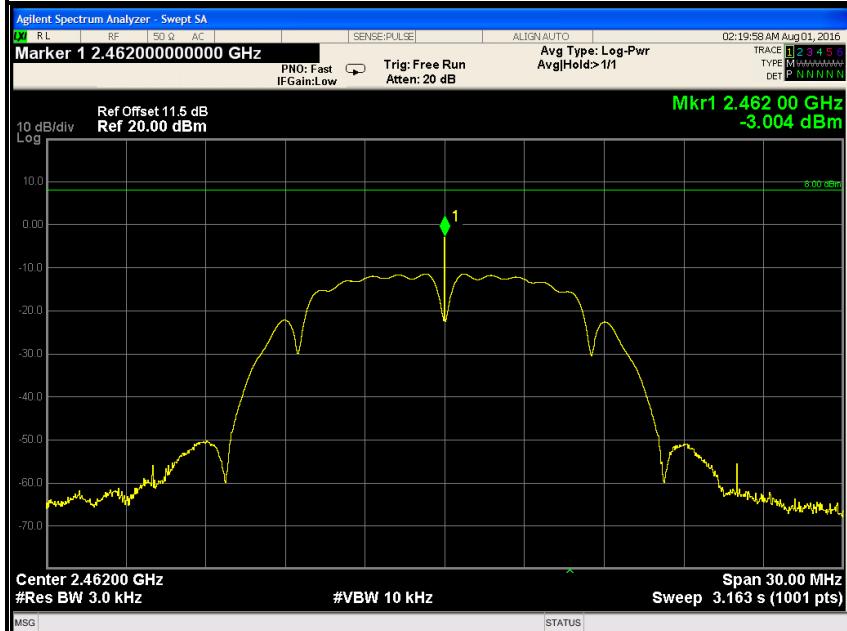
PPSD (CH Low)



PPSD (CH Mid)



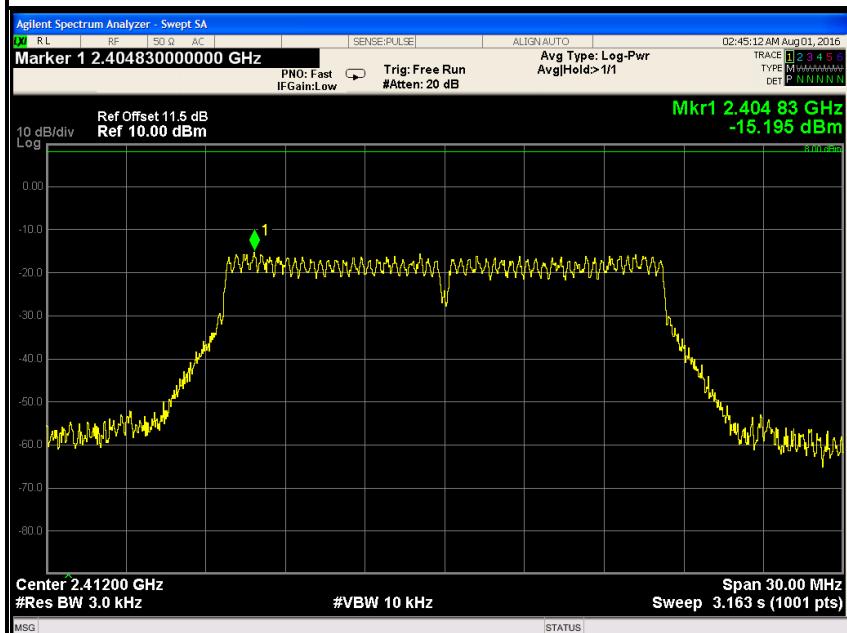
**PPSD (CH High)****IEEE 802.11b mode (Antenna 2)****PPSD (CH Low)**

