Test Mode: TX / IEEE 802.11g (CH High) **Tested by:** Darry Wu

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** June 4, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1198.000	48.71	-7.80	40.91	74.00	-33.09	V	Peak
1999.000	50.71	-5.01	45.70	74.00	-28.30	V	Peak
3988.000	43.10	1.54	44.64	74.00	-29.36	V	Peak
4924.000	52.71	4.73	57.44	74.00	-16.56	V	Peak
4924.000	42.18	4.73	46.91	54.00	-7.09	V	AVG
6904.000	41.47	7.54	49.01	74.00	-24.99	V	Peak
7957.000	42.08	9.57	51.65	74.00	-22.35	V	Peak
1495.000	48.23	-6.89	41.34	74.00	-32.66	H	Peak
1729.000	48.31	-6.42	41.89	74.00	-32.11	H	Peak
1954.000	50.10	-5.29	44.81	74.00	-29.19	H	Peak
4024.000	42.63	1.67	44.30	74.00	-29.70	H	Peak
4933.000	53.60	4.76	58.36	74.00	-15.64	H	Peak
4933.000	40.75	4.76	45.51	54.00	-8.49	H	AVG
7273.000	41.34	8.23	49.57	74.00	-24.43	H	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Test Mode: TX / IEEE 802.11n HT20 MHz (CH Low) **Tested by:** Darry Wu

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** June 4, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1099.000	49.24	-8.18	41.06	74.00	-32.94	V	Peak
1603.000	47.90	-6.69	41.21	74.00	-32.79	V	Peak
1999.000	50.37	-5.01	45.36	74.00	-28.64	V	Peak
3799.000	43.53	0.74	44.27	74.00	-29.73	V	Peak
4825.000	47.47	4.41	51.88	74.00	-22.12	V	Peak
7444.000	41.12	8.57	49.69	74.00	-24.31	V	Peak
1495.000	48.60	-6.89	41.71	74.00	-32.29	H	Peak
1747.000	47.93	-6.38	41.55	74.00	-32.45	H	Peak
1999.000	48.93	-5.01	43.92	74.00	-30.08	H	Peak
4339.000	42.66	2.78	45.44	74.00	-28.56	H	Peak
4825.000	49.92	4.41	54.33	74.00	-19.67	H	Peak
4825.000	38.32	4.41	42.73	54.00	-11.27	H	AVG
7138.000	41.46	7.97	49.43	74.00	-24.57	H	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Test Mode: TX / IEEE 802.11n HT20 MHz (CH Mid) **Tested by:** Darry Wu

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** June 4, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1612.000	50.66	-6.67	43.99	74.00	-30.01	V	Peak
1999.000	50.68	-5.01	45.67	74.00	-28.33	V	Peak
3061.000	44.20	-1.26	42.94	74.00	-31.06	V	Peak
4870.000	50.71	4.56	55.27	74.00	-18.73	V	Peak
4870.000	41.05	4.56	45.61	54.00	-8.39	V	AVG
6517.000	41.65	6.92	48.57	74.00	-25.43	V	Peak
7282.000	41.15	8.25	49.40	74.00	-24.60	V	Peak
1162.000	48.42	-7.94	40.48	74.00	-33.52	H	Peak
1738.000	48.96	-6.40	42.56	74.00	-31.44	H	Peak
1999.000	48.95	-5.01	43.94	74.00	-30.06	H	Peak
4546.000	43.91	3.50	47.41	74.00	-26.59	H	Peak
4870.000	53.12	4.56	57.68	74.00	-16.32	H	Peak
4870.000	40.72	4.56	45.28	54.00	-8.72	H	AVG
8173.000	41.25	9.55	50.80	74.00	-23.20	H	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Test Mode: TX / EEE 802.11n HT20 MHz (CH High) **Tested by:** Darry Wu

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** June 4, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1099.000	48.79	-8.18	40.61	74.00	-33.39	V	Peak
1504.000	48.18	-6.87	41.31	74.00	-32.69	V	Peak
1999.000	54.29	-5.01	49.28	74.00	-24.72	V	Peak
4924.000	52.18	4.73	56.91	74.00	-17.09	V	Peak
4924.000	42.53	4.73	47.26	54.00	-6.74	V	AVG
6076.000	41.70	6.20	47.90	74.00	-26.10	V	Peak
7516.000	40.47	8.71	49.18	74.00	-24.82	V	Peak
1495.000	47.59	-6.89	40.70	74.00	-33.30	H	Peak
1999.000	48.73	-5.01	43.72	74.00	-30.28	H	Peak
4267.000	42.74	2.53	45.27	74.00	-28.73	H	Peak
4933.000	53.64	4.76	58.40	74.00	-15.60	H	Peak
4933.000	43.66	4.76	48.42	54.00	-5.58	H	AVG
5662.000	41.86	5.94	47.80	74.00	-26.20	H	Peak
8038.000	41.74	9.63	51.37	74.00	-22.63	H	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Test Mode: TX / IEEE 802.11n HT40 MHz (CH Low) **Tested by:** Darry Wu

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** June 4, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1495.000	47.82	-6.89	40.93	74.00	-33.07	V	Peak
1990.000	50.16	-5.06	45.10	74.00	-28.90	V	Peak
3331.000	44.97	-0.80	44.17	74.00	-29.83	V	Peak
4843.000	46.13	4.47	50.60	74.00	-23.40	V	Peak
6697.000	41.40	7.21	48.61	74.00	-25.39	V	Peak
7192.000	42.39	8.07	50.46	74.00	-23.54	V	Peak
1495.000	48.25	-6.89	41.36	74.00	-32.64	H	Peak
1990.000	48.38	-5.06	43.32	74.00	-30.68	H	Peak
2539.000	45.60	-2.19	43.41	74.00	-30.59	H	Peak
3331.000	44.40	-0.80	43.60	74.00	-30.40	H	Peak
4852.000	49.09	4.50	53.59	74.00	-20.41	H	Peak
4852.000	38.75	4.50	43.25	54.00	-10.75	H	AVG
7930.000	41.49	9.51	51.00	74.00	-23.00	H	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Test Mode: TX / IEEE 802.11n HT40 MHz (CH Mid) **Tested by:** Darry Wu

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** June 4, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1099.000	48.79	-8.18	40.61	74.00	-33.39	V	Peak
1495.000	48.40	-6.89	41.51	74.00	-32.49	V	Peak
1999.000	50.47	-5.01	45.46	74.00	-28.54	V	Peak
4879.000	47.22	4.59	51.81	74.00	-22.19	V	Peak
5833.000	42.30	6.01	48.31	74.00	-25.69	V	Peak
6490.000	41.56	6.87	48.43	74.00	-25.57	V	Peak
1495.000	48.56	-6.89	41.67	74.00	-32.33	H	Peak
1990.000	49.77	-5.06	44.71	74.00	-29.29	H	Peak
3754.000	43.54	0.55	44.09	74.00	-29.91	H	Peak
4879.000	48.18	4.59	52.77	74.00	-21.23	H	Peak
4879.000	41.09	4.59	45.68	54.00	-8.32	H	AVG
7156.000	41.46	8.00	49.46	74.00	-24.54	H	Peak
8110.000	41.24	9.59	50.83	74.00	-23.17	H	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

Test Mode: TX / EEE 802.11n HT40 MHz (CH High) **Tested by:** Darry Wu

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** June 4, 2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1495.000	48.85	-6.89	41.96	74.00	-32.04	V	Peak
1990.000	50.06	-5.06	45.00	74.00	-29.00	V	Peak
4906.000	48.17	4.67	52.84	74.00	-21.16	V	Peak
4906.000	41.37	4.67	46.04	54.00	-7.96	V	AVG
5662.000	41.42	5.94	47.36	74.00	-26.64	V	Peak
7093.000	41.84	7.88	49.72	74.00	-24.28	V	Peak
7723.000	41.55	9.11	50.66	74.00	-23.34	V	Peak
1504.000	49.23	-6.87	42.36	74.00	-31.64	H	Peak
1999.000	48.86	-5.01	43.85	74.00	-30.15	H	Peak
3088.000	44.16	-1.21	42.95	74.00	-31.05	H	Peak
4906.000	49.55	4.67	54.22	74.00	-19.78	H	Peak
4906.000	44.04	4.67	48.71	54.00	-5.29	H	AVG
6472.000	41.66	6.84	48.50	74.00	-25.50	H	Peak
7966.000	41.28	9.58	50.86	74.00	-23.14	H	Peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

7.3. 6dB BANDWIDTH MEASUREMENT

7.3.1. LIMITS

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz. The minimum 6 dB bandwidth shall be at least 500 kHz.

7.3.2. TEST INSTRUMENTS

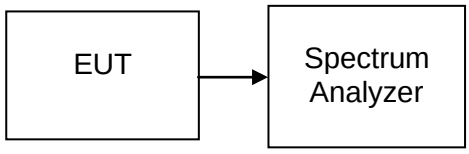
Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Spectrum Analyzer	Agilent	N9010A	MY52221469	01/27/2018	01/26/2019

7.3.3. TEST PROCEDURES (please refer to measurement standard)

8.2 Option 2:

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW ≥ 3 RBW, peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.

7.3.4. TEST SETUP



7.3.5. TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	9097	>500	PASS
Mid	2437	9065		PASS
High	2462	9101		PASS

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	16390	>500	PASS
Mid	2437	16410		PASS
High	2462	16410		PASS

Test mode: IEEE 802.11n HT20 MHz

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	17570	>500	PASS
Mid	2437	17570		PASS
High	2462	17560		PASS

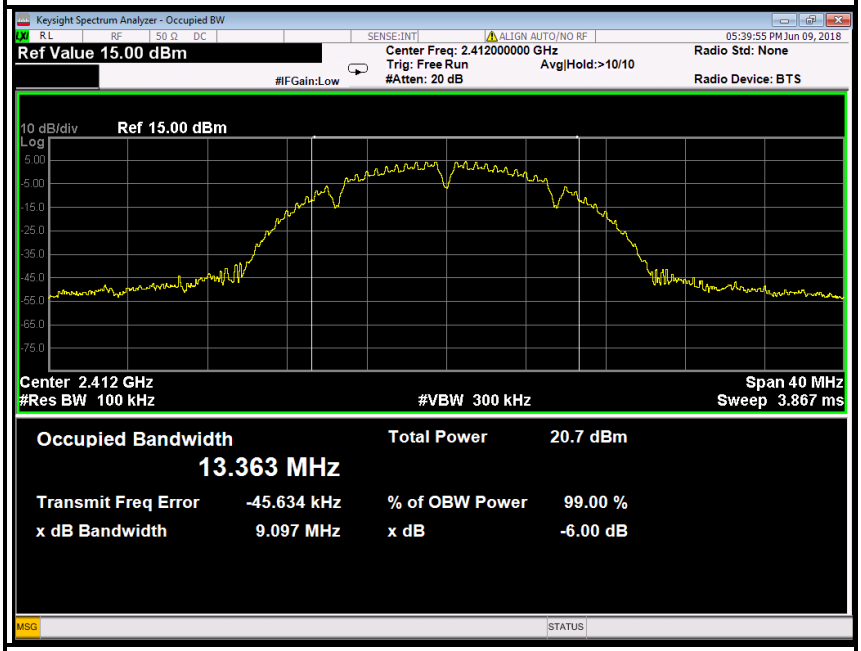
Test mode: IEEE 802.11n HT40 MHz

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2422	36080	>500	PASS
Mid	2437	36110		PASS
High	2452	36120		PASS

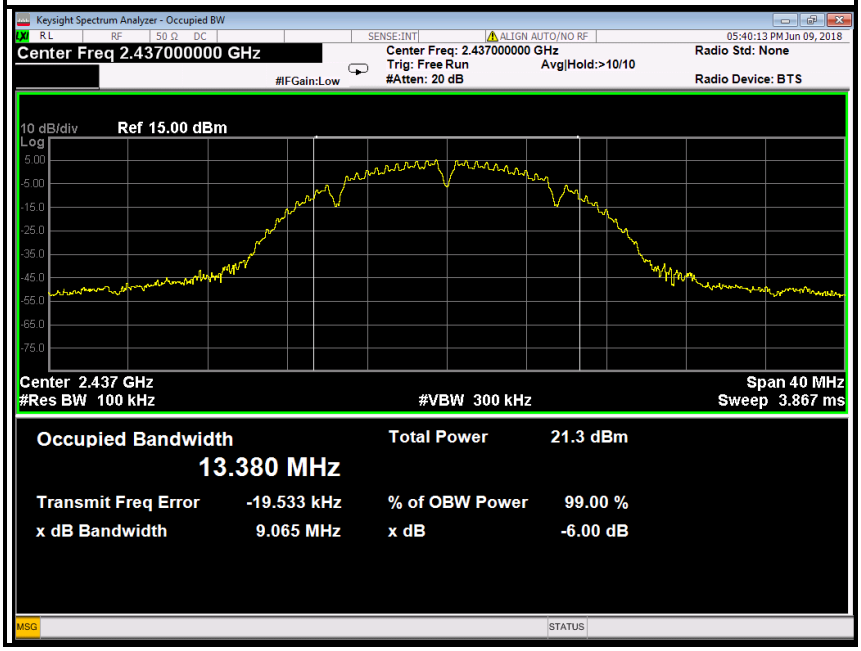
Test Plot

IEEE 802.11b mode

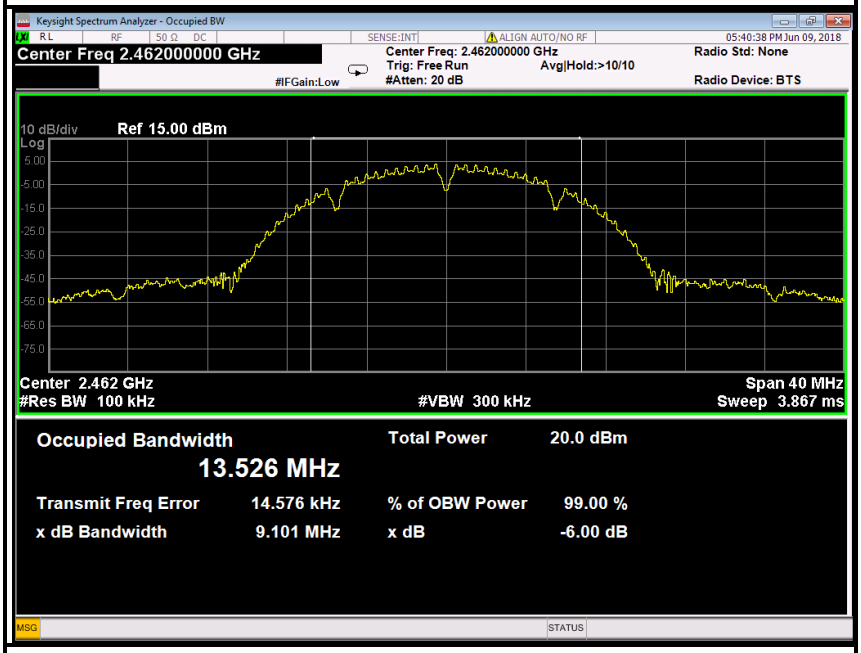
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

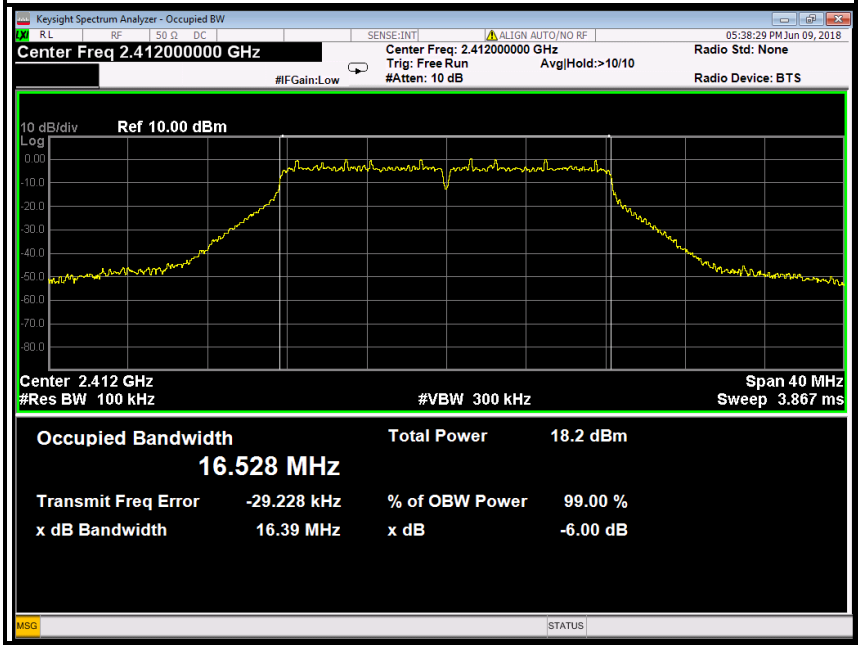


6dB Bandwidth (CH High)

