Test Mode: TX / IEEE 802.11g (CH High) **Tested by:** Saber Huang

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** April 6, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2521.000	46.49	-2.22	44.27	74.00	-29.73	V	Peak
3736.000	43.34	0.48	43.82	74.00	-30.18	V	Peak
4627.000	42.89	3.76	46.65	74.00	-27.35	V	Peak
5086.000	43.05	5.13	48.18	74.00	-25.82	V	Peak
6229.000	42.56	6.45	49.01	74.00	-24.99	V	Peak
7705.000	42.14	9.07	51.21	74.00	-22.79	V	Peak
1324.000	51.04	-7.34	43.70	74.00	-30.30	H	Peak
2530.000	47.46	-2.21	45.25	74.00	-28.75	H	Peak
3763.000	44.17	0.59	44.76	74.00	-29.24	H	Peak
4672.000	42.81	3.91	46.72	74.00	-27.28	H	Peak
5383.000	42.20	5.66	47.86	74.00	-26.14	H	Peak
7381.000	43.11	8.44	51.55	74.00	-22.45	H	Peak

REMARKS:

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).*

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

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** April 6, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2557.000	47.28	-2.16	45.12	74.00	-28.88	V	Peak
3817.000	43.18	0.82	44.00	74.00	-30.00	V	Peak
4348.000	42.94	2.81	45.75	74.00	-28.25	V	Peak
4825.000	48.13	4.41	52.54	74.00	-21.46	V	Peak
4825.000	43.87	4.41	48.28	54.00	-5.72	V	AVG
5428.000	42.81	5.74	48.55	74.00	-25.45	V	Peak
6724.000	42.06	7.25	49.31	74.00	-24.69	V	Peak
2521.000	46.49	-2.22	44.27	74.00	-29.73	H	Peak
3214.000	45.91	-1.00	44.91	74.00	-29.09	H	Peak
3925.000	44.37	1.27	45.64	74.00	-28.36	H	Peak
4825.000	49.72	4.41	54.13	74.00	-19.87	H	Peak
4825.000	46.85	4.41	51.26	54.00	-2.74	H	AVG
5626.000	42.73	5.92	48.65	74.00	-25.35	H	Peak
7228.000	44.69	8.14	52.83	74.00	-21.17	H	Peak
7228.000	41.74	8.14	49.88	54.00	-4.12	H	AVG

REMARKS:

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).*

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

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** April 6, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2242.000	45.82	-3.67	42.15	74.00	-31.85	V	Peak
2494.000	46.53	-2.29	44.24	74.00	-29.76	V	Peak
3250.000	44.95	-0.94	44.01	74.00	-29.99	V	Peak
4186.000	44.13	2.24	46.37	74.00	-27.63	V	Peak
4870.000	46.07	4.56	50.63	74.00	-23.37	V	Peak
6625.000	41.47	7.09	48.56	74.00	-25.44	V	Peak
2494.000	47.31	-2.29	45.02	74.00	-28.98	H	Peak
4141.000	43.06	2.09	45.15	74.00	-28.85	H	Peak
4870.000	48.42	4.56	52.98	74.00	-21.02	H	Peak
4870.000	44.96	4.56	49.52	54.00	-4.48	H	AVG
5770.000	42.18	5.98	48.16	74.00	-25.84	H	Peak
6544.000	41.86	6.96	48.82	74.00	-25.18	H	Peak
7309.000	45.32	8.30	53.62	74.00	-20.38	H	Peak
7309.000	40.26	8.30	48.56	54.00	-5.44	H	AVG

REMARKS:

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).*

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

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** April 6, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2521.000	46.67	-2.22	44.45	74.00	-29.55	V	Peak
4015.000	43.50	1.64	45.14	74.00	-28.86	V	Peak
4330.000	42.67	2.75	45.42	74.00	-28.58	V	Peak
5392.000	42.40	5.68	48.08	74.00	-25.92	V	Peak
6661.000	42.00	7.15	49.15	74.00	-24.85	V	Peak
7975.000	42.28	9.60	51.88	74.00	-22.12	V	Peak
2791.000	46.00	-1.74	44.26	74.00	-29.74	H	Peak
3808.000	43.57	0.78	44.35	74.00	-29.65	H	Peak
4429.000	43.31	3.10	46.41	74.00	-27.59	H	Peak
5374.000	42.41	5.65	48.06	74.00	-25.94	H	Peak
5878.000	42.52	6.03	48.55	74.00	-25.45	H	Peak
7390.000	43.65	8.46	52.11	74.00	-21.89	H	Peak

REMARKS:

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).*

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

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** April 6, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2233.000	46.06	-3.72	42.34	74.00	-31.66	V	Peak
2503.000	46.27	-2.25	44.02	74.00	-29.98	V	Peak
3844.000	43.30	0.93	44.23	74.00	-29.77	V	Peak
4312.000	43.08	2.69	45.77	74.00	-28.23	V	Peak
4834.000	44.64	4.44	49.08	74.00	-24.92	V	Peak
5599.000	42.62	5.91	48.53	74.00	-25.47	V	Peak
2539.000	45.66	-2.19	43.47	74.00	-30.53	H	Peak
3232.000	44.81	-0.97	43.84	74.00	-30.16	H	Peak
4420.000	43.51	3.07	46.58	74.00	-27.42	H	Peak
4843.000	45.25	4.47	49.72	74.00	-24.28	H	Peak
5608.000	42.56	5.92	48.48	74.00	-25.52	H	Peak
6472.000	42.78	6.84	49.62	74.00	-24.38	H	Peak

REMARKS:

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).*

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

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** April 6, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2512.000	46.77	-2.24	44.53	74.00	-29.47	V	Peak
3250.000	44.98	-0.94	44.04	74.00	-29.96	V	Peak
3763.000	44.24	0.59	44.83	74.00	-29.17	V	Peak
4870.000	43.18	4.56	47.74	74.00	-26.26	V	Peak
5491.000	42.32	5.85	48.17	74.00	-25.83	V	Peak
6373.000	41.96	6.68	48.64	74.00	-25.36	V	Peak
2512.000	47.69	-2.24	45.45	74.00	-28.55	H	Peak
3799.000	43.99	0.74	44.73	74.00	-29.27	H	Peak
4591.000	43.46	3.65	47.11	74.00	-26.89	H	Peak
4870.000	45.18	4.56	49.74	74.00	-24.26	H	Peak
5626.000	42.45	5.92	48.37	74.00	-25.63	H	Peak
6292.000	42.72	6.55	49.27	74.00	-24.73	H	Peak

REMARKS:

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).*

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

Ambient temperature: 24°C **Relative humidity:** 52% RH **Date:** April 6, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2485.000	47.09	-2.34	44.75	74.00	-29.25	V	Peak
2809.000	45.47	-1.70	43.77	74.00	-30.23	V	Peak
4033.000	43.31	1.71	45.02	74.00	-28.98	V	Peak
4564.000	42.64	3.56	46.20	74.00	-27.80	V	Peak
4906.000	43.53	4.67	48.20	74.00	-25.80	V	Peak
5455.000	42.53	5.79	48.32	74.00	-25.68	V	Peak
1324.000	49.94	-7.34	42.60	74.00	-31.40	H	Peak
2242.000	46.15	-3.67	42.48	74.00	-31.52	H	Peak
2503.000	46.21	-2.25	43.96	74.00	-30.04	H	Peak
3781.000	43.83	0.67	44.50	74.00	-29.50	H	Peak
4933.000	42.56	4.76	47.32	74.00	-26.68	H	Peak
5518.000	42.29	5.88	48.17	74.00	-25.83	H	Peak

REMARKS:

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).*

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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

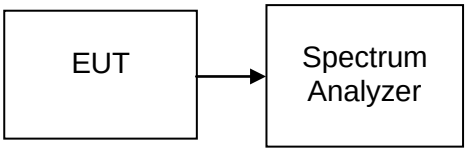
Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Spectrum Analyzer	Agilent	N9010A	MY52221469	02/21/2017	02/20/2018

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



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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	10030	>500	PASS
Mid	2437	9095		PASS
High	2462	9567		PASS

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	16300	>500	PASS
Mid	2437	16340		PASS
High	2462	16340		PASS

Test mode: IEEE 802.11n HT20 MHz

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	17580	>500	PASS
Mid	2437	17540		PASS
High	2462	17580		PASS

Test mode: IEEE 802.11n HT40 MHz

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2422	35820	>500	PASS
Mid	2437	35820		PASS
High	2452	35800		PASS

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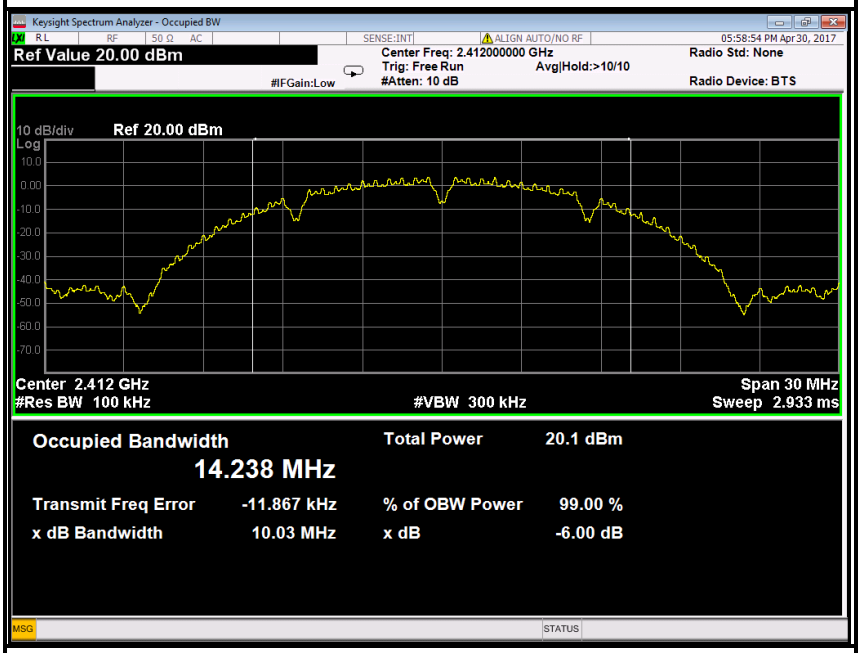
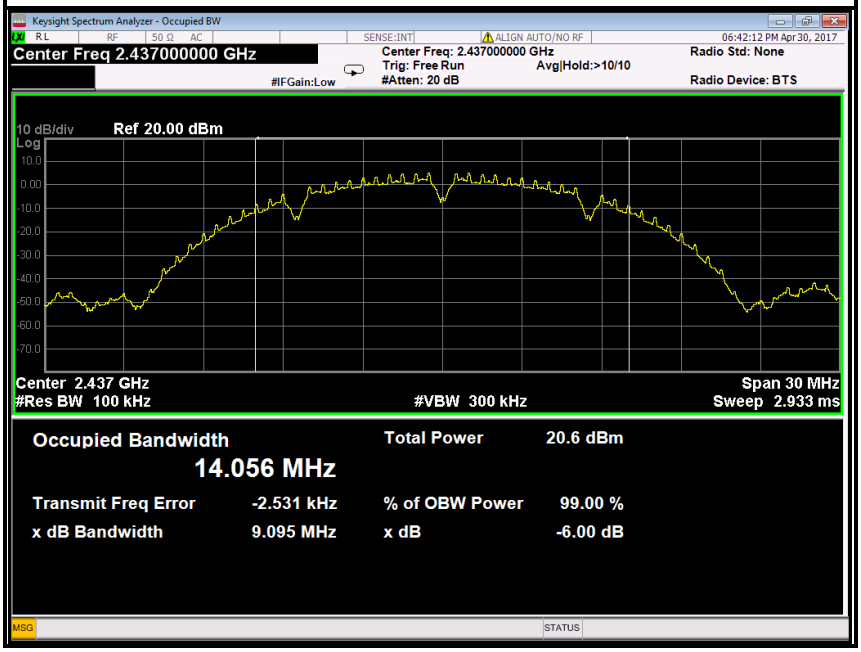
Test Plot

IEEE 802.11b mode

6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)



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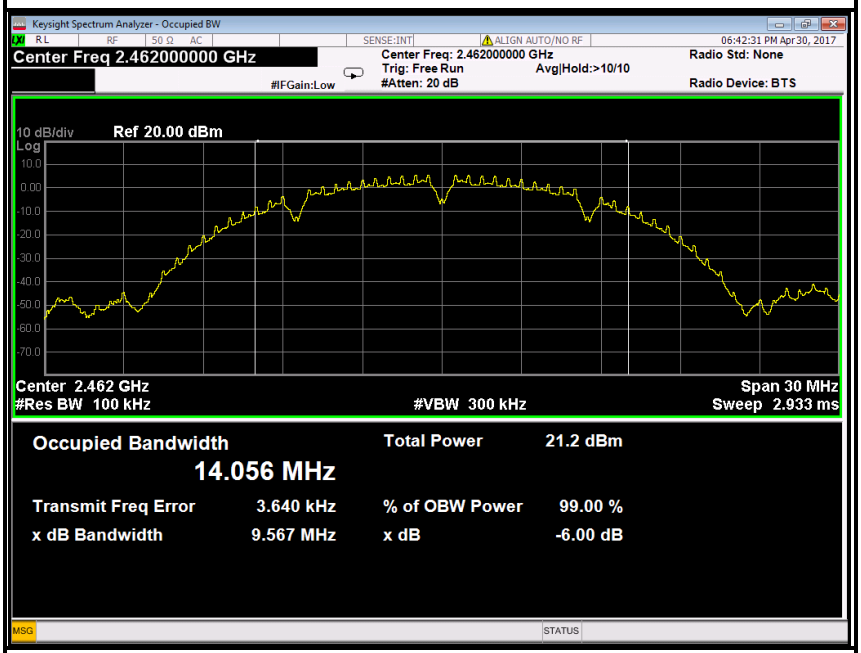
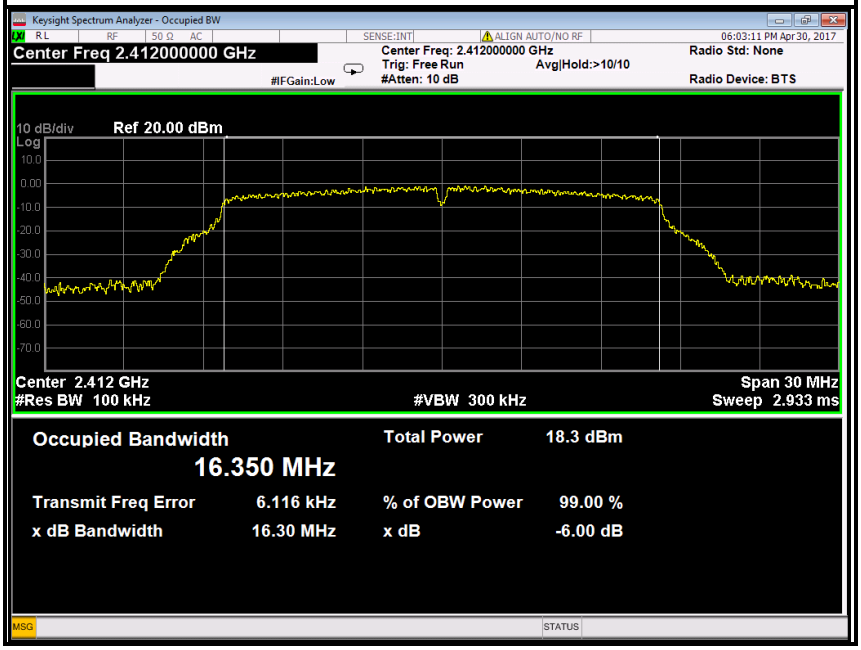
6dB Bandwidth (CH High)



IEEE 802.11g mode

6dB Bandwidth (CH Low)



