

**Antenna 2****Test Mode:** TX / IEEE 802.11g(CH Low)**Tested by:** Saber Huang**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** April 2, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2170.000	46.63	-4.07	42.56	74.00	-31.44	V	Peak
2530.000	46.82	-2.21	44.61	74.00	-29.39	V	Peak
3655.000	44.38	0.13	44.51	74.00	-29.49	V	Peak
4249.000	44.53	2.47	47.00	74.00	-27.00	V	Peak
5509.000	42.36	5.87	48.23	74.00	-25.77	V	Peak
6139.000	42.76	6.31	49.07	74.00	-24.93	V	Peak
2539.000	46.69	-2.19	44.50	74.00	-29.50	H	Peak
3610.000	43.94	-0.06	43.88	74.00	-30.12	H	Peak
3907.000	43.95	1.20	45.15	74.00	-28.85	H	Peak
4861.000	43.26	4.53	47.79	74.00	-26.21	H	Peak
5077.000	43.23	5.12	48.35	74.00	-25.65	H	Peak
5275.000	43.18	5.47	48.65	74.00	-25.35	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).

**Test Mode:** TX / IEEE 802.11g (CH Mid)**Tested by:** Saber Huang**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** April 2, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2080.000	47.54	-4.56	42.98	74.00	-31.02	V	Peak
2539.000	46.47	-2.19	44.28	74.00	-29.72	V	Peak
4258.000	42.82	2.50	45.32	74.00	-28.68	V	Peak
4681.000	43.19	3.94	47.13	74.00	-26.87	V	Peak
5329.000	42.80	5.57	48.37	74.00	-25.63	V	Peak
5968.000	42.35	6.07	48.42	74.00	-25.58	V	Peak
2521.000	46.35	-2.22	44.13	74.00	-29.87	H	Peak
3385.000	43.37	-0.71	42.66	74.00	-31.34	H	Peak
3655.000	44.85	0.13	44.98	74.00	-29.02	H	Peak
4465.000	43.37	3.23	46.60	74.00	-27.40	H	Peak
5068.000	43.12	5.10	48.22	74.00	-25.78	H	Peak
5644.000	43.94	5.93	49.87	74.00	-24.13	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).



Test Mode: TX / IEEE 802.11g (CH High)

Tested by: Saber Huang

Ambient temperature: 24°C

Relative humidity: 52% RH

Date: April 2, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2233.000	46.53	-3.72	42.81	74.00	-31.19	V	Peak
2521.000	46.16	-2.22	43.94	74.00	-30.06	V	Peak
3043.000	44.38	-1.29	43.09	74.00	-30.91	V	Peak
3655.000	43.14	0.13	43.27	74.00	-30.73	V	Peak
4582.000	43.76	3.62	47.38	74.00	-26.62	V	Peak
4987.000	42.48	4.94	47.42	74.00	-26.58	V	Peak
2530.000	46.40	-2.21	44.19	74.00	-29.81	H	Peak
3367.000	43.75	-0.74	43.01	74.00	-30.99	H	Peak
3943.000	44.84	1.35	46.19	74.00	-27.81	H	Peak
4600.000	42.27	3.68	45.95	74.00	-28.05	H	Peak
4672.000	42.61	3.91	46.52	74.00	-27.48	H	Peak
5509.000	42.77	5.87	48.64	74.00	-25.36	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).

**Combine with Antenna 1 and Antenna 2****Test Mode:** TX / IEEE 802.11n HT20 MHz (CH Low)**Tested by:** Saber Huang**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** April 2, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2260.000	46.90	-3.58	43.32	74.00	-30.68	V	Peak
2512.000	46.34	-2.24	44.10	74.00	-29.90	V	Peak
3070.000	43.90	-1.24	42.66	74.00	-31.34	V	Peak
3646.000	44.85	0.10	44.95	74.00	-29.05	V	Peak
4285.000	44.00	2.59	46.59	74.00	-27.41	V	Peak
4825.000	42.77	4.41	47.18	74.00	-26.82	V	Peak
2512.000	46.73	-2.24	44.49	74.00	-29.51	H	Peak
3214.000	44.05	-1.00	43.05	74.00	-30.95	H	Peak
3718.000	43.47	0.40	43.87	74.00	-30.13	H	Peak
4249.000	43.47	2.47	45.94	74.00	-28.06	H	Peak
4555.000	43.16	3.53	46.69	74.00	-27.31	H	Peak
5500.000	43.11	5.87	48.98	74.00	-25.02	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).

**Test Mode:** TX / IEEE 802.11n HT20 MHz (CH Mid)**Tested by:** Saber Huang**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** April 2, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2530.000	46.37	-2.21	44.16	74.00	-29.84	V	Peak
2800.000	45.88	-1.72	44.16	74.00	-29.84	V	Peak
3367.000	43.93	-0.74	43.19	74.00	-30.81	V	Peak
4213.000	42.34	2.34	44.68	74.00	-29.32	V	Peak
4465.000	43.31	3.23	46.54	74.00	-27.46	V	Peak
5590.000	43.82	5.91	49.73	74.00	-24.27	V	Peak
2242.000	47.46	-3.67	43.79	74.00	-30.21	H	Peak
2584.000	46.21	-2.11	44.10	74.00	-29.90	H	Peak
3700.000	43.87	0.32	44.19	74.00	-29.81	H	Peak
4150.000	42.75	2.12	44.87	74.00	-29.13	H	Peak
4879.000	42.77	4.59	47.36	74.00	-26.64	H	Peak
6121.000	42.50	6.28	48.78	74.00	-25.22	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).

Test Mode: TX / EEE 802.11n HT20 MHz (CH High)Tested by: Saber HuangAmbient temperature: 24°CRelative humidity: 52% RHDate: April 2, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2260.000	45.88	-3.58	42.30	74.00	-31.70	V	Peak
2539.000	46.37	-2.19	44.18	74.00	-29.82	V	Peak
2818.000	45.72	-1.69	44.03	74.00	-29.97	V	Peak
3754.000	43.22	0.55	43.77	74.00	-30.23	V	Peak
4582.000	42.94	3.62	46.56	74.00	-27.44	V	Peak
4654.000	44.04	3.85	47.89	74.00	-26.11	V	Peak
1756.000	47.37	-6.36	41.01	74.00	-32.99	H	Peak
2197.000	46.38	-3.92	42.46	74.00	-31.54	H	Peak
2530.000	46.38	-2.21	44.17	74.00	-29.83	H	Peak
3349.000	45.60	-0.77	44.83	74.00	-29.17	H	Peak
4438.000	43.25	3.13	46.38	74.00	-27.62	H	Peak
5302.000	43.18	5.52	48.70	74.00	-25.30	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).



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

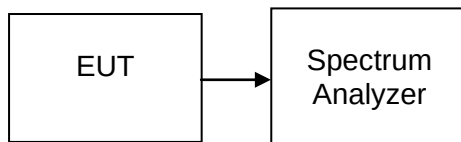
Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Spectrum Analyzer	Agilent	N9010A	MY52221469	02/21/2017	02/20/2018

7.3.3. TEST PROCEDURES (please refer to measurement standard)

8.1 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 $\geq$ 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 $\geq$ 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
		Antenna 1	Antenna 2		
Low	2412	10040	10040	>500	PASS
Mid	2437	10010	10040		PASS
High	2462	10030	10050		PASS

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Bandwidth (kHz)		Limit (kHz)	Test Result
		Antenna 1	Antenna 2		
Low	2412	15110	15100	>500	PASS
Mid	2437	15110	15110		PASS
High	2462	15100	15110		PASS

Test mode: IEEE 802.11n HT20 MHz

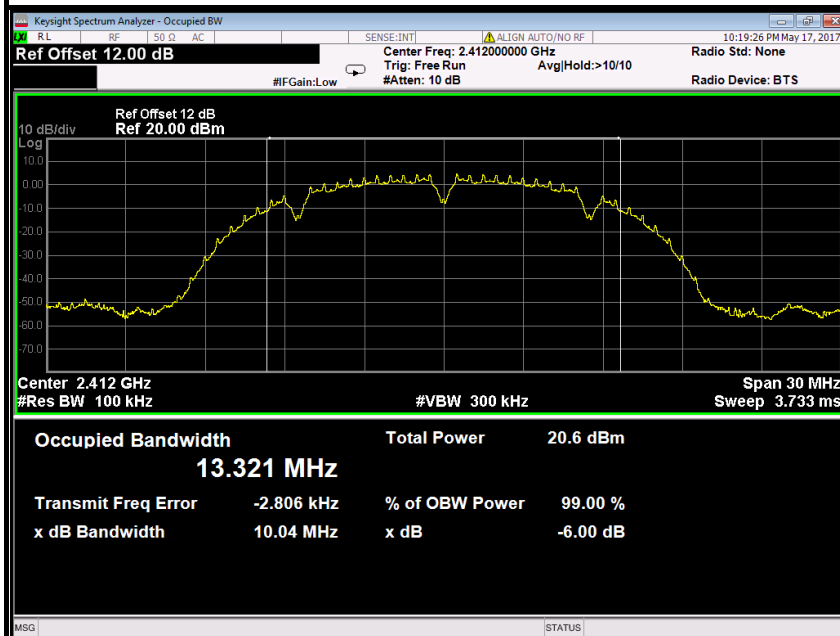
Channel	Frequency (MHz)	Bandwidth (kHz)		Limit (kHz)	Test Result
		Antenna 1	Antenna 2		
Low	2412	15110	15100	>500	PASS
Mid	2437	15110	15050		PASS
High	2462	15100	15110		PASS



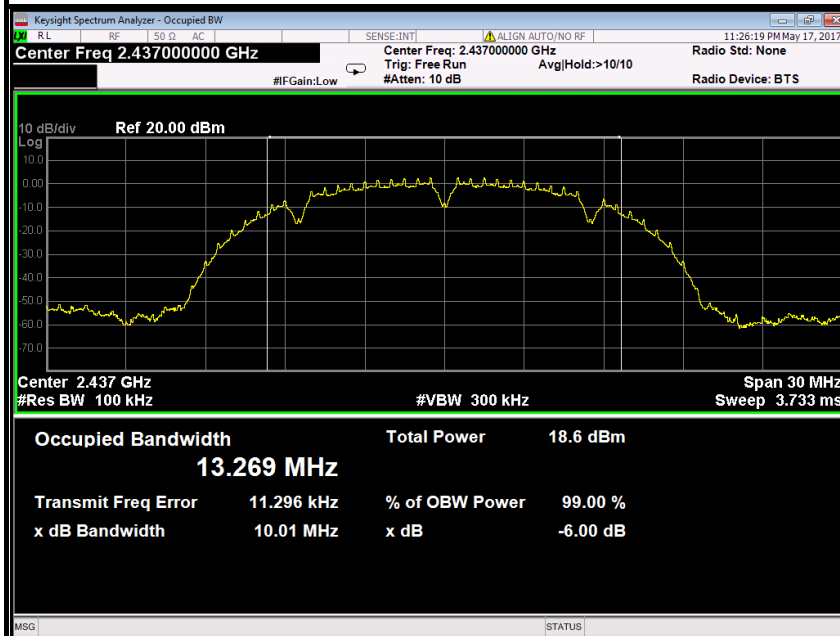
Test Plot

IEEE 802.11b mode (Antenna 1)

6dB Bandwidth (CH Low)

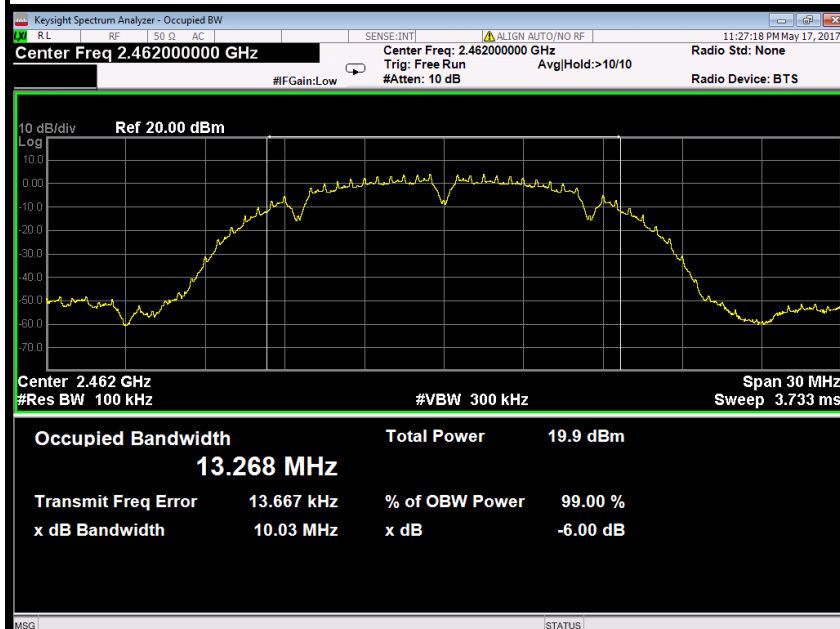


6dB Bandwidth (CH Mid)



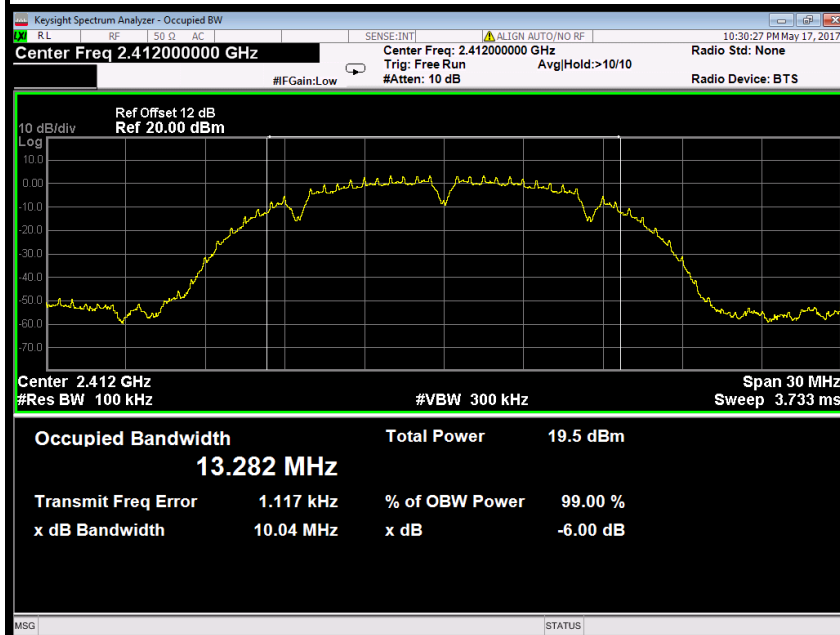


6dB Bandwidth (CH High)