**PPSD (CH Mid)****PPSD (CH High)**

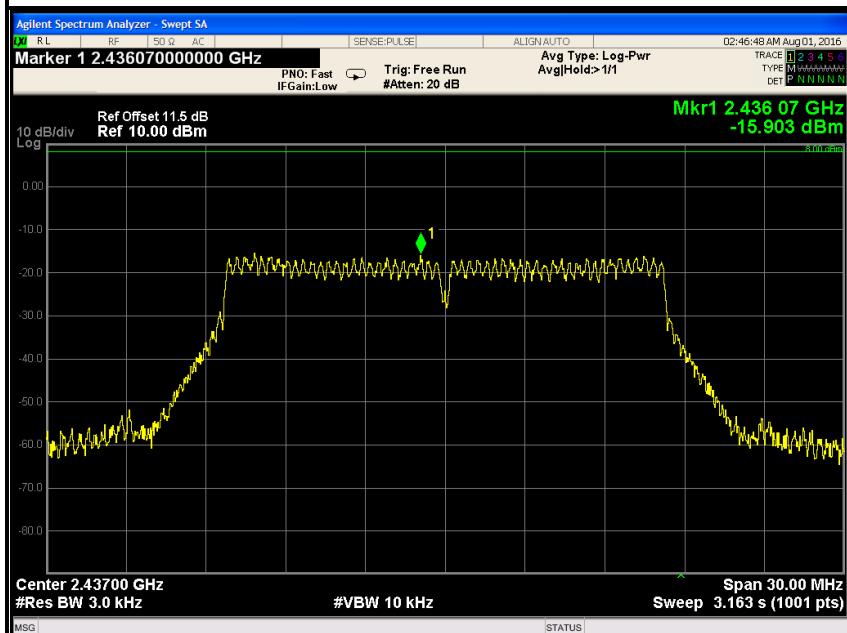


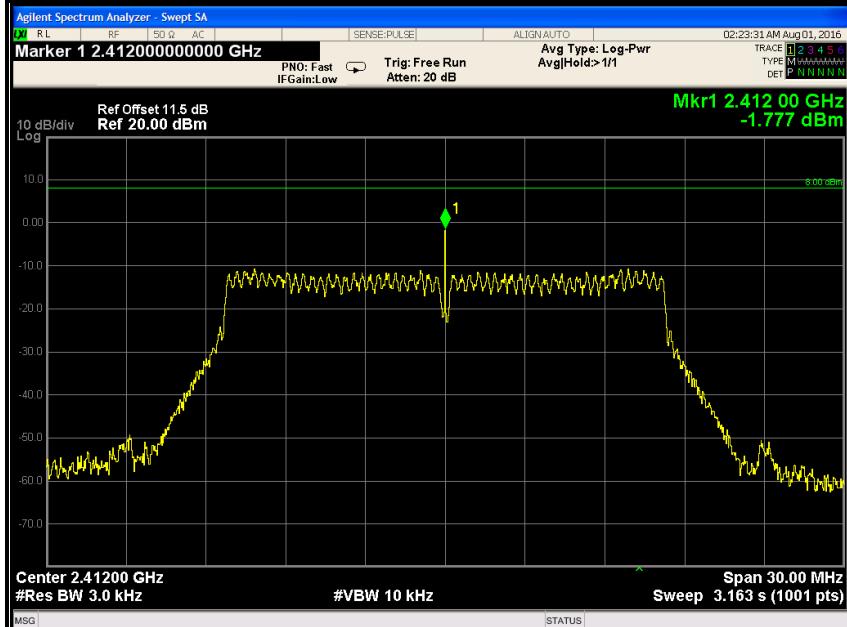
IEEE 802.11g mode (Antenna 1)

PPSD (CH Low)