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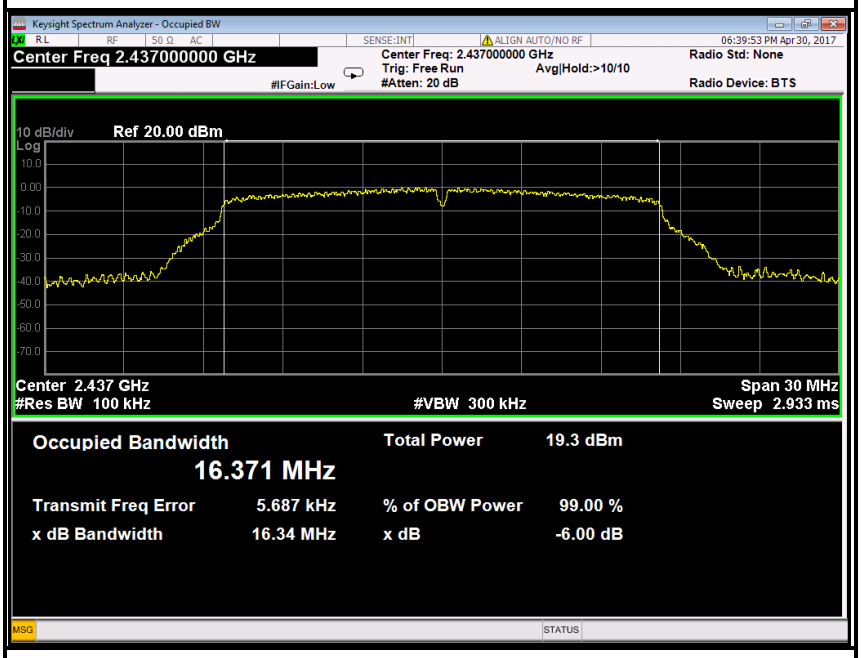
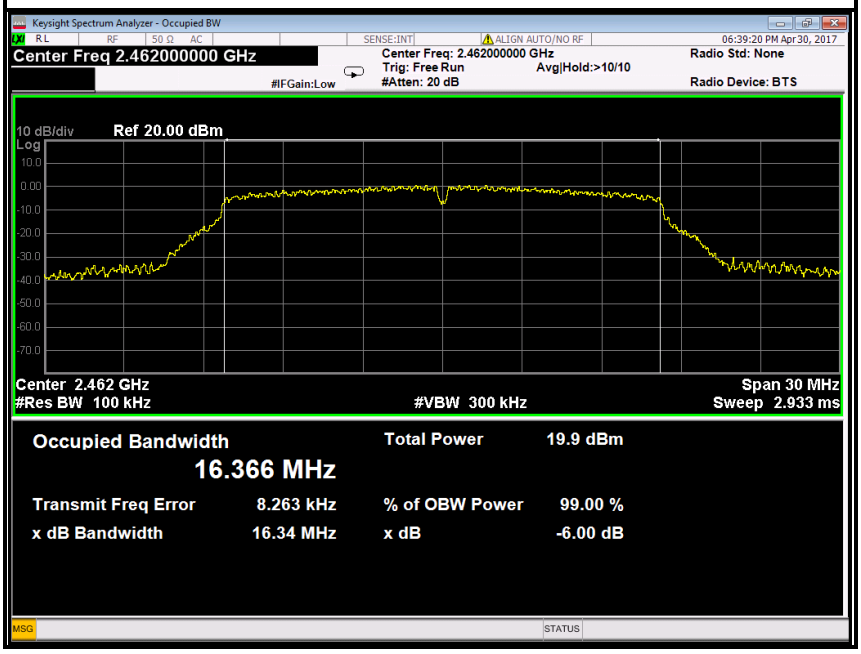
6dB Bandwidth (CH Mid)



6dB Bandwidth (CH High)



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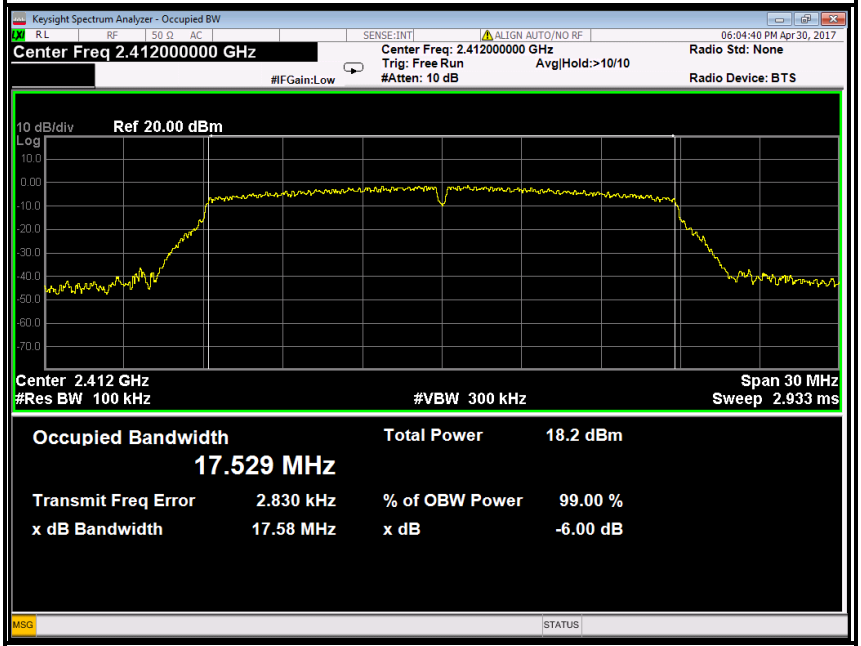
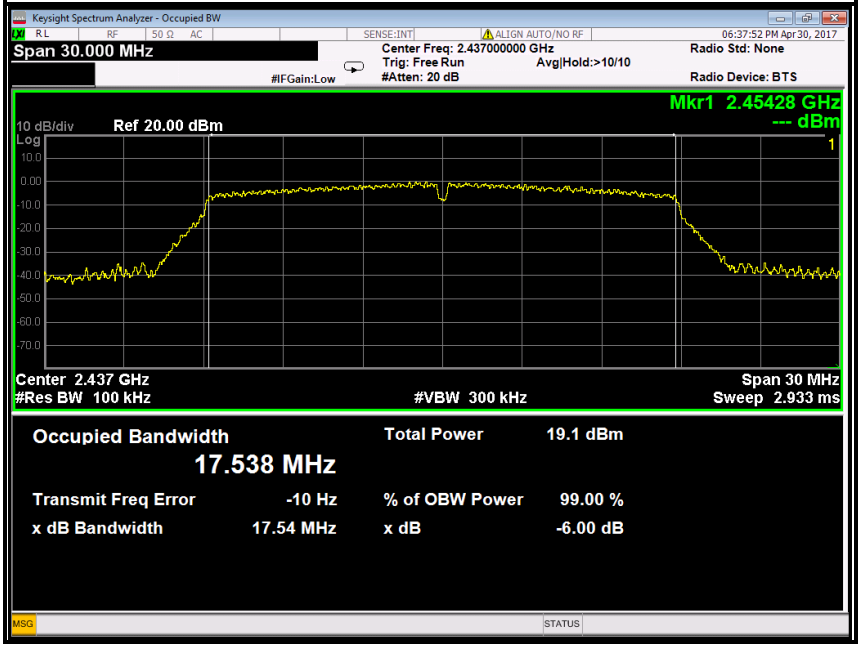
IEEE 802.11n HT20 MHz mode

6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)



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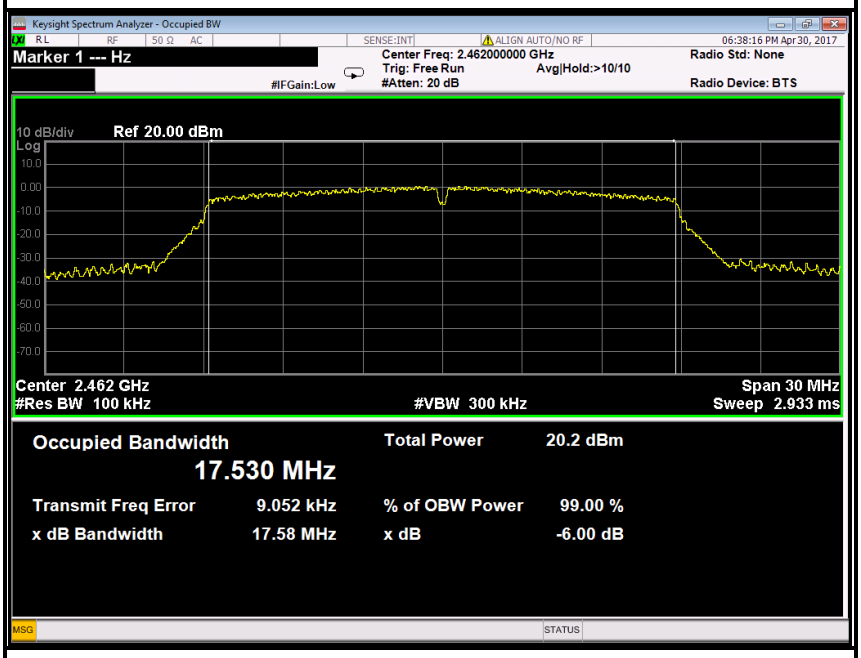
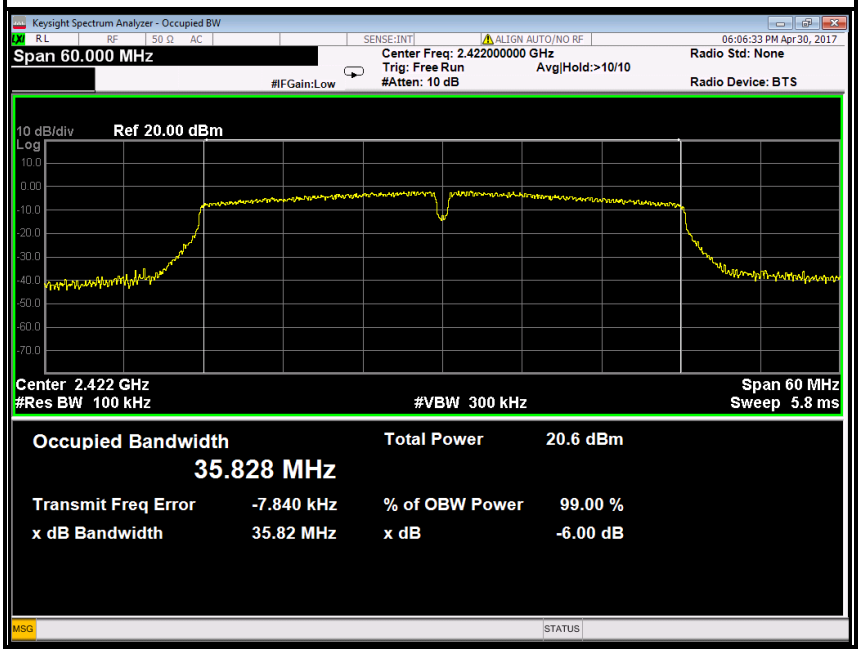
6dB Bandwidth (CH High)



IEEE 802.11n HT40 MHz mode

6dB Bandwidth (CH Low)



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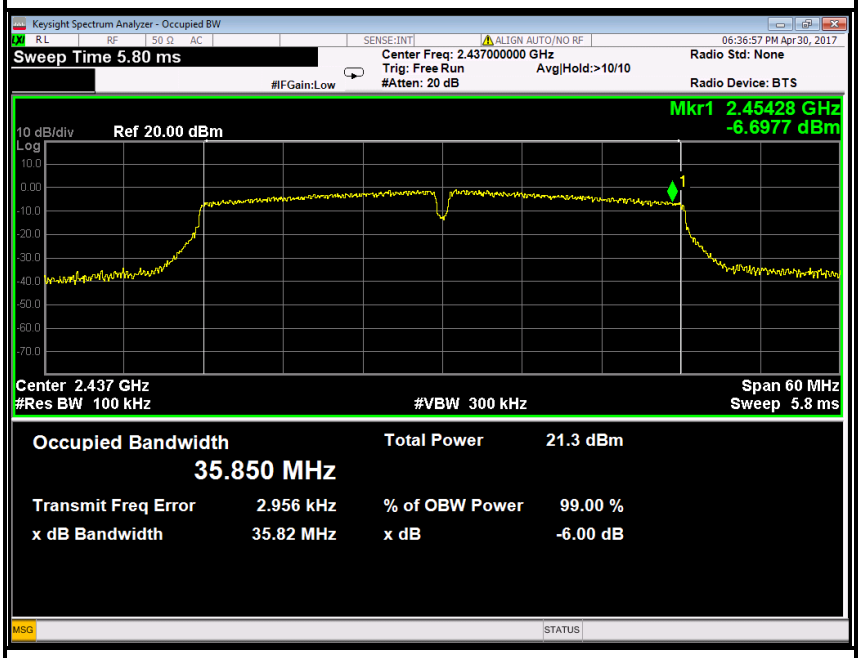
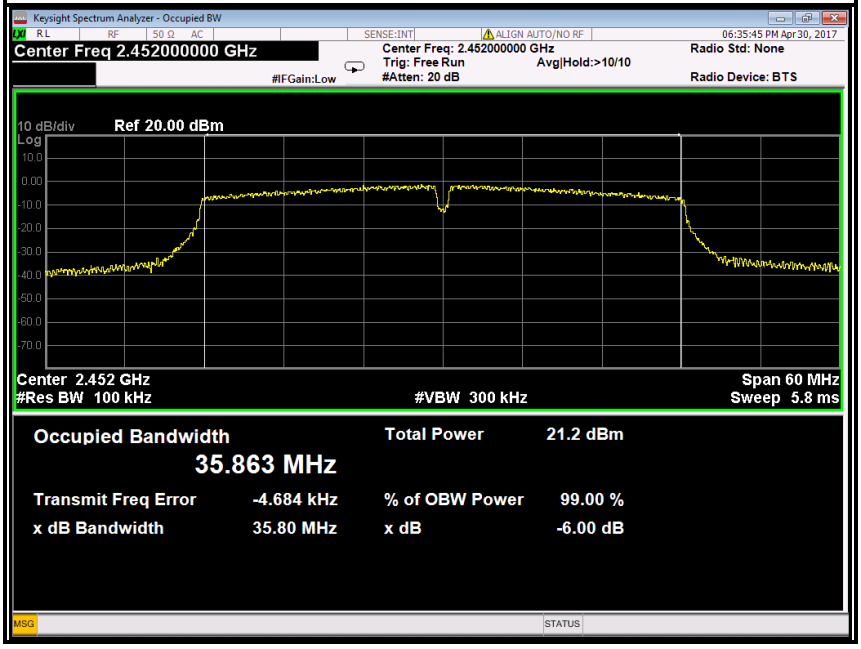
6dB Bandwidth (CH Mid)



6dB Bandwidth (CH High)



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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

T_{nom}	V_{nom}	Lowest channel 2412MHz	Middle channel 2437MHz	Highest channel 2462MHz
Conducted power [dBm/MHz] Measured with DSSS modulation		4.04	4.64	4.94
Radiated power [dBm/MHz] Measured with DSSS modulation		5.09	5.29	5.69
ain [dBi] Calculated		1.05	0.65	0.75
Measurement uncertainty		± 1.5 dB (cond.) / ± 3 dB (rad.)		

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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	02/21/2017	02/20/2018
Power Sensor	Anritsu	MA2411B	1126150	02/21/2017	02/20/2018

7.5.3. TEST PROCEDURES (please refer to measurement standard)

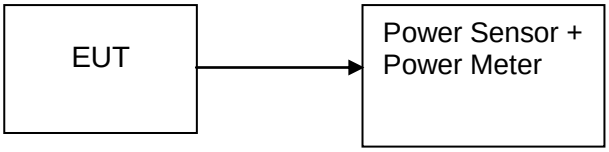
9.1.1 RBW ≥ *DTS bandwidth*

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



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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	15.50	0.03548	Peak	1	PASS
Mid	2437	16.10	0.04074			PASS
High	2462	16.40	0.04365			PASS
Low	2412	13.70	0.02344	AVG	1	PASS
Mid	2437	14.30	0.02692			PASS
High	2462	14.60	0.02884			PASS

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	21.90	0.15488	Peak	1	PASS
Mid	2437	21.90	0.15488			PASS
High	2462	21.70	0.14791			PASS
Low	2412	13.10	0.02042	AVG	1	PASS
Mid	2437	13.20	0.02089			PASS
High	2462	14.10	0.02570			PASS

Test mode: IEEE 802.11n HT20 MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	21.90	0.15488	Peak	1	PASS
Mid	2437	21.80	0.15136			PASS
High	2462	21.30	0.13490			PASS
Low	2412	13.30	0.02138	AVG	1	PASS
Mid	2437	13.50	0.02239			PASS
High	2462	14.20	0.02630			PASS

Test mode: IEEE 802.11n HT40 MHz

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2422	20.40	0.10965	Peak	1	PASS
Mid	2437	21.00	0.12589			PASS
High	2452	20.20	0.10471			PASS
Low	2422	13.40	0.02188	AVG	1	PASS
Mid	2437	13.80	0.02399			PASS
High	2452	13.40	0.02188			PASS

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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	MY55370330	02/21/2017	02/20/2018
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/21/2017	02/20/2018
Amplifier	EMEC	EM330	060661	03/18/2017	03/17/2018
High Noise Amplifier	Agilent	8449B	3008A01838	02/21/2017	02/20/2018
Loop Antenna	COM-POWER	AL-130	121044	09/25/2016	09/24/2017
Bilog Antenna	SCHAFFNER	CBL6143	5082	02/21/2017	02/20/2018
Horn Antenna	SCHWARZBECK	BBHA9120	D286	02/28/2017	02/27/2018
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	02/28/2017	02/27/2018
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	02/21/2017	02/20/2018
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.