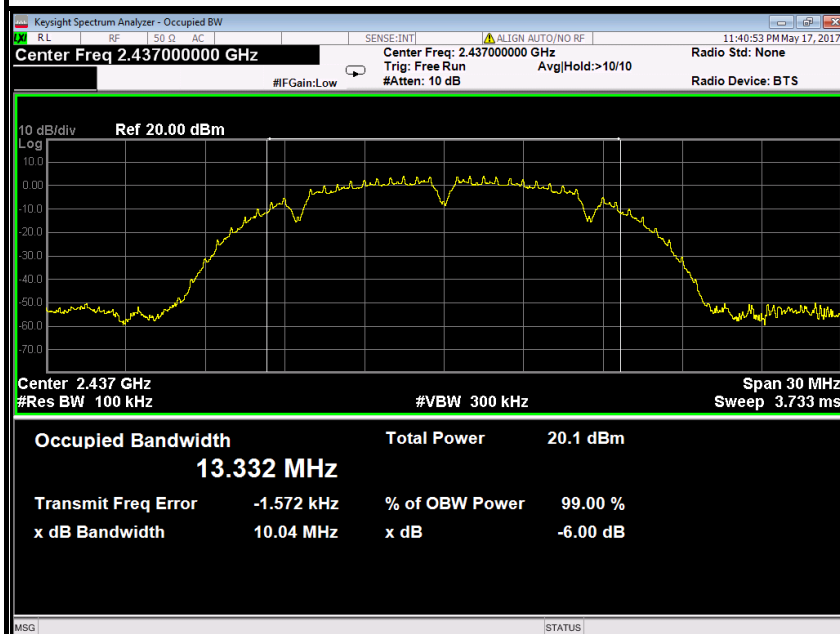
IEEE 802.11b mode (Antenna 2)

6dB Bandwidth (CH Low)

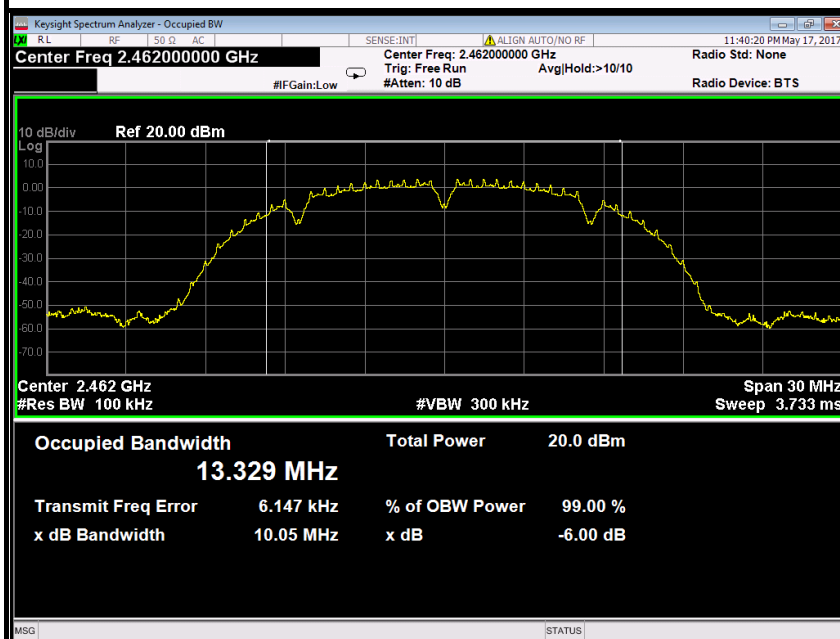




6dB Bandwidth (CH Mid)



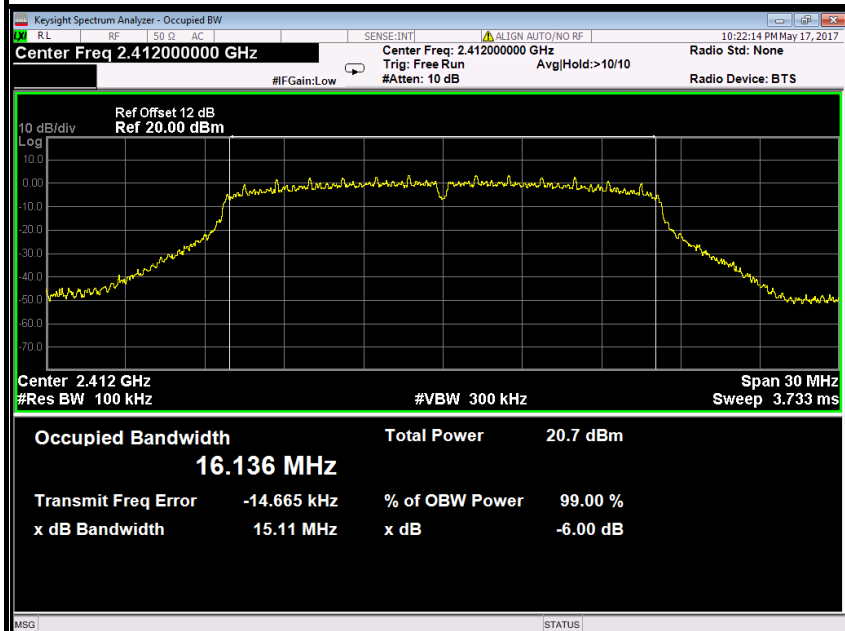
6dB Bandwidth (CH High)



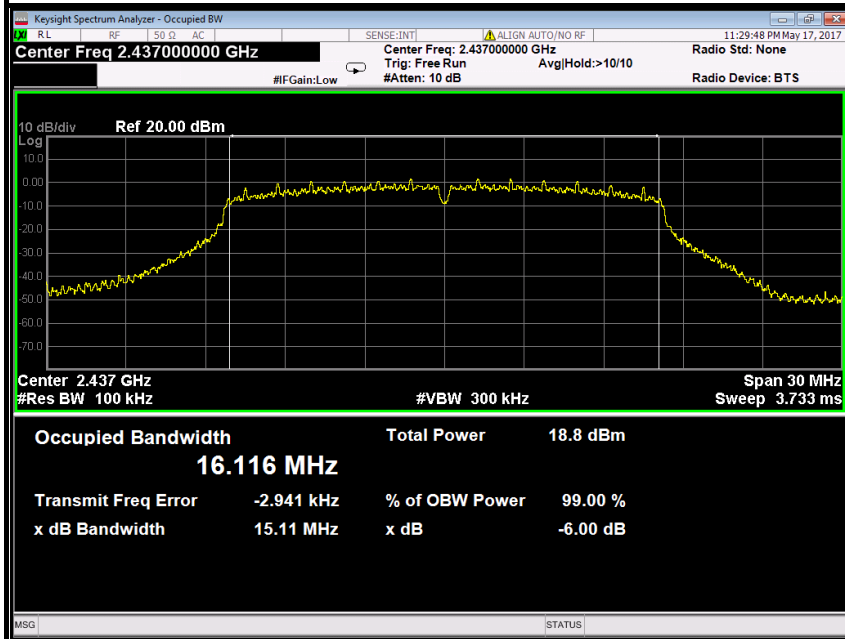


IEEE 802.11g mode (Antenna 1)

6dB Bandwidth (CH Low)

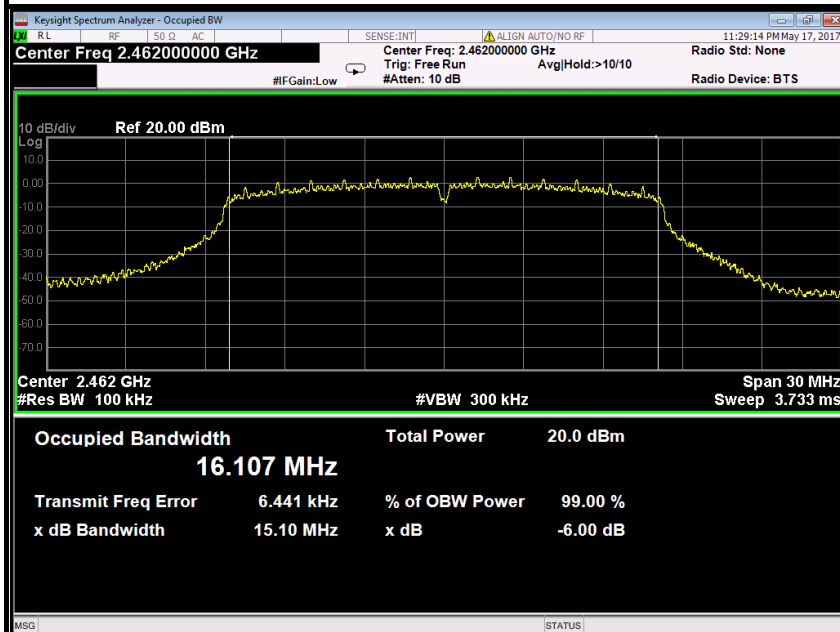


6dB Bandwidth (CH Mid)



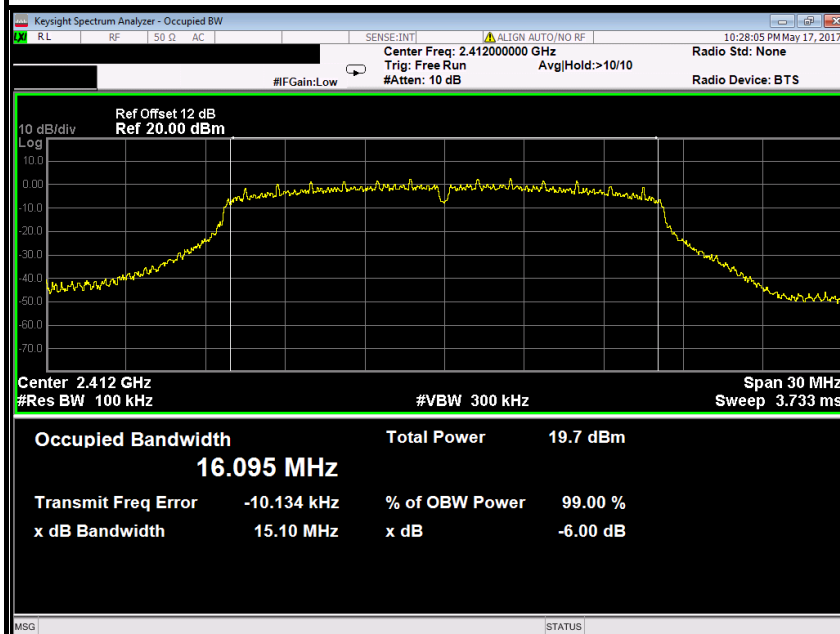


6dB Bandwidth (CH High)



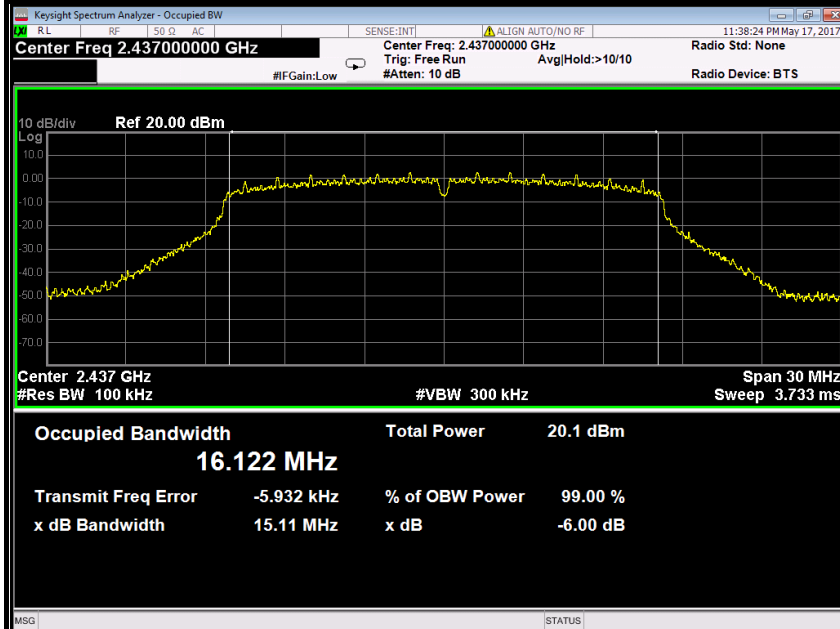
IEEE 802.11g mode (Antenna 2)

6dB Bandwidth (CH Low)

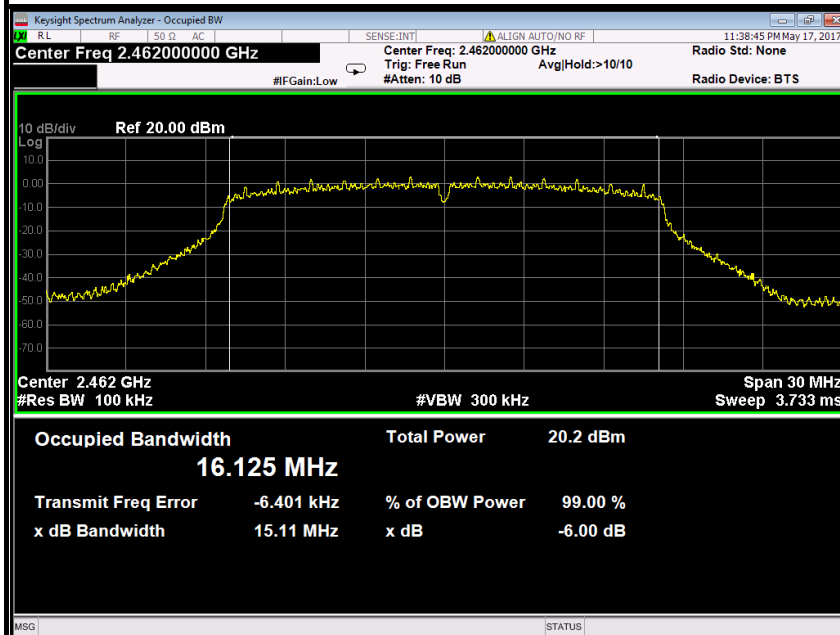




6dB Bandwidth (CH Mid)



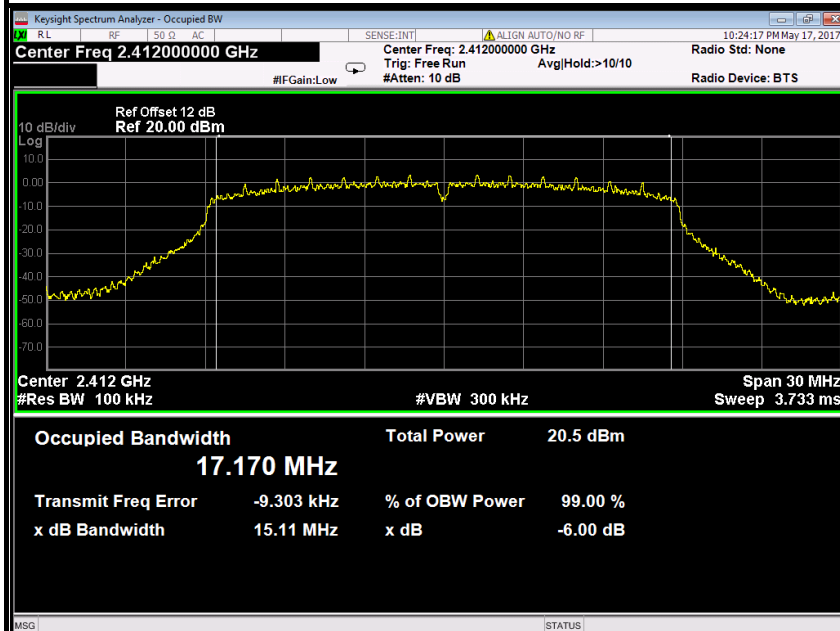
6dB Bandwidth (CH High)