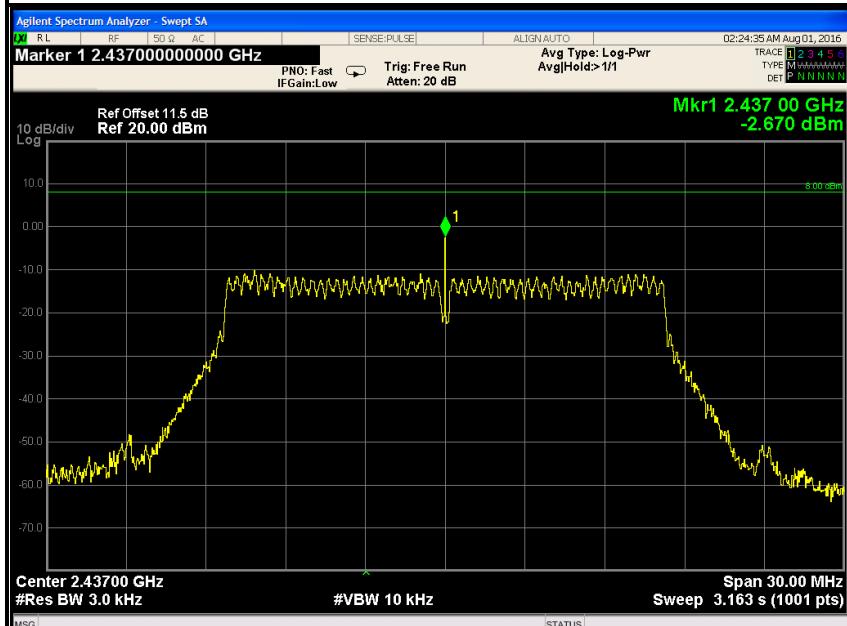
PPSD (CH Mid)



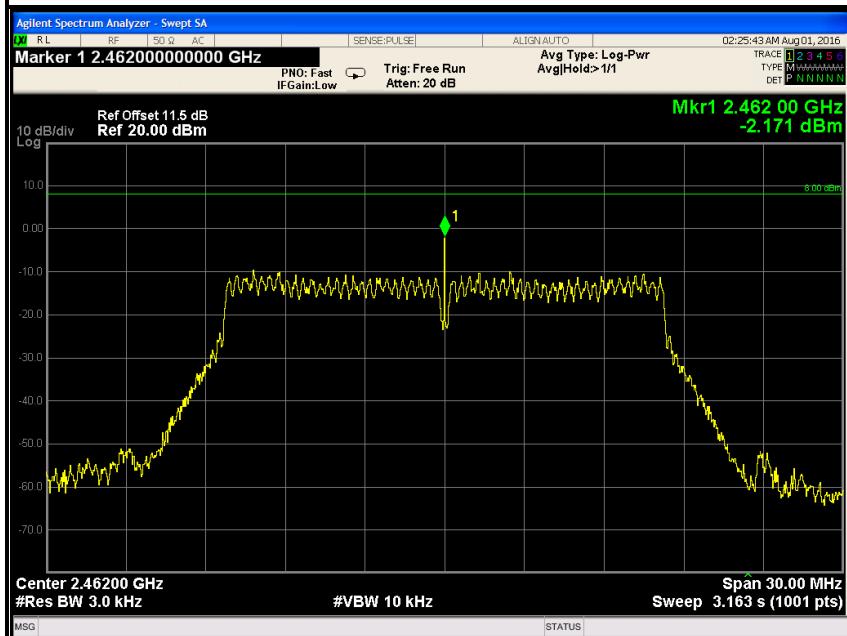
**PPSD (CH High)****IEEE 802.11g mode (Antenna 2)****PPSD (CH Low)**



PPSD (CH Mid)



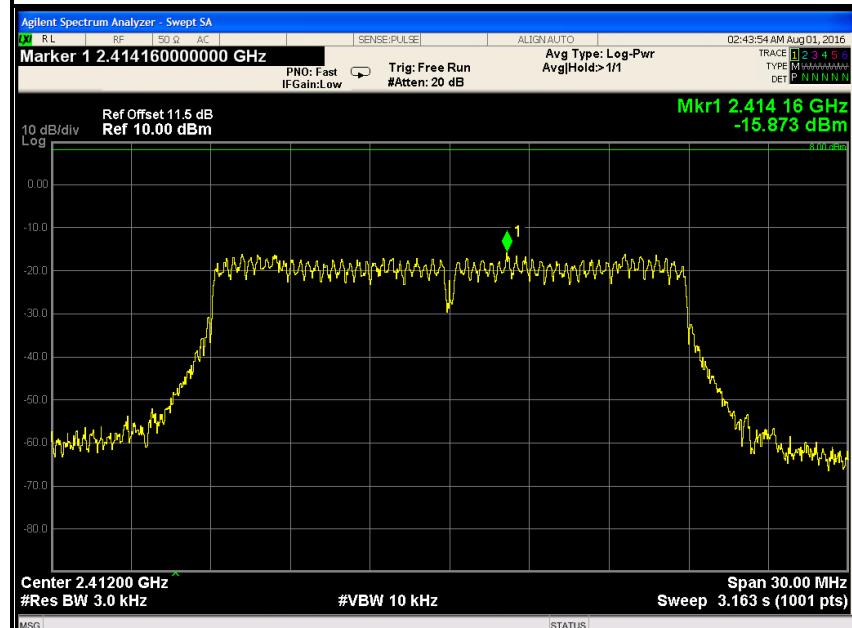
PPSD (CH High)