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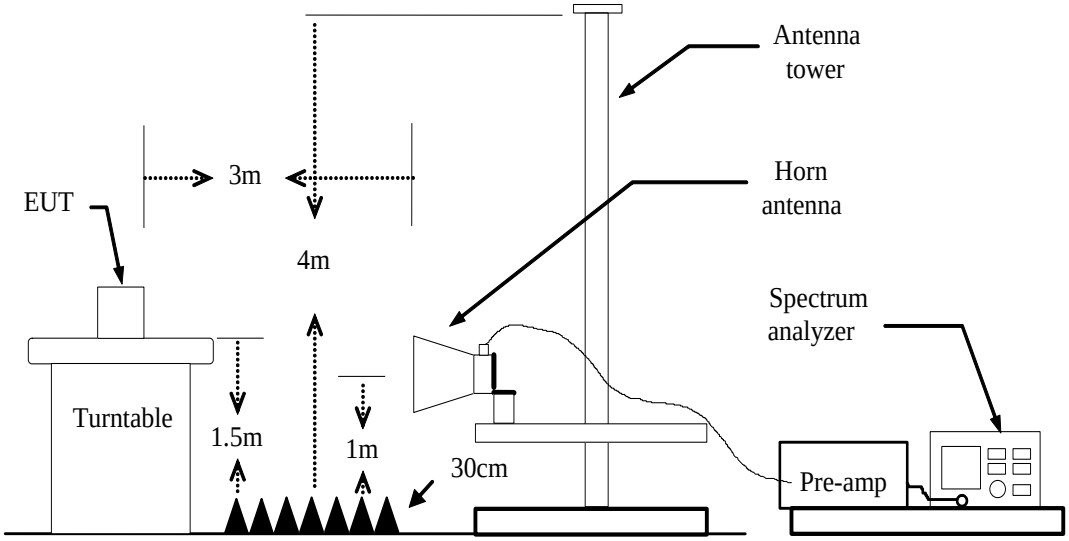
7.6.3. TEST PROCEDURES (please refer to measurement standard)

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

7.6.4. TEST SETUP



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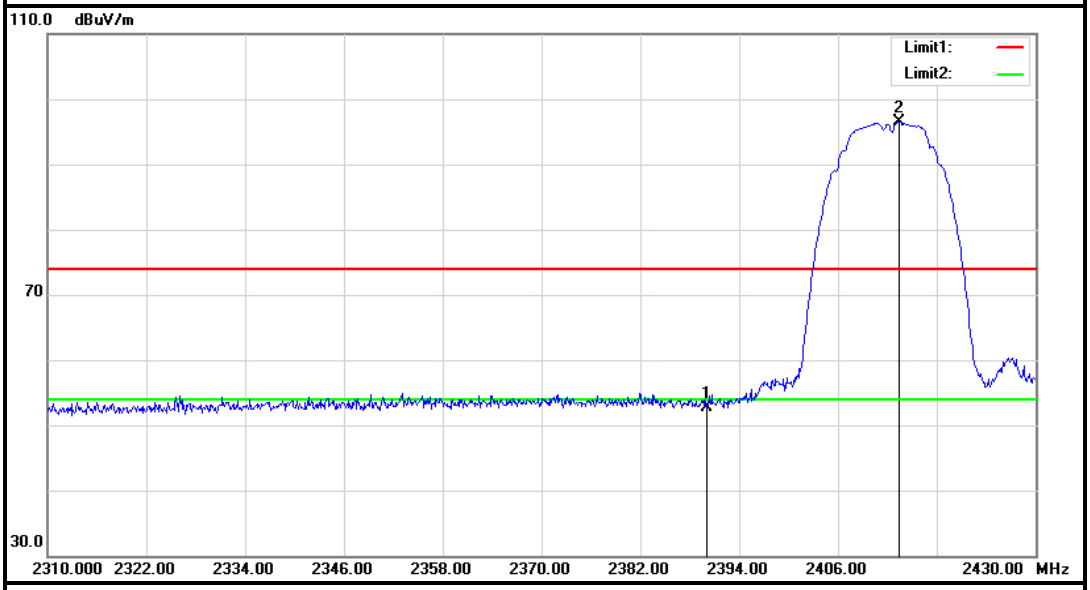
7.6.5. TEST RESULTS

Test Plot

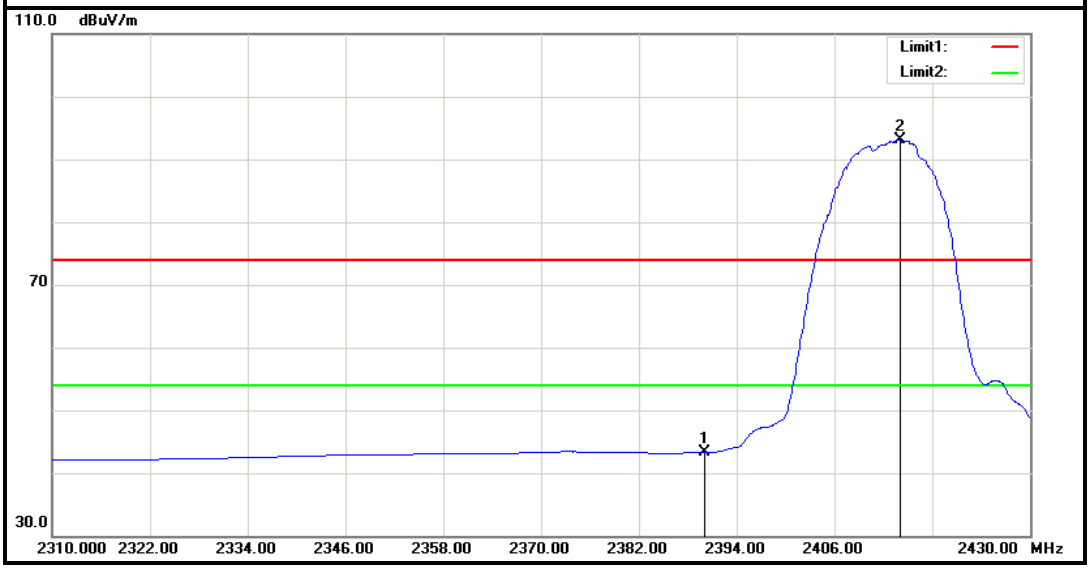
IEEE 802.11b mode

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	55.57	-2.86	52.71	74.00	-21.29	Peak	Vertical
2.	2413.440	99.25	-2.73	96.52	---	---	Peak	Vertical
1.	2390.000	46.18	-2.86	43.32	54.00	-10.68	Average	Vertical
2.	2414.040	95.93	-2.73	93.20	---	---	Average	Vertical

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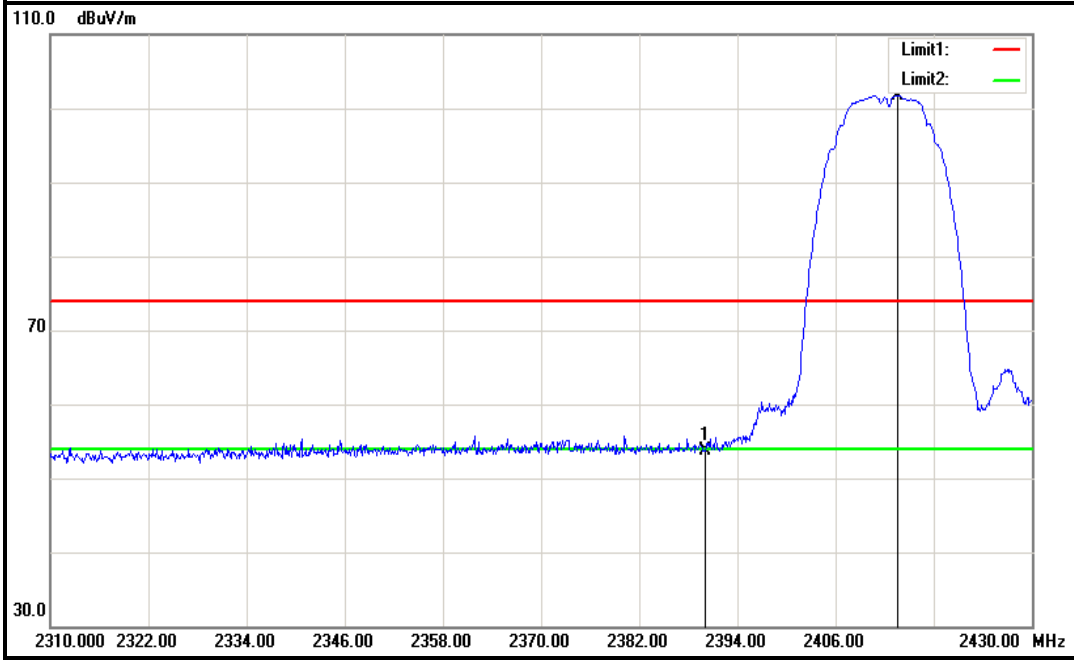
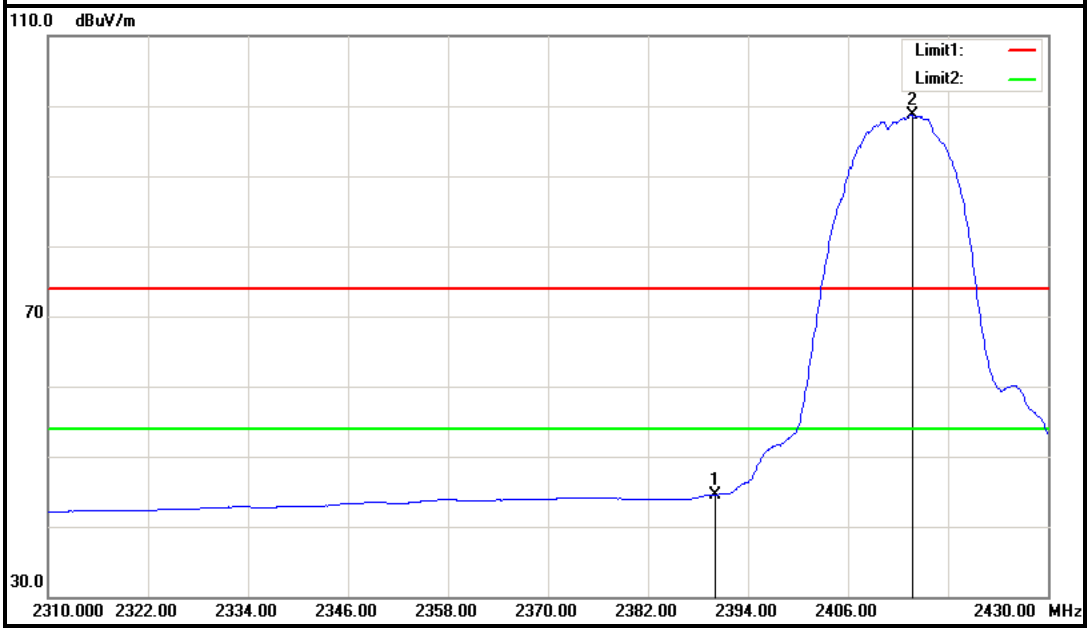
Detector mode: Peak **Polarity: Horizontal**



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	56.61	-2.86	53.75	74.00	-20.25	Peak	Horizontal
2.	2413.560	104.48	-2.73	101.75	---	---	Peak	Horizontal
1.	2390.000	47.40	-2.86	44.54	54.00	-9.46	Average	Horizontal
2.	2413.800	101.38	-2.73	98.65	---	---	Average	Horizontal

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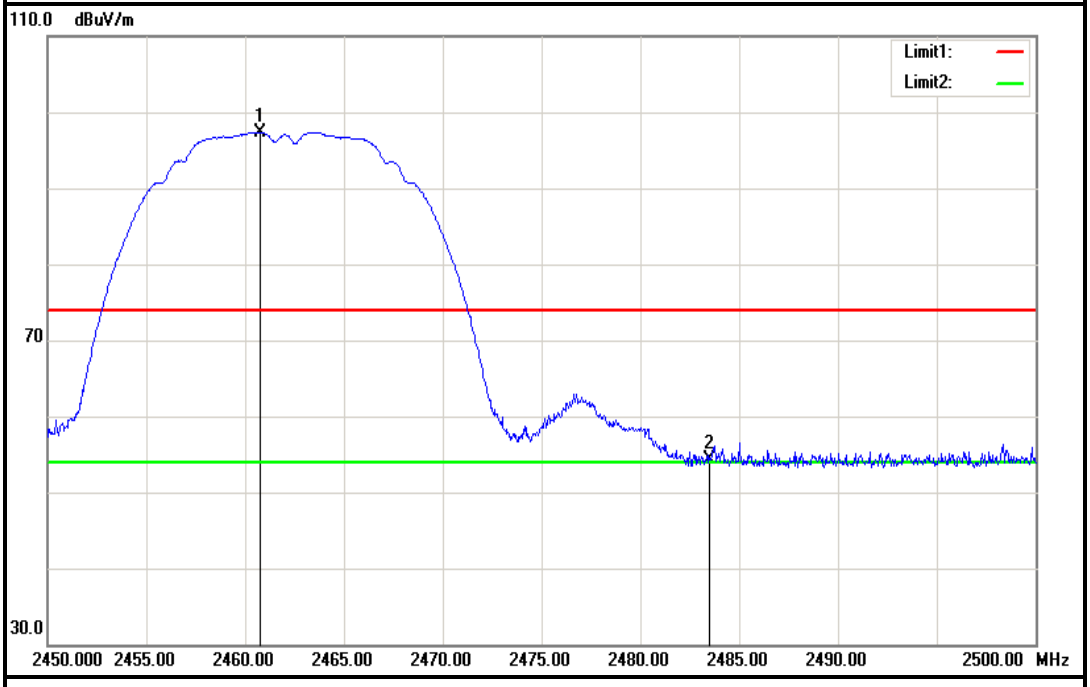
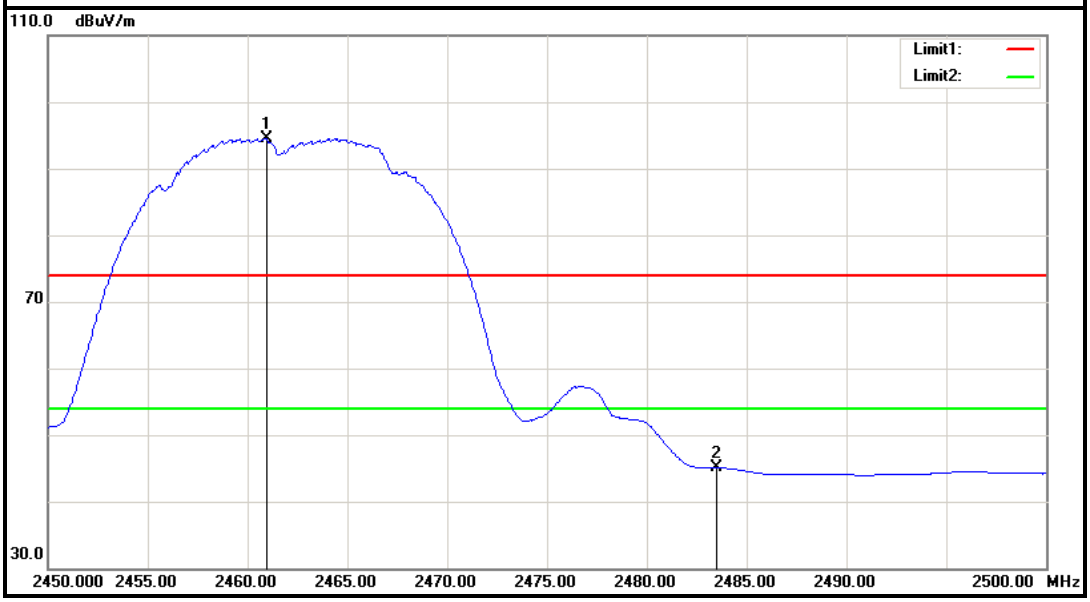
Band Edges (CH High)

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.	2460.750	99.82	-2.47	97.35	---	---	Peak	Vertical
2.	2483.500	56.75	-2.35	54.40	74.00	-19.60	Peak	Vertical
1.	2460.950	97.01	-2.47	94.54	---	---	Average	Vertical
2.	2483.500	47.52	-2.35	45.17	54.00	-8.83	Average	Vertical