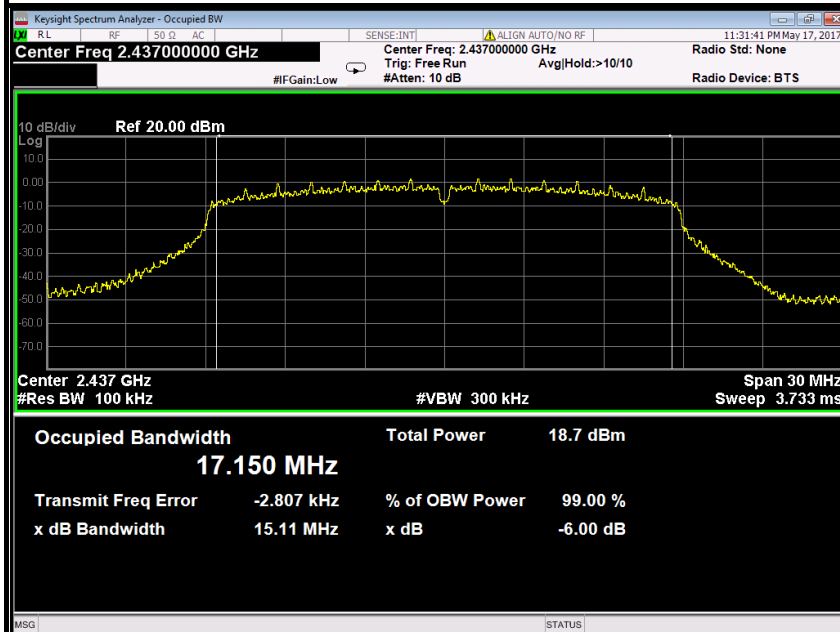


IEEE 802.11n HT20 MHz mode (Antenna 1)

6dB Bandwidth (CH Low)

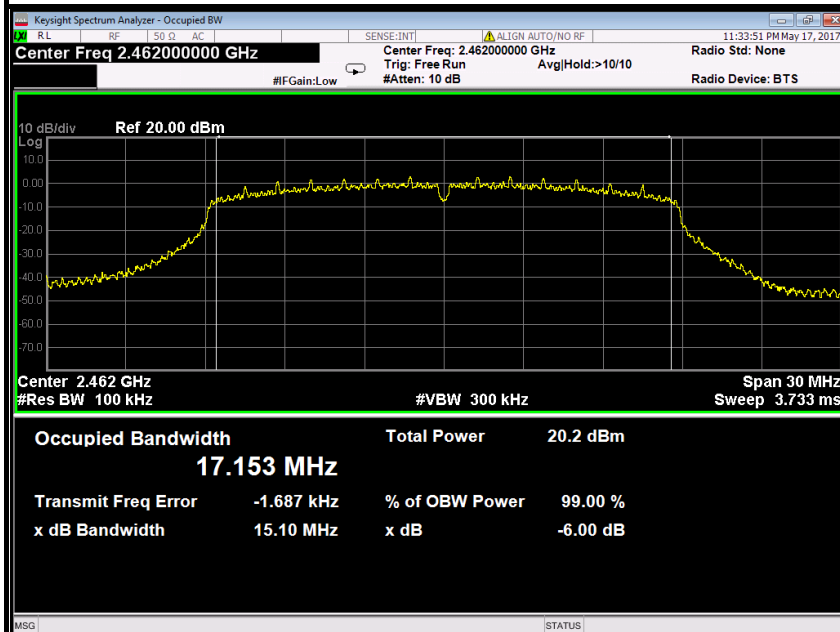


6dB Bandwidth (CH Mid)



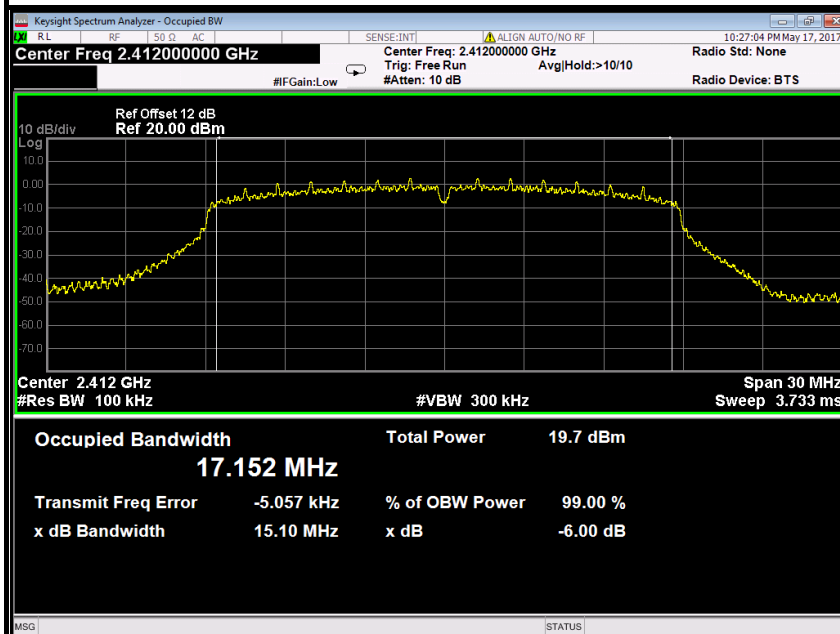


6dB Bandwidth (CH High)



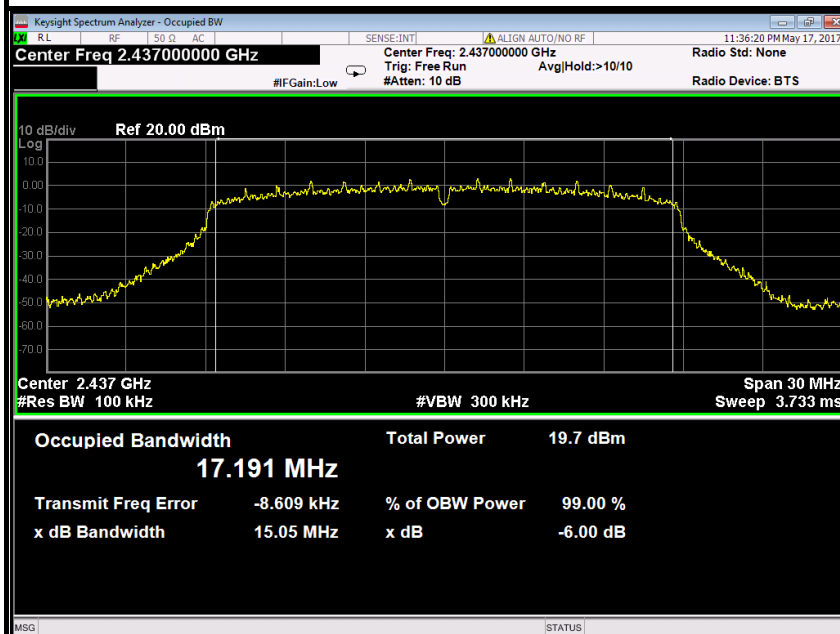
IEEE 802.11n HT20 MHz mode (Antenna 2)

6dB Bandwidth (CH Low)

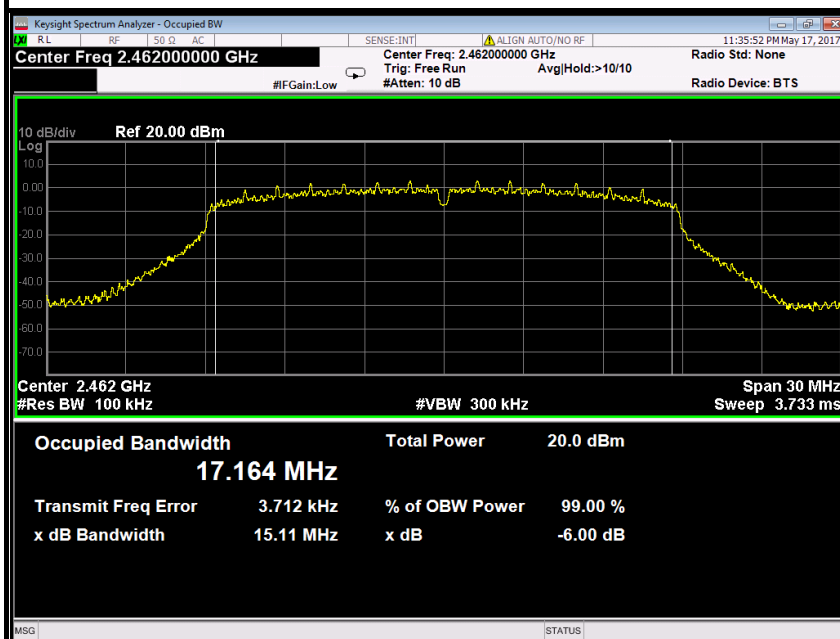




6dB Bandwidth (CH Mid)



6dB Bandwidth (CH High)





7.4. ANTENNA GAIN

MEASUREMENT

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

MEASUREMENT PARAMETERS

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

LIMITS

FCC	IC
Antenna Gain	
6 dBi	



TEST RESULTS

IEEE 802.11b (Antenna 1)

T_{nom}	V_{nom}	Lowest channel 2412MHz	Middle channel 2437MHz	Highest channel 2462MHz
Conducted power [dBm/MHz] Measured with DSSS modulation		6.55	6.27	6.67
Radiated power [dBm/MHz] Measured with DSSS modulation		8.24	8.68	9.11
Gain [dBi] Calculated		1.69	2.41	2.44
Measurement uncertainty		± 1.5 dB (cond.) / ± 3 dB (rad.)		

IEEE 802.11b (Antenna 2)

T_{nom}	V_{nom}	Lowest channel 2412MHz	Middle channel 2437MHz	Highest channel 2462MHz
Conducted power [dBm/MHz] Measured with DSSS modulation		6.07	5.95	6.05
Radiated power [dBm/MHz] Measured with DSSS modulation		7.57	8.00	8.43
Gain [dBi] Calculated		1.50	2.05	2.38
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	02/21/2017	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 $\geq$ DTS bandwidth

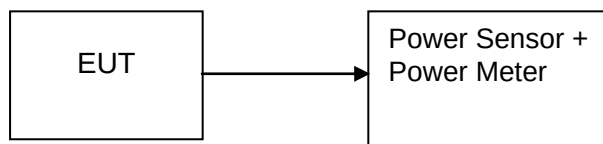
This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the *DTS bandwidth*.

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

9.1.2 PKPM1 Peak power meter method

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

7.5.4. TEST SETUP





7.5.5. TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b (Antenna 1)

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	17.80	0.06026	Peak	1	PASS
Mid	2437	17.50	0.05623			PASS
High	2462	17.90	0.06166			PASS
Low	2412	15.00	0.03162	AVG	1	PASS
Mid	2437	14.70	0.02951			PASS
High	2462	15.00	0.03162			PASS

Test mode: IEEE 802.11b (Antenna 2)

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	17.30	0.05370	Peak	1	PASS
Mid	2437	17.20	0.05248			PASS
High	2462	17.30	0.05370			PASS
Low	2412	14.60	0.02884	AVG	1	PASS
Mid	2437	14.50	0.02818			PASS
High	2462	14.50	0.02818			PASS

Test mode: IEEE 802.11g (Antenna 1)

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	23.50	0.22387	Peak	1	PASS
Mid	2437	24.00	0.25119			PASS
High	2462	24.00	0.25119			PASS
Low	2412	14.70	0.02951	AVG	1	PASS
Mid	2437	15.00	0.03162			PASS
High	2462	15.10	0.03236			PASS

**Test mode: IEEE 802.11g (Antenna 2)**

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	23.80	0.23988	Peak	1	PASS
Mid	2437	24.50	0.28184			PASS
High	2462	24.80	0.30200			PASS
Low	2412	14.90	0.03090	AVG	1	PASS
Mid	2437	15.20	0.03311			PASS
High	2462	15.30	0.03388			PASS

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

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Peak / AVG	Limit (W)	Result
		Antenna 0	Antenna 1	Total				
Low	2412	23.50	23.80	26.66	0.46376	Peak	1	PASS
Mid	2437	23.40	23.90	26.67	0.46425			PASS
High	2462	23.60	23.40	26.51	0.44786			PASS
Low	2412	14.80	15.10	17.96	0.06256	AVG	1	PASS
Mid	2437	14.90	15.00	17.96	0.06253			PASS
High	2462	15.00	14.70	17.86	0.06113			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 is 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	E4446A	US44300399	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			

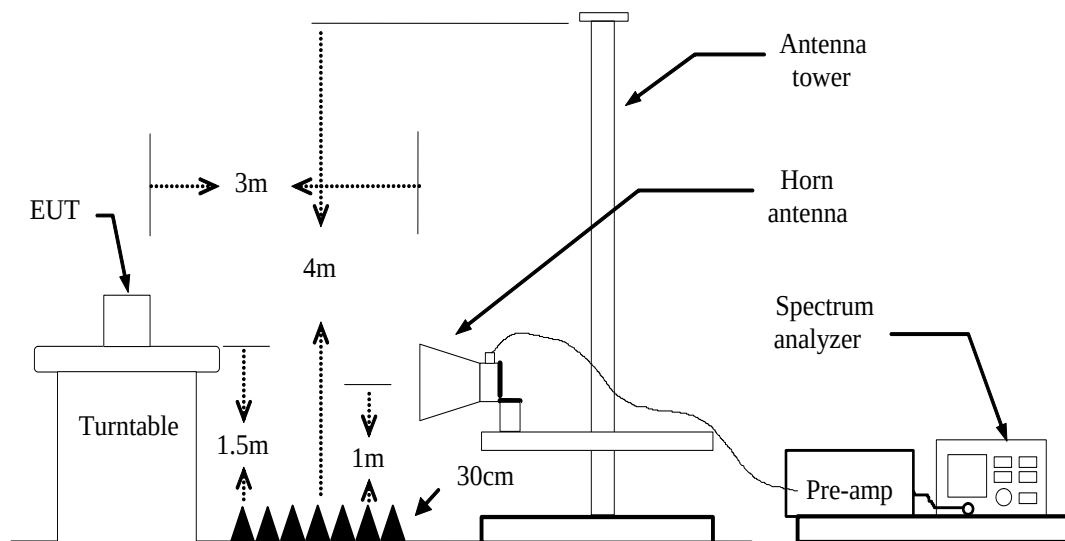
- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The FCC Site Registration number is 101879.
3. N.C.R = No Calibration Required.