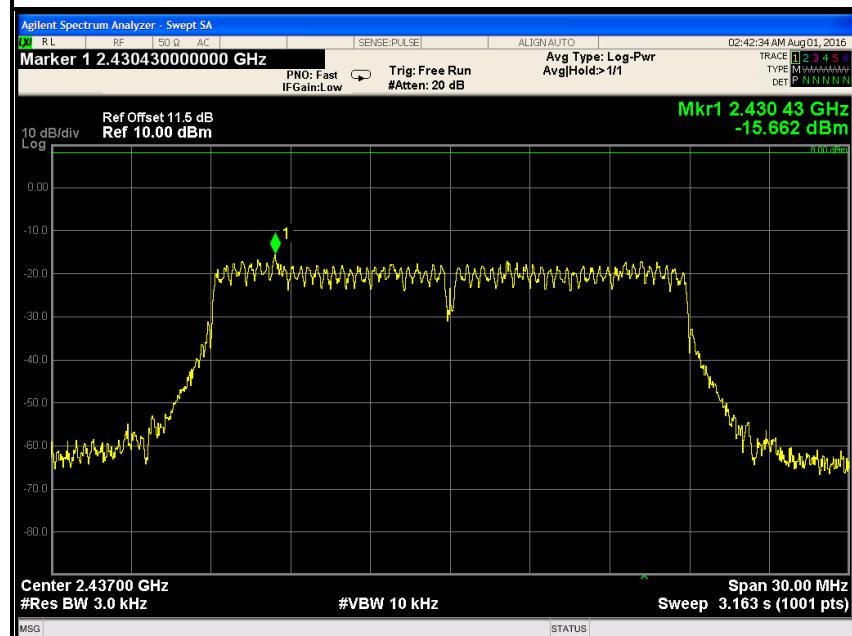


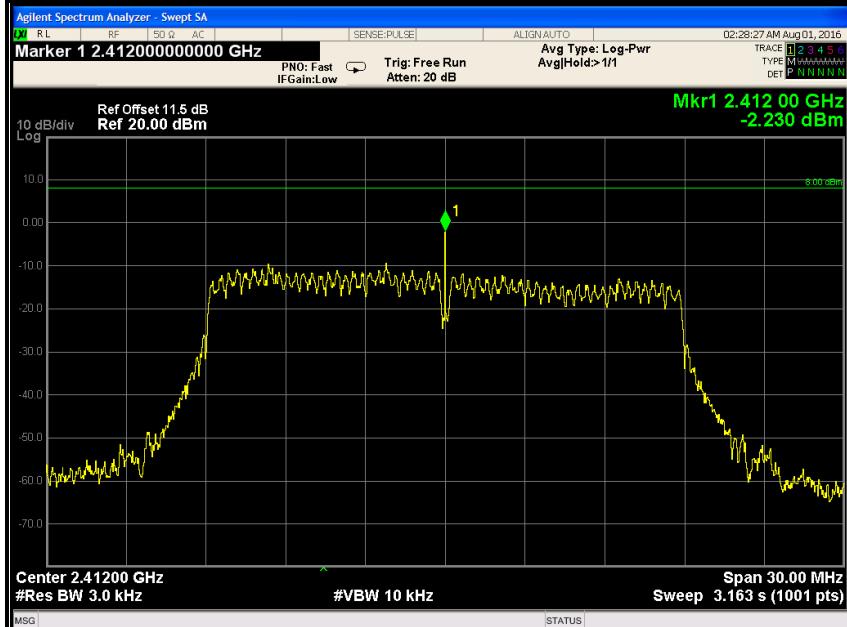
IEEE 802.11n HT20 MHz mode (Antenna 1)