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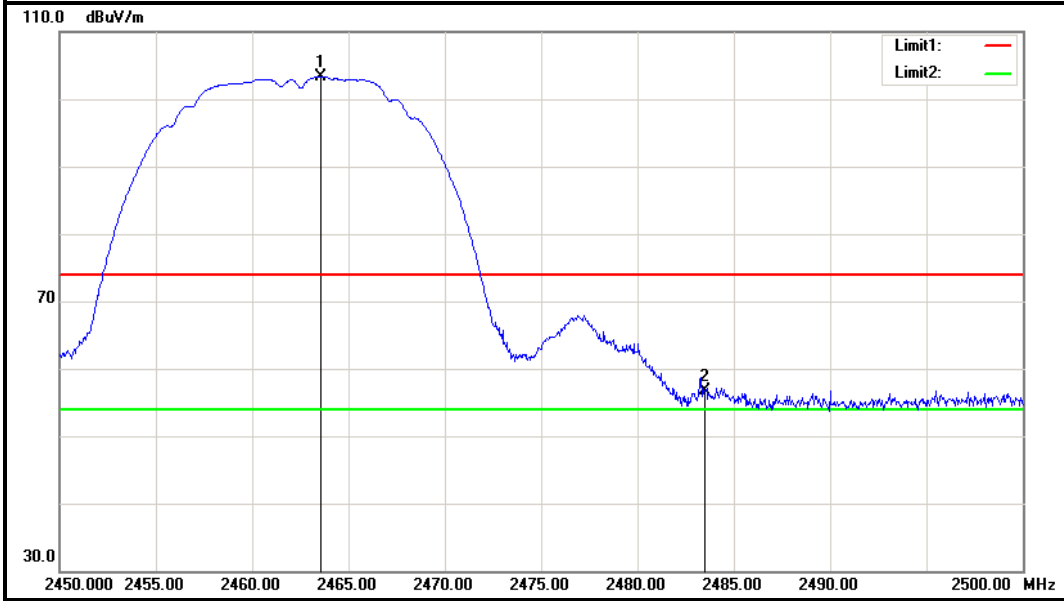
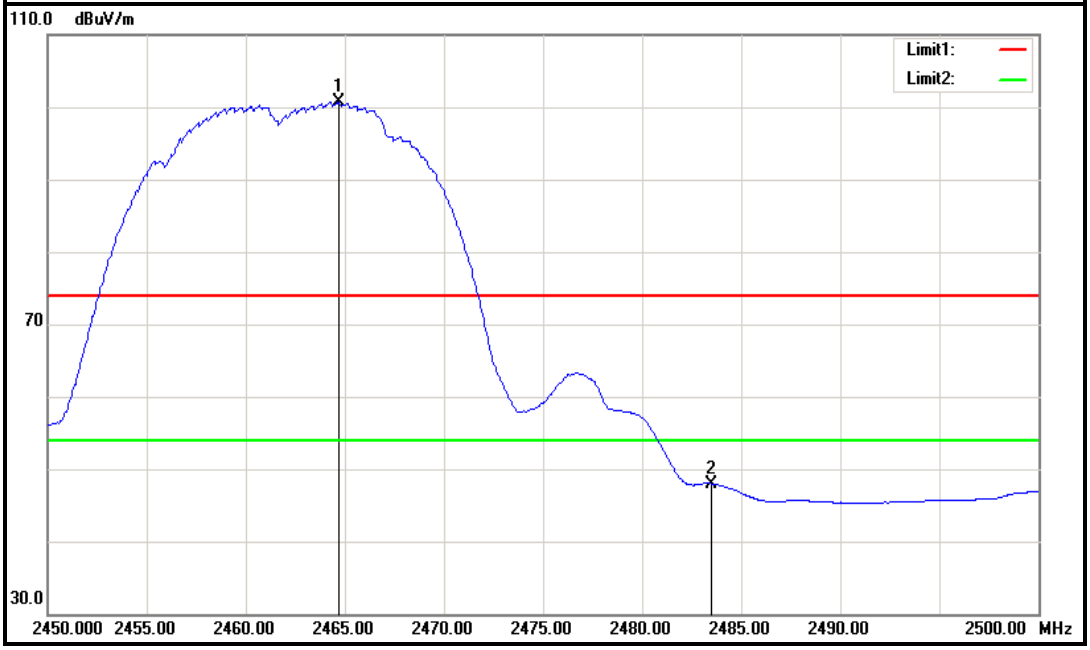
Detector mode: Peak **Polarity: Horizontal**



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.	2463.550	105.79	-2.46	103.33	---	---	Peak	Horizontal
2.	2483.500	58.97	-2.35	56.62	74.00	-17.38	Peak	Horizontal
1.	2464.700	103.14	-2.45	100.69	---	---	Average	Horizontal
2.	2483.500	50.35	-2.35	48.00	54.00	-6.00	Average	Horizontal

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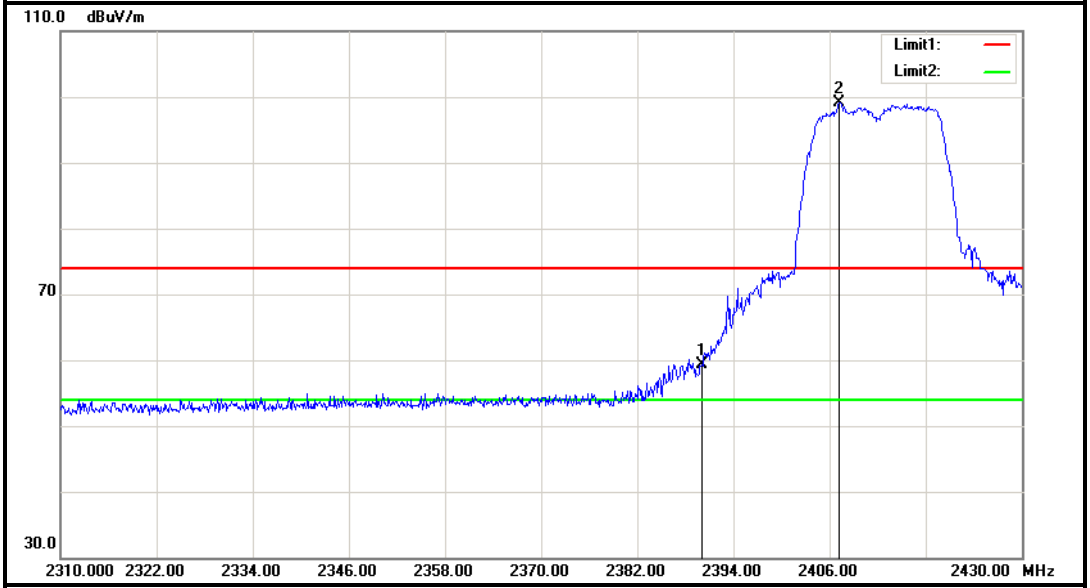
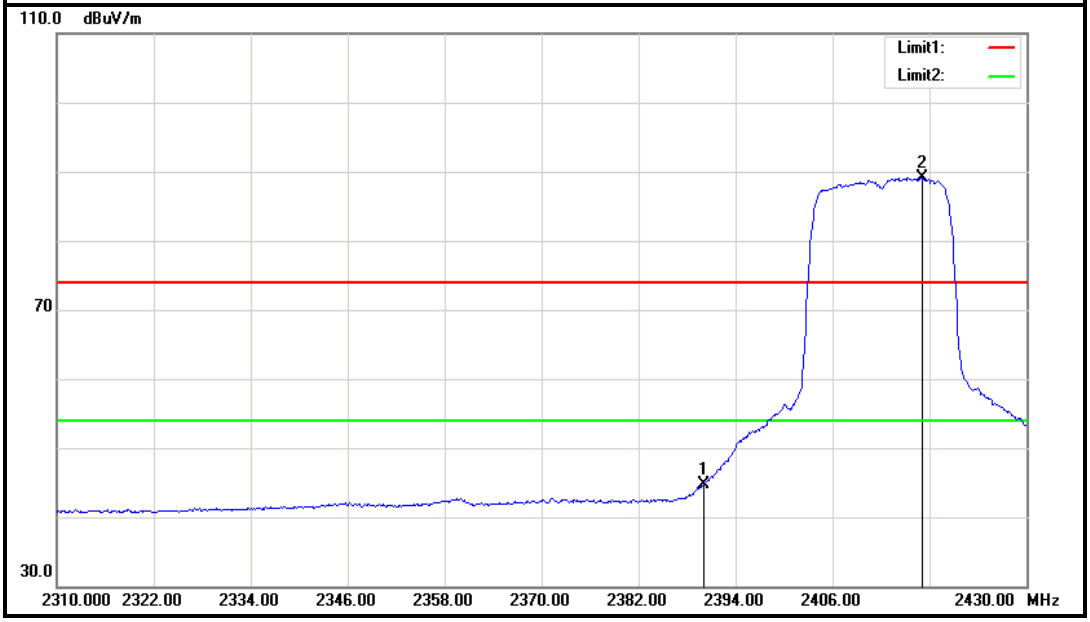
IEEE 802.11g mode
Band Edges (CH Low)

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	62.14	-2.86	59.28	74.00	-14.72	Peak	Vertical
2.	2407.200	101.94	-2.77	99.17	---	---	Peak	Vertical
1.	2390.000	47.56	-2.86	44.70	54.00	-9.30	Average	Vertical
2.	2417.040	91.79	-2.71	89.08	---	---	Average	Vertical

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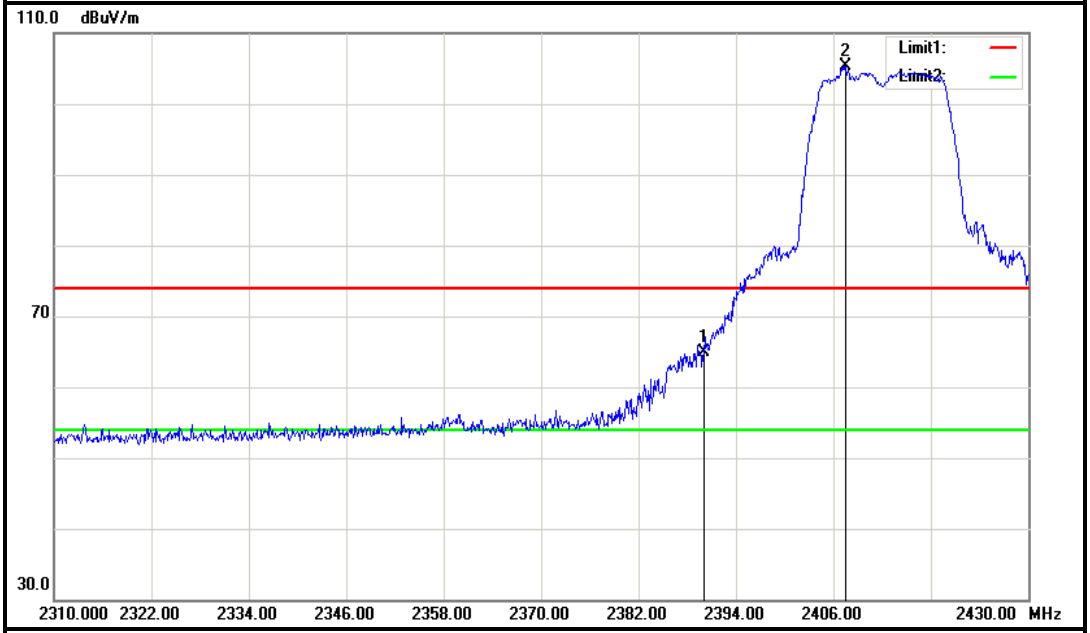
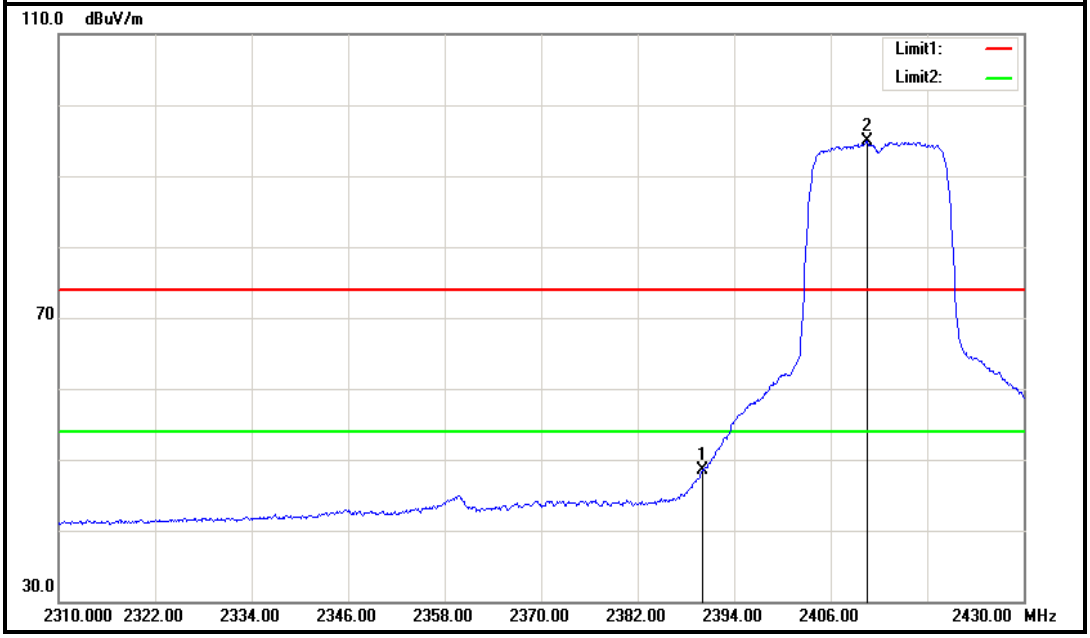
Detector mode: Peak **Polarity: Horizontal**



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	67.67	-2.86	64.81	74.00	-9.19	Peak	Horizontal
2.	2407.560	108.15	-2.77	105.38	---	---	Peak	Horizontal
1.	2390.000	51.30	-2.86	48.44	54.00	-5.56	Average	Horizontal
2.	2410.560	97.64	-2.75	94.89	---	---	Average	Horizontal

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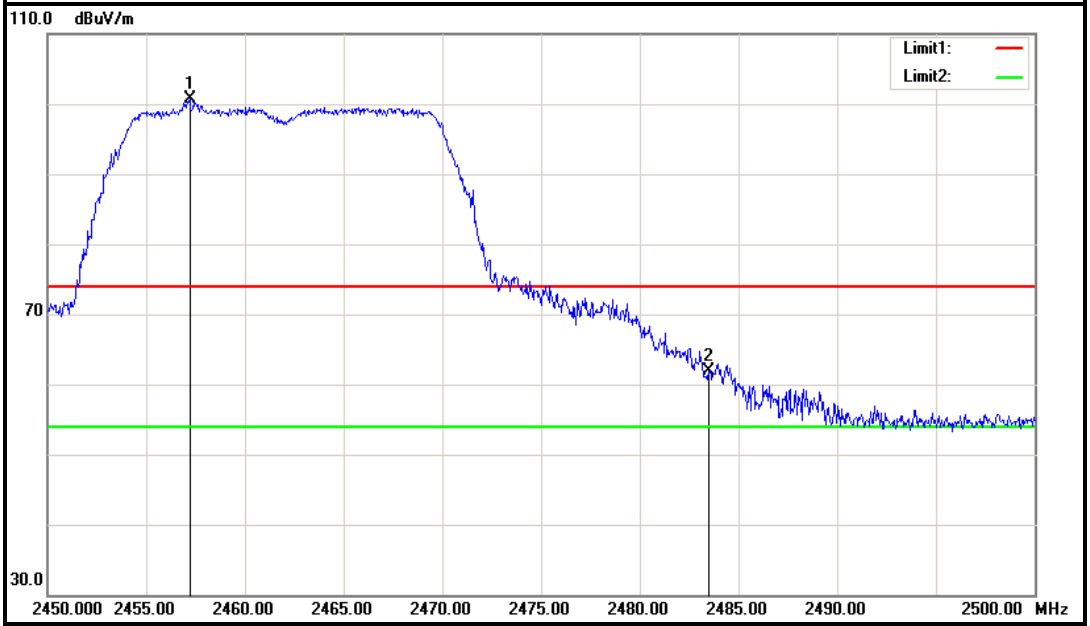
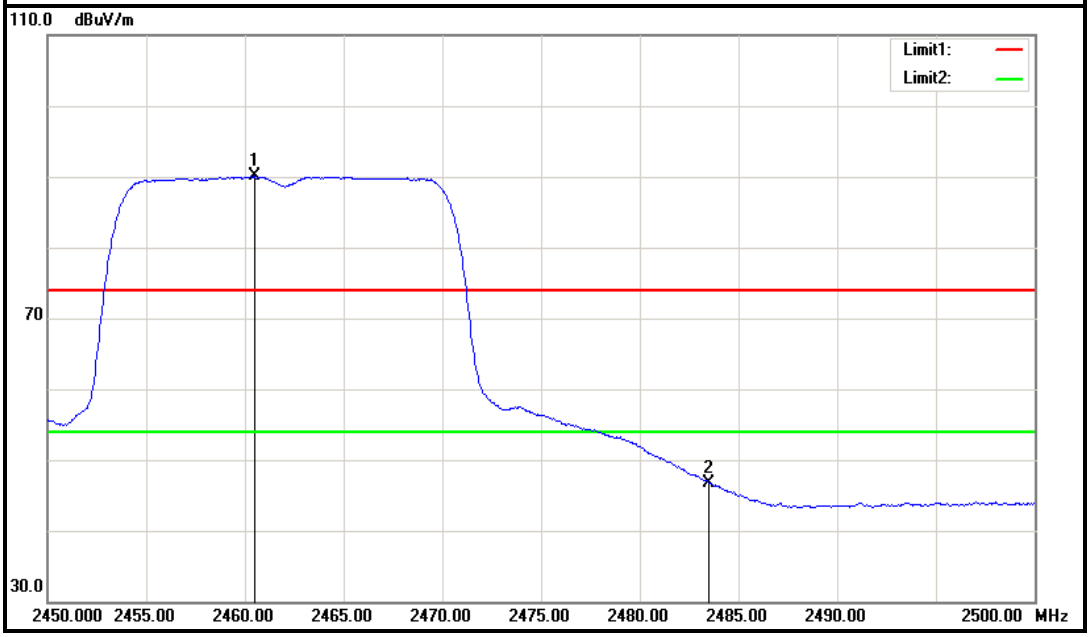
Band Edges (CH High)