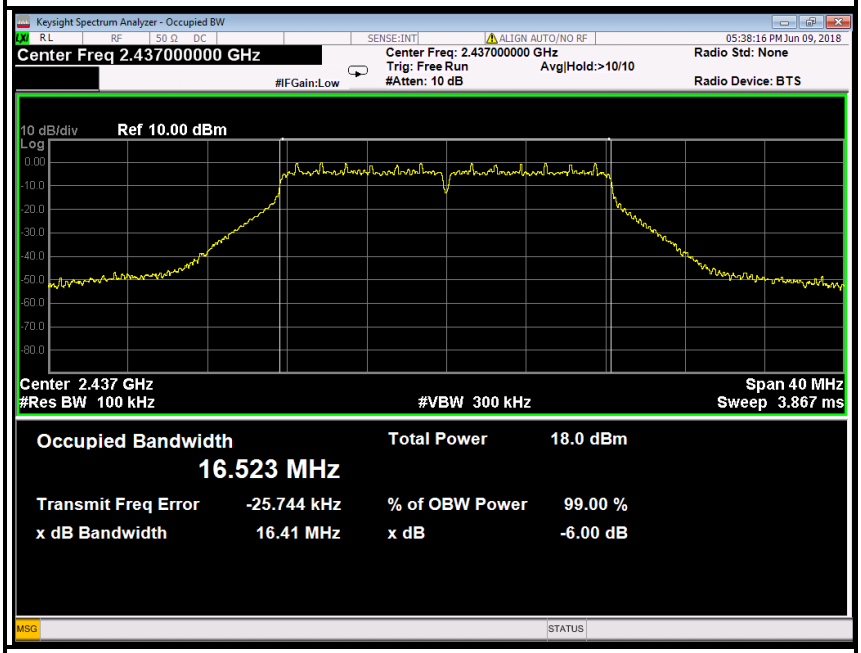


IEEE 802.11g mode

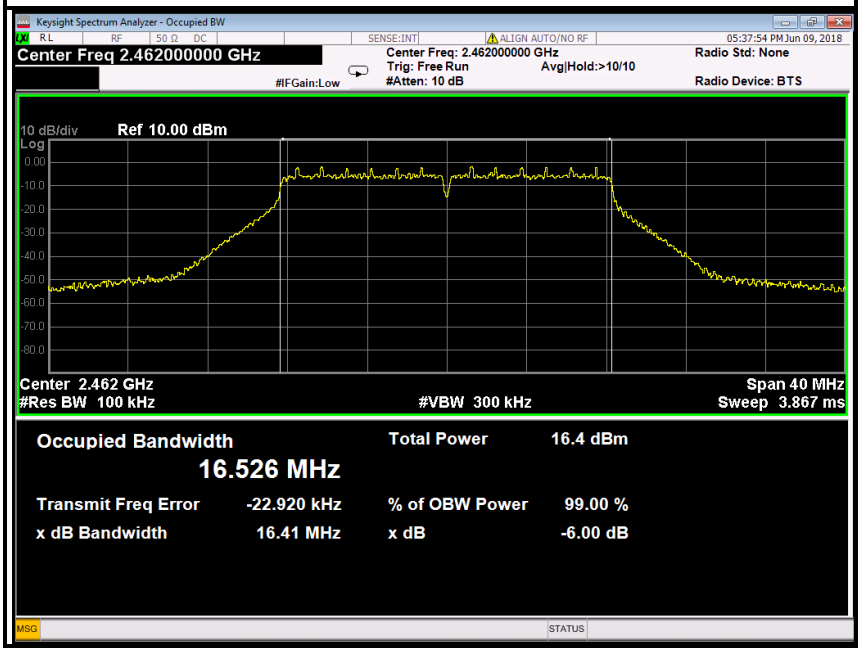
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

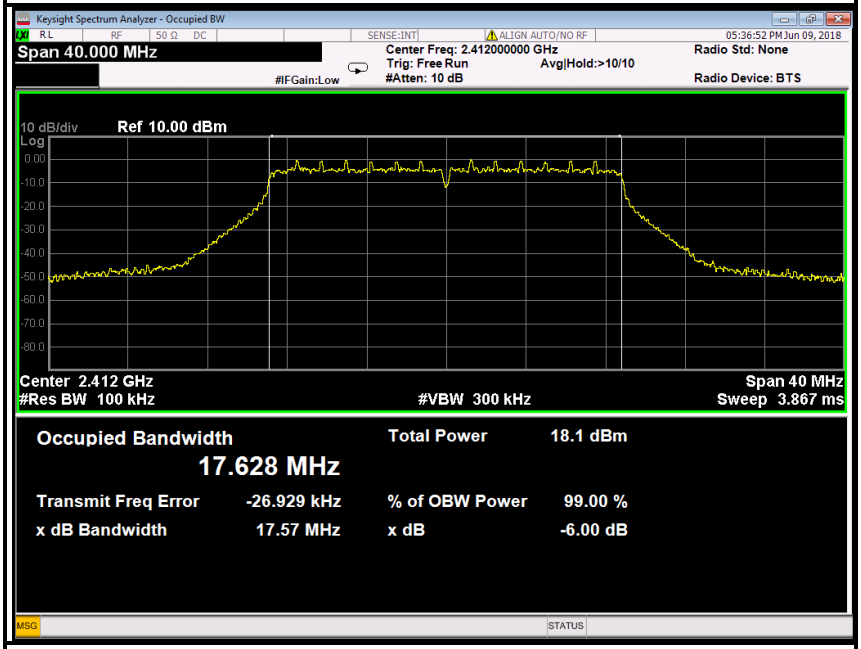


6dB Bandwidth (CH High)

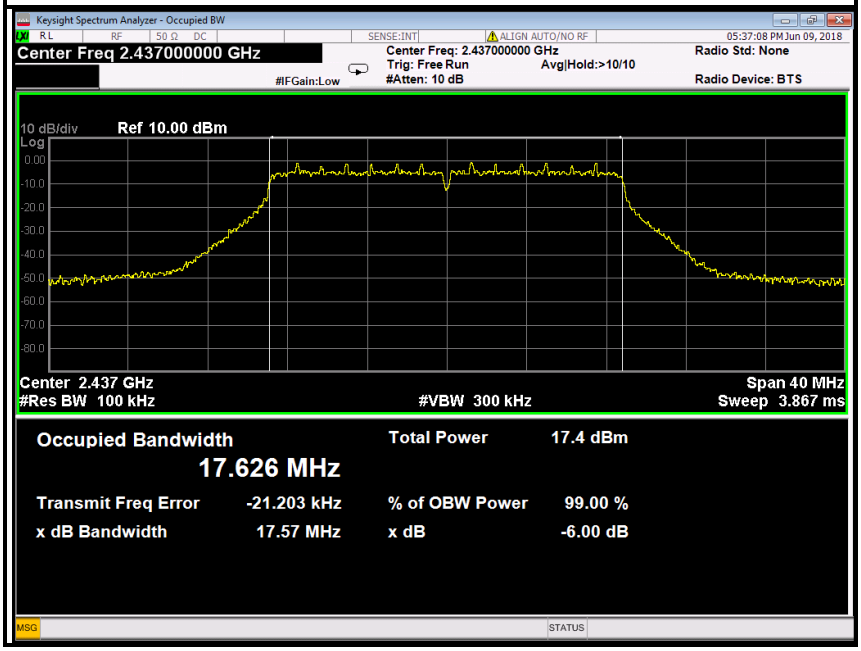


IEEE 802.11n HT20 MHz mode

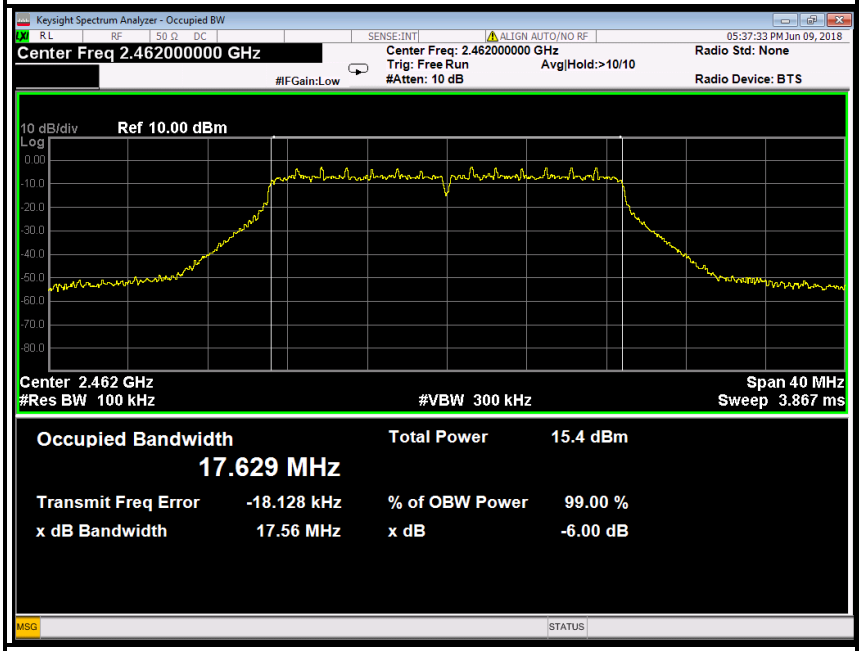
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)

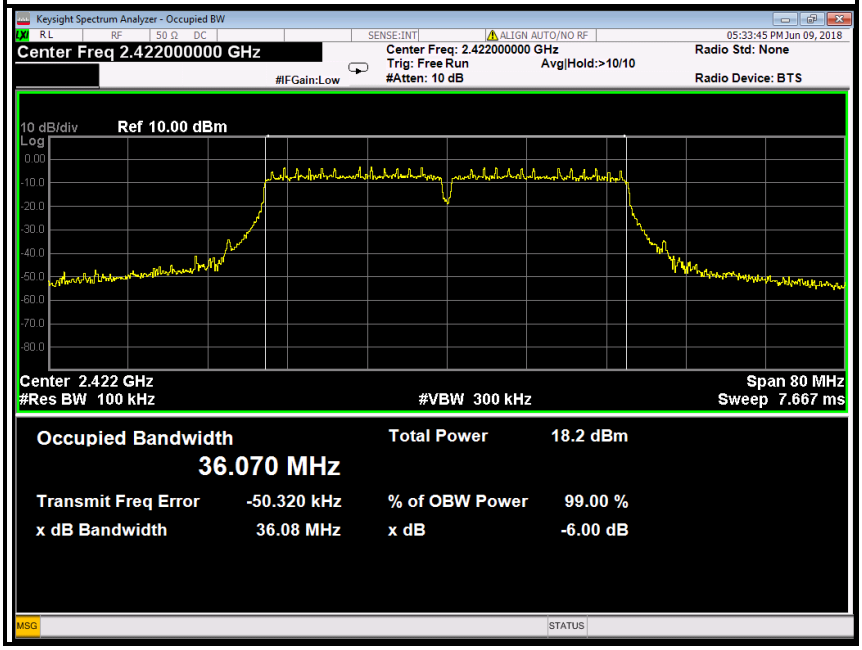


6dB Bandwidth (CH High)

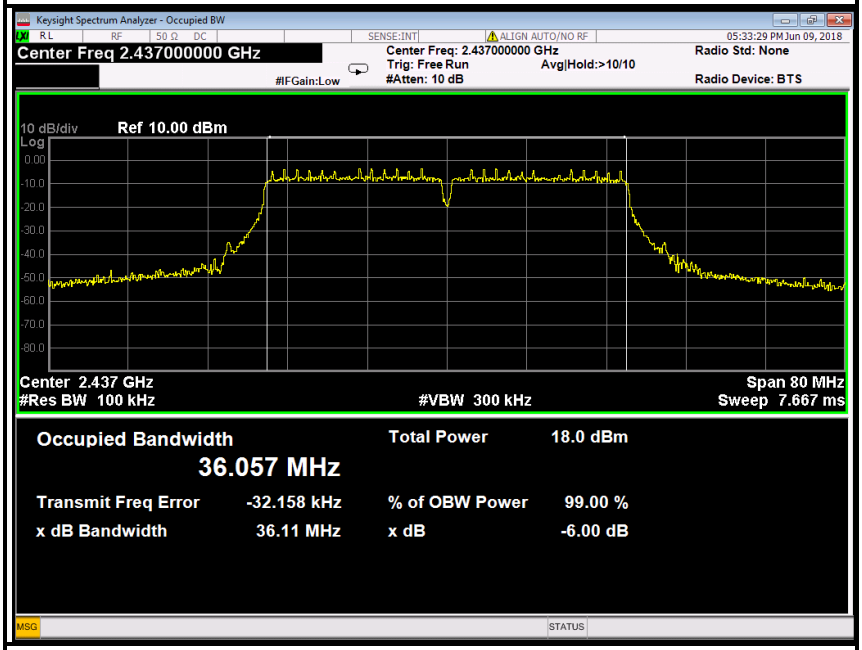


IEEE 802.11n HT40 MHz mode

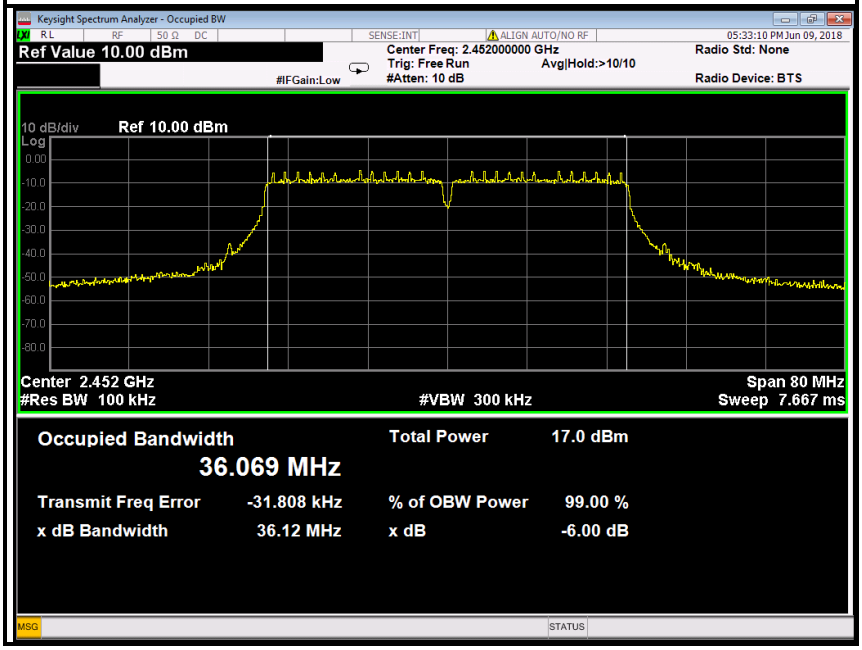
6dB Bandwidth (CH Low)



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

T_{nom}	V_{nom}	Lowest channel 2412MHz	Middle channel 2437MHz	Highest channel 2462MHz
Conducted power [dBm/MHz] Measured with DSSS modulation		16.42	15.43	16.69
Radiated power [dBm/MHz] Measured with DSSS modulation		16.32	15.31	16.55
Gain [dBi] Calculated		-0.10	-0.12	-0.14
Measurement uncertainty		± 1.5 dB (cond.) / ± 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	02/21/2018	02/20/2019
Power Sensor	Anritsu	MA2411B	1126150	02/21/2018	02/20/2019

7.5.3. TEST PROCEDURES (please refer to measurement standard)

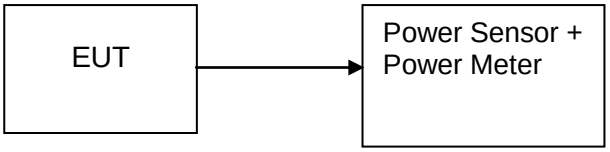
9.1.1 RBW ≥ *DTS bandwidth*

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 ≥ *DTS bandwidth*.
b) Set VBW ≥ 3 RBW.
c) Set span ≥ 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.