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

7.6.4. TEST SETUP



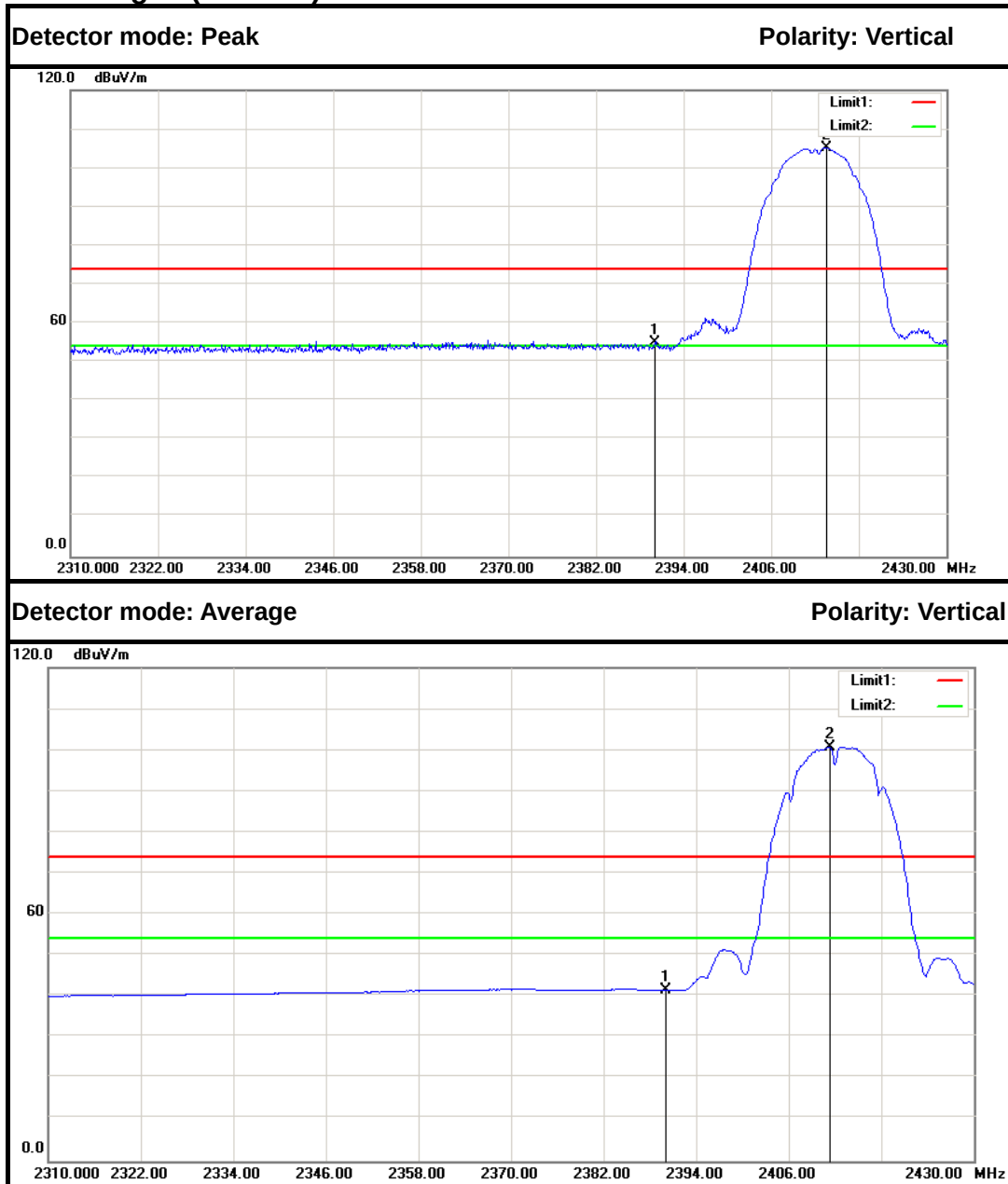


7.6.5. TEST RESULTS

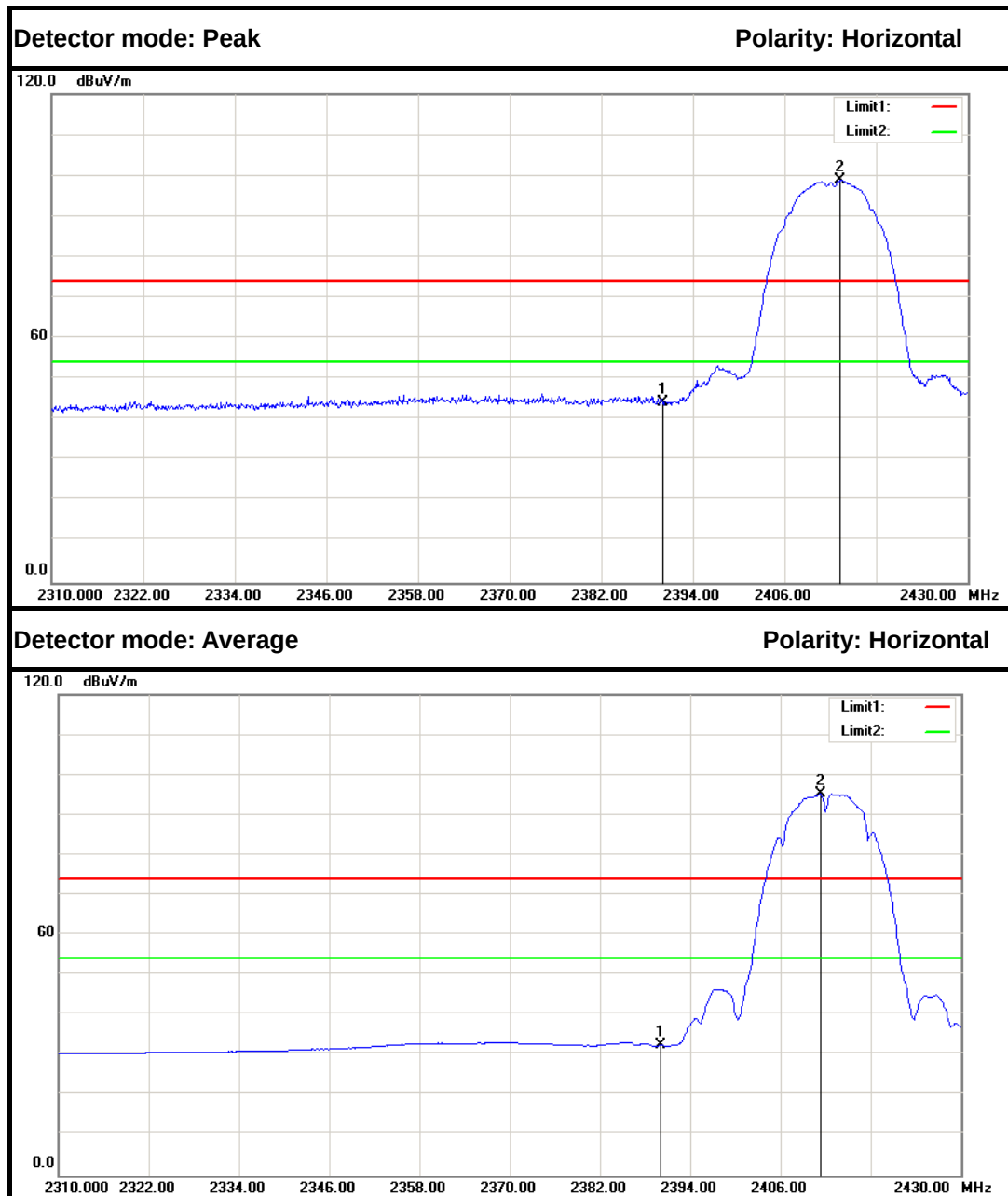
Test Plot

IEEE 802.11b mode (Antenna 1)

Band Edges (CH Low)



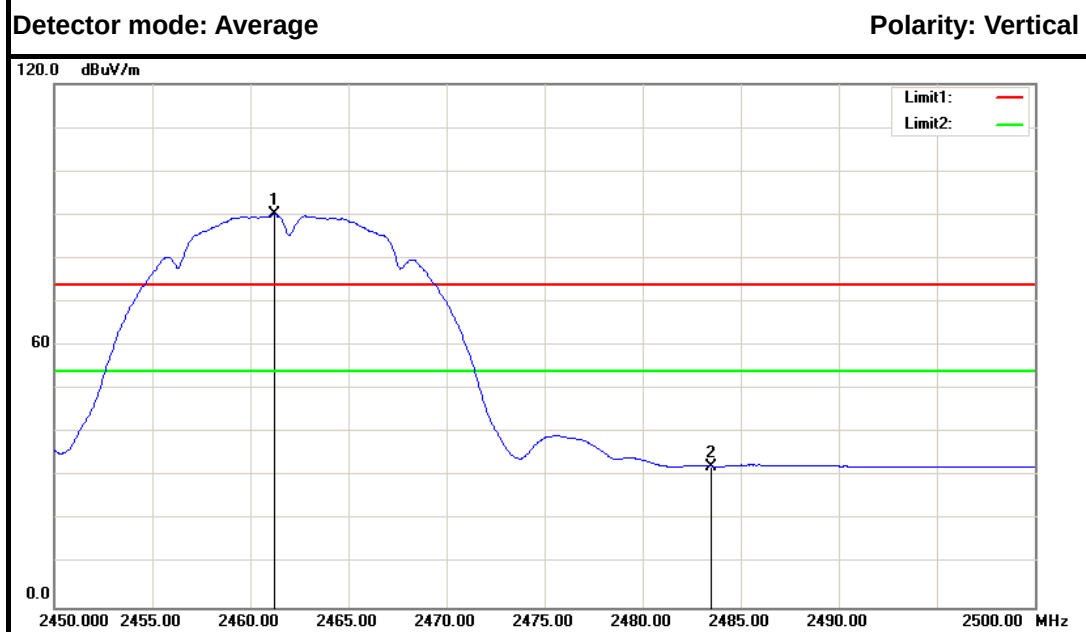
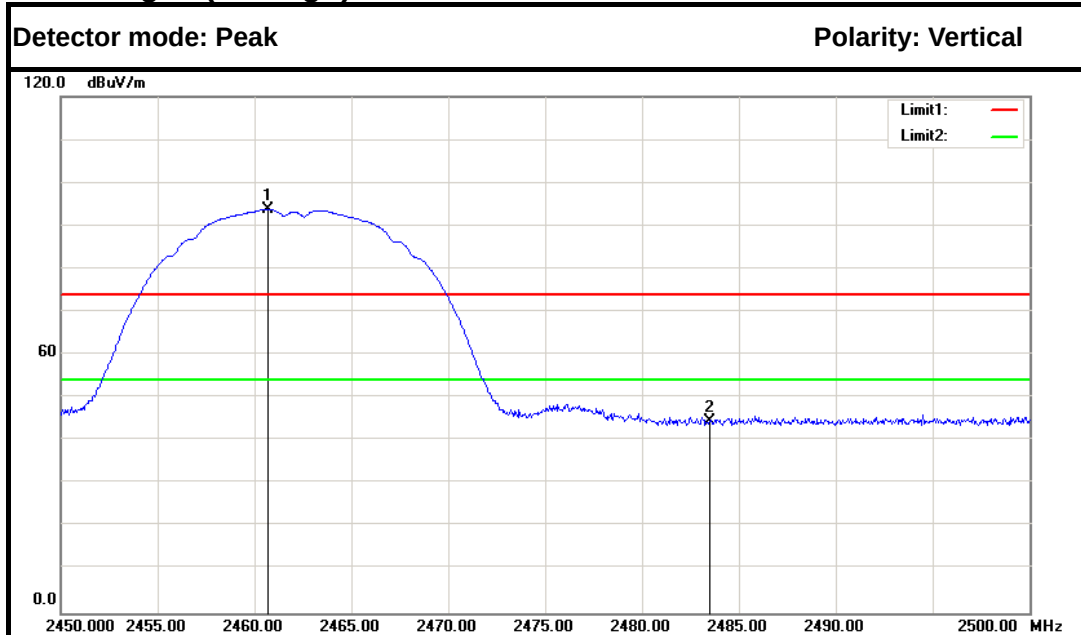
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	57.84	-2.86	54.98	74.00	-19.02	Peak	Vertical
2.	2413.560	107.95	-2.73	105.22	---	---	Peak	Vertical
1.	2390.000	44.35	-2.86	41.49	54.00	-12.51	Average	Vertical
2.	2411.280	103.51	-2.75	100.76	---	---	Average	Vertical



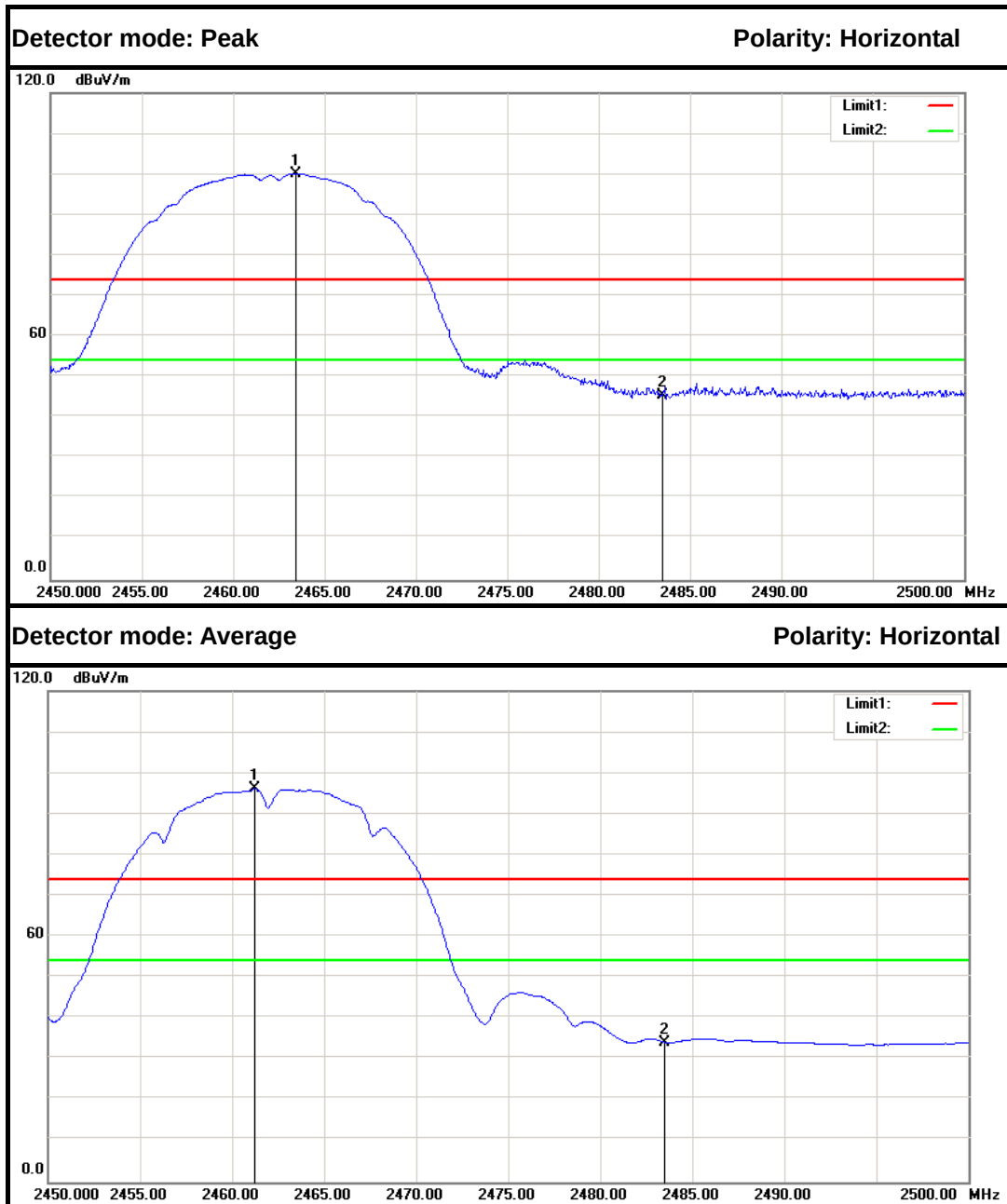
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	47.20	-2.86	44.34	74.00	-29.66	Peak	Horizontal
2.	2413.320	101.47	-2.73	98.74	---	---	Peak	Horizontal
1.	2390.000	35.30	-2.86	32.44	54.00	-21.56	Average	Horizontal
2.	2411.280	97.92	-2.75	95.17	---	---	Average	Horizontal