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.	2457.200	103.27	-2.49	100.78	---	---	Peak	Vertical
2.	2483.500	64.24	-2.35	61.89	74.00	-12.11	Peak	Vertical
1.	2460.500	92.54	-2.48	90.06	---	---	Average	Vertical
2.	2483.500	49.11	-2.35	46.76	54.00	-7.24	Average	Vertical

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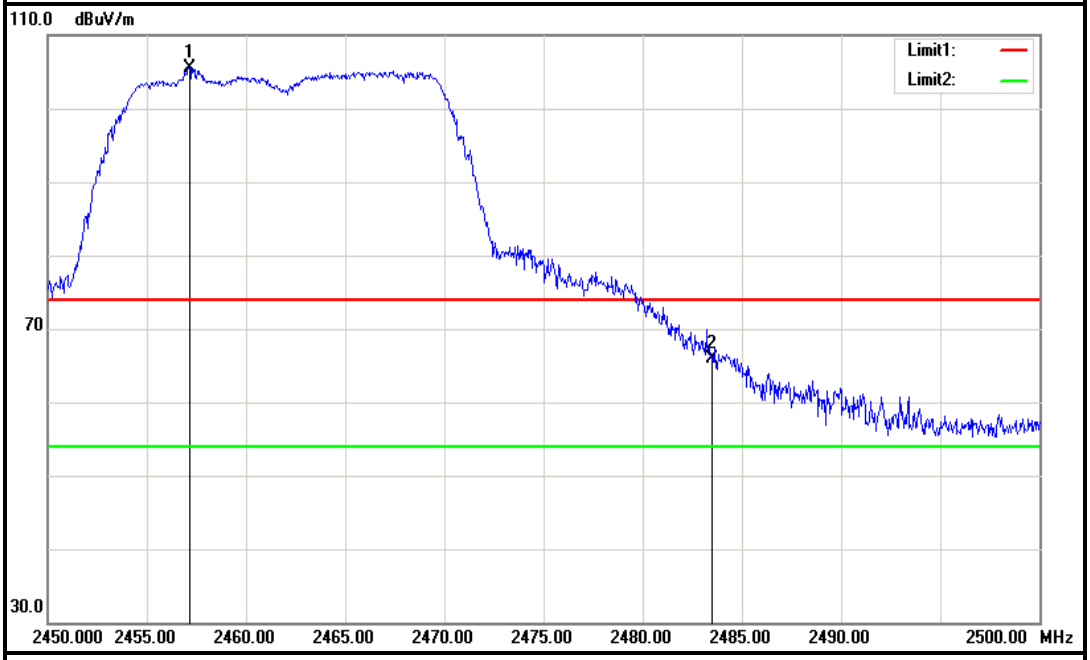
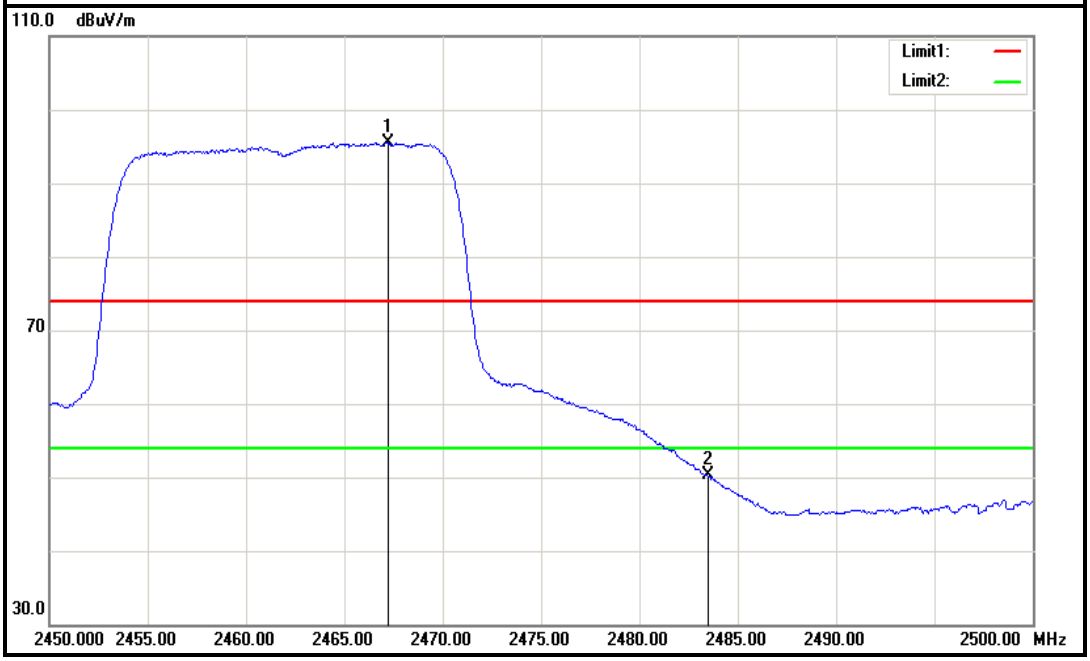
Detector mode: Peak **Polarity: Horizontal**



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.	2457.150	108.02	-2.49	105.53	---	---	Peak	Horizontal
2.	2483.500	68.34	-2.35	65.99	74.00	-8.01	Peak	Horizontal
1.	2467.200	97.94	-2.44	95.50	---	---	Average	Horizontal
2.	2483.500	52.55	-2.35	50.20	54.00	-3.80	Average	Horizontal

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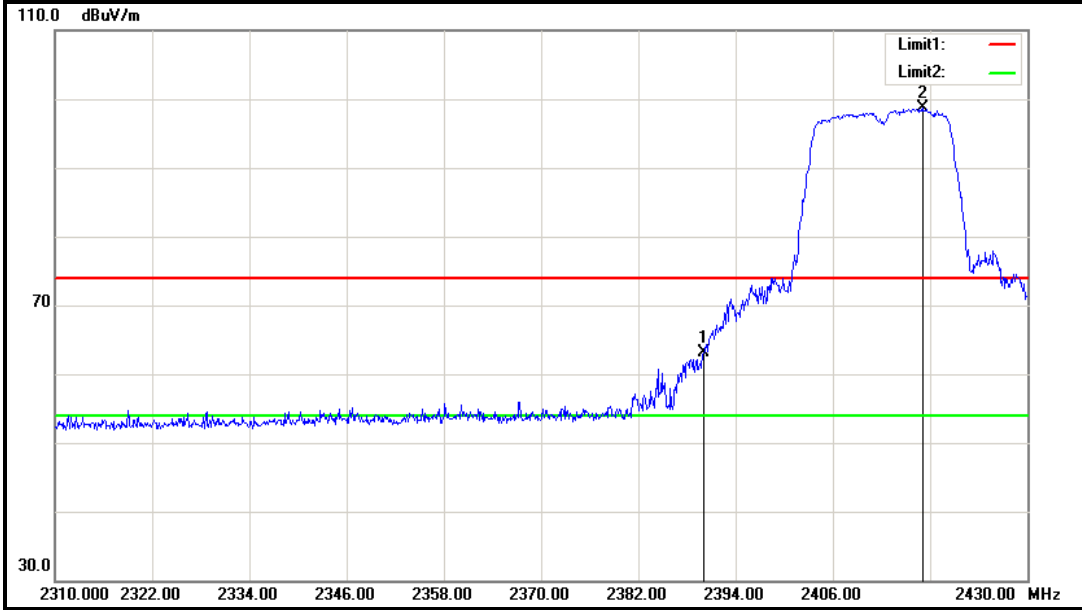
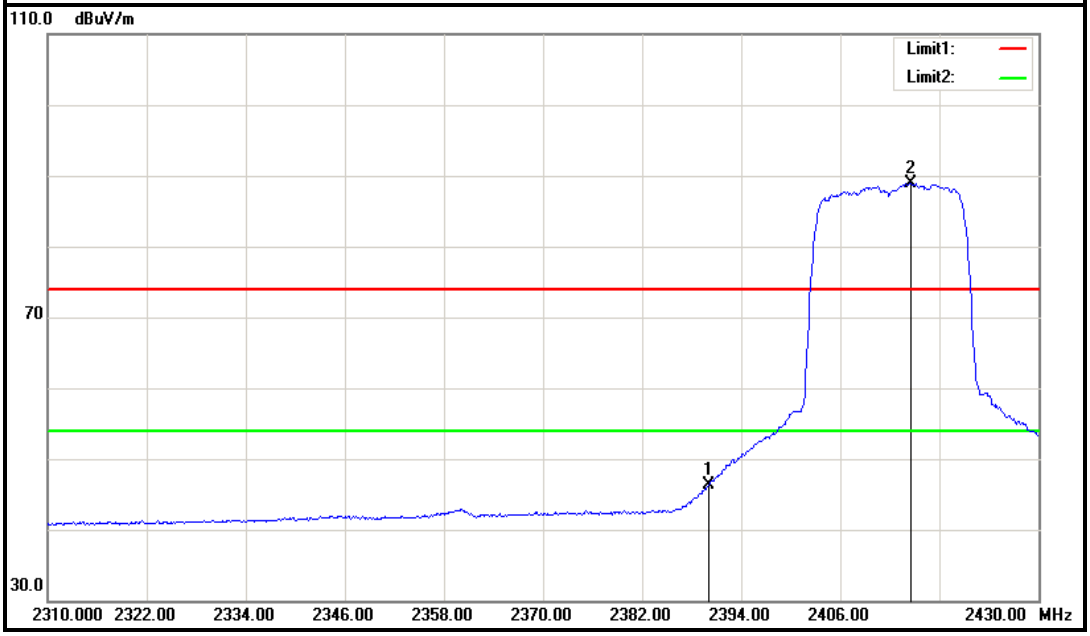
IEEE 802.11n HT20 MHz mode
Band Edges (CH Low)

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	66.05	-2.86	63.19	74.00	-10.81	Peak	Vertical
2.	2417.040	101.33	-2.71	98.62	---	---	Peak	Vertical
1.	2390.000	49.17	-2.86	46.31	54.00	-7.69	Average	Vertical
2.	2414.520	91.73	-2.73	89.00	---	---	Average	Vertical

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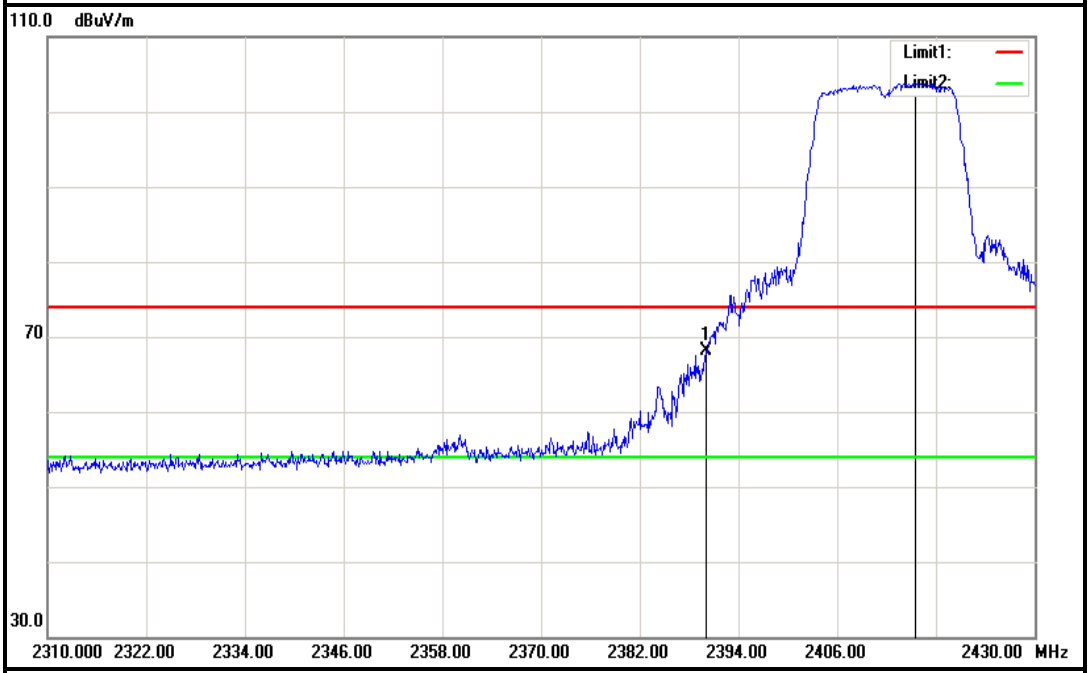
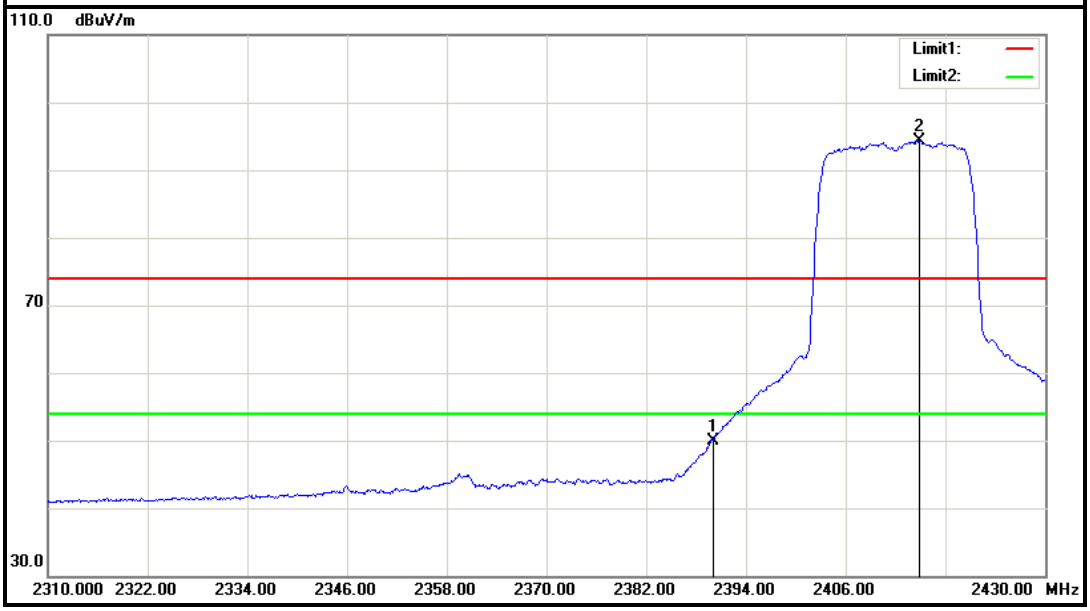
Detector mode: Peak **Polarity: Horizontal**



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	70.88	-2.86	68.02	74.00	-5.98	Peak	Horizontal
2.	2415.480	106.59	-2.72	103.87	---	---	Peak	Horizontal
1.	2390.000	52.86	-2.86	50.00	54.00	-4.00	Average	Horizontal
2.	2414.880	97.01	-2.73	94.28	---	---	Average	Horizontal