9.1.3 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



7.5.5. TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	16.42	0.04385	Peak	1	PASS
Mid	2437	15.43	0.03491			PASS
High	2462	16.69	0.04667			PASS
Low	2412	14.08	0.02559	AVG	1	PASS
Mid	2437	13.08	0.02032			PASS
High	2462	14.21	0.02636			PASS

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	19.18	0.08279	Peak	1	PASS
Mid	2437	19.22	0.08356			PASS
High	2462	18.70	0.07413			PASS
Low	2412	10.40	0.01096	AVG	1	PASS
Mid	2437	10.38	0.01091			PASS
High	2462	9.64	0.00920			PASS

Test mode: IEEE 802.11n HT20 MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	19.43	0.08770	Peak	1	PASS
Mid	2437	19.35	0.08610			PASS
High	2462	17.71	0.05902			PASS
Low	2412	9.10	0.00813	AVG	1	PASS
Mid	2437	8.61	0.00726			PASS
High	2462	7.57	0.00571			PASS

Test mode: IEEE 802.11n HT40 MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2422	19.64	0.09204	Peak	1	PASS
Mid	2437	19.33	0.08570			PASS
High	2452	18.22	0.06637			PASS
Low	2422	10.02	0.01005	AVG	1	PASS
Mid	2437	9.91	0.00979			PASS
High	2452	8.81	0.00760			PASS

7.6. BAND EDGES MEASUREMENT

7.6.1. LIMITS

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

7.6.2. TEST INSTRUMENTS

Radiated Emission Test Site 966（2）					
Name of Equipment	**Manufacturer**	**Model Number**	**Serial Number**	**Last Calibration**	**Due Calibration**
PSA Series Spectrum Analyzer	Agilent	N9010A	MY52221469	01/27/2018	01/26/2019
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/21/2018	02/20/2019
Amplifier	EMEC	EM330	060661	03/18/2018	03/17/2019
High Noise Amplifier	Agilent	8449B	3008A01838	02/21/2018	02/20/2019
Loop Antenna	COM-POWER	AL-130	121044	09/25/2017	09/24/2018
Bilog Antenna	SCHAFFNER	CBL6143	5082	02/21/2018	02/20/2019
Horn Antenna	SCHWARZBECK	BBHA9120	D286	02/27/2018	02/27/2019
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	02/27/2018	02/27/2019
Turn Table	N/A	N/A	N/A	N.C.R	N.C.R
Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R
Controller	Sunol Sciences	SC104V	022310-1	N.C.R	N.C.R
Controller	CT	N/A	N/A	N.C.R	N.C.R
Temp. / Humidity Meter	Anymetre	JR913	N/A	01/29/2018	01/28/2019
Test S/W	FARAD	LZ-RF / CCS-SZ-3A2			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

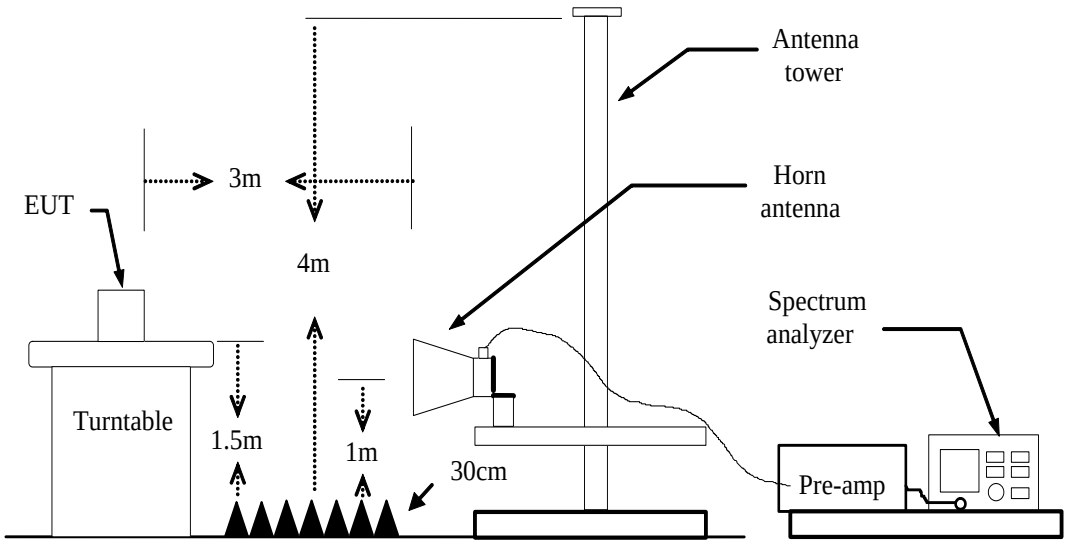
2. The FCC Site Registration number is 101879.

3. N.C.R = No Calibration Required.

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=1/T / Sweep=AUTO / Detector=PEAK
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

7.6.4. TEST SETUP



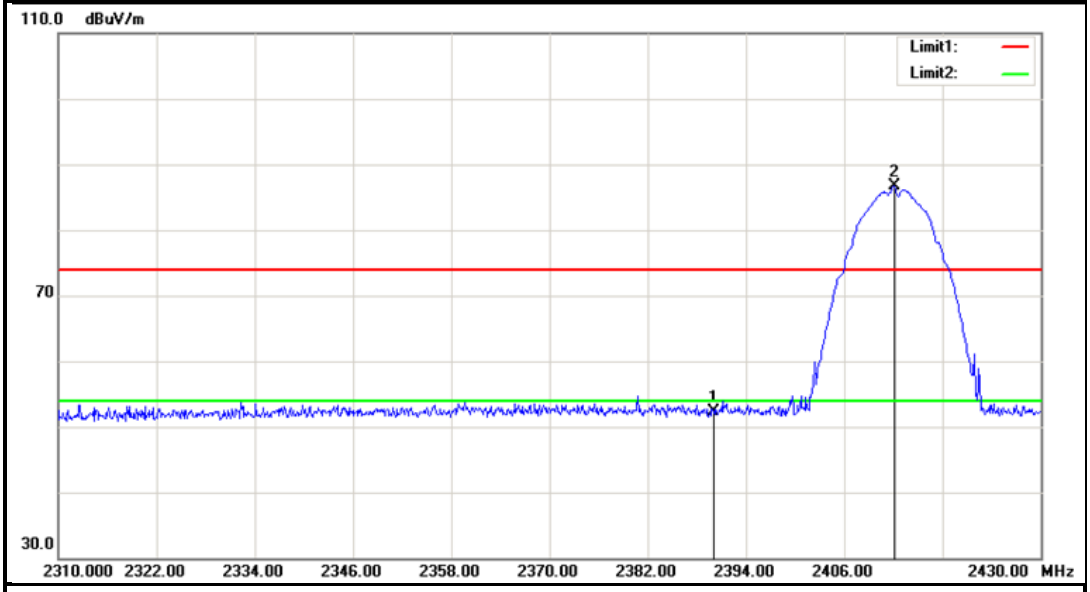
7.6.5. TEST RESULTS

Test Plot

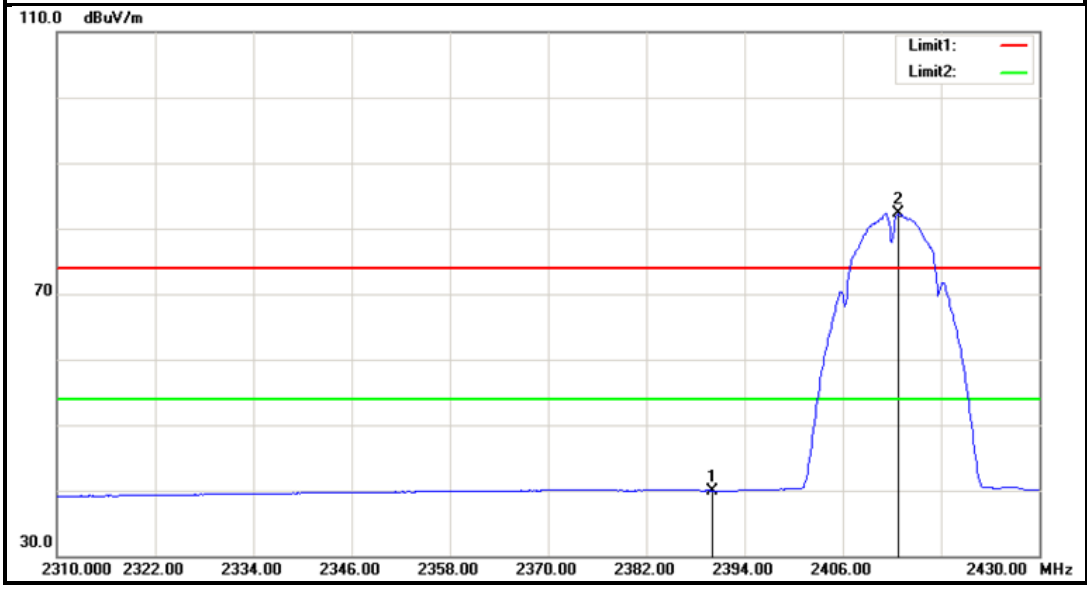
IEEE 802.11b mode

Band Edges (CH Low)

Detector mode: Peak **Polarity: Vertical**

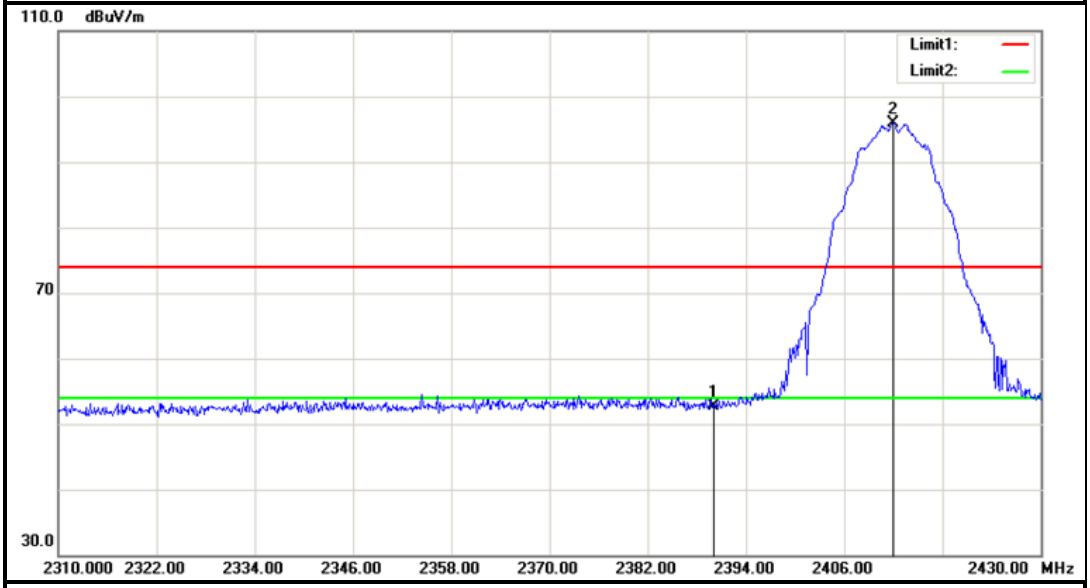


Detector mode: Average **Polarity: Vertical**

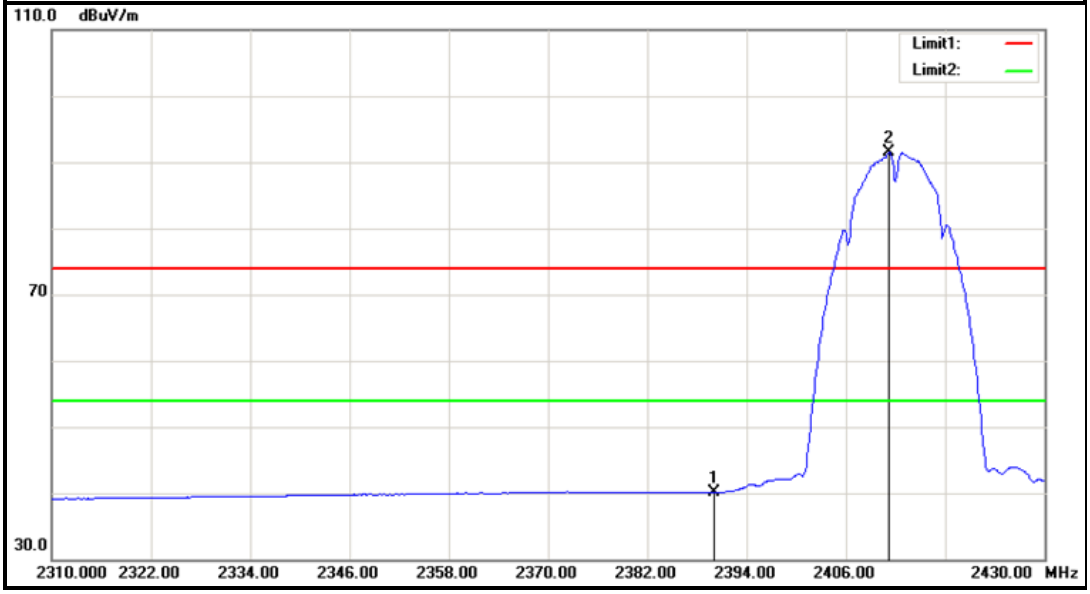


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	55.19	-2.86	52.33	74.00	-21.67	Peak	Vertical
2.	2412.120	89.42	-2.74	86.68	---	---	Peak	Vertical
1.	2390.000	42.84	-2.86	39.98	54.00	-14.02	Average	Vertical
2.	2412.720	85.00	-2.74	82.26	---	---	Average	Vertical

Detector mode: Peak **Polarity: Horizontal**



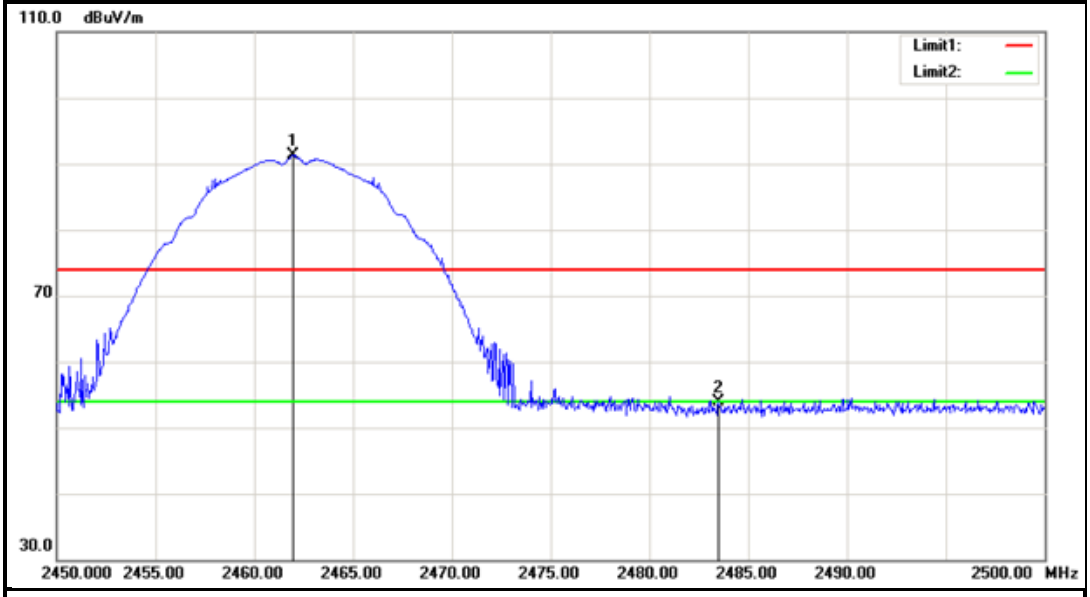
Detector mode: Average **Polarity: Horizontal**