PPSD (CH Low)



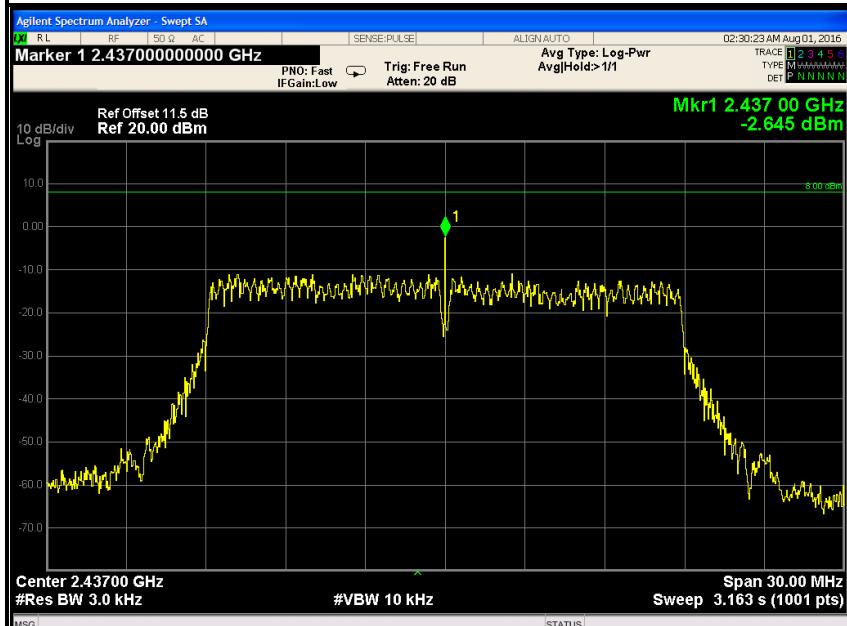
PPSD (CH Mid)



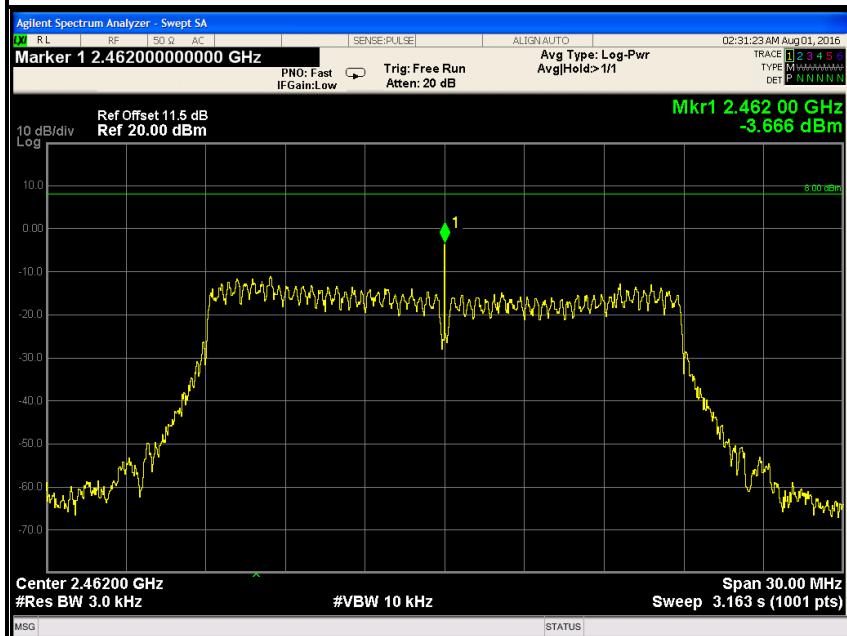
**PPSD (CH High)****IEEE 802.11n HT20 MHz mode (Antenna 2)****PPSD (CH Low)**