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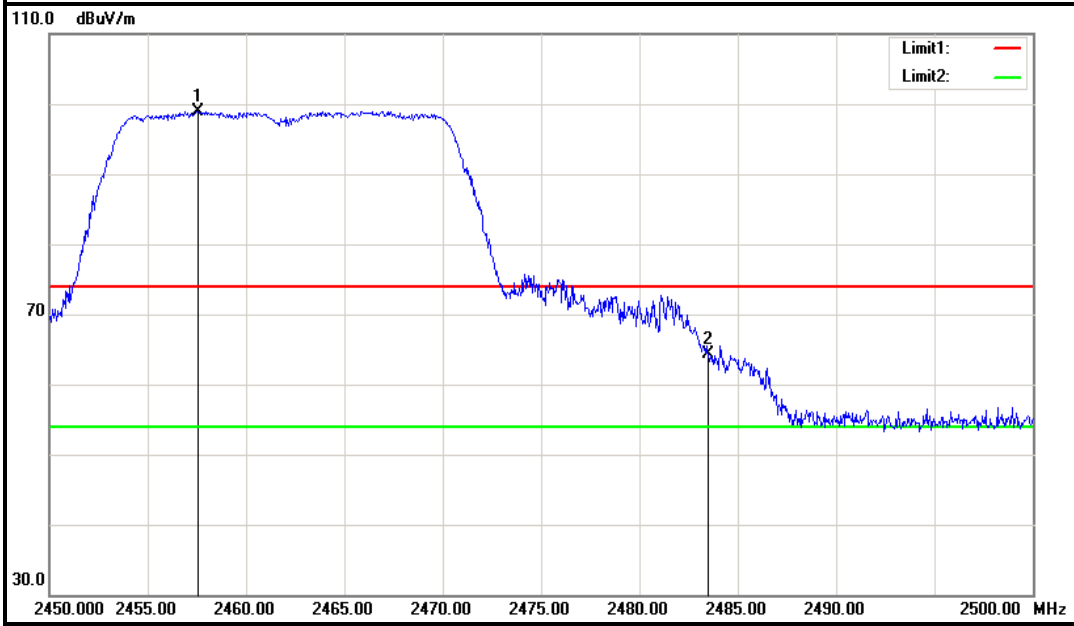
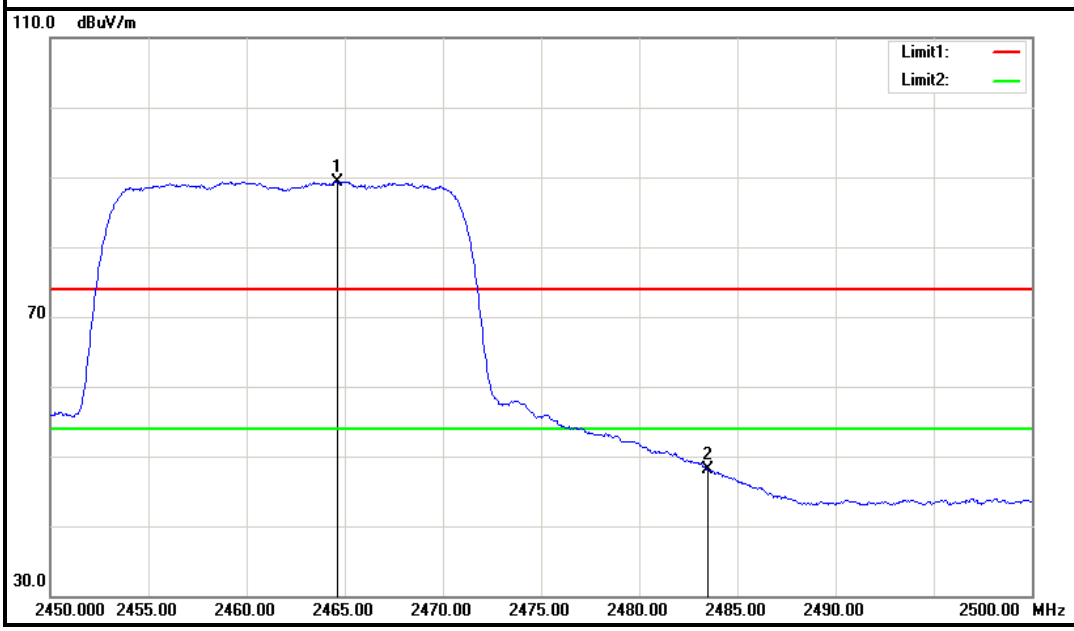
Band Edges (CH High)

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.	2457.550	101.39	-2.49	98.90	---	---	Peak	Vertical
2.	2483.500	66.59	-2.35	64.24	74.00	-9.76	Peak	Vertical
1.	2464.650	91.79	-2.45	89.34	---	---	Average	Vertical
2.	2483.500	50.46	-2.35	48.11	54.00	-5.89	Average	Vertical

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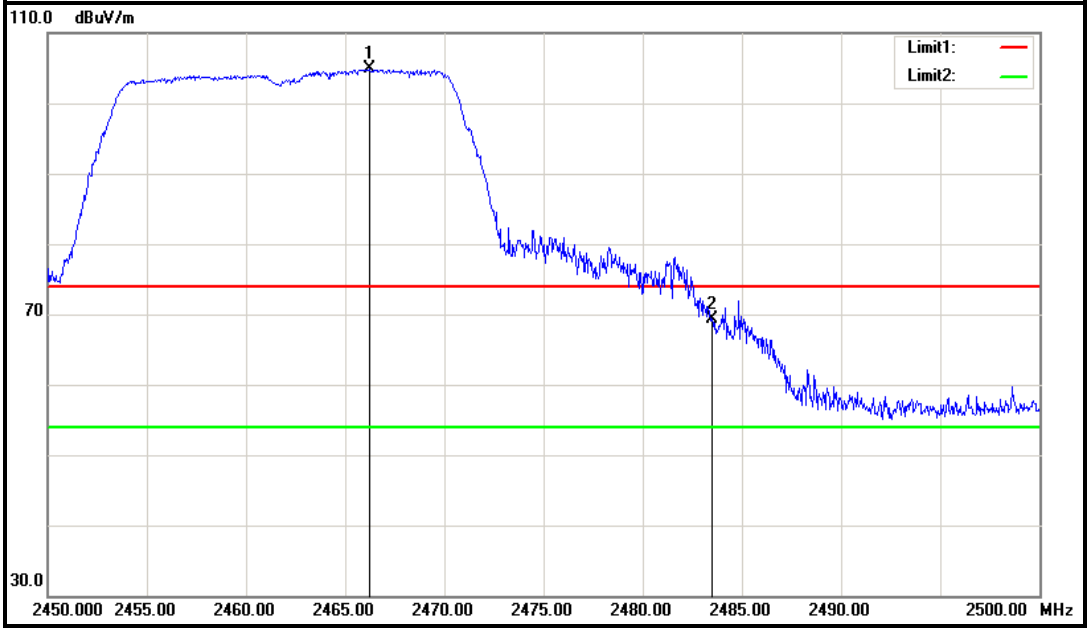
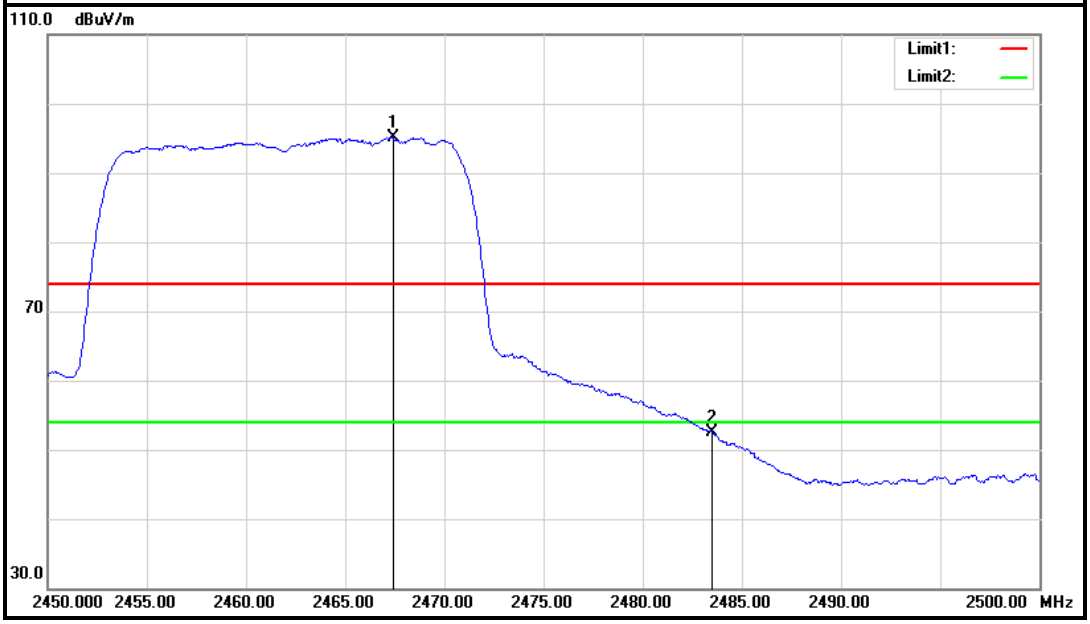
Detector mode: Peak **Polarity: Horizontal**



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.	2466.200	107.30	-2.45	104.85	---	---	Peak	Horizontal
2.	2483.500	71.63	-2.35	69.28	74.00	-4.72	Peak	Horizontal
1.	2467.400	97.64	-2.44	95.20	---	---	Average	Horizontal
2.	2483.500	54.95	-2.35	52.60	54.00	-1.40	Average	Horizontal

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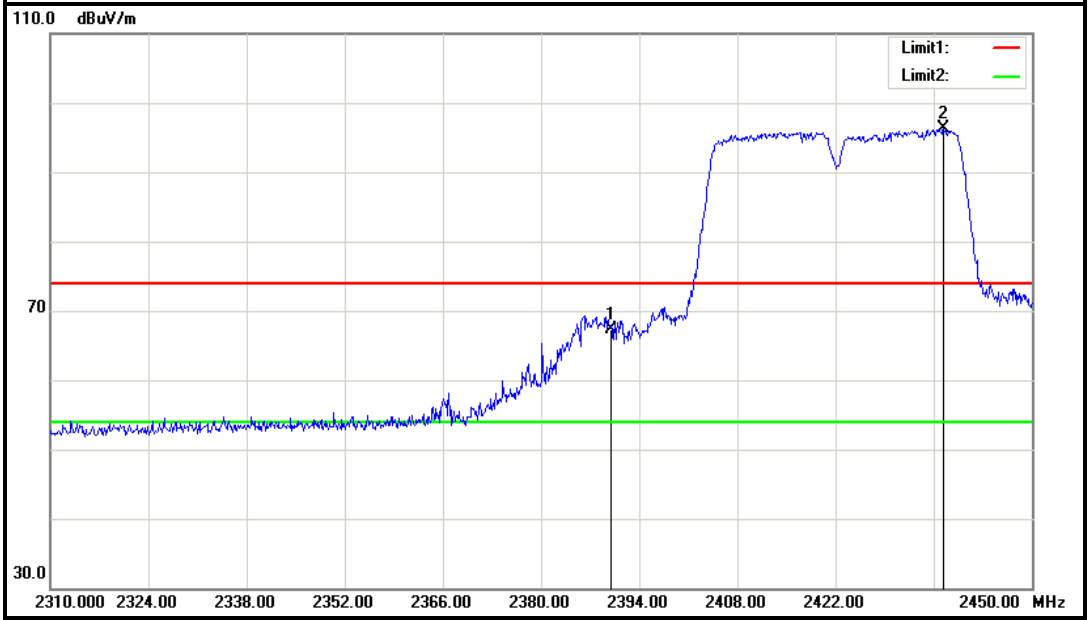
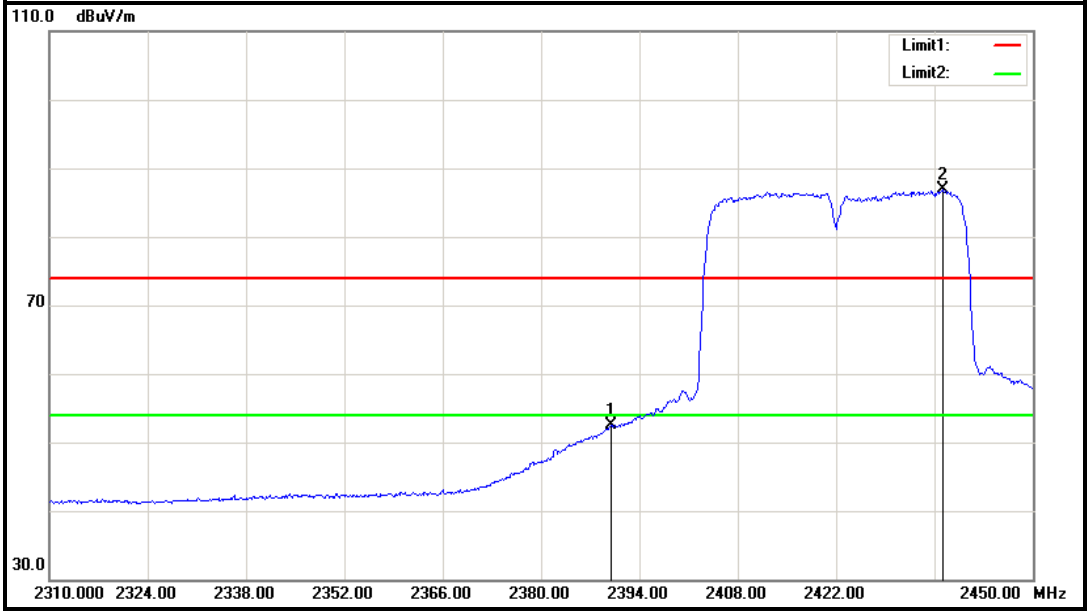
IEEE 802.11n HT40 MHz mode
Band Edges (CH Low)

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	70.17	-2.86	67.31	74.00	-6.69	Peak	Vertical
2.	2437.400	98.82	-2.60	96.22	---	---	Peak	Vertical
1.	2390.000	55.29	-2.86	52.43	54.00	-1.57	Average	Vertical
2.	2437.120	89.41	-2.60	86.81	---	---	Average	Vertical

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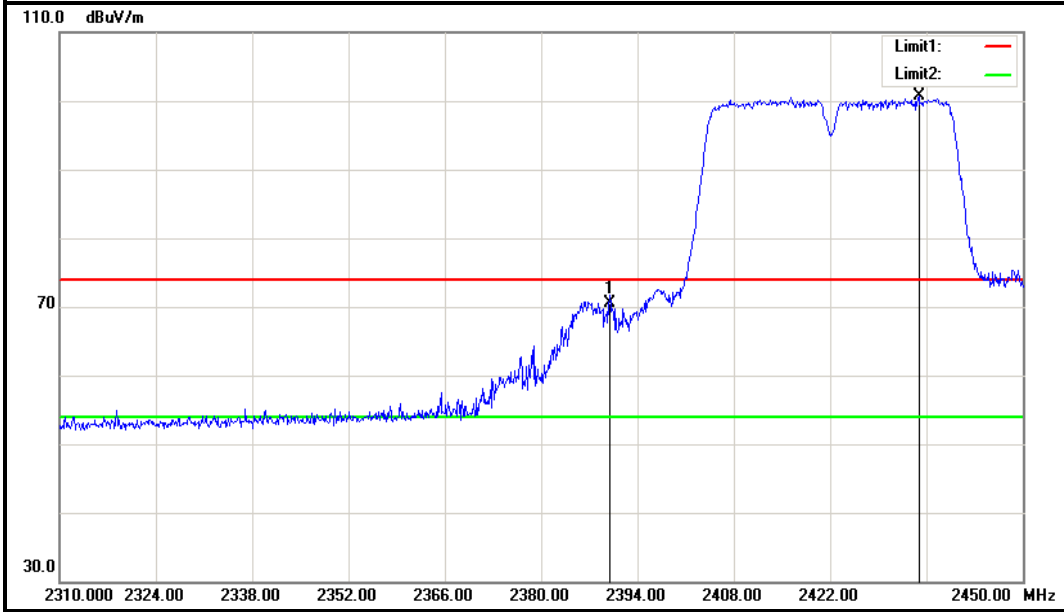
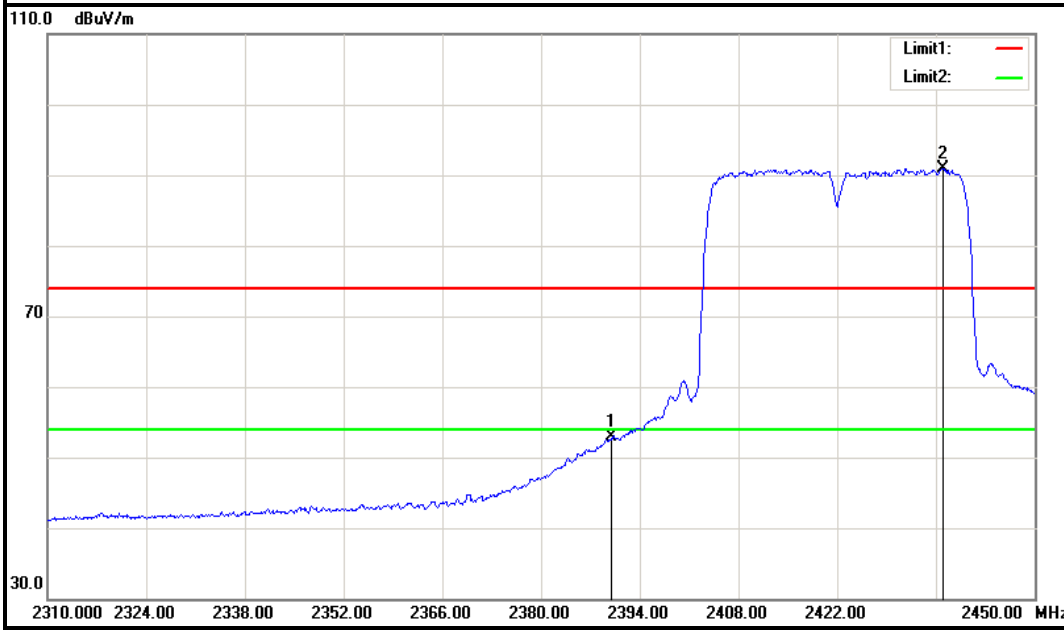
Detector mode: Peak **Polarity: Horizontal**