Band Edges (CH High)



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2460.700	96.19	-2.48	93.71	---	---	Peak	Vertical
2.	2483.500	46.78	-2.35	44.43	74.00	-29.57	Peak	Vertical
1.	2461.200	92.53	-2.47	90.06	---	---	Average	Vertical
2.	2483.500	34.75	-2.35	32.40	54.00	-21.60	Average	Vertical

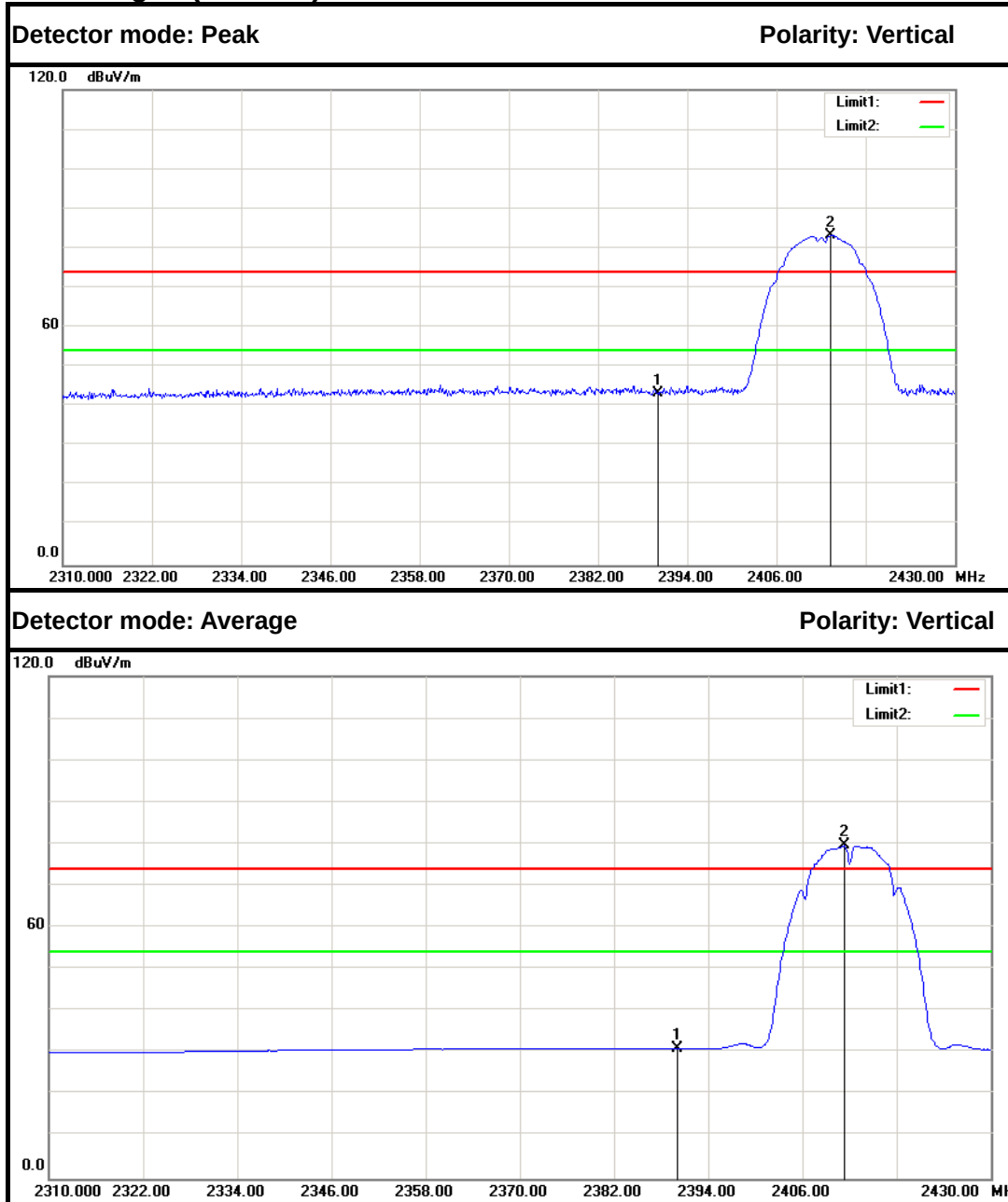


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2463.400	102.63	-2.46	100.17	---	---	Peak	Horizontal
2.	2483.500	47.88	-2.35	45.53	74.00	-28.47	Peak	Horizontal
1.	2461.200	98.50	-2.47	96.03	---	---	Average	Horizontal
2.	2483.500	36.52	-2.35	34.17	54.00	-19.83	Average	Horizontal



IEEE 802.11b mode (Antenna 2)

Band Edges (CH Low)

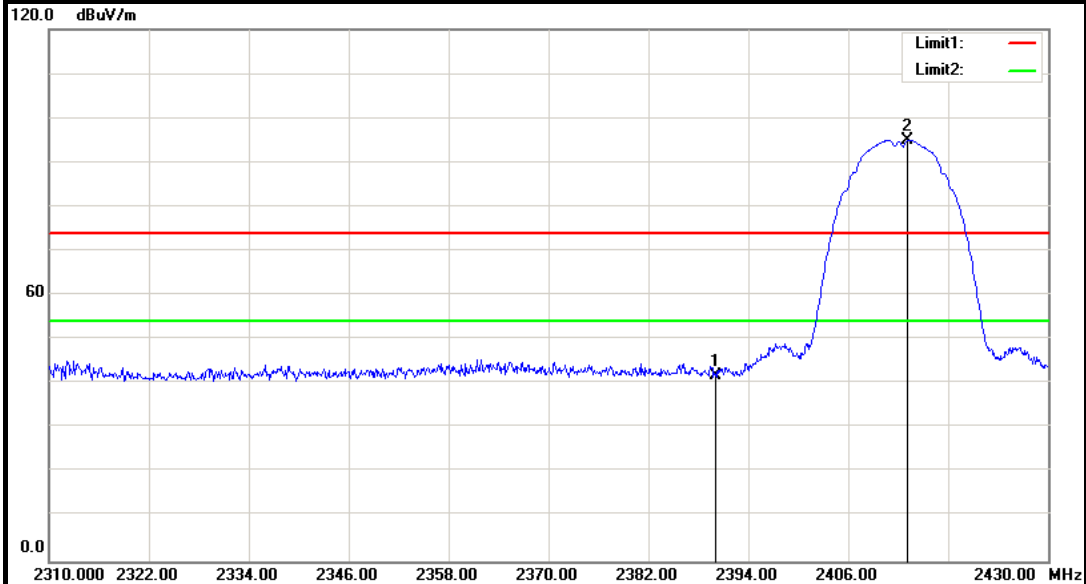


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	46.32	-2.86	43.46	74.00	-30.54	Peak	Vertical
2.	2413.320	85.90	-2.73	83.17	---	---	Peak	Vertical
1.	2390.000	33.87	-2.86	31.01	54.00	-22.99	Average	Vertical
2.	2411.280	82.26	-2.75	79.51	---	---	Average	Vertical



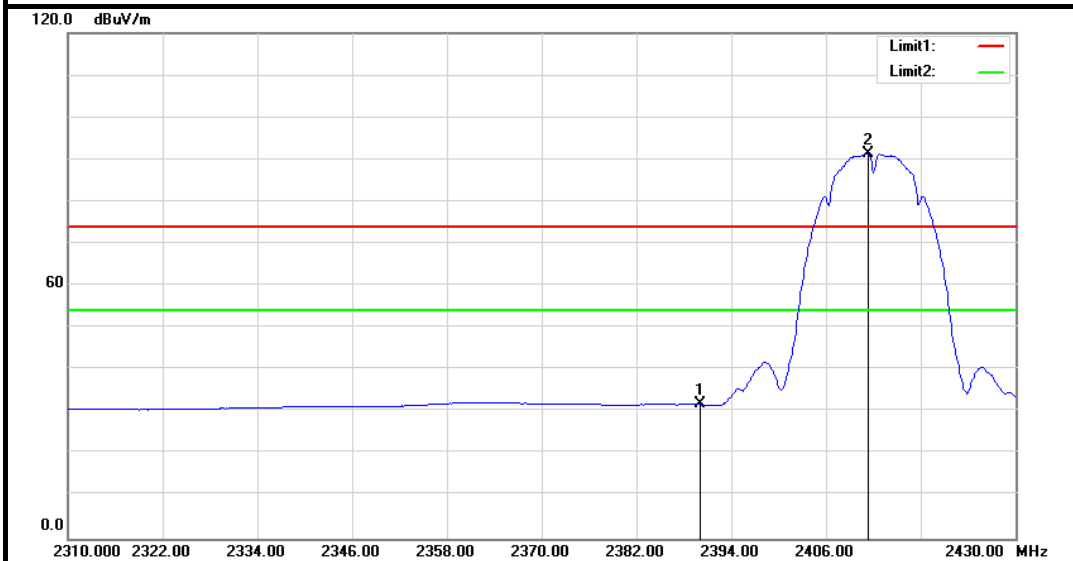
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

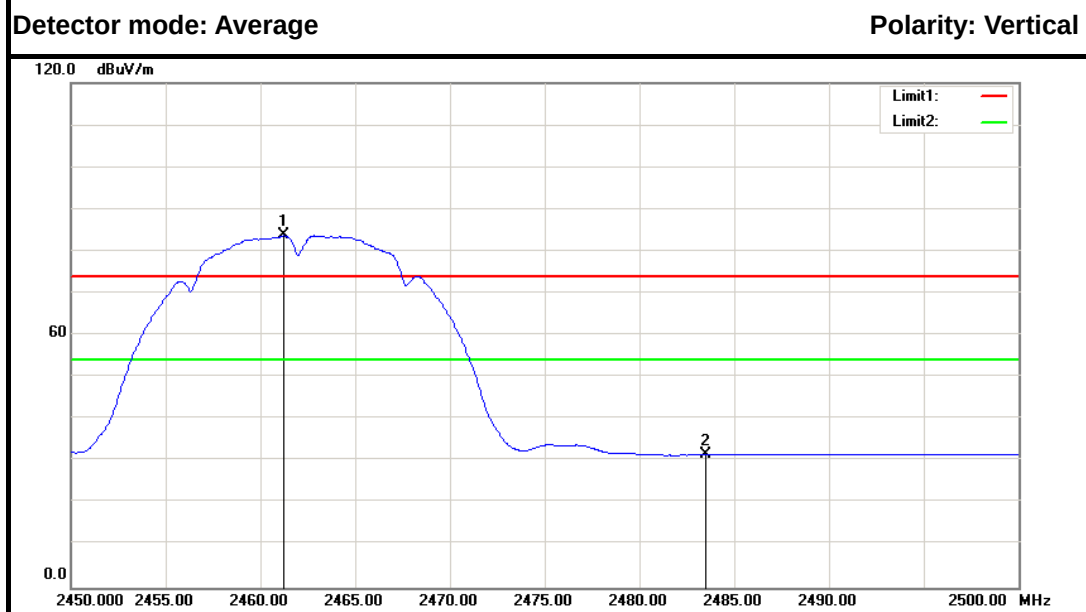
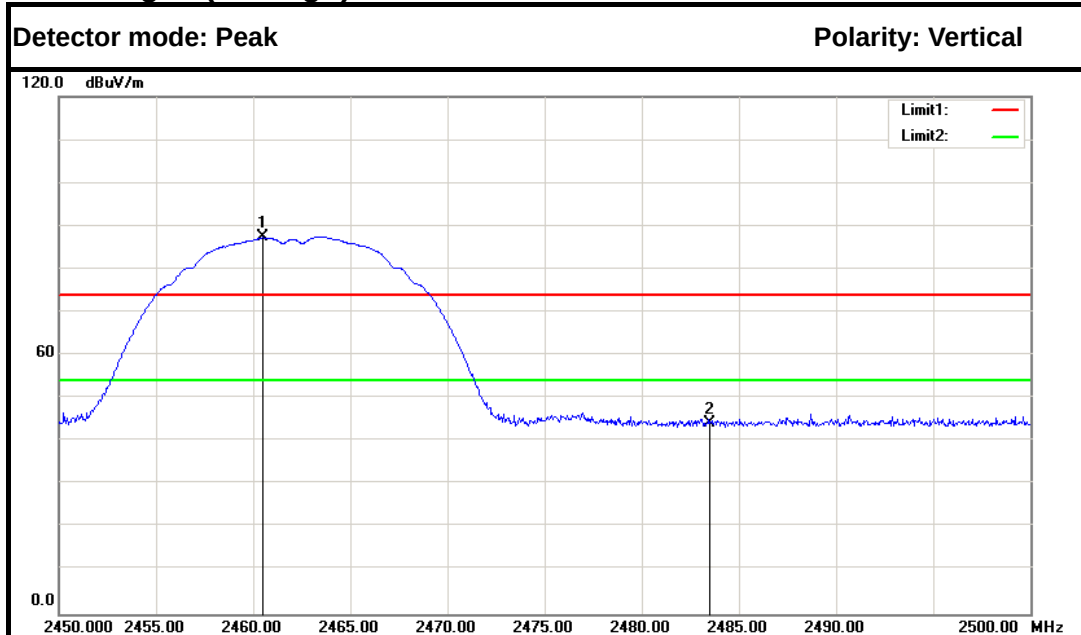
Polarity: Horizontal