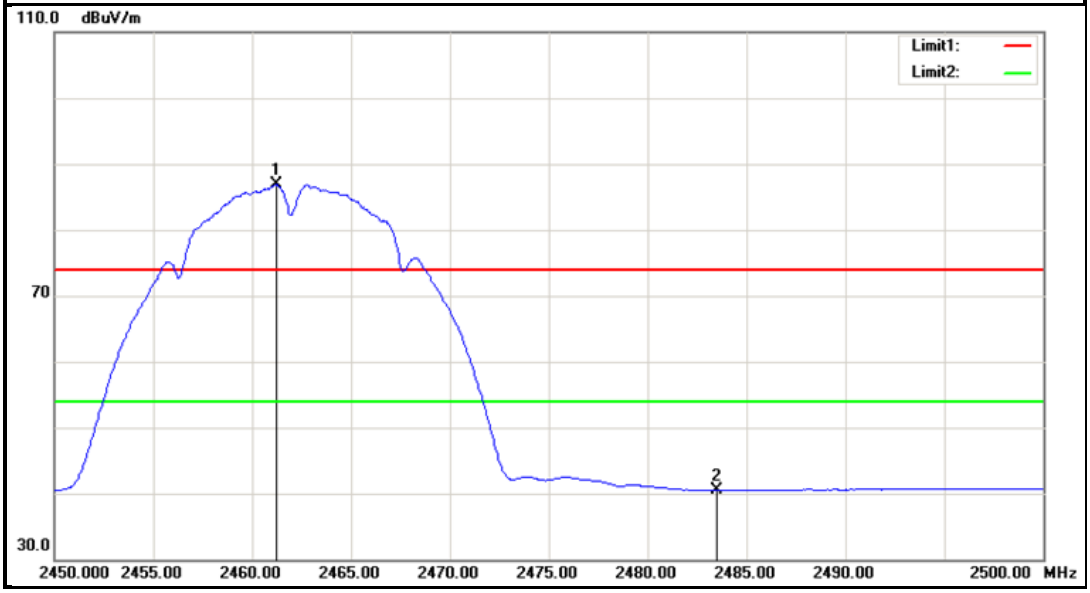
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	55.66	-2.86	52.80	74.00	-21.20	Peak	Horizontal
2.	2412.000	98.70	-2.74	95.96	---	---	Peak	Horizontal
1.	2390.000	42.96	-2.86	40.10	54.00	-13.90	Average	Horizontal
2.	2411.160	94.23	-2.75	91.48	---	---	Average	Horizontal

Band Edges (CH High)

Detector mode: Peak **Polarity: Vertical**

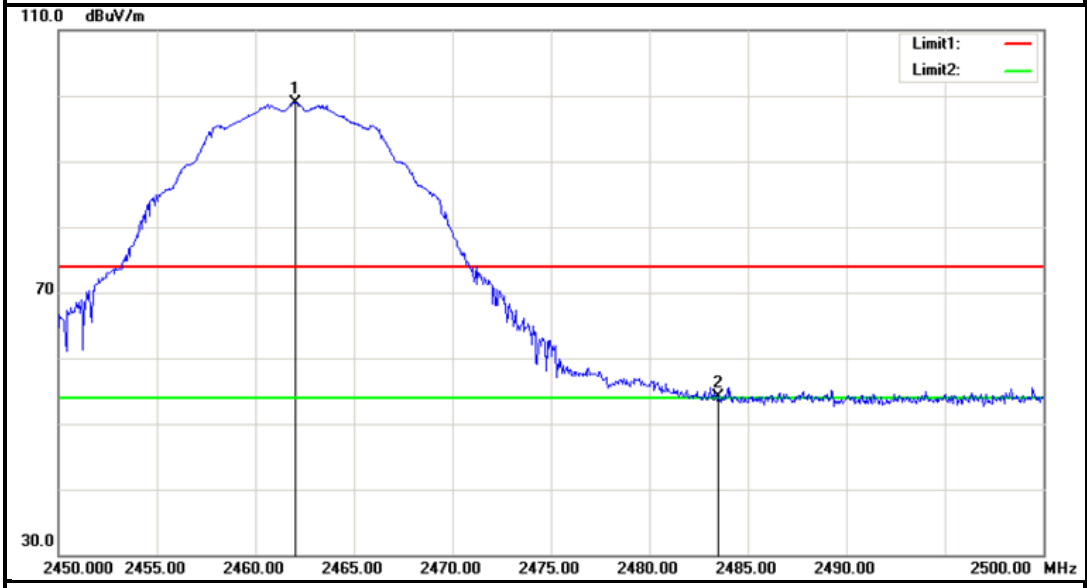


Detector mode: Average **Polarity: Vertical**

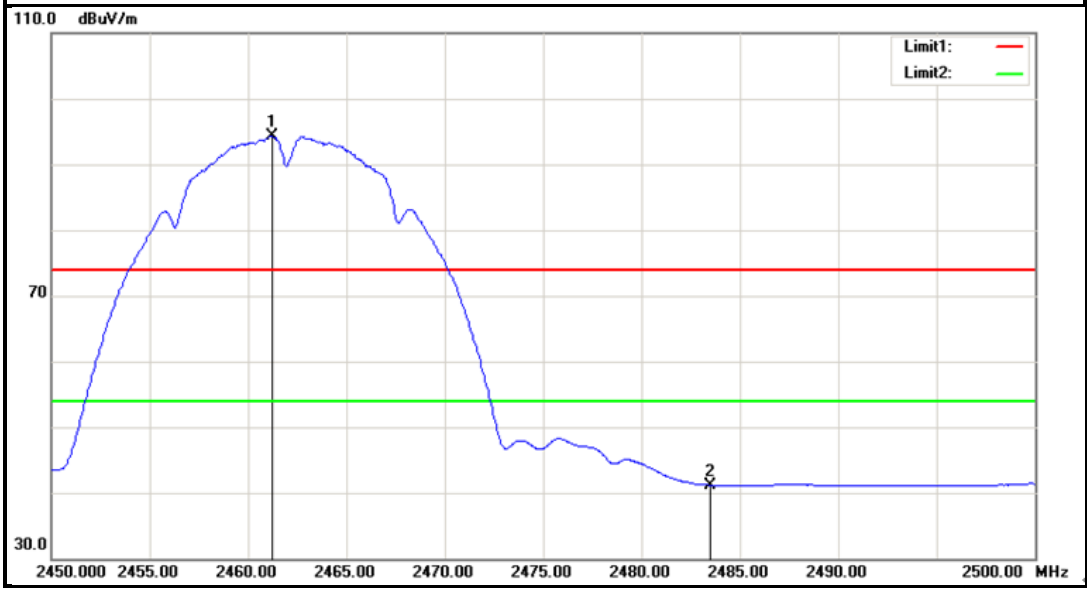


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2461.950	93.75	-2.47	91.28	---	---	Peak	Vertical
2.	2483.500	56.31	-2.35	53.96	74.00	-20.04	Peak	Vertical
1.	2461.250	89.31	-2.47	86.84	---	---	Average	Vertical
2.	2483.500	42.88	-2.35	40.53	54.00	-13.47	Average	Vertical

Detector mode: Peak **Polarity: Horizontal**



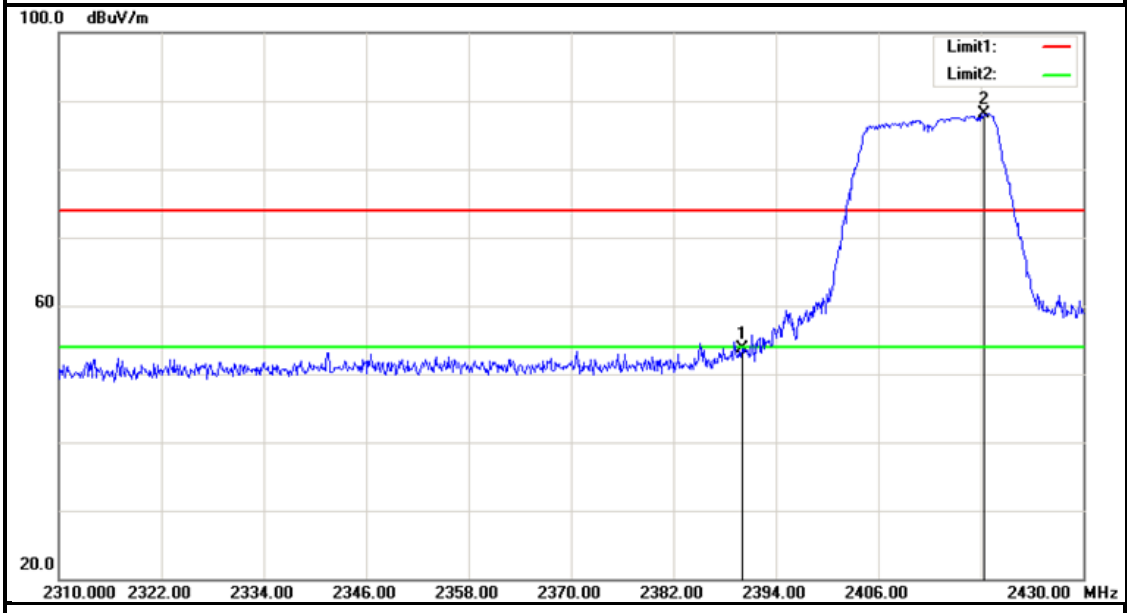
Detector mode: Average **Polarity: Horizontal**



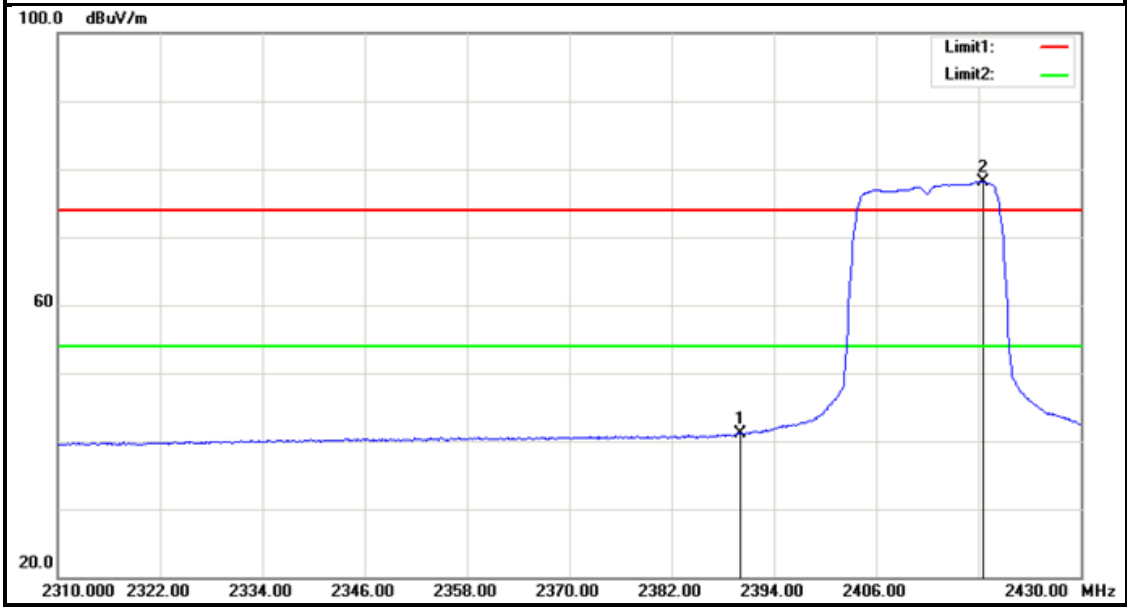
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2462.050	101.42	-2.47	98.95	---	---	Peak	Horizontal
2.	2483.500	56.48	-2.35	54.13	74.00	-19.87	Peak	Horizontal
1.	2461.250	96.82	-2.47	94.35	---	---	Average	Horizontal
2.	2483.500	43.52	-2.35	41.17	54.00	-12.83	Average	Horizontal

IEEE 802.11g mode
Band Edges (CH Low)

Detector mode: Peak **Polarity: Vertical**

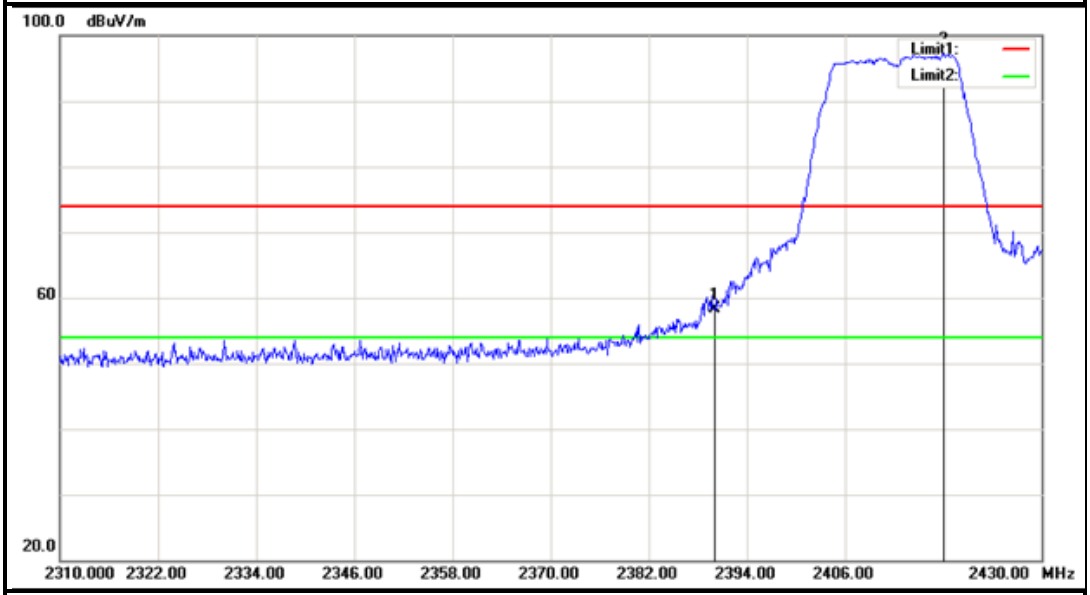


Detector mode: Average **Polarity: Vertical**

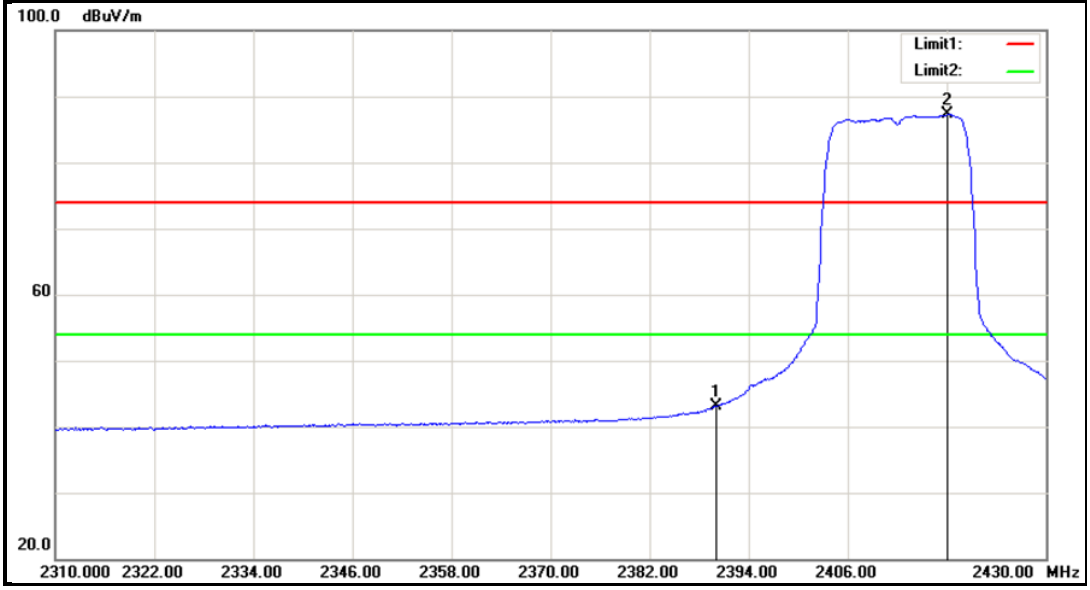


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	56.49	-2.86	53.63	74.00	-20.37	Peak	Vertical
2.	2418.360	90.86	-2.71	88.15	---	---	Peak	Vertical
1.	2390.000	43.89	-2.86	41.03	54.00	-12.97	Average	Vertical
2.	2418.480	80.89	-2.71	78.18	---	---	Average	Vertical