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	73.31	-2.86	70.45	74.00	-3.55	Peak	Horizontal
2.	2434.880	103.23	-2.62	100.61	---	---	Peak	Horizontal
1.	2390.000	55.67	-2.86	52.81	54.00	-1.19	Average	Horizontal
2.	2436.980	93.52	-2.61	90.91	---	---	Average	Horizontal

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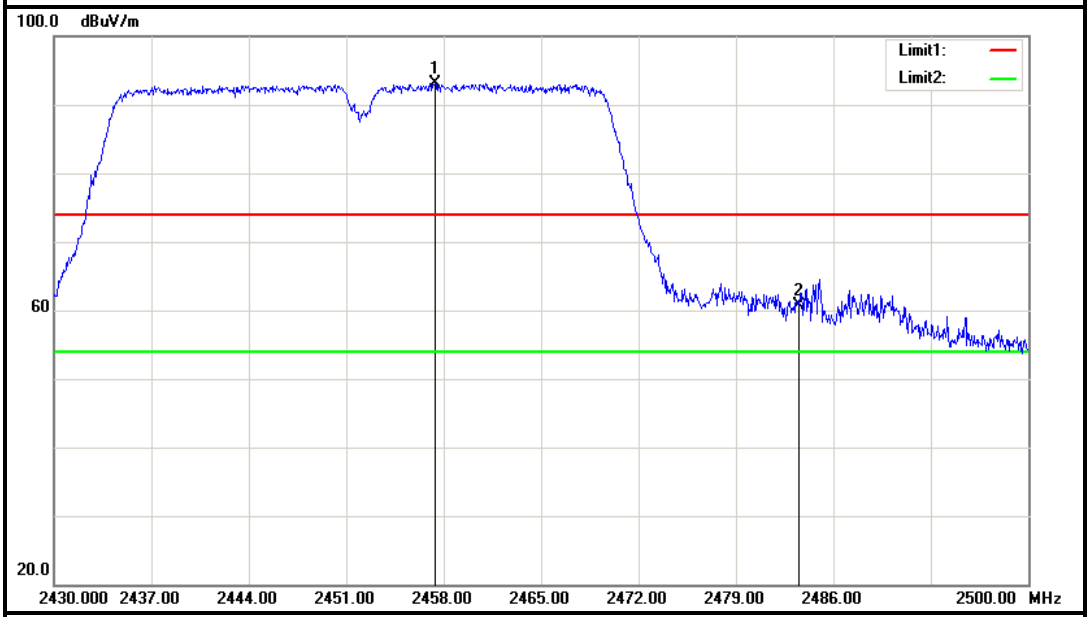
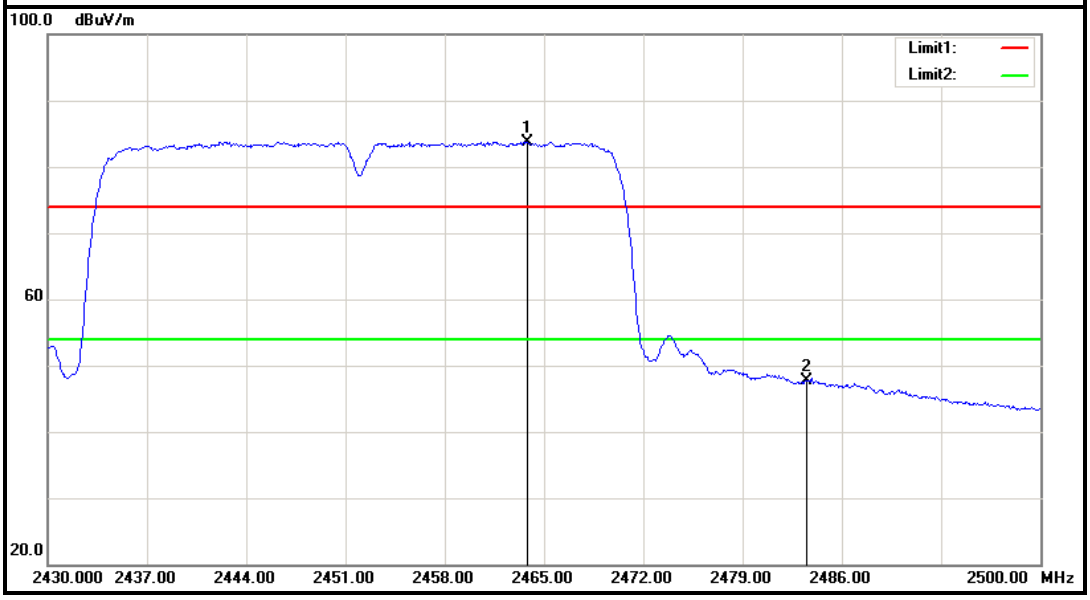
Band Edges (CH High)

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.	2457.370	95.68	-2.49	93.19	---	---	Peak	Vertical
2.	2483.500	62.98	-2.35	60.63	74.00	-13.37	Peak	Vertical
1.	2463.810	86.22	-2.46	83.76	---	---	Average	Vertical
2.	2483.500	50.02	-2.35	47.67	54.00	-6.33	Average	Vertical

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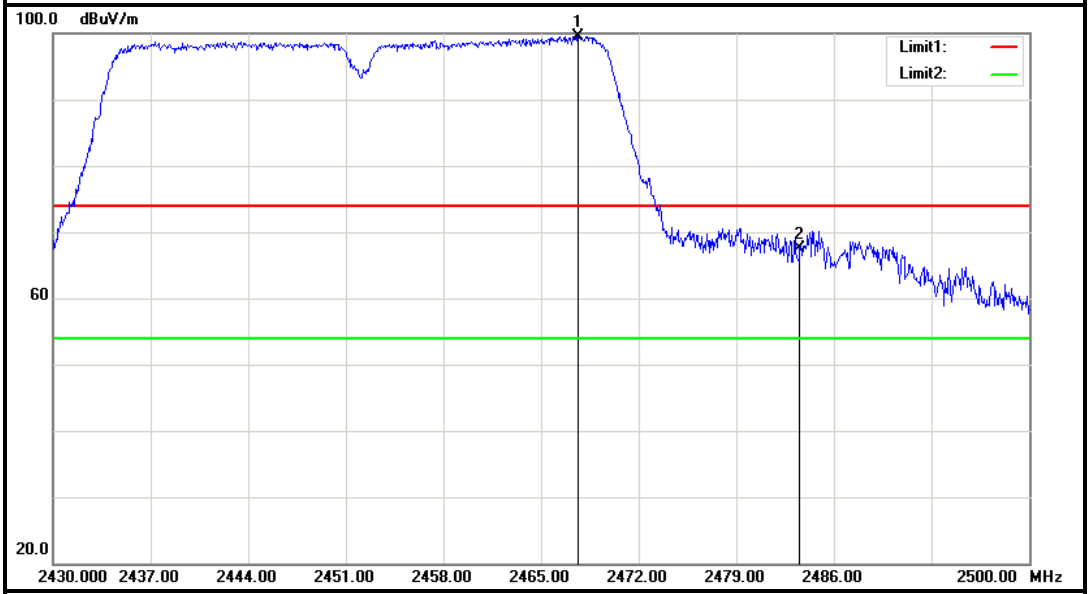
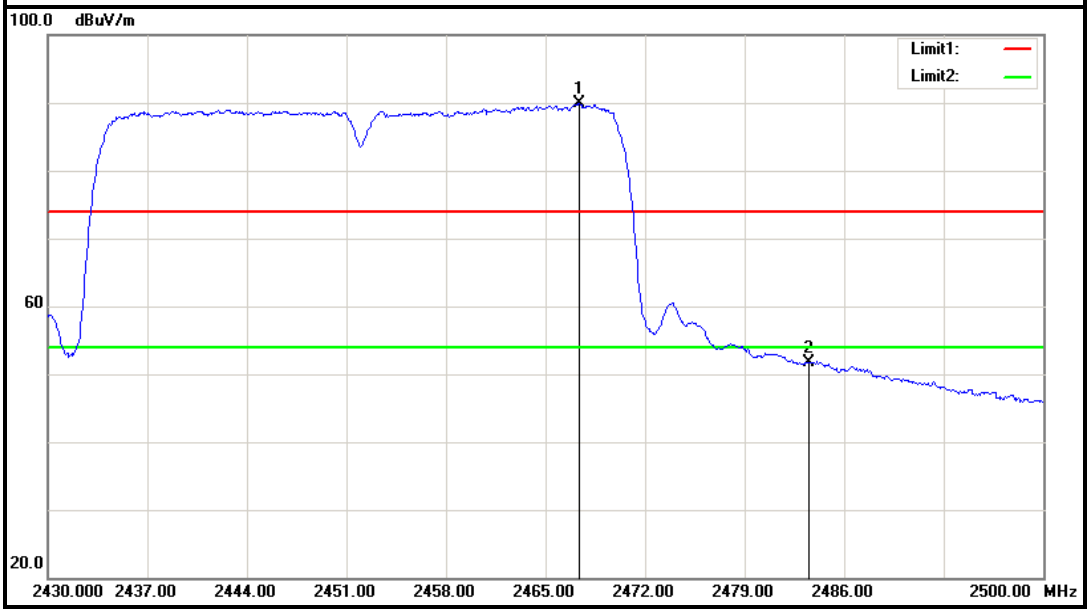
Detector mode: Peak **Polarity: Horizontal**



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.	2467.660	101.97	-2.44	99.53	---	---	Peak	Horizontal
2.	2483.500	69.95	-2.35	67.60	74.00	-6.40	Peak	Horizontal
1.	2467.380	92.30	-2.44	89.86	---	---	Average	Horizontal
2.	2483.500	54.05	-2.35	51.70	54.00	-2.30	Average	Horizontal

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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	02/21/2017	02/20/2018

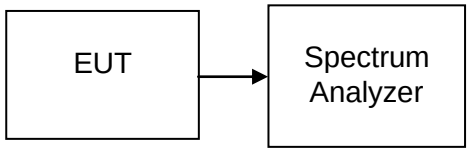
7.7.3. TEST PROCEDURES (please refer to measurement standard)

§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



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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	-9.839	8	PASS
Mid	2437	-8.455		PASS
High	2462	-8.364		PASS

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-11.614	8	PASS
Mid	2437	-11.379		PASS
High	2462	-9.879		PASS

Test mode: IEEE 802.11n HT20 MHz

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-12.492	8	PASS
Mid	2437	-12.157		PASS
High	2462	-10.322		PASS

Test mode: IEEE 802.11n HT40 MHz

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2422	-13.448	8	PASS
Mid	2437	-12.009		PASS
High	2452	-12.315		PASS

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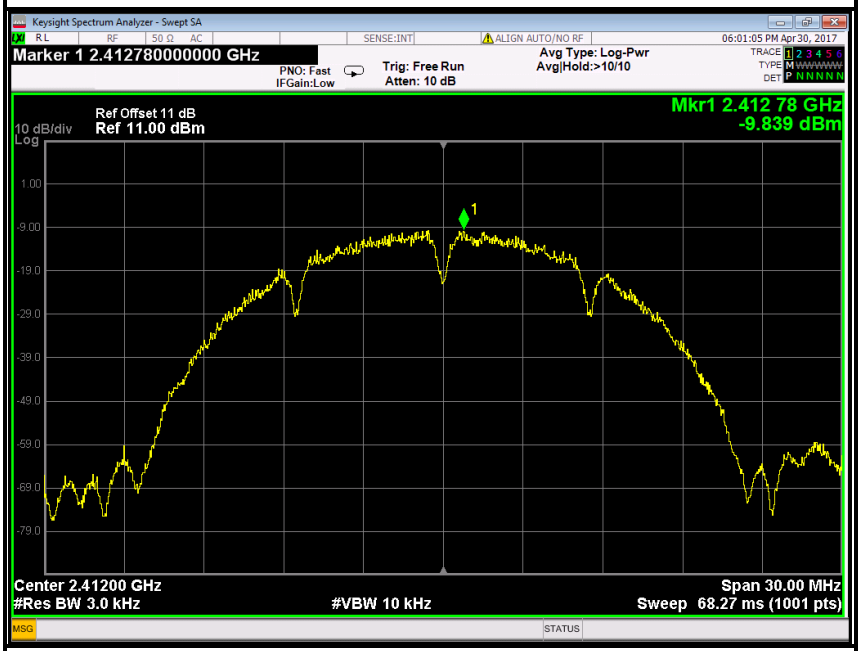
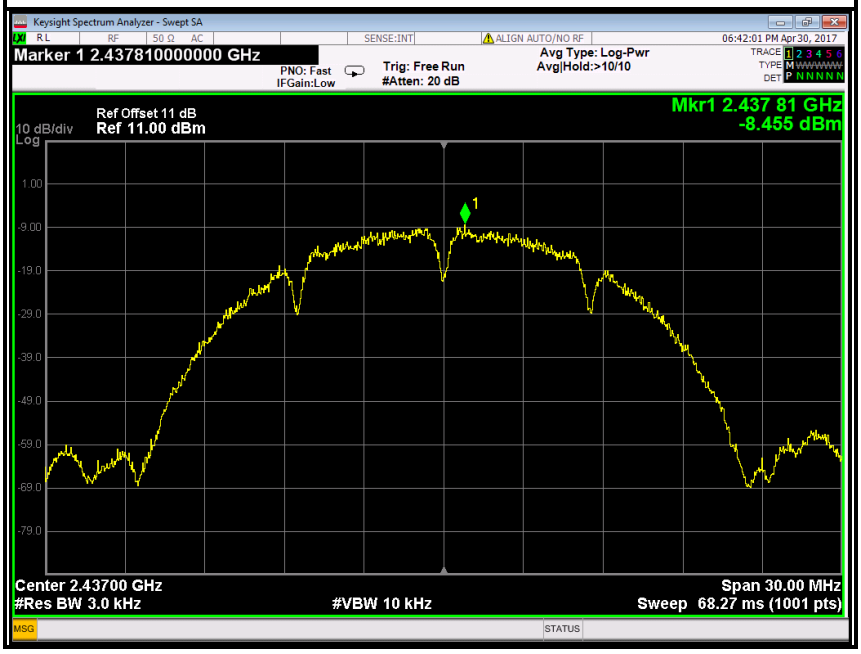
Test Plot

IEEE 802.11b mode

PPSD (CH Low)



PPSD (CH Mid)