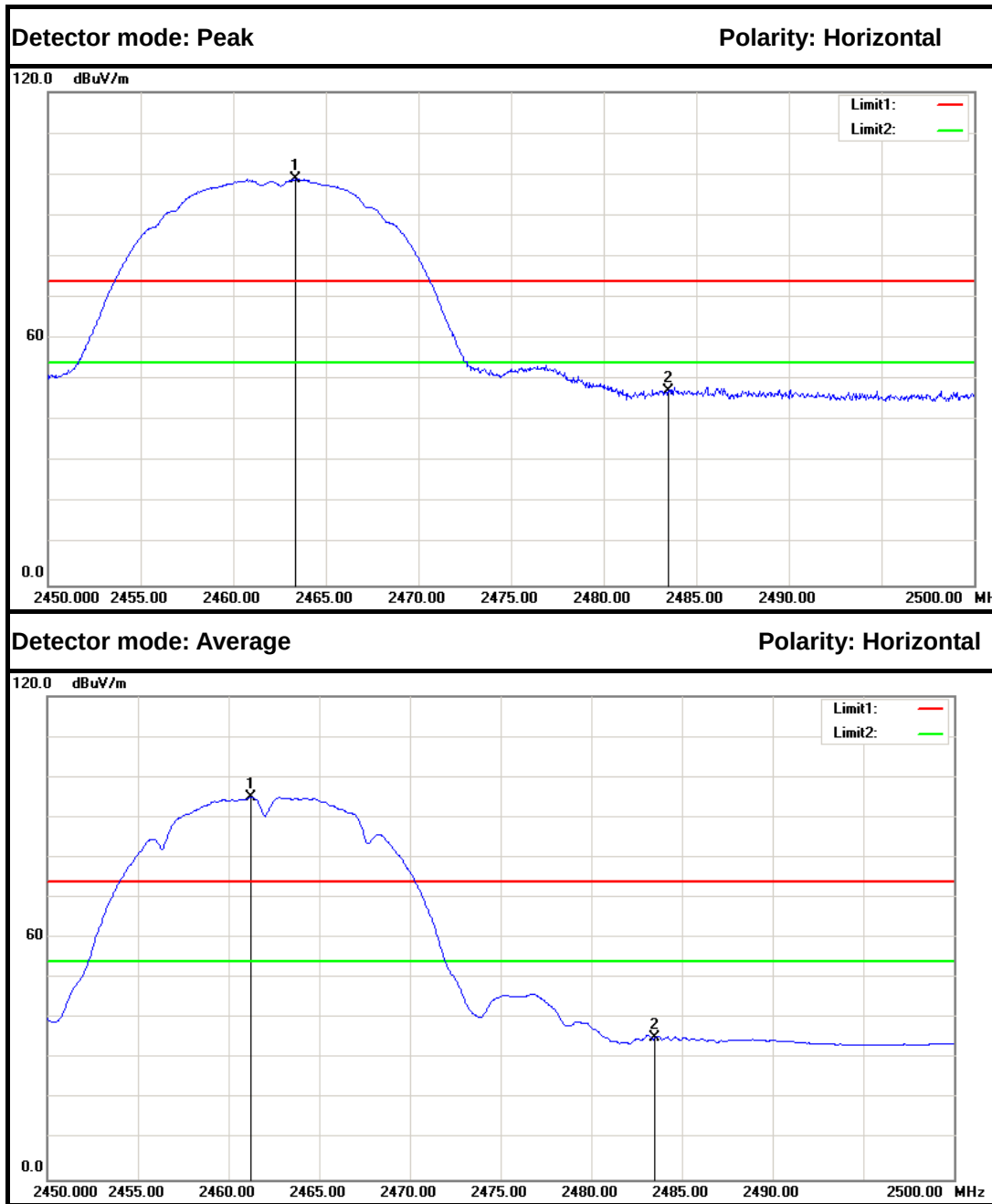
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	44.67	-2.86	41.81	74.00	-32.19	Peak	Horizontal
2.	2413.080	97.71	-2.74	94.97	---	---	Peak	Horizontal
1.	2390.000	34.68	-2.86	31.82	54.00	-22.18	Average	Horizontal
2.	2411.280	94.20	-2.75	91.45	---	---	Average	Horizontal



Band Edges (CH High)



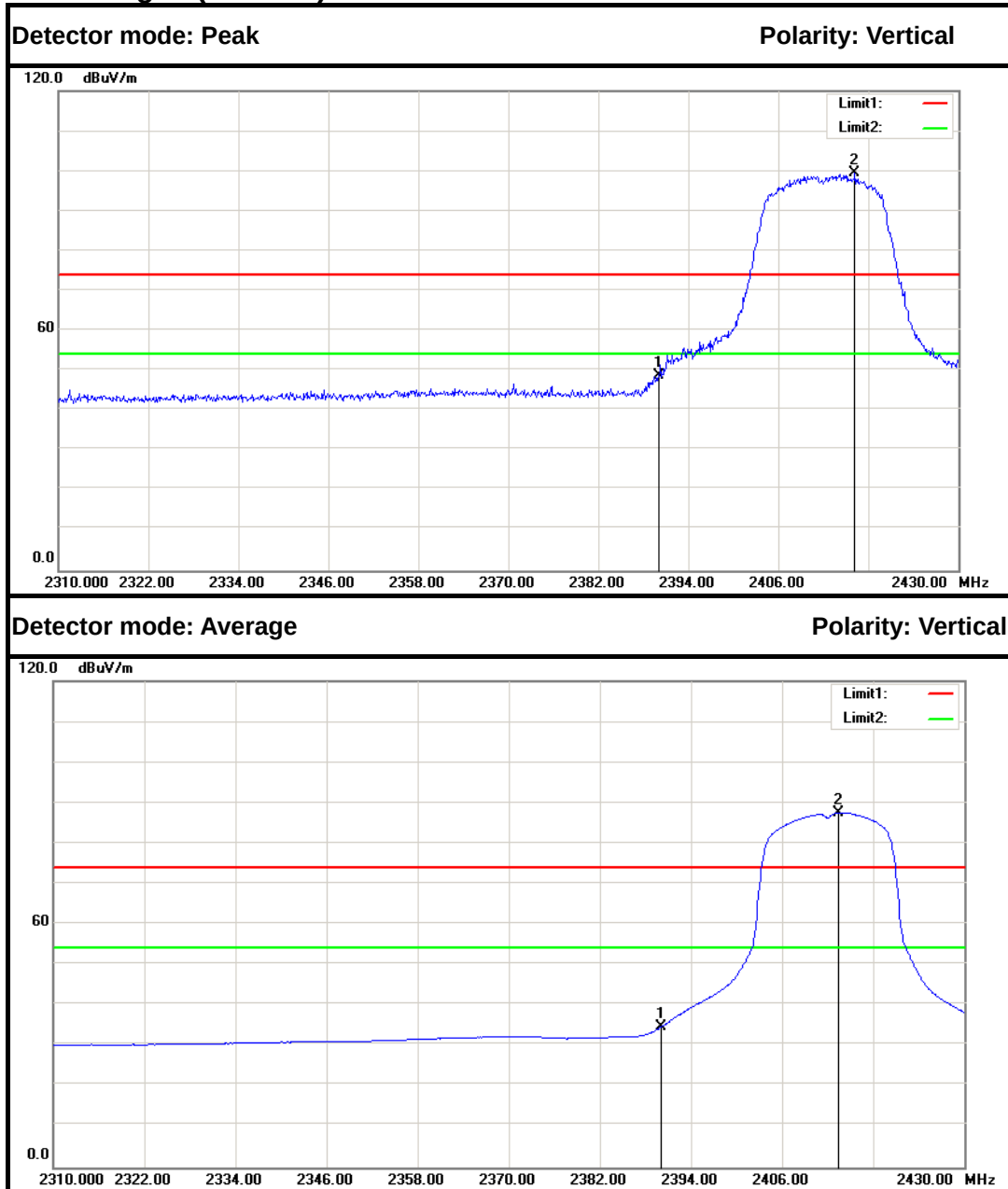
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2460.500	89.96	-2.48	87.48	---	---	Peak	Vertical
2.	2483.500	46.61	-2.35	44.26	74.00	-29.74	Peak	Vertical
1.	2461.250	86.23	-2.47	83.76	---	---	Average	Vertical
2.	2483.500	34.04	-2.35	31.69	54.00	-22.31	Average	Vertical



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2463.350	101.42	-2.46	98.96	---	---	Peak	Horizontal
2.	2483.500	49.59	-2.35	47.24	74.00	-26.76	Peak	Horizontal
1.	2461.250	97.40	-2.47	94.93	---	---	Average	Horizontal
2.	2483.500	37.56	-2.35	35.21	54.00	-18.79	Average	Horizontal



IEEE 802.11g mode (Antenna 1)
Band Edges (CH Low)

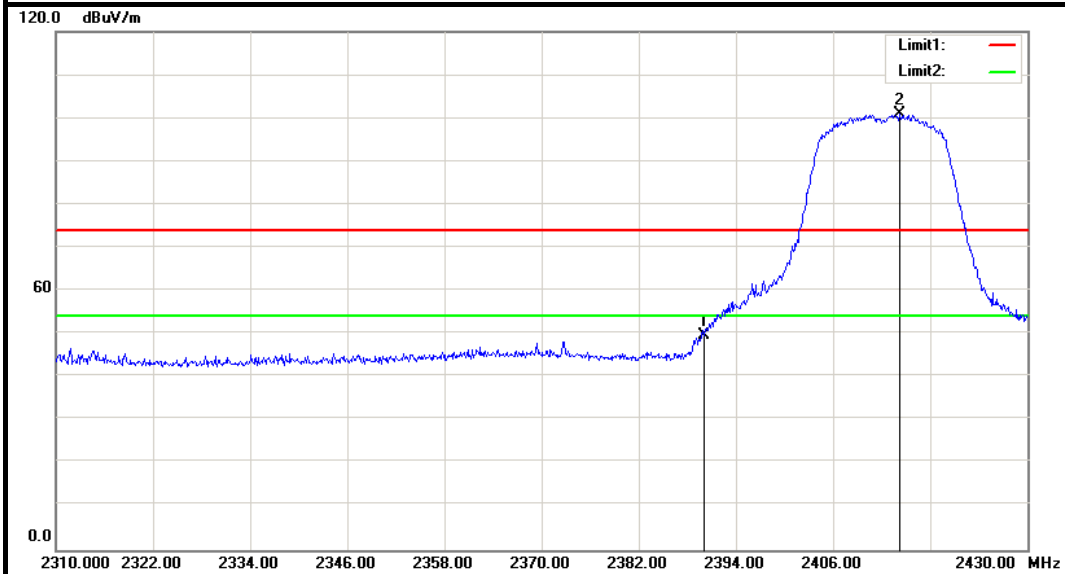


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	51.74	-2.86	48.88	74.00	-25.12	Peak	Vertical
2.	2416.200	102.04	-2.72	99.32	---	---	Peak	Vertical
1.	2390.000	37.50	-2.86	34.64	54.00	-19.36	Average	Vertical
2.	2413.440	90.23	-2.73	87.50	---	---	Average	Vertical



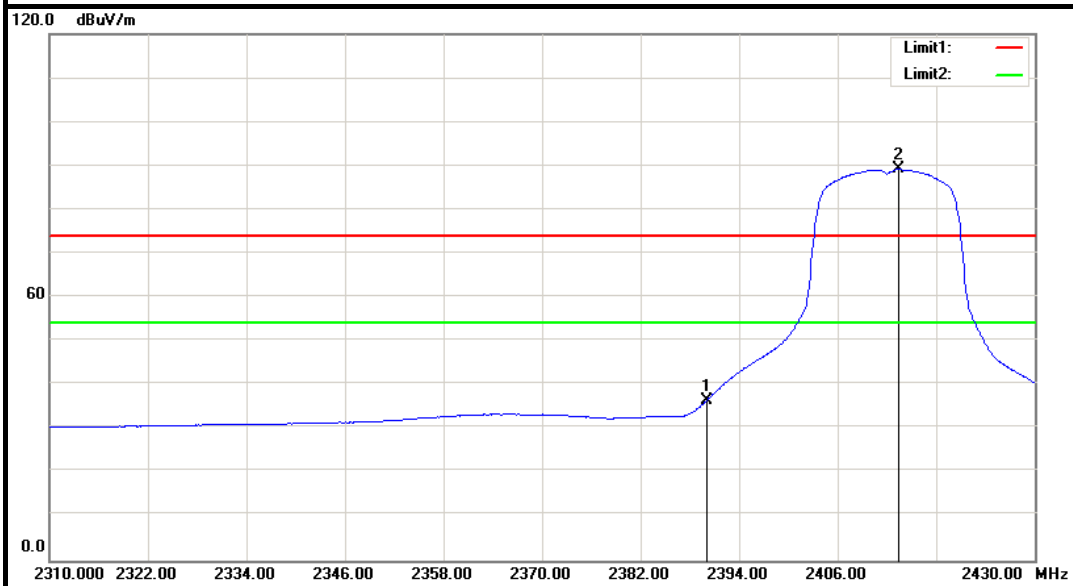
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

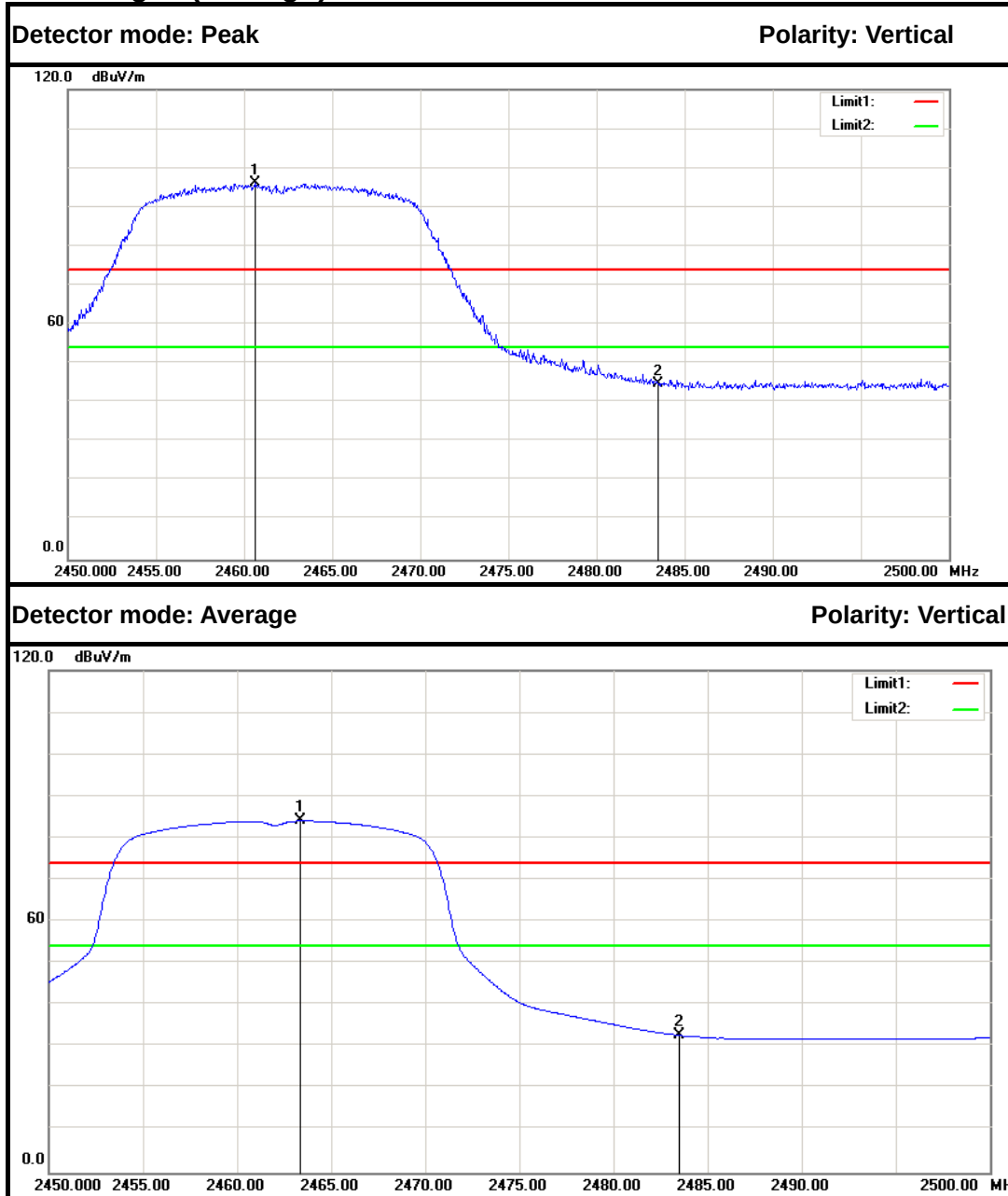
Polarity: Horizontal



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	52.47	-2.86	49.61	74.00	-24.39	Peak	Horizontal
2.	2414.160	103.61	-2.73	100.88	---	---	Peak	Horizontal
1.	2390.000	39.30	-2.86	36.44	54.00	-17.56	Average	Horizontal
2.	2413.440	91.89	-2.73	89.16	---	---	Average	Horizontal