Detector mode: Peak **Polarity: Horizontal**



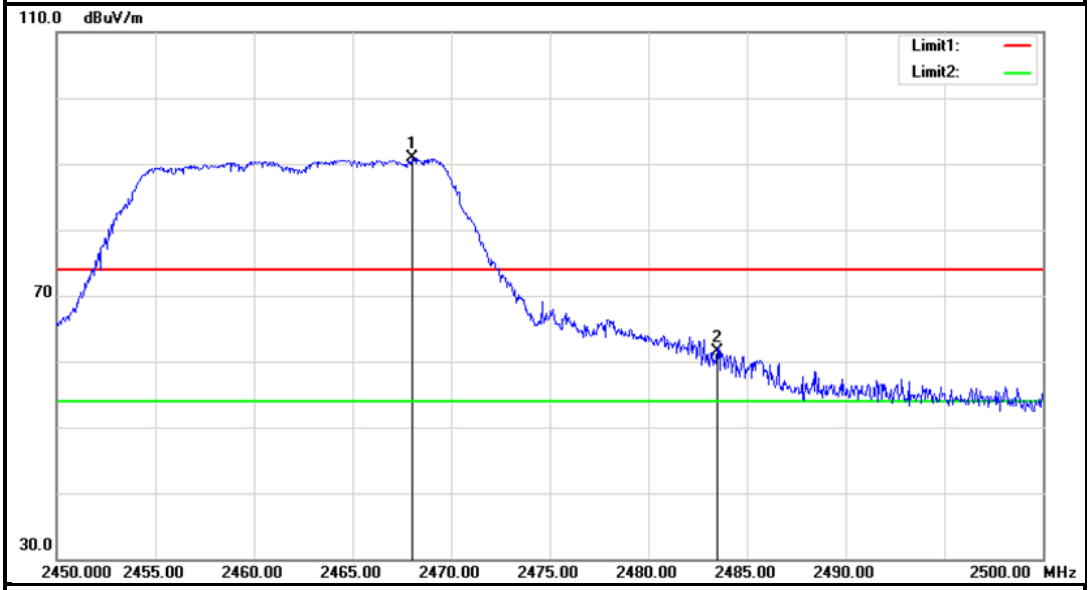
Detector mode: Average **Polarity: Horizontal**



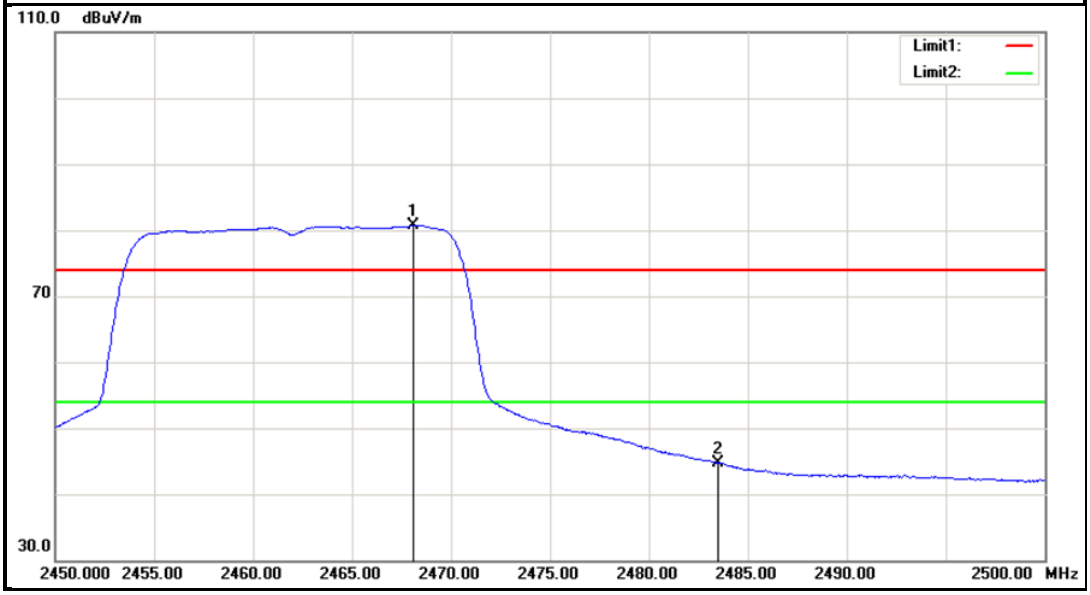
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	61.08	-2.86	58.22	74.00	-15.78	Peak	Horizontal
2.	2418.120	99.98	-2.71	97.27	---	---	Peak	Horizontal
1.	2390.000	45.95	-2.86	43.09	54.00	-10.91	Average	Horizontal
2.	2418.120	89.94	-2.71	87.23	---	---	Average	Horizontal

Band Edges (CH High)

Detector mode: Peak **Polarity: Vertical**

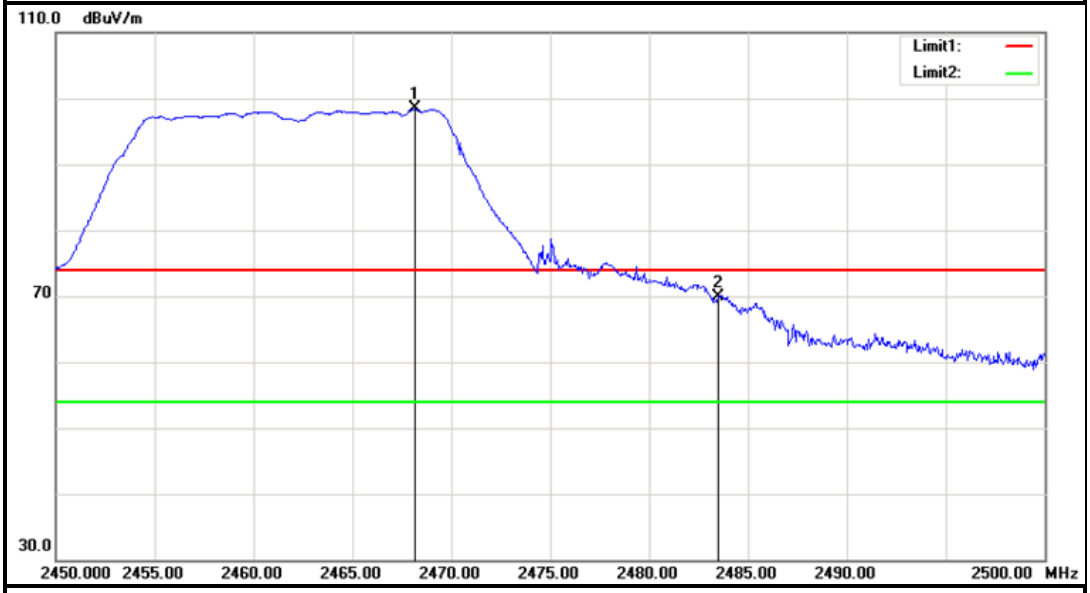


Detector mode: Average **Polarity: Vertical**

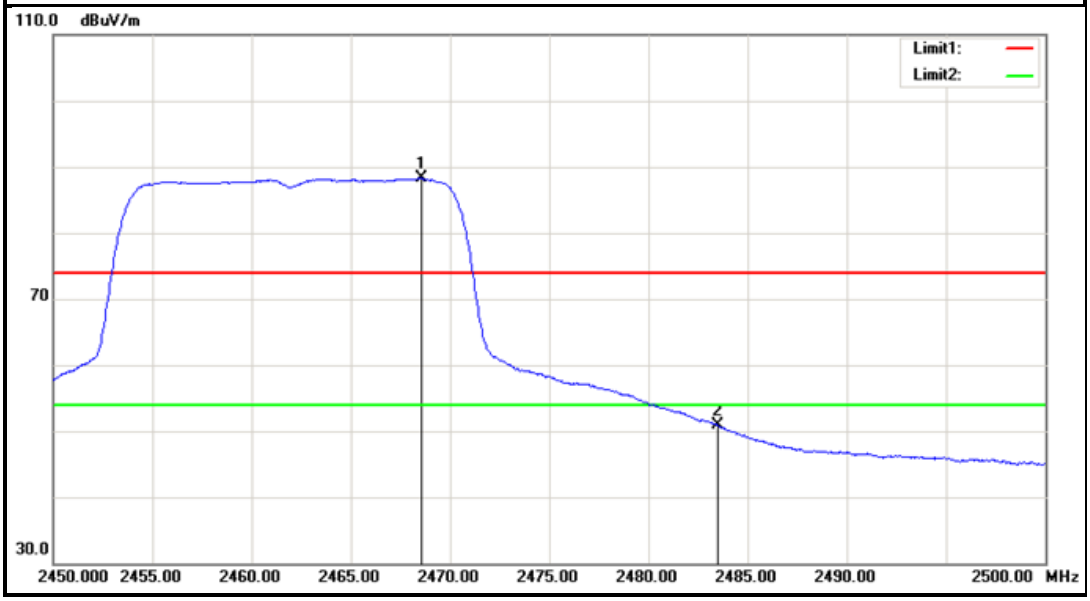


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2468.050	93.40	-2.43	90.97	---	---	Peak	Vertical
2.	2483.500	63.85	-2.35	61.50	74.00	-12.50	Peak	Vertical
1.	2468.100	83.08	-2.43	80.65	---	---	Average	Vertical
2.	2483.500	47.15	-2.35	44.80	54.00	-9.20	Average	Vertical

Detector mode: Peak **Polarity: Horizontal**



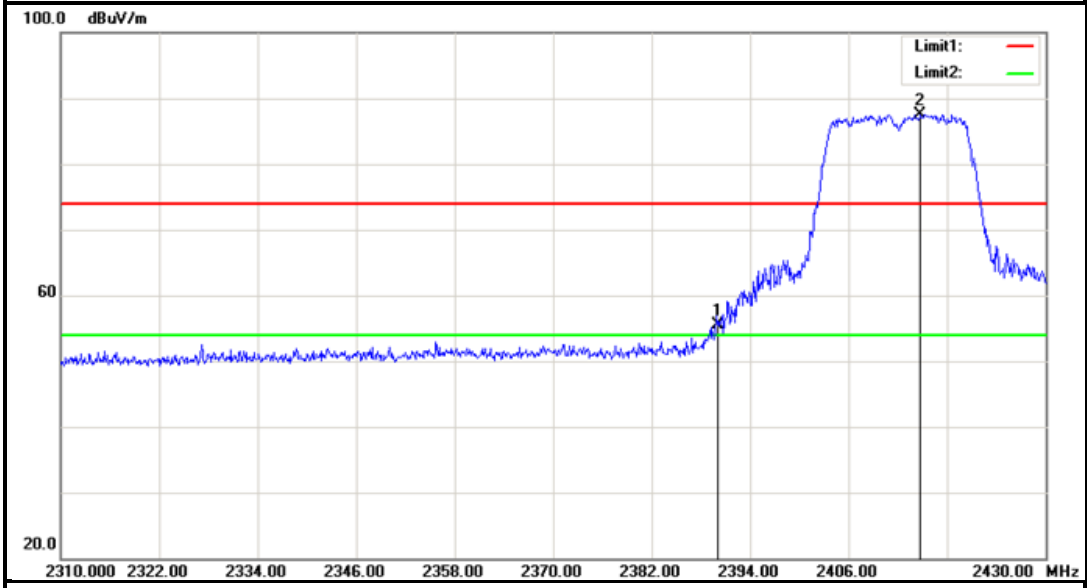
Detector mode: Average **Polarity: Horizontal**



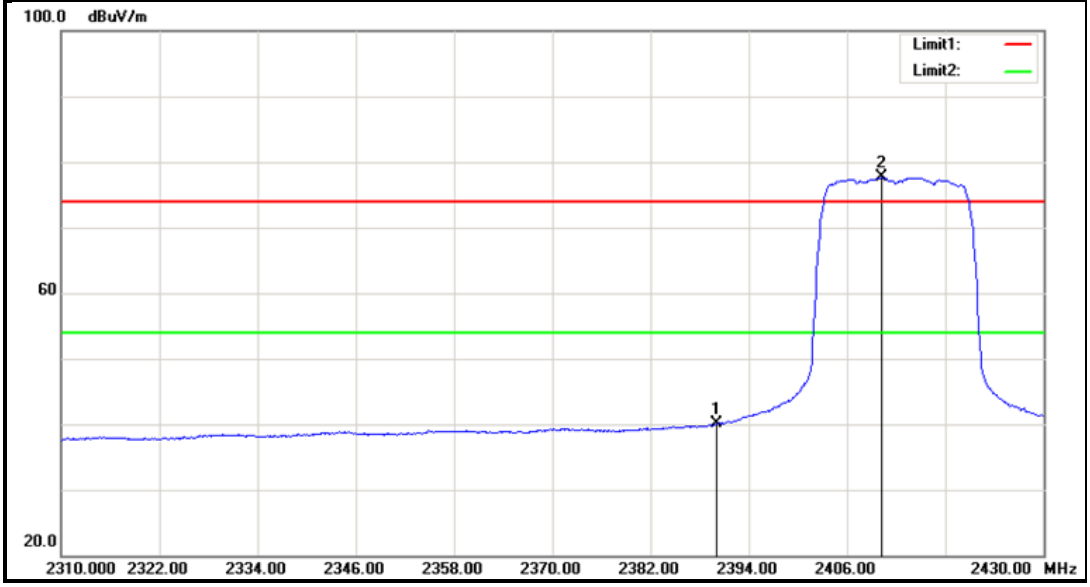
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2468.150	100.85	-2.43	98.42	---	---	Peak	Horizontal
2.	2483.500	72.23	-2.35	69.88	74.00	-4.12	Peak	Horizontal
1.	2468.550	90.66	-2.43	88.23	---	---	Average	Horizontal
2.	2483.500	53.25	-2.35	50.90	54.00	-3.10	Average	Horizontal

IEEE 802.11n HT20 MHz mode
Band Edges (CH Low)

Detector mode: Peak **Polarity: Vertical**

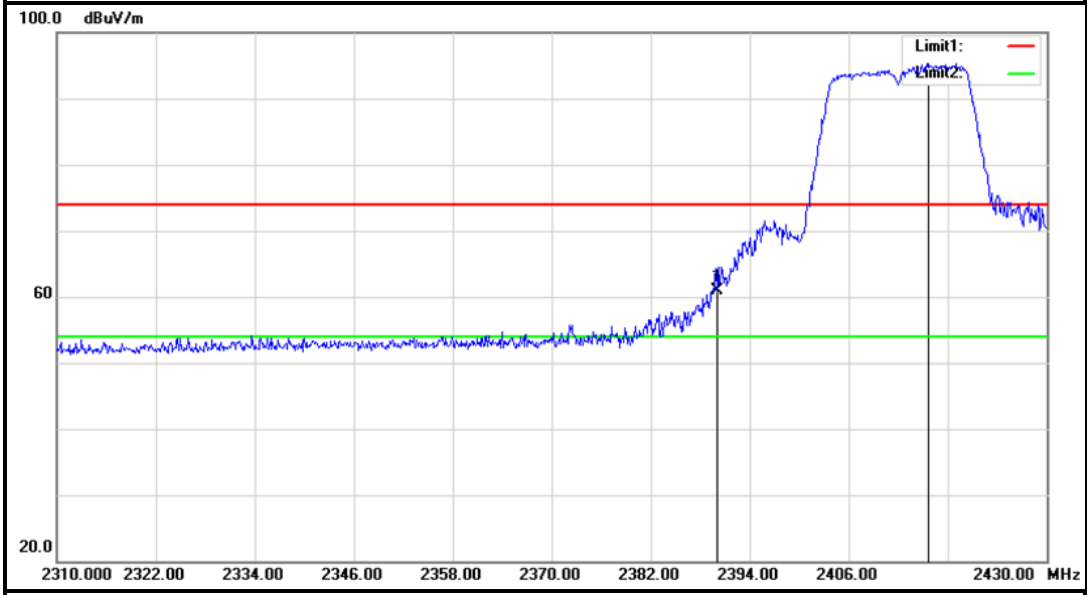


Detector mode: Average **Polarity: Vertical**

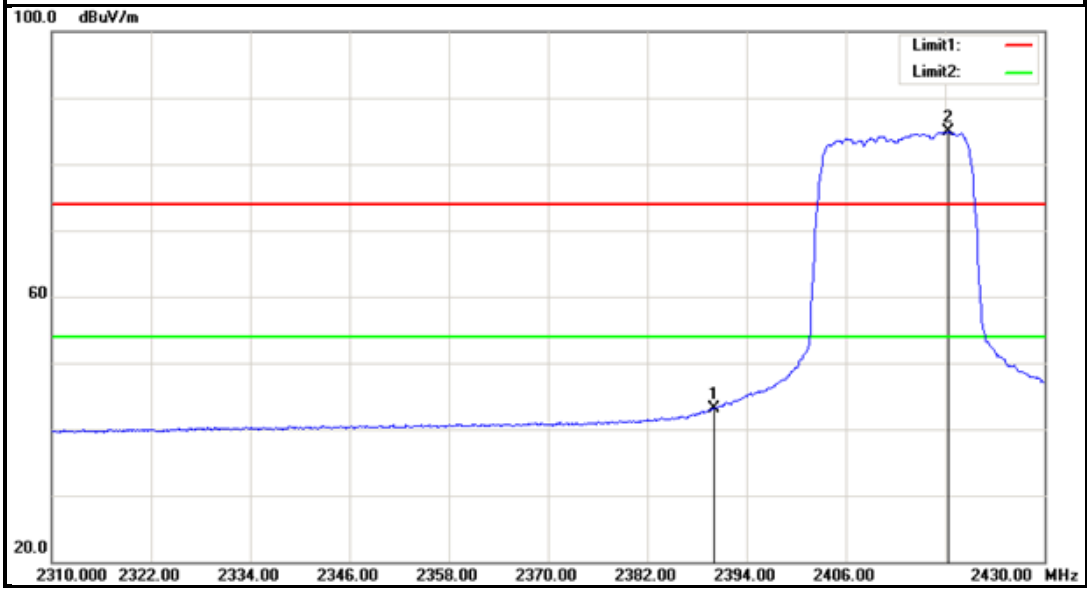


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	58.32	-2.86	55.46	74.00	-18.54	Peak	Vertical
2.	2414.760	90.32	-2.73	87.59	---	---	Peak	Vertical
1.	2390.000	42.87	-2.86	40.01	54.00	-13.99	Average	Vertical
2.	2410.200	80.36	-2.75	77.61	---	---	Average	Vertical