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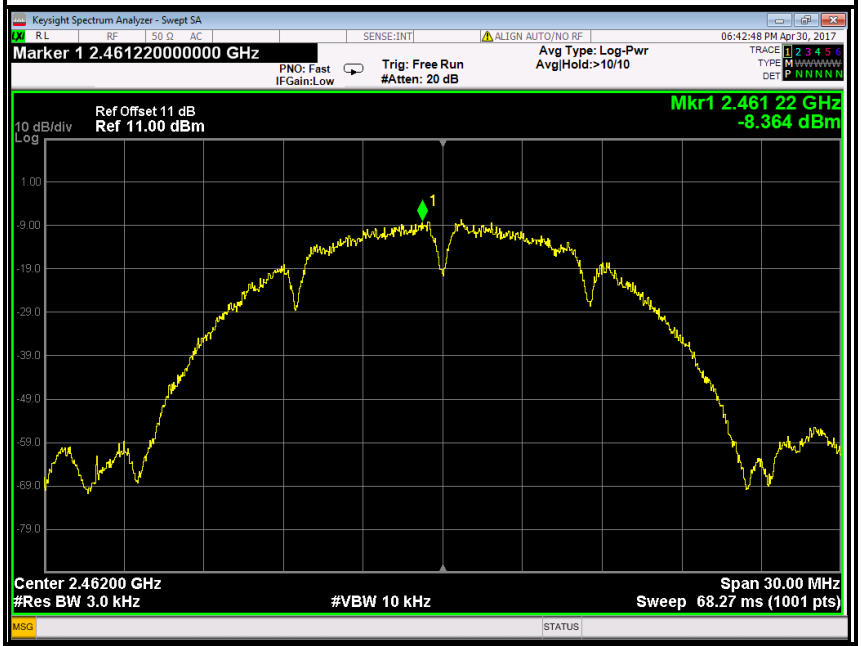
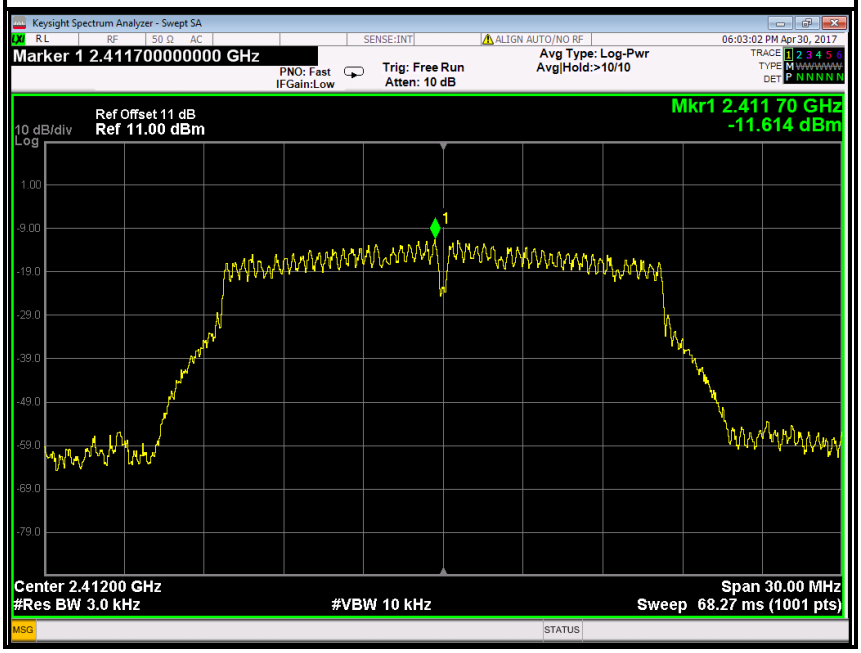
PPSD (CH High)



IEEE 802.11g mode

PPSD (CH Low)



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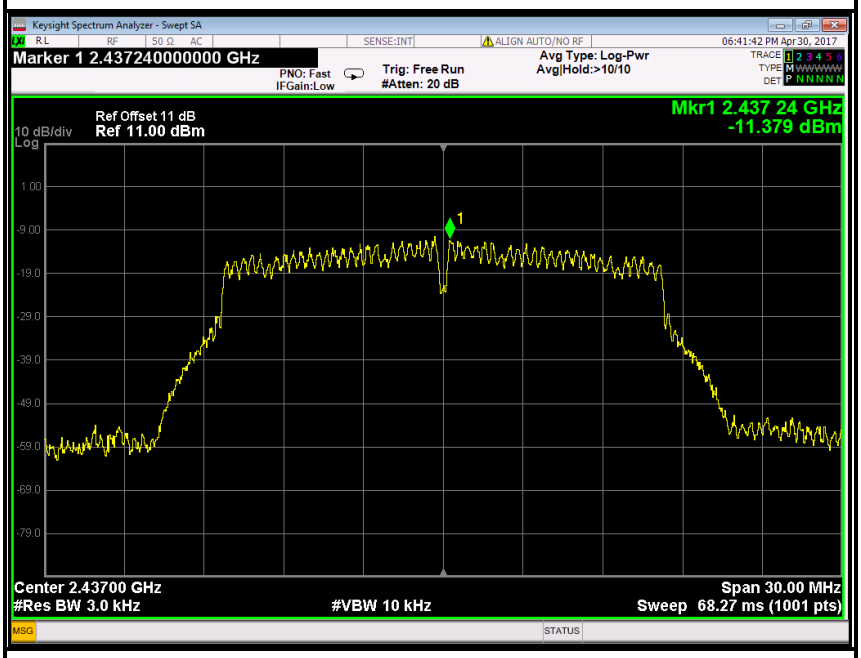
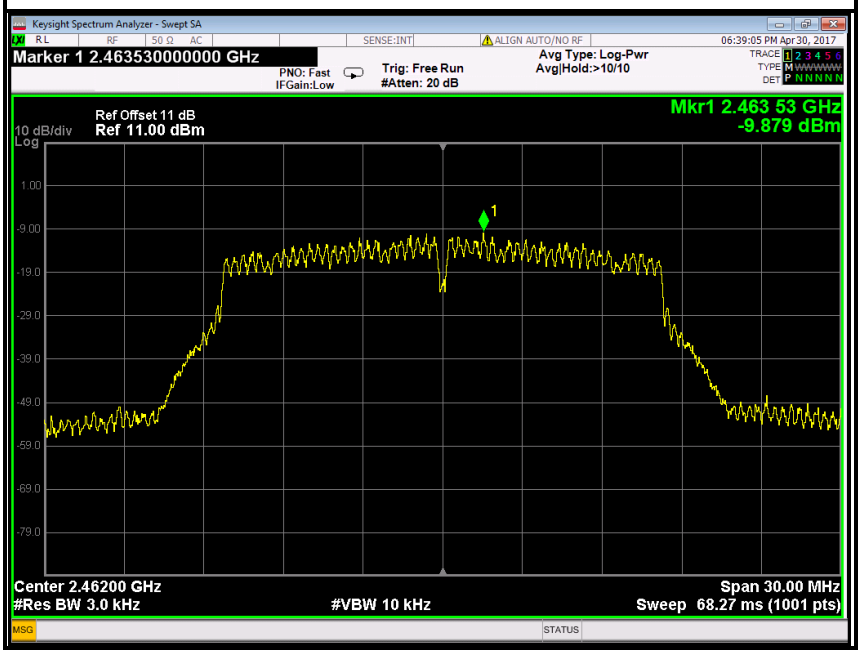
PPSD (CH Mid)



PPSD (CH High)



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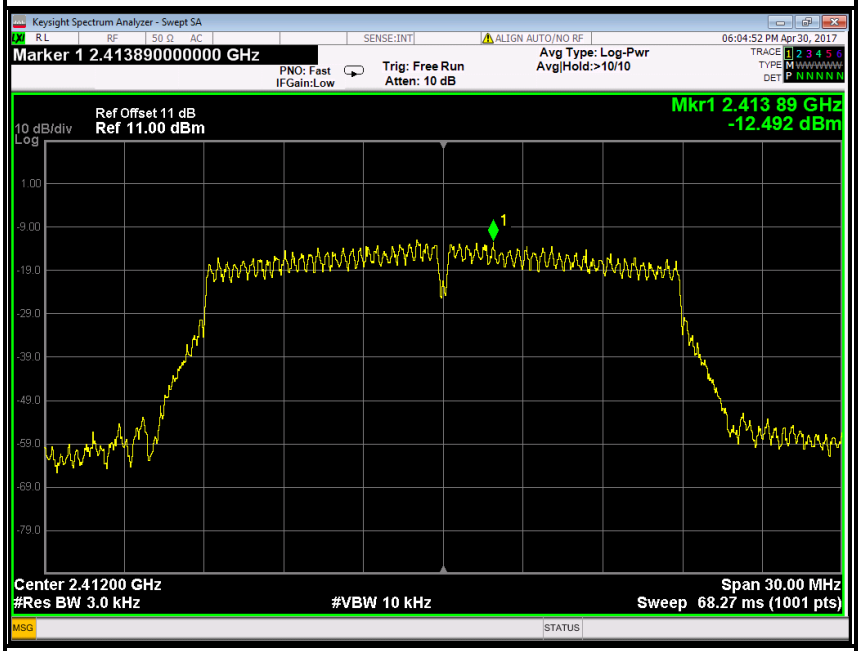
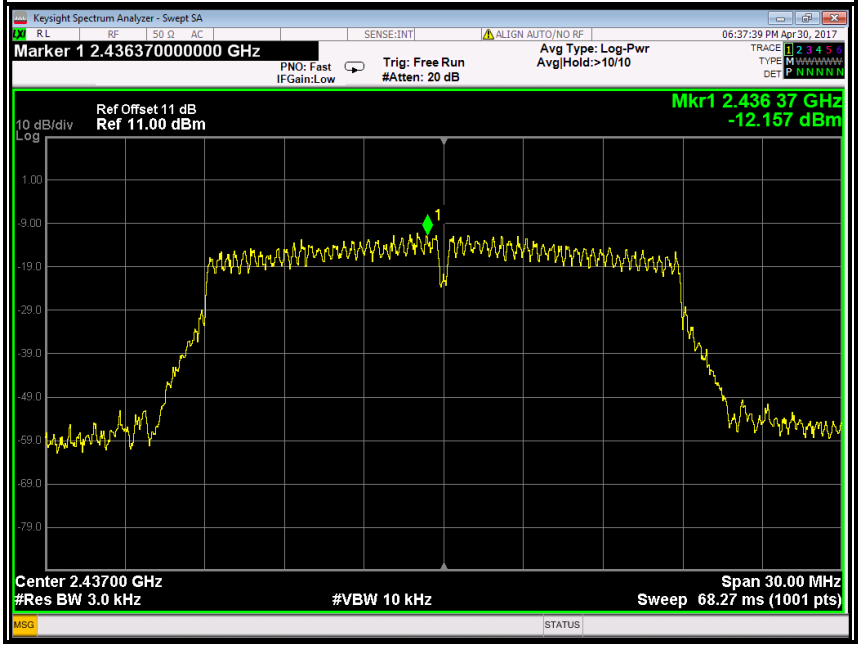
IEEE 802.11n HT20 MHz mode

PPSD (CH Low)



PPSD (CH Mid)



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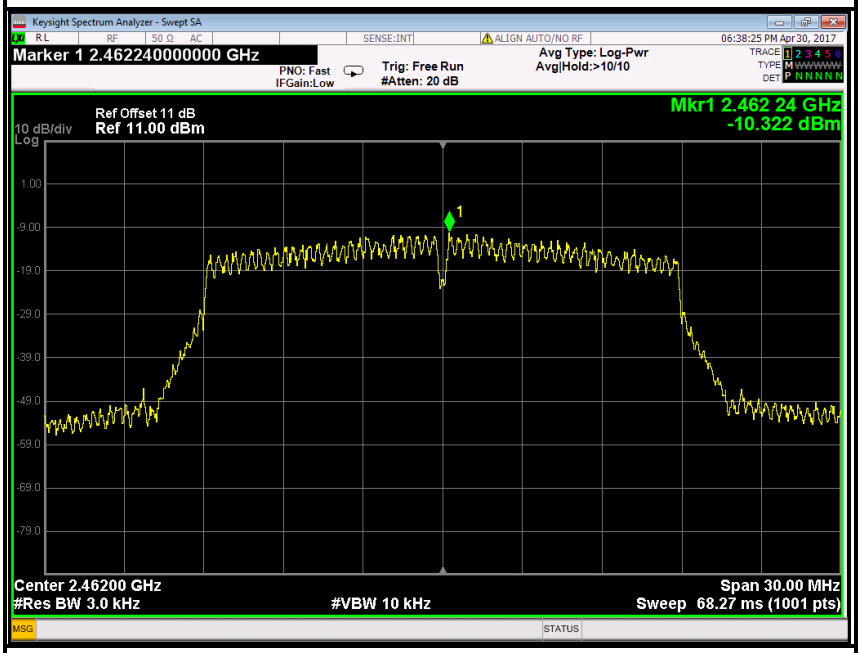
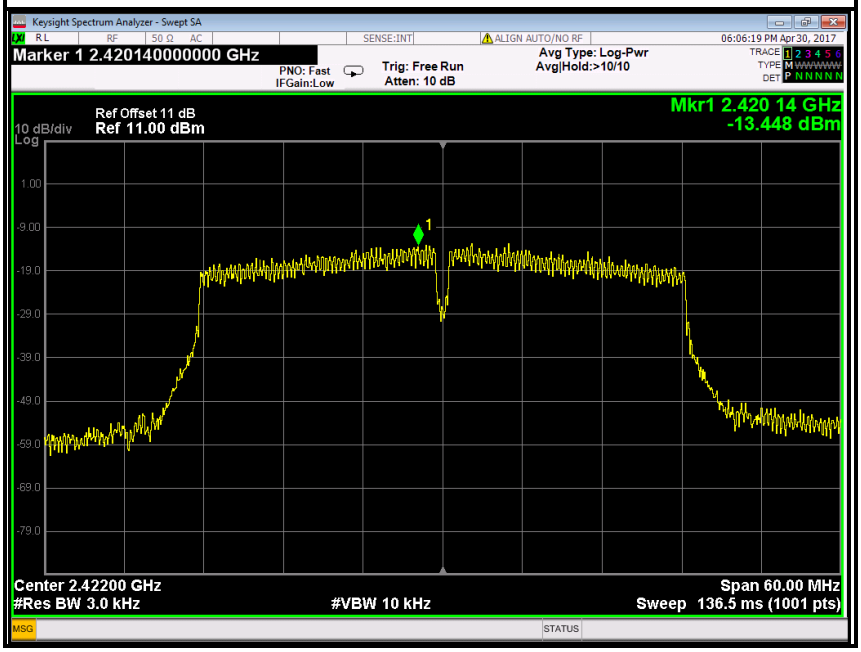
PPSD (CH High)



IEEE 802.11n HT40 MHz mode

PPSD (CH Low)



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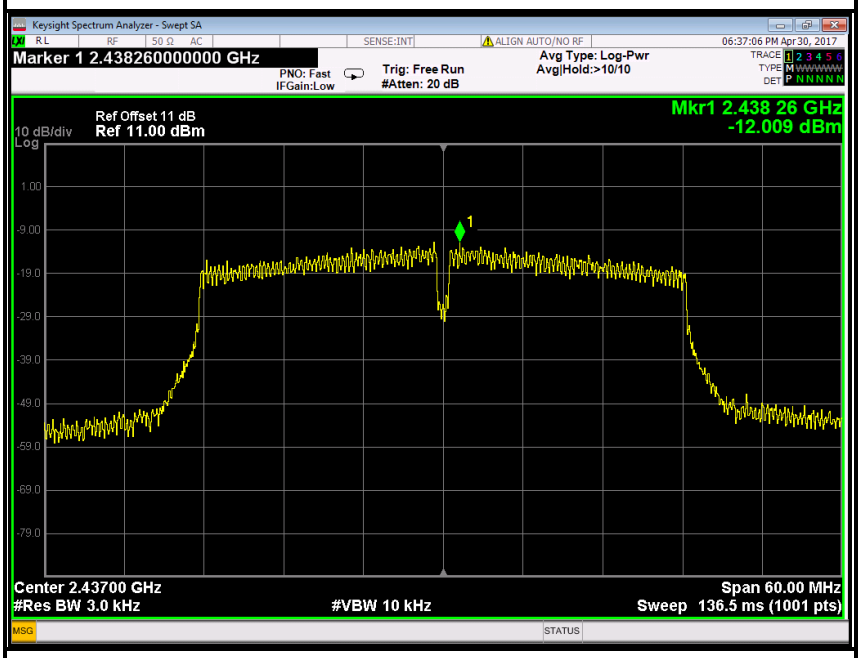
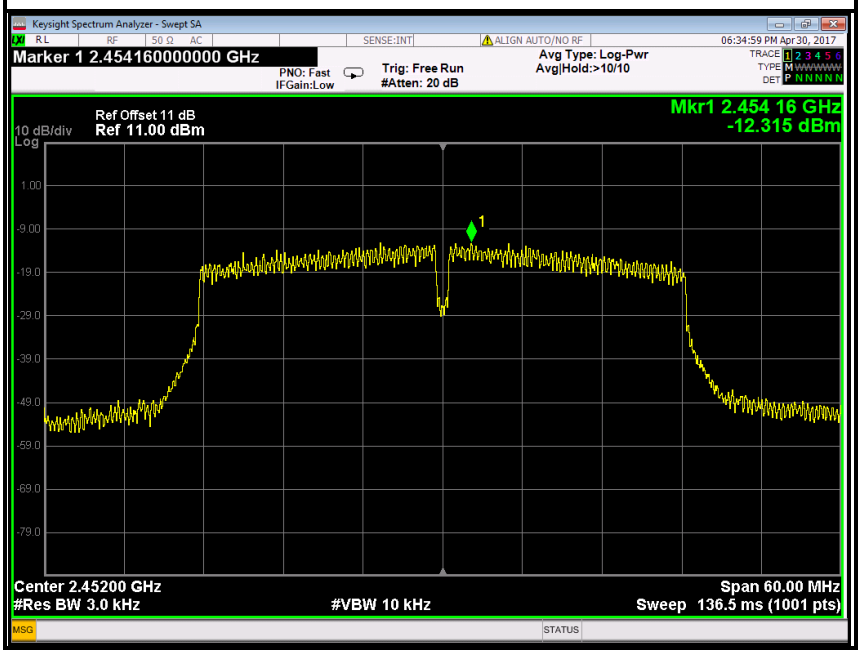
PPSD (CH Mid)



PPSD (CH High)



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