Band Edges (CH High)

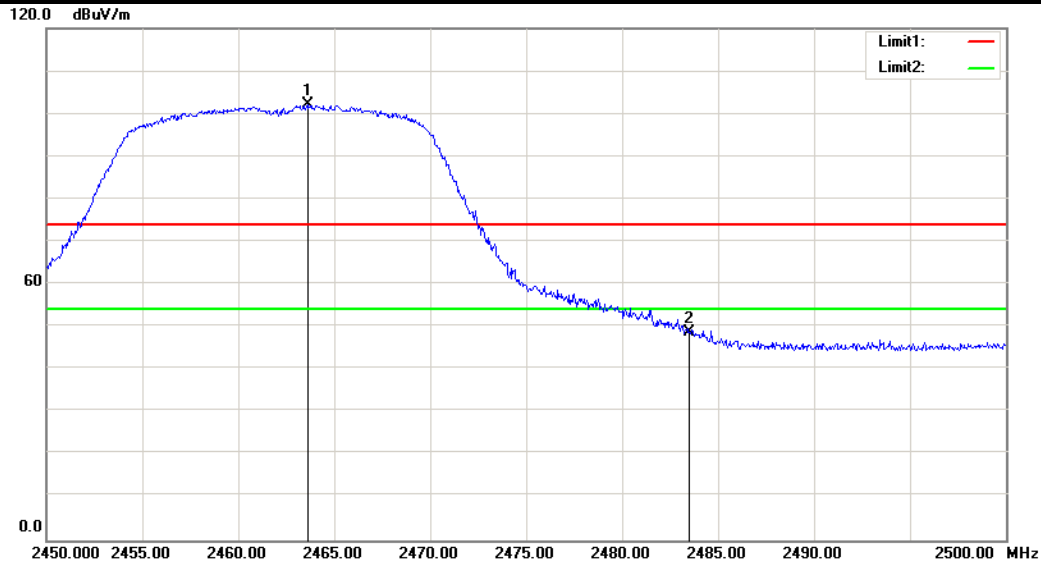


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2460.650	98.75	-2.48	96.27	---	---	Peak	Vertical
2.	2483.500	47.28	-2.35	44.93	74.00	-29.07	Peak	Vertical
1.	2463.350	86.51	-2.46	84.05	---	---	Average	Vertical
2.	2483.500	35.17	-2.35	32.82	54.00	-21.18	Average	Vertical



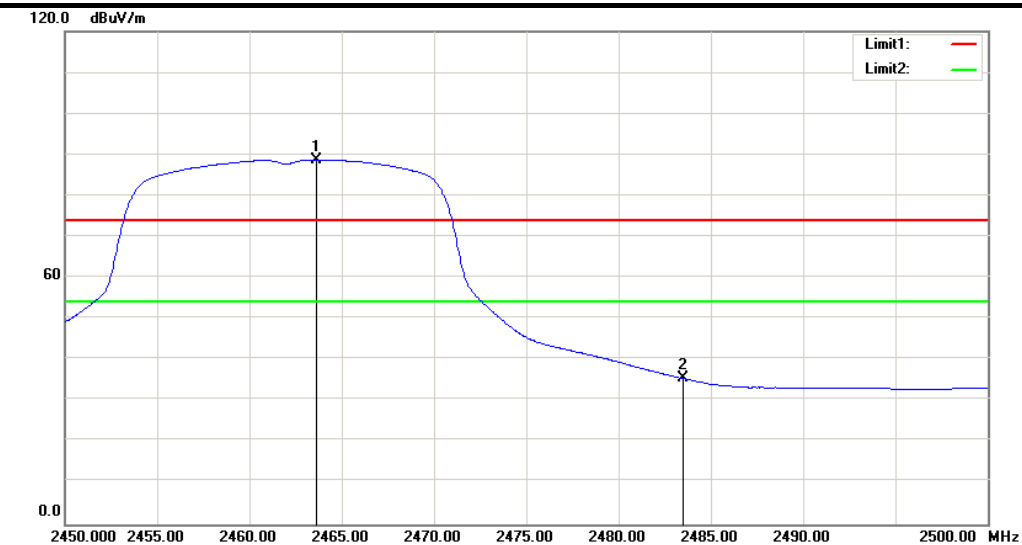
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

Polarity: Horizontal

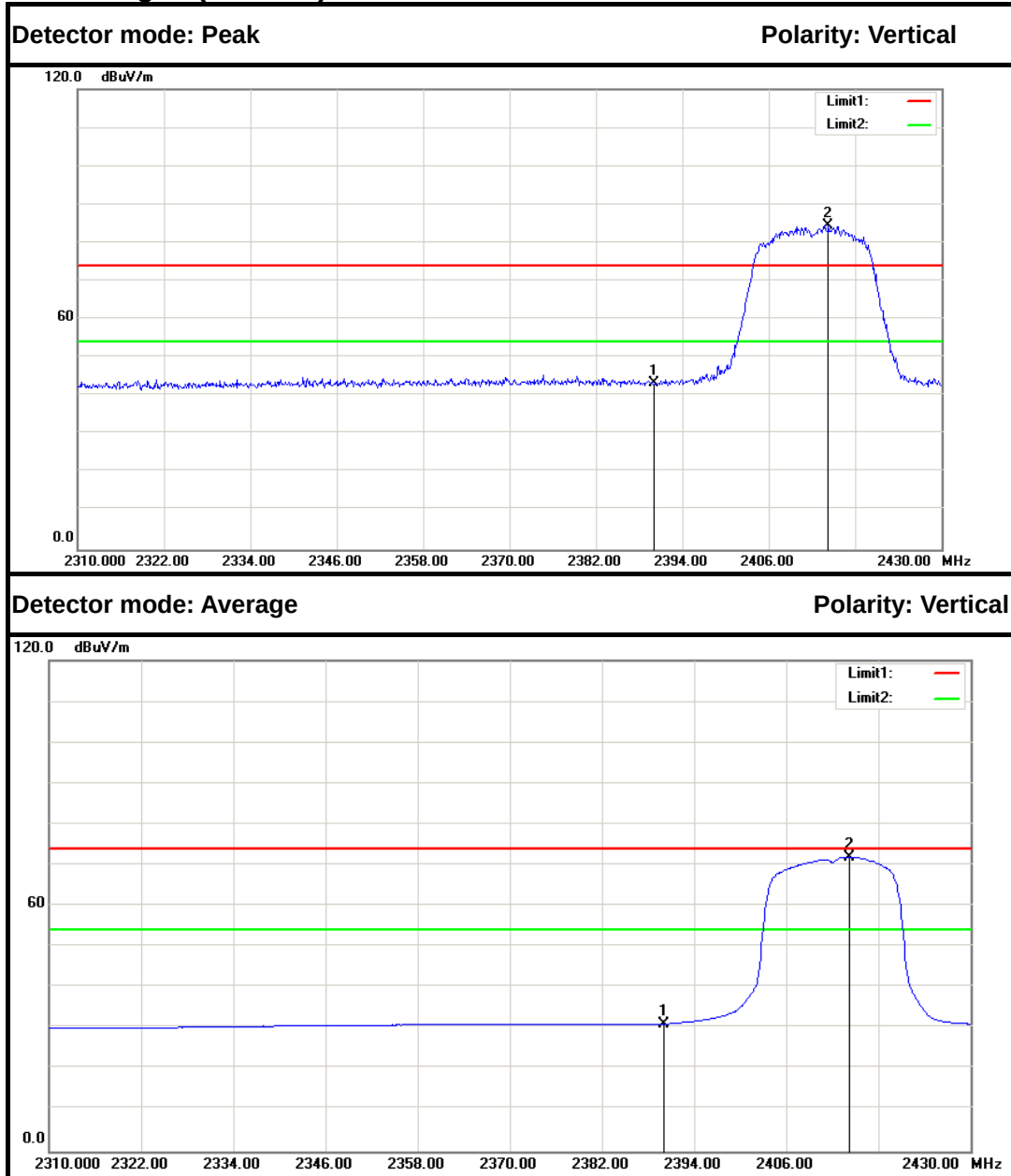


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2463.600	104.53	-2.46	102.07	---	---	Peak	Horizontal
2.	2483.500	50.99	-2.35	48.64	74.00	-25.36	Peak	Horizontal
1.	2463.650	91.24	-2.46	88.78	---	---	Average	Horizontal
2.	2483.500	37.83	-2.35	35.48	54.00	-18.52	Average	Horizontal

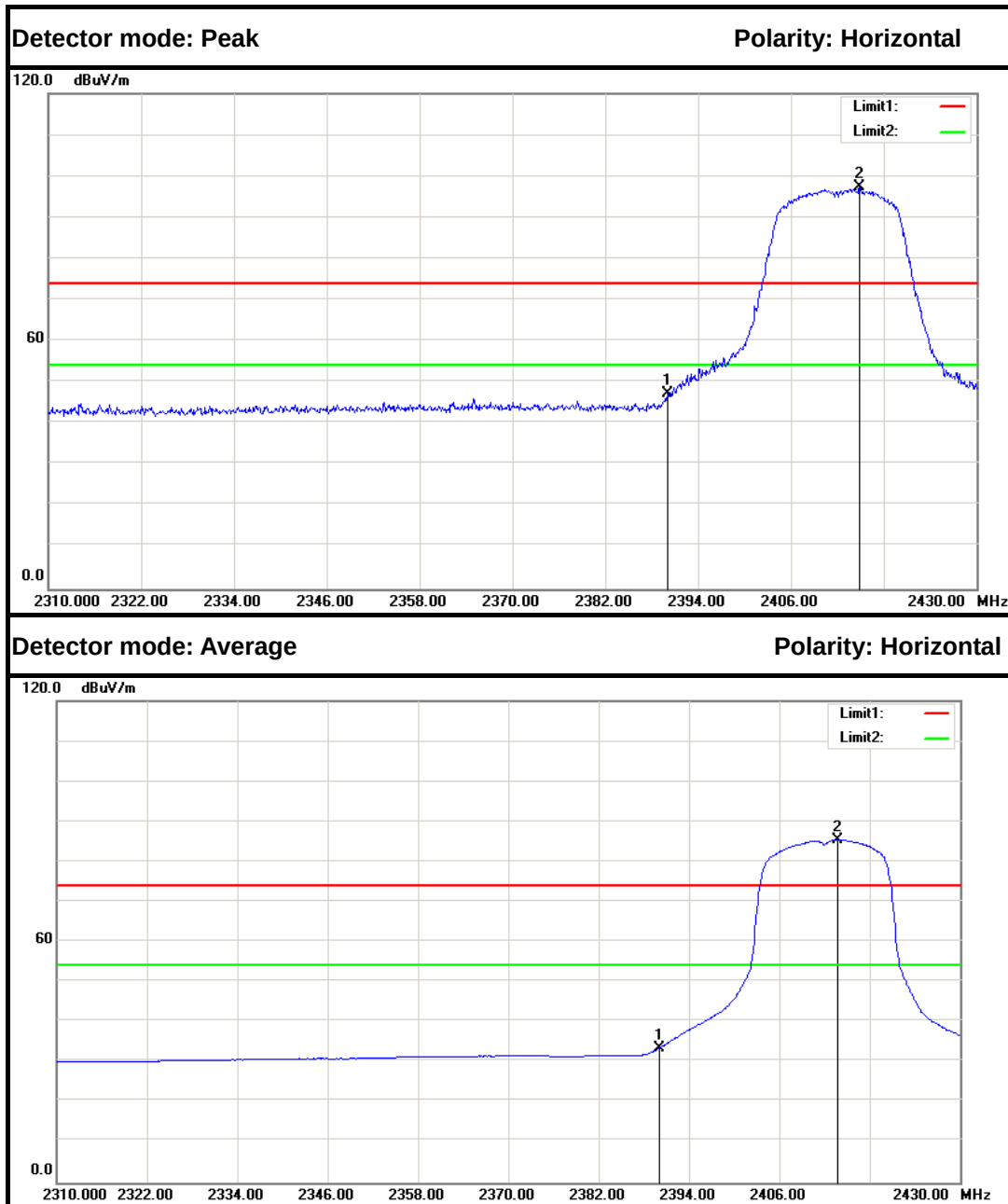


IEEE 802.11g mode (Antenna 2)

Band Edges (CH Low)