Detector mode: Peak **Polarity: Horizontal**



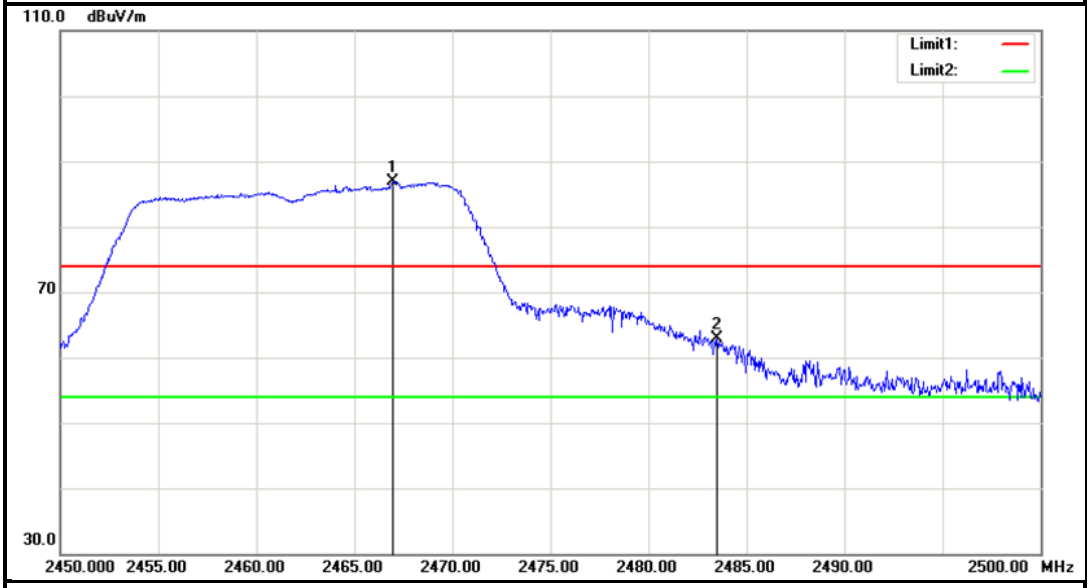
Detector mode: Average **Polarity: Horizontal**



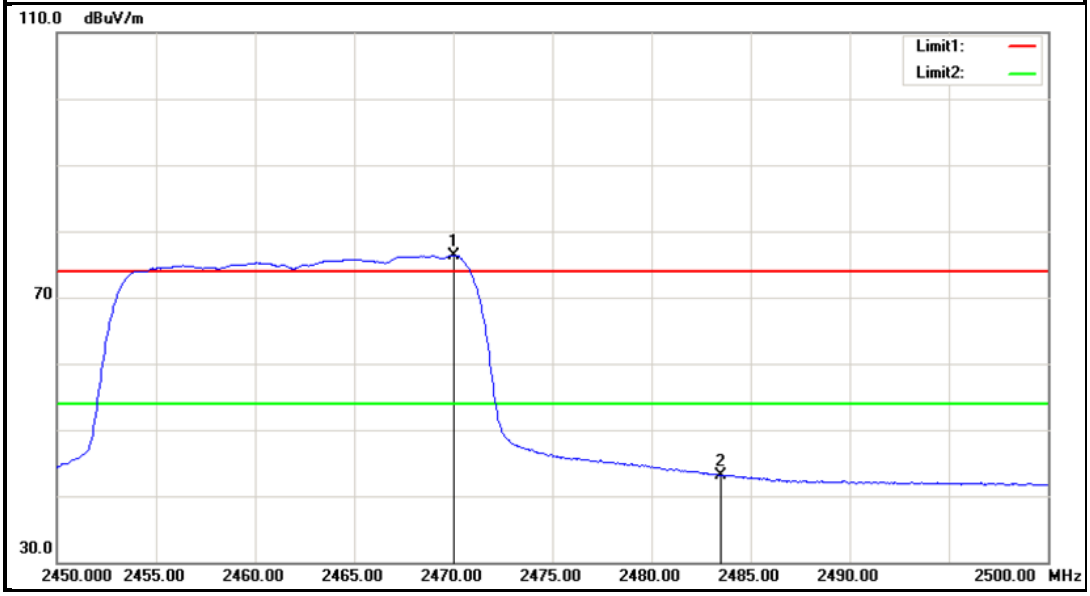
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	63.76	-2.86	60.90	74.00	-13.10	Peak	Horizontal
2.	2415.600	98.02	-2.72	95.30	---	---	Peak	Horizontal
1.	2390.000	46.04	-2.86	43.18	54.00	-10.82	Average	Horizontal
2.	2418.360	87.53	-2.71	84.82	---	---	Average	Horizontal

Band Edges (CH High)

Detector mode: Peak **Polarity: Vertical**

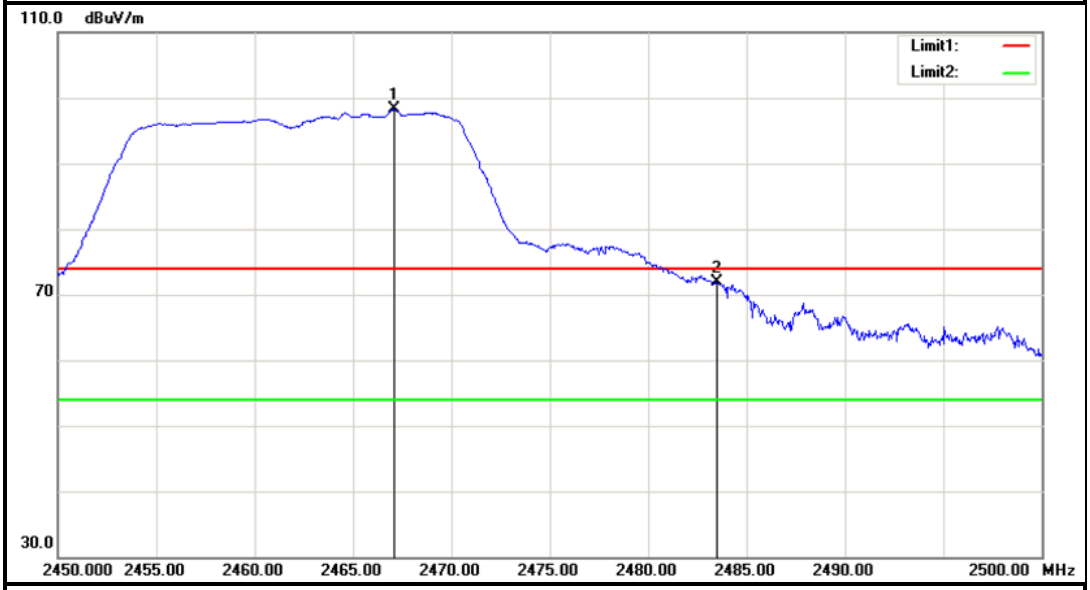


Detector mode: Average **Polarity: Vertical**

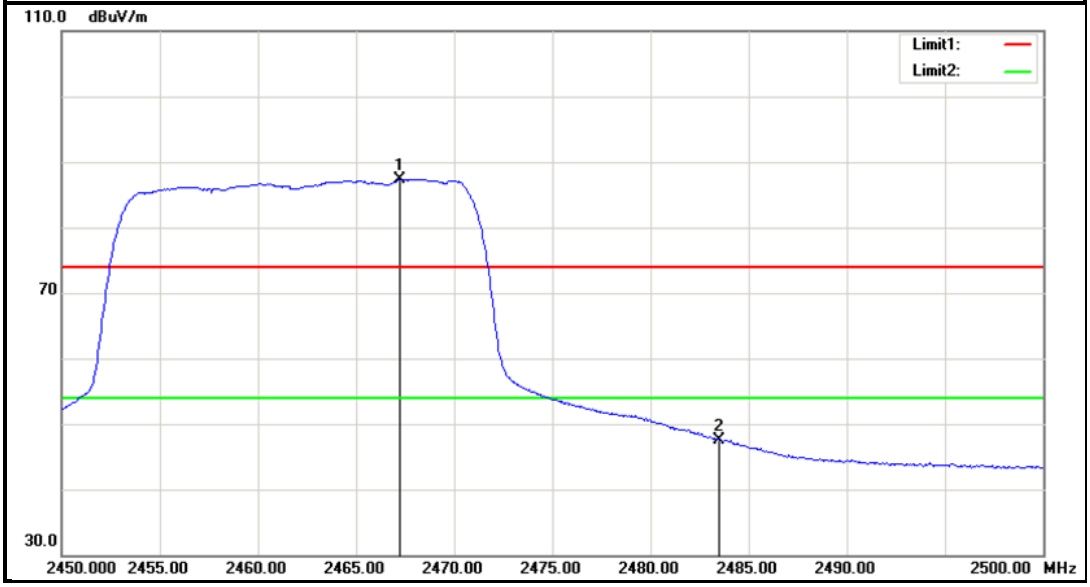


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2466.950	89.29	-2.44	86.85	---	---	Peak	Vertical
2.	2483.500	65.35	-2.35	63.00	74.00	-11.00	Peak	Vertical
1.	2470.050	78.71	-2.42	76.29	---	---	Average	Vertical
2.	2483.500	45.52	-2.35	43.17	54.00	-10.83	Average	Vertical

Detector mode: Peak **Polarity: Horizontal**



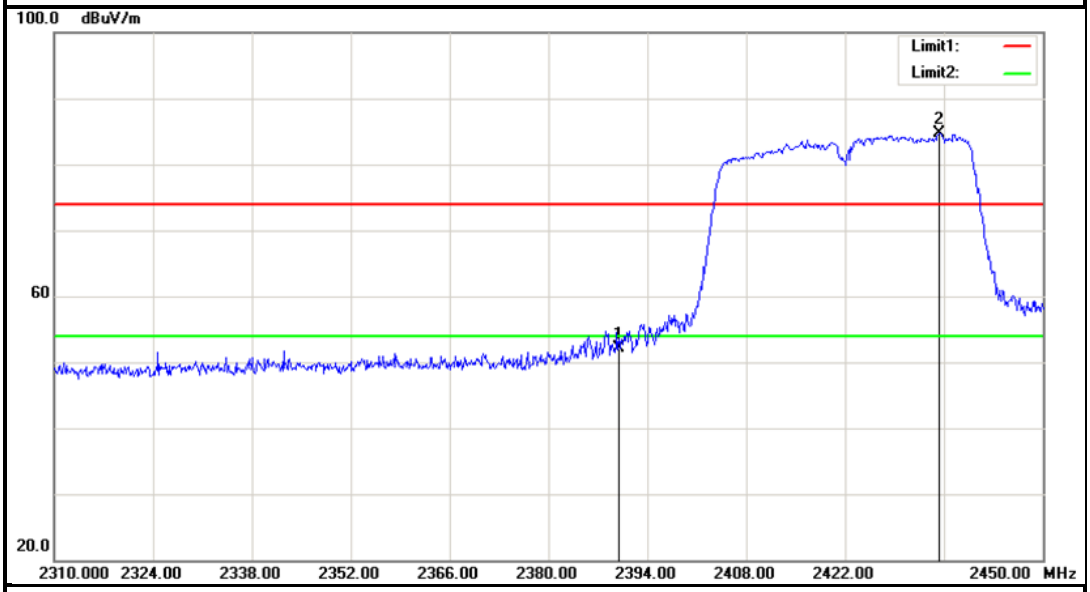
Detector mode: Average **Polarity: Horizontal**



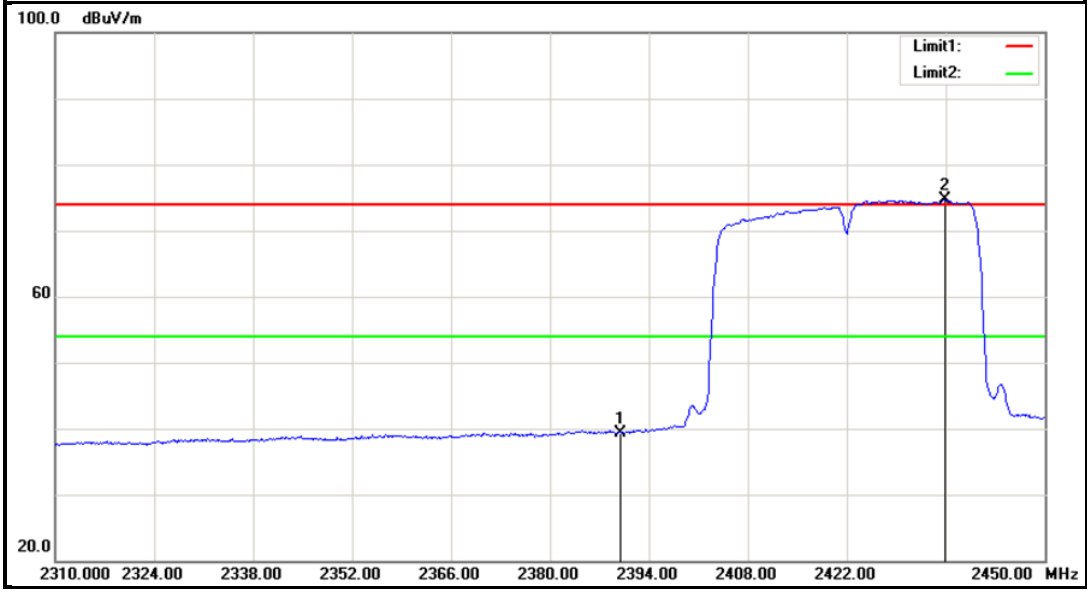
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2467.100	100.66	-2.44	98.22	---	---	Peak	Horizontal
2.	2483.500	74.29	-2.35	71.94	74.00	-2.06	Peak	Horizontal
1.	2467.250	89.74	-2.44	87.30	---	---	Average	Horizontal
2.	2483.500	49.78	-2.35	47.43	54.00	-6.57	Average	Horizontal

IEEE 802.11n HT40 MHz mode
Band Edges (CH Low)