PPSD (CH Mid)



PPSD (CH High)



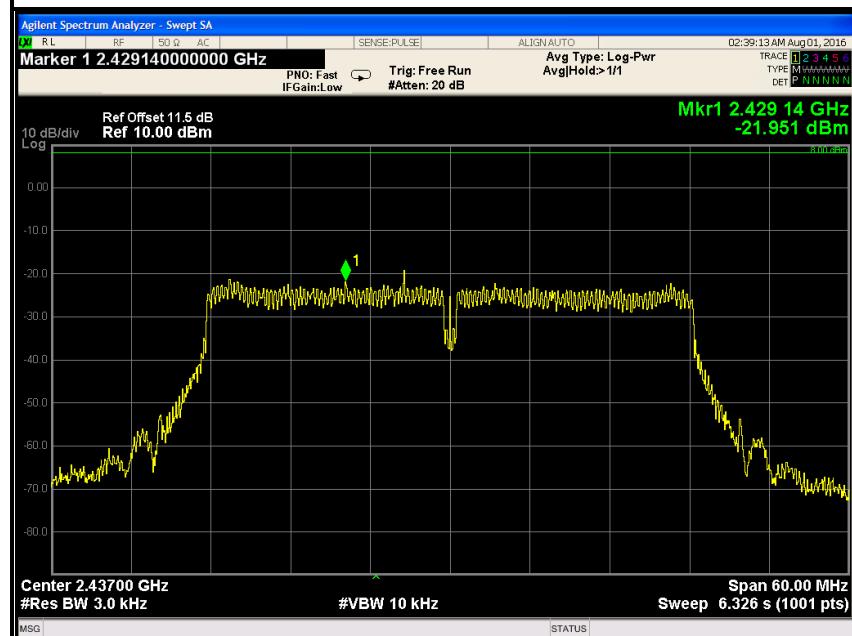


IEEE 802.11n HT40 MHz mode (Antenna 1)

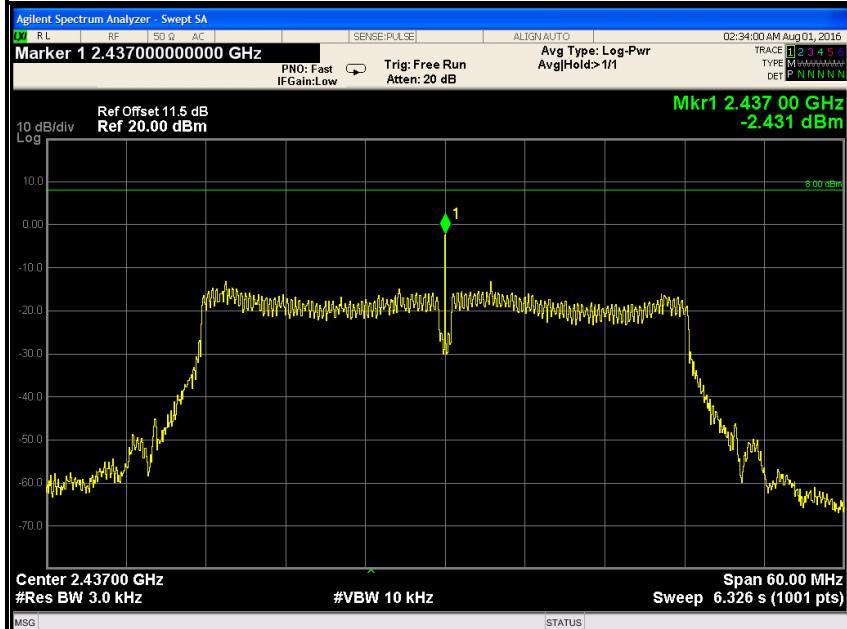
PPSD (CH Low)



PPSD (CH Mid)



**PPSD (CH High)****IEEE 802.11n HT40 MHz mode (Antenna 2)****PPSD (CH Low)**

**PPSD (CH Mid)****PPSD (CH High)**