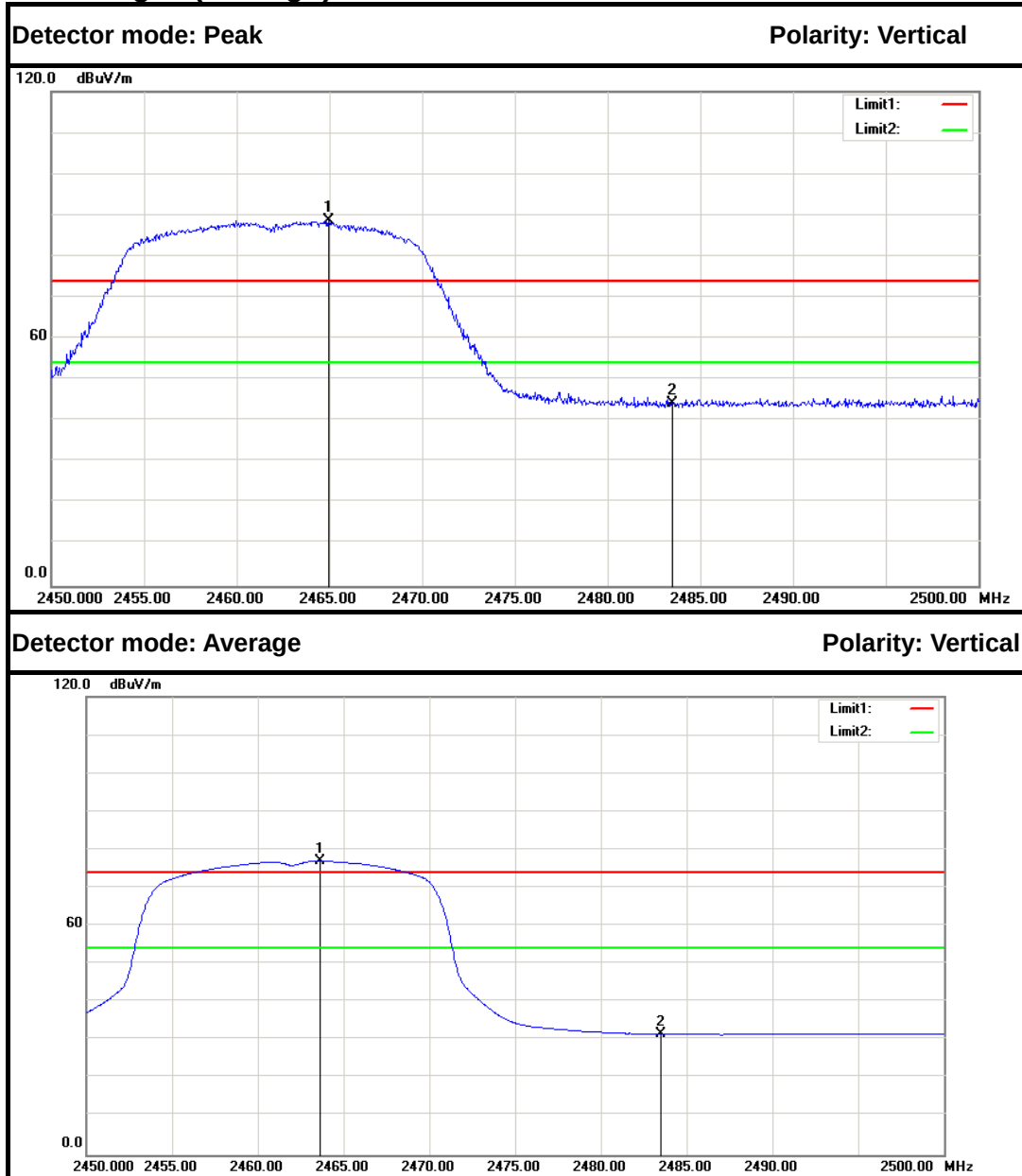
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	46.06	-2.86	43.20	74.00	-30.80	Peak	Vertical
2.	2414.280	87.30	-2.73	84.57	---	---	Peak	Vertical
1.	2390.000	33.98	-2.86	31.12	54.00	-22.88	Average	Vertical
2.	2414.160	74.73	-2.73	72.00	---	---	Average	Vertical



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	49.99	-2.86	47.13	74.00	-26.87	Peak	Horizontal
2.	2414.880	100.23	-2.73	97.50	---	---	Peak	Horizontal
1.	2390.000	36.33	-2.86	33.47	54.00	-20.53	Average	Horizontal
2.	2413.680	88.13	-2.73	85.40	---	---	Average	Horizontal



Band Edges (CH High)

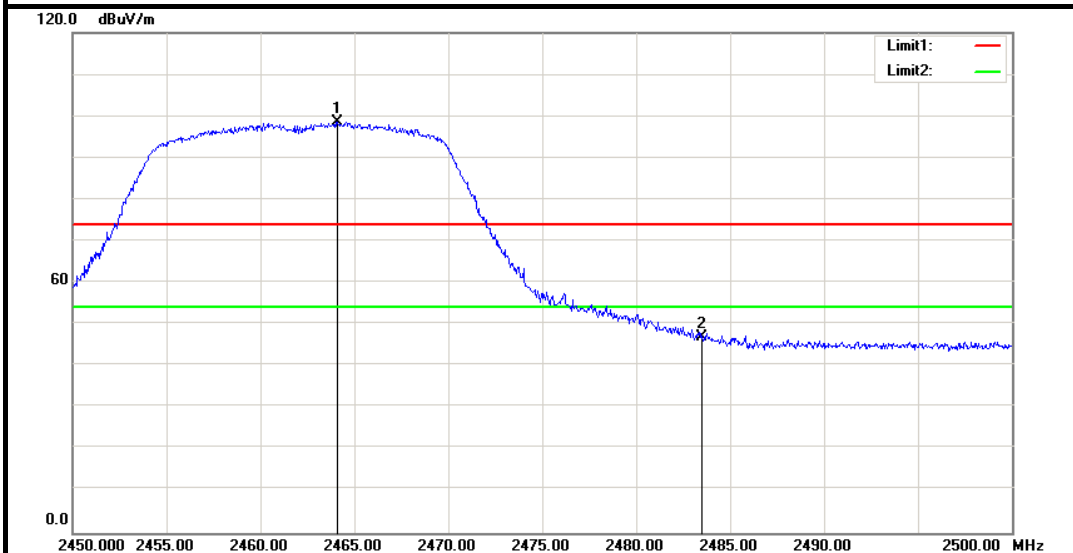


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2464.950	91.21	-2.45	88.76	---	---	Peak	Vertical
2.	2483.500	46.52	-2.35	44.17	74.00	-29.83	Peak	Vertical
1.	2463.650	79.35	-2.46	76.89	---	---	Average	Vertical
2.	2483.500	33.91	-2.35	31.56	54.00	-22.44	Average	Vertical



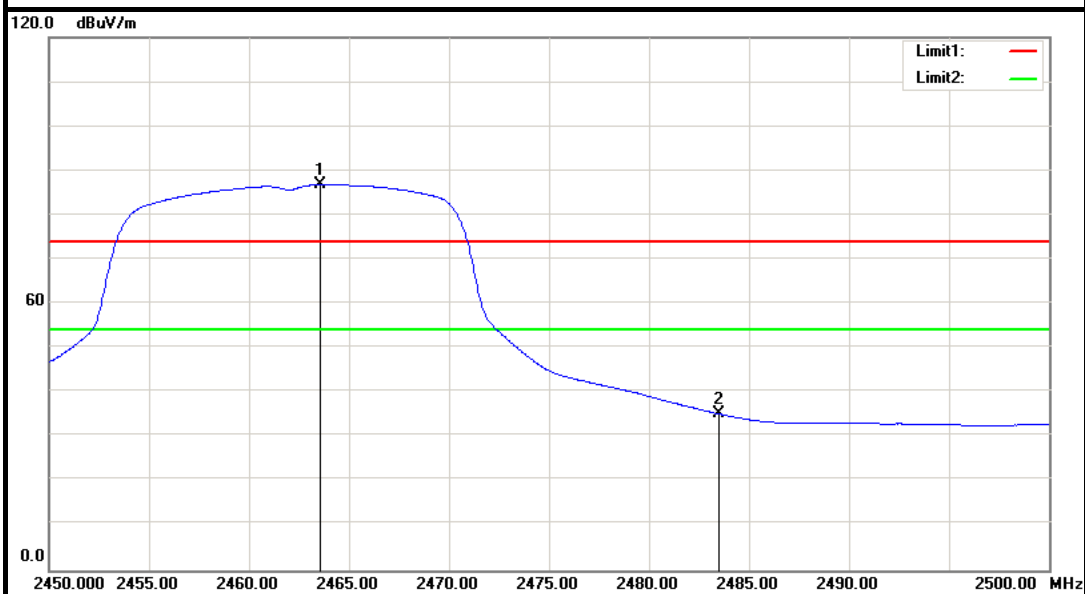
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

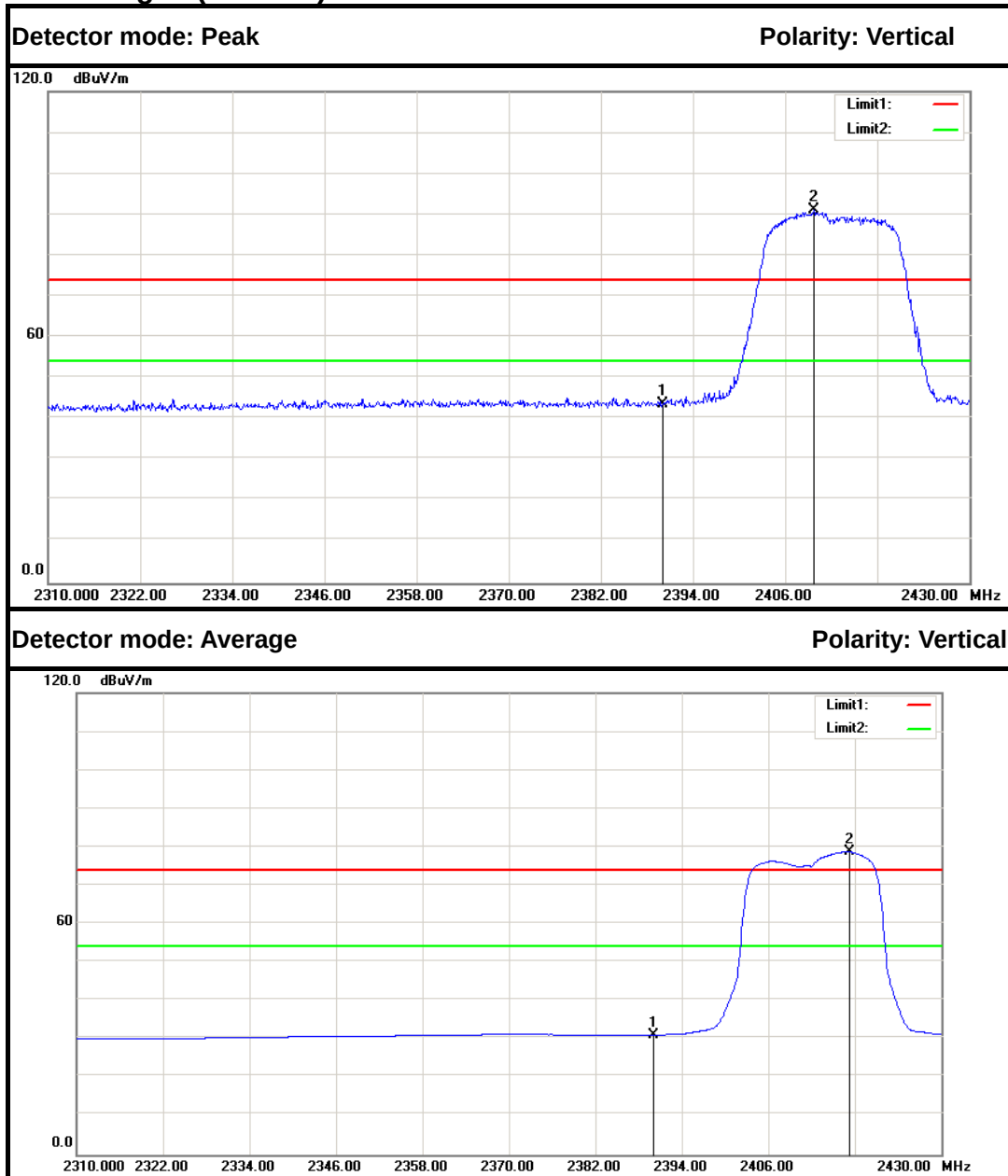
Polarity: Horizontal



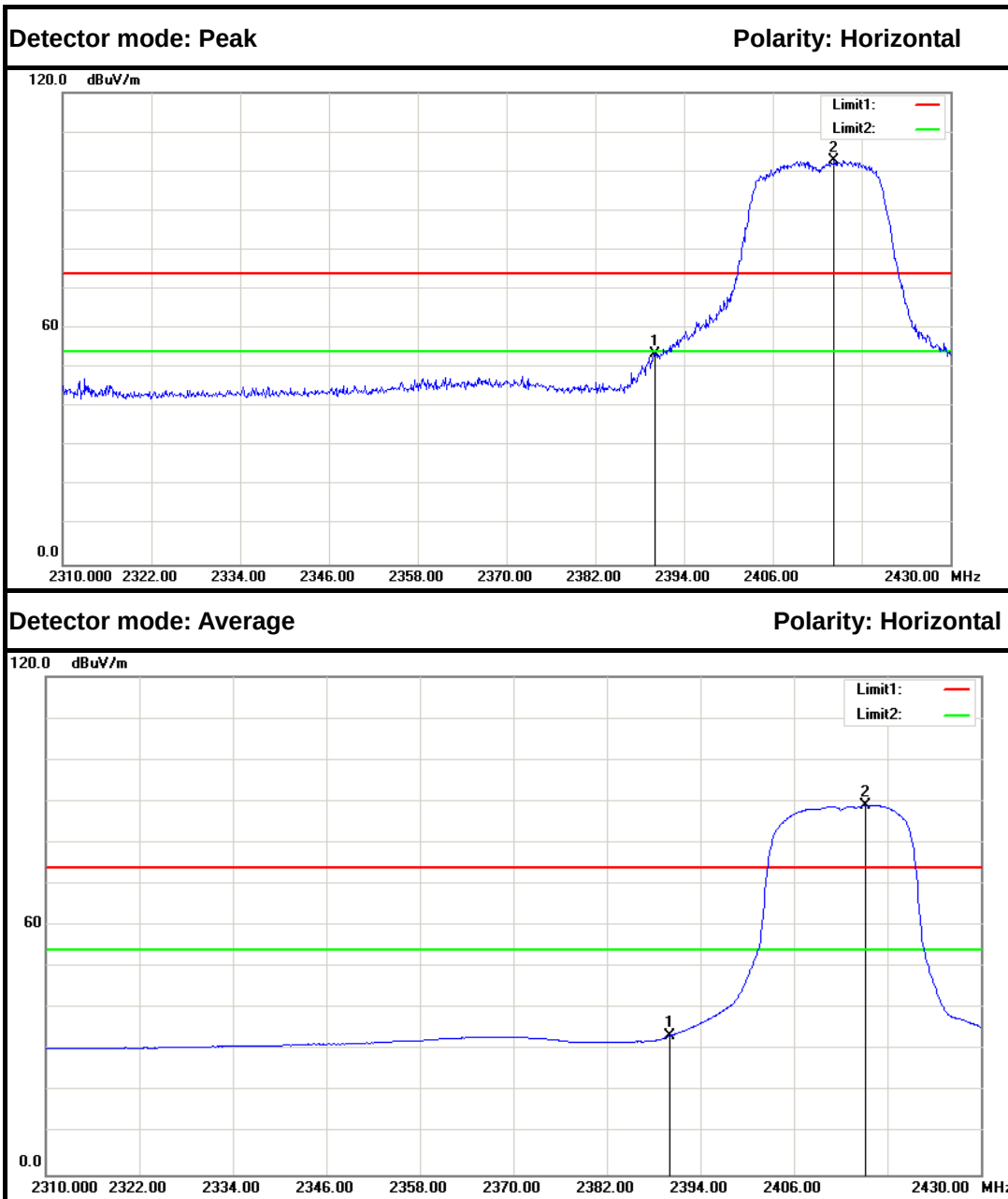
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2464.100	101.06	-2.46	98.60	---	---	Peak	Horizontal
2.	2483.500	49.21	-2.35	46.86	74.00	-27.14	Peak	Horizontal
1.	2463.550	89.31	-2.46	86.85	---	---	Average	Horizontal
2.	2483.500	37.55	-2.35	35.20	54.00	-18.80	Average	Horizontal



IEEE 802.11n HT20 MHz mode (Combine with Antenna 1 and Antenna 2)
Band Edges (CH Low)