Detector mode: Peak **Polarity: Vertical**

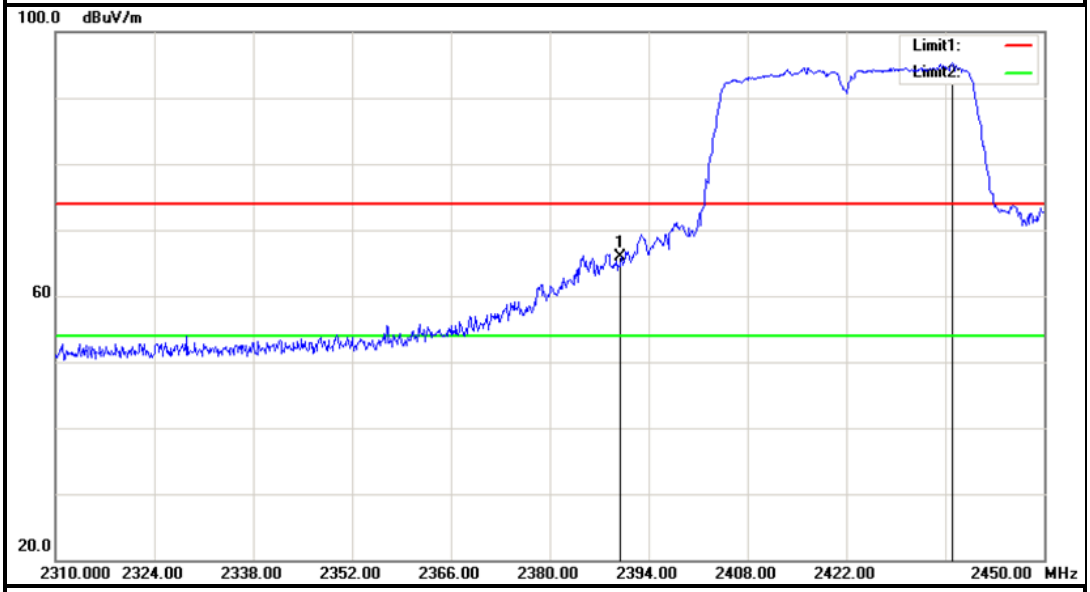


Detector mode: Average **Polarity: Vertical**

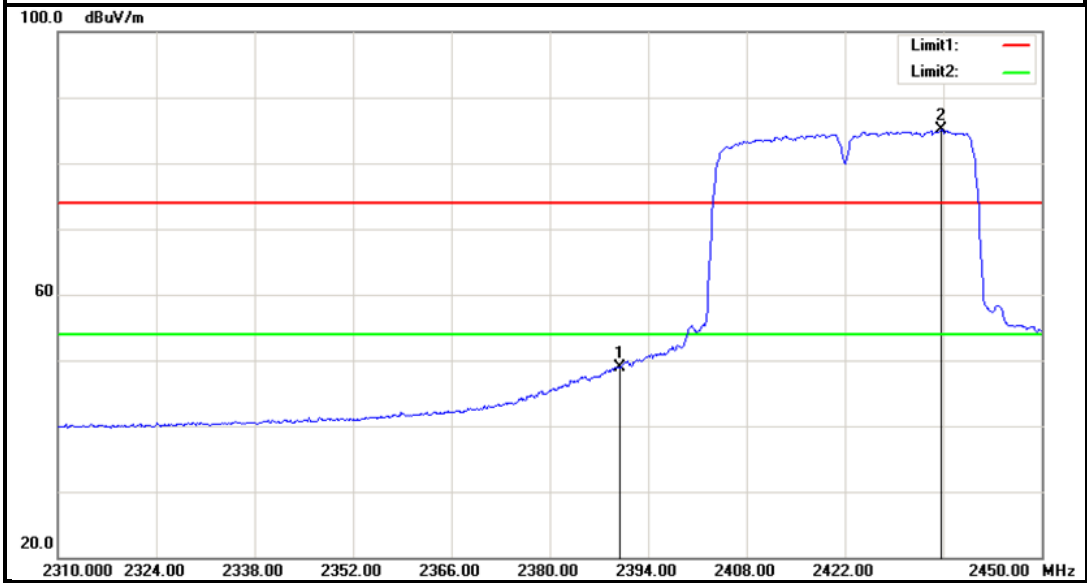


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	55.03	-2.86	52.17	74.00	-21.83	Peak	Vertical
2.	2435.300	87.30	-2.61	84.69	---	---	Peak	Vertical
1.	2390.000	42.23	-2.86	39.37	54.00	-14.63	Average	Vertical
2.	2435.860	77.22	-2.61	74.61	---	---	Average	Vertical

Detector mode: Peak **Polarity: Horizontal**



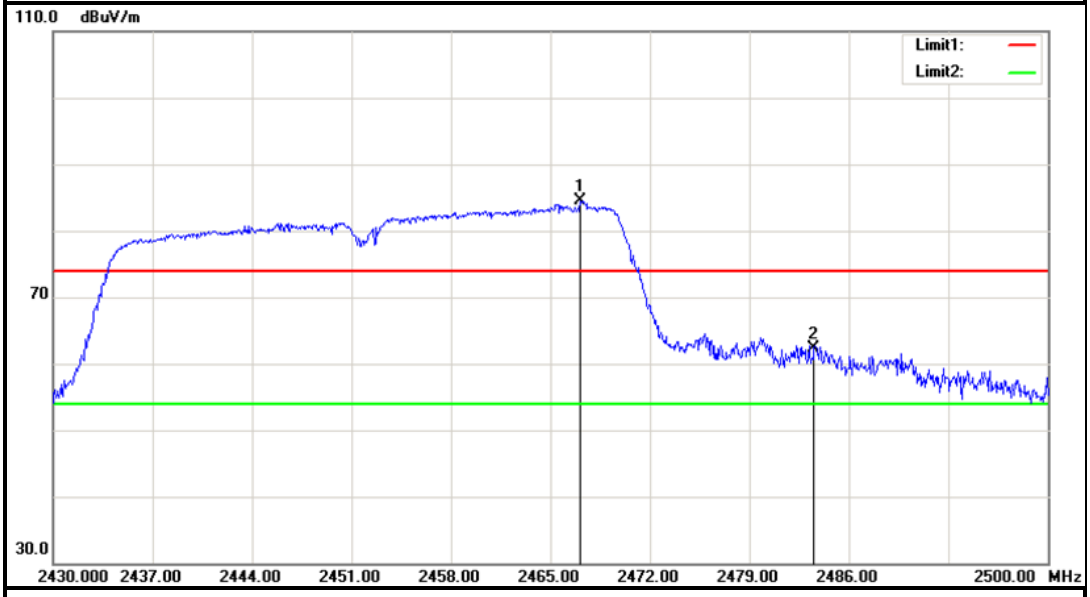
Detector mode: Average **Polarity: Horizontal**



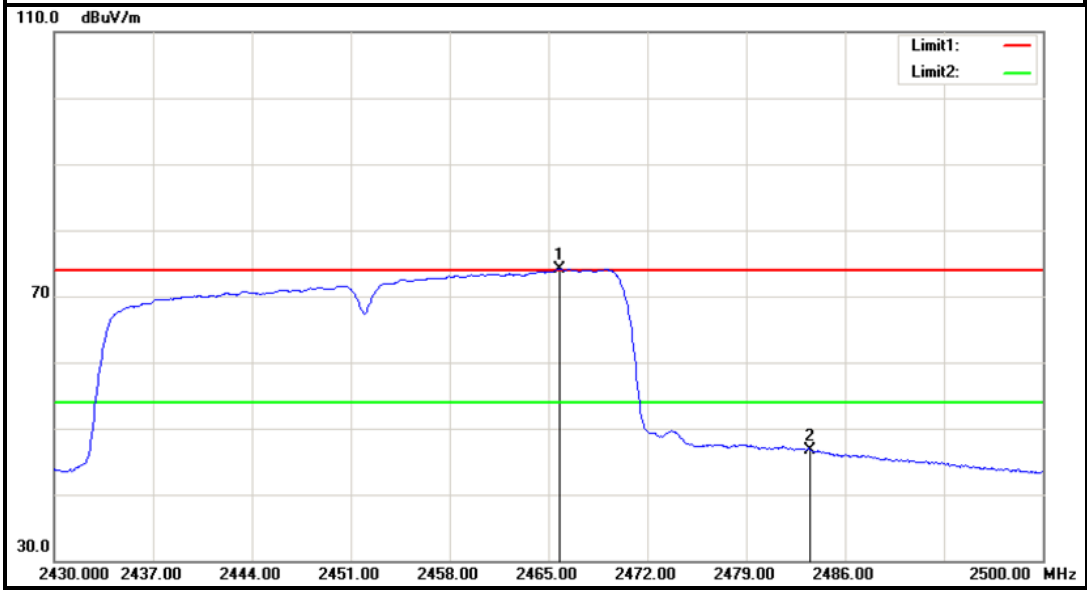
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	68.73	-2.86	65.87	74.00	-8.13	Peak	Horizontal
2.	2436.980	97.86	-2.61	95.25	---	---	Peak	Horizontal
1.	2390.000	51.86	-2.86	49.00	54.00	-5.00	Average	Horizontal
2.	2435.720	87.70	-2.61	85.09	---	---	Average	Horizontal

Band Edges (CH High)

Detector mode: Peak **Polarity: Vertical**

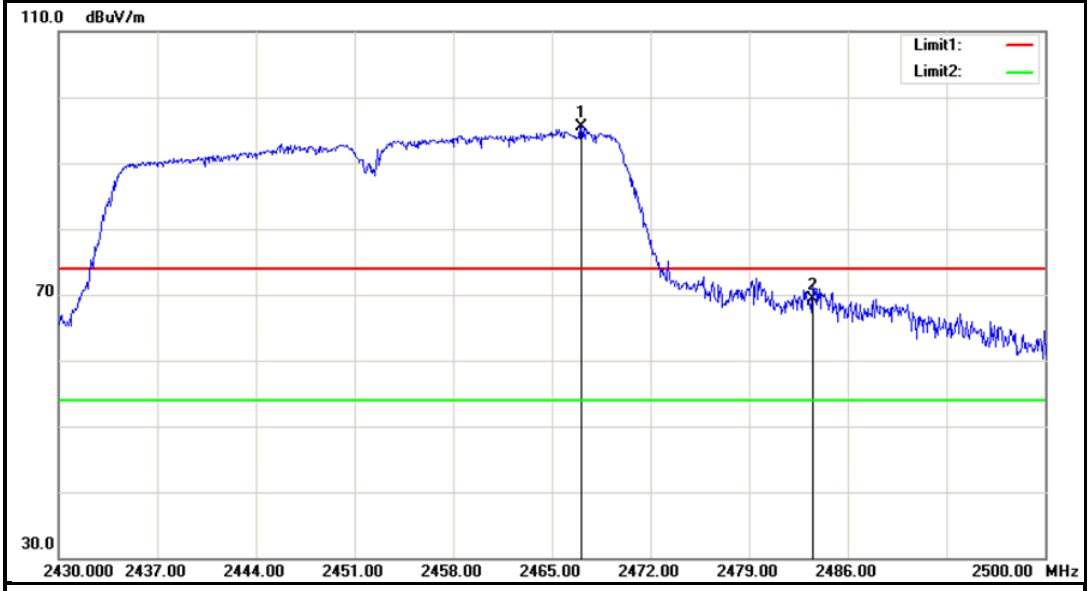


Detector mode: Average **Polarity: Vertical**

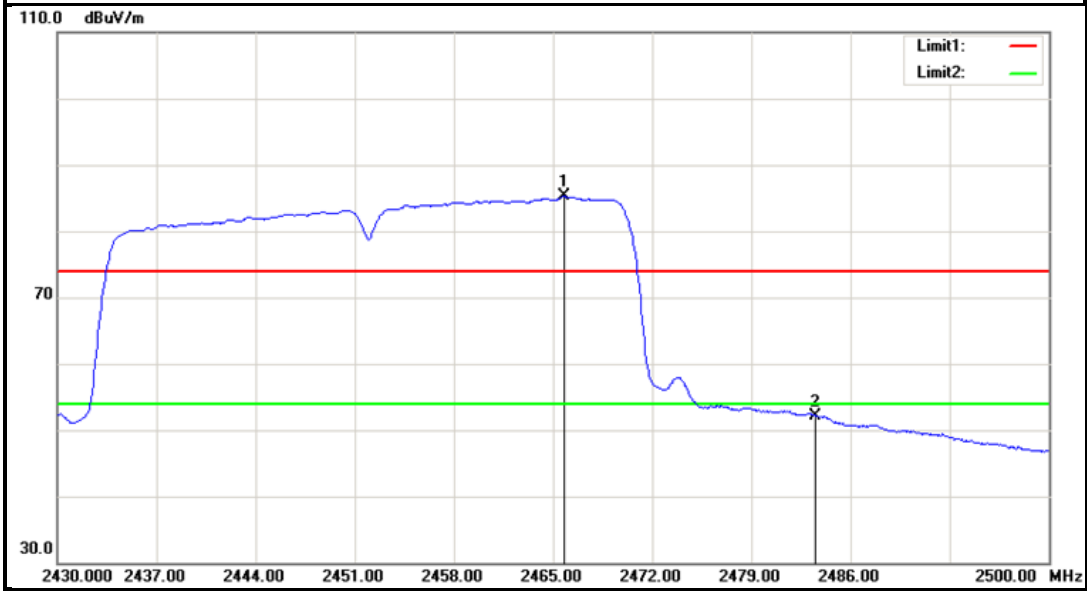


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2467.100	86.91	-2.44	84.47	---	---	Peak	Vertical
2.	2483.500	64.70	-2.35	62.35	74.00	-11.65	Peak	Vertical
1.	2465.770	76.57	-2.45	74.12	---	---	Average	Vertical
2.	2483.500	48.99	-2.35	46.64	54.00	-7.36	Average	Vertical

Detector mode: Peak **Polarity: Horizontal**



Detector mode: Average **Polarity: Horizontal**



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2467.100	98.03	-2.44	95.59	---	---	Peak	Horizontal
2.	2483.500	71.63	-2.35	69.28	74.00	-4.72	Peak	Horizontal
1.	2465.770	87.66	-2.45	85.21	---	---	Average	Horizontal
2.	2483.500	54.51	-2.35	52.16	54.00	-1.84	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	N9010A	MY52221469	01/27/2018	01/26/2019

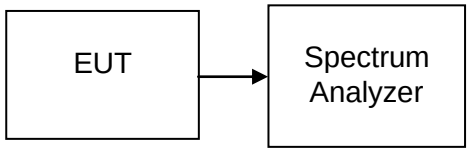
7.7.3. TEST PROCEDURES (please refer to measurement standard)

§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 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 x 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

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-9.182	8	PASS
Mid	2437	-9.722		PASS
High	2462	-10.801		PASS

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-15.637	8	PASS
Mid	2437	-16.479		PASS
High	2462	-17.513		PASS

Test mode: IEEE 802.11n HT20 MHz

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-16.008	8	PASS
Mid	2437	-16.715		PASS
High	2462	-18.371		PASS

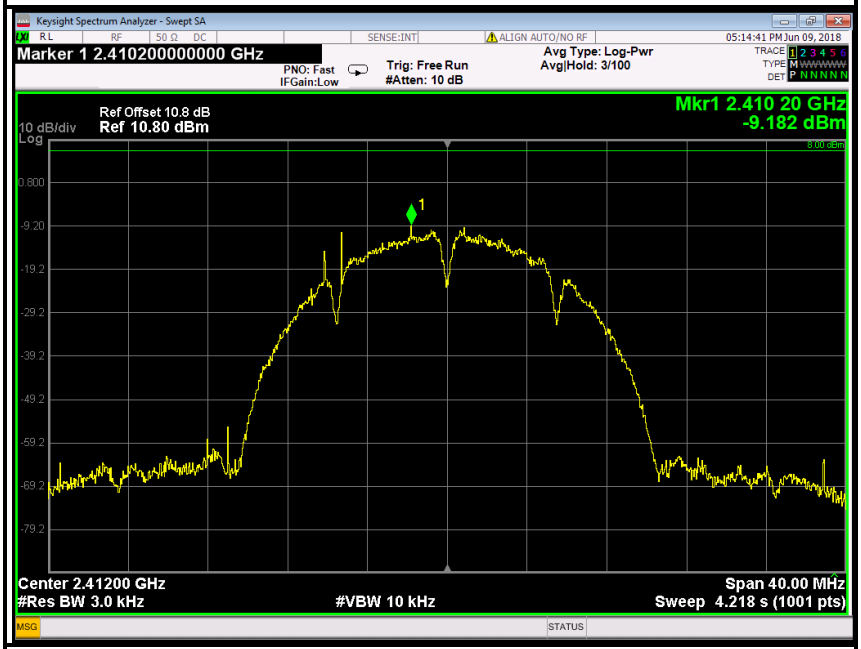
Test mode: IEEE 802.11n HT40 MHz

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2422	-19.347	8	PASS
Mid	2437	-19.087		PASS
High	2452	-21.405		PASS

Test Plot

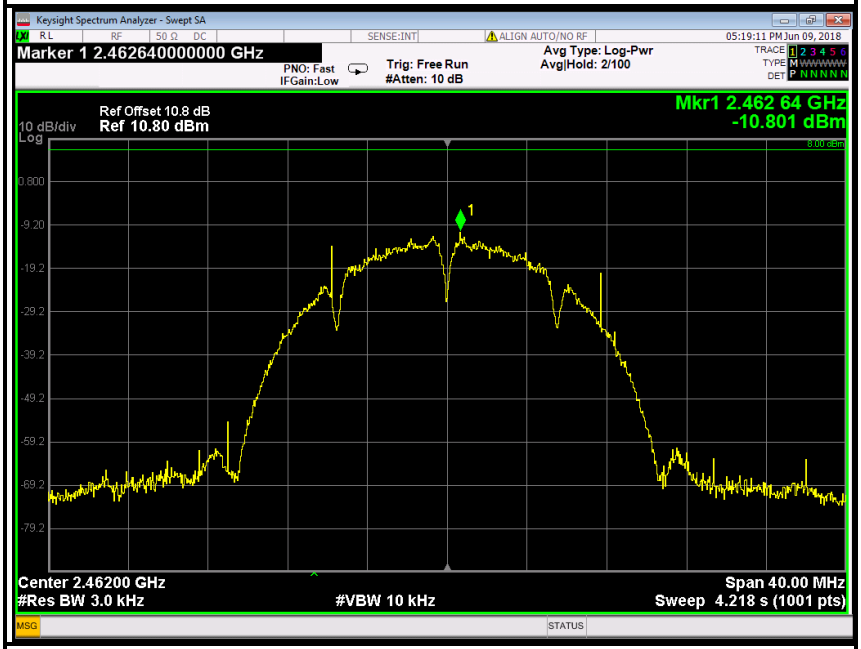
IEEE 802.11b mode

PPSD (CH Low)



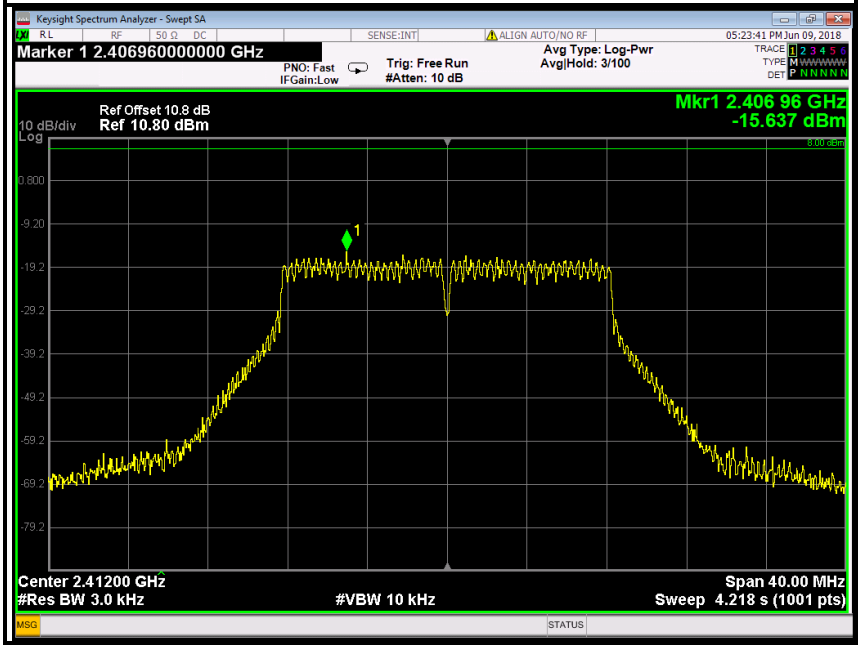
PPSD (CH Mid)

PPSD (CH High)

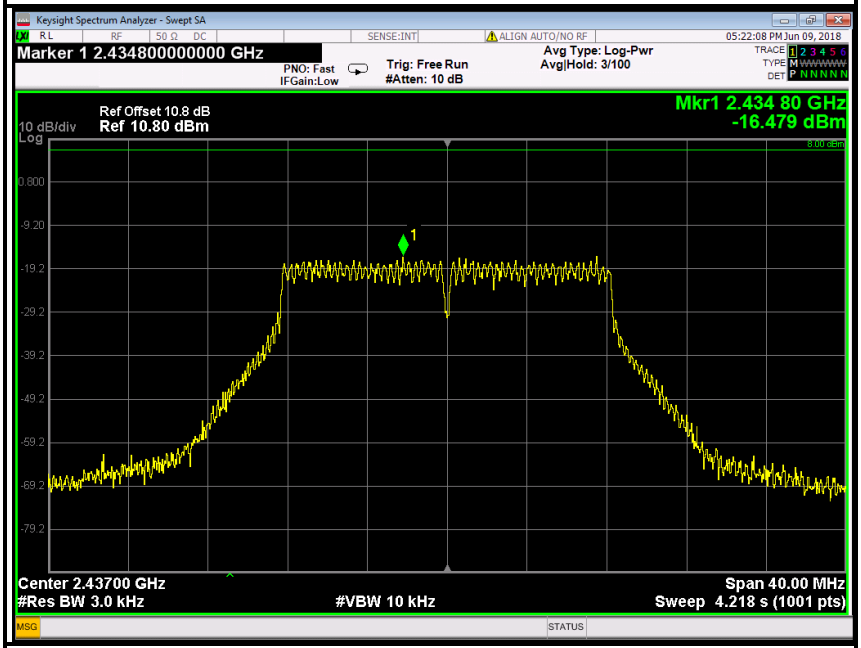


IEEE 802.11g mode

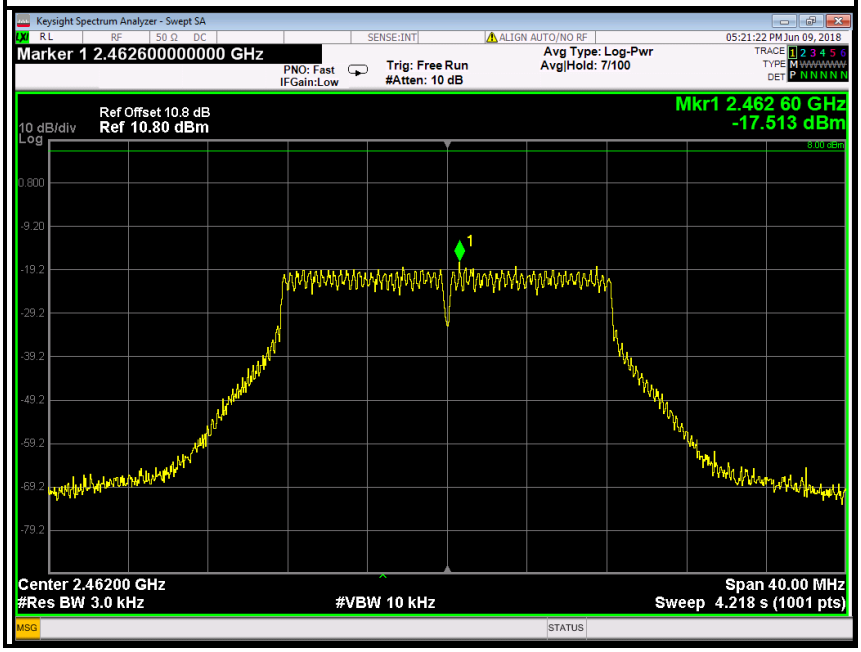
PPSD (CH Low)



PPSD (CH Mid)

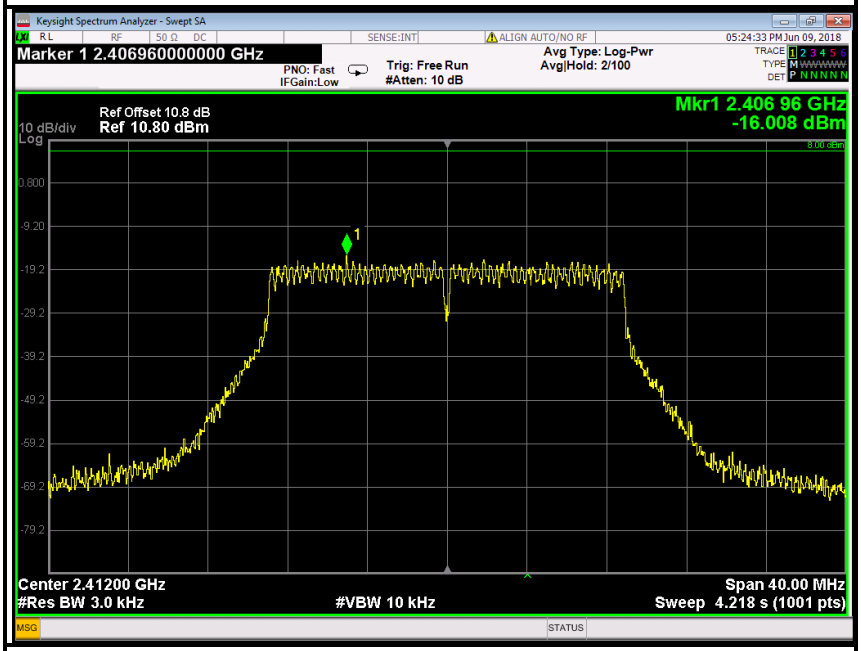


PPSD (CH High)

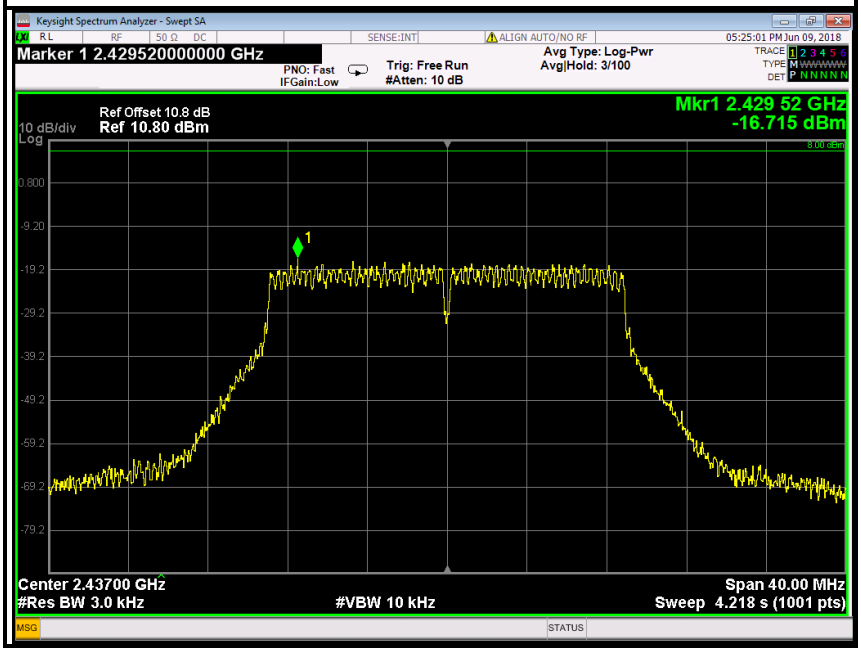


IEEE 802.11n HT20 MHz mode

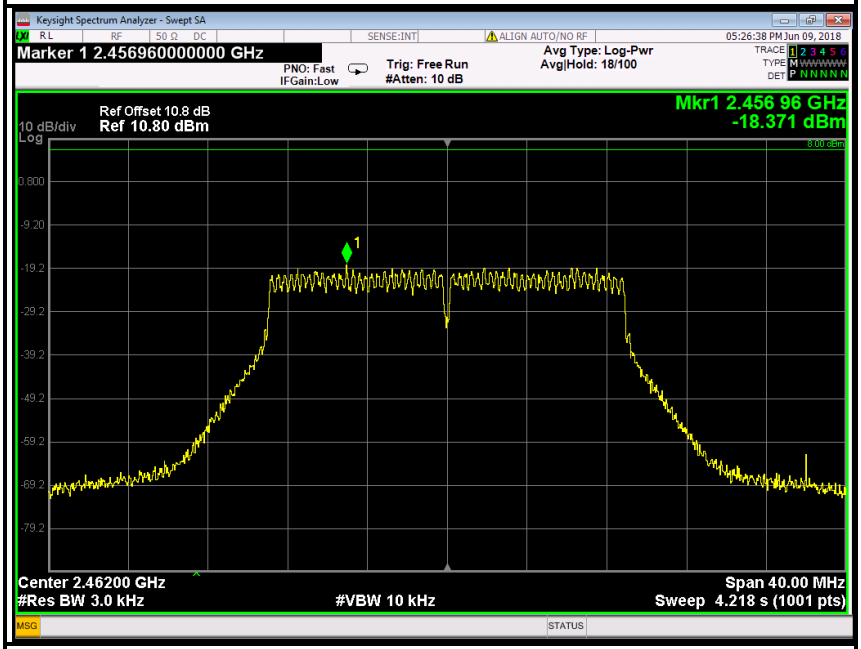
PPSD (CH Low)



PPSD (CH Mid)

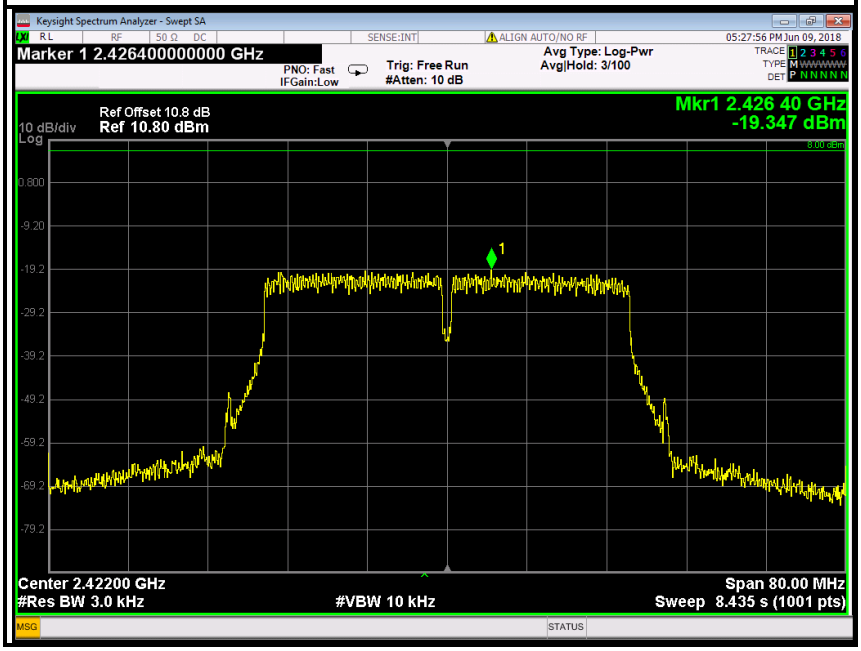


PPSD (CH High)

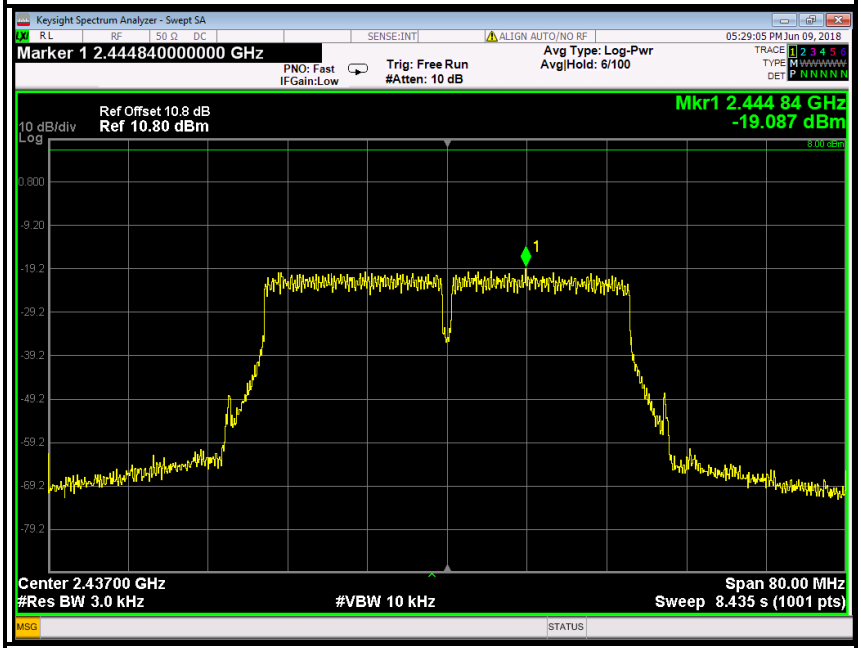


IEEE 802.11n HT40 MHz mode

PPSD (CH Low)



PPSD (CH Mid)



PPSD (CH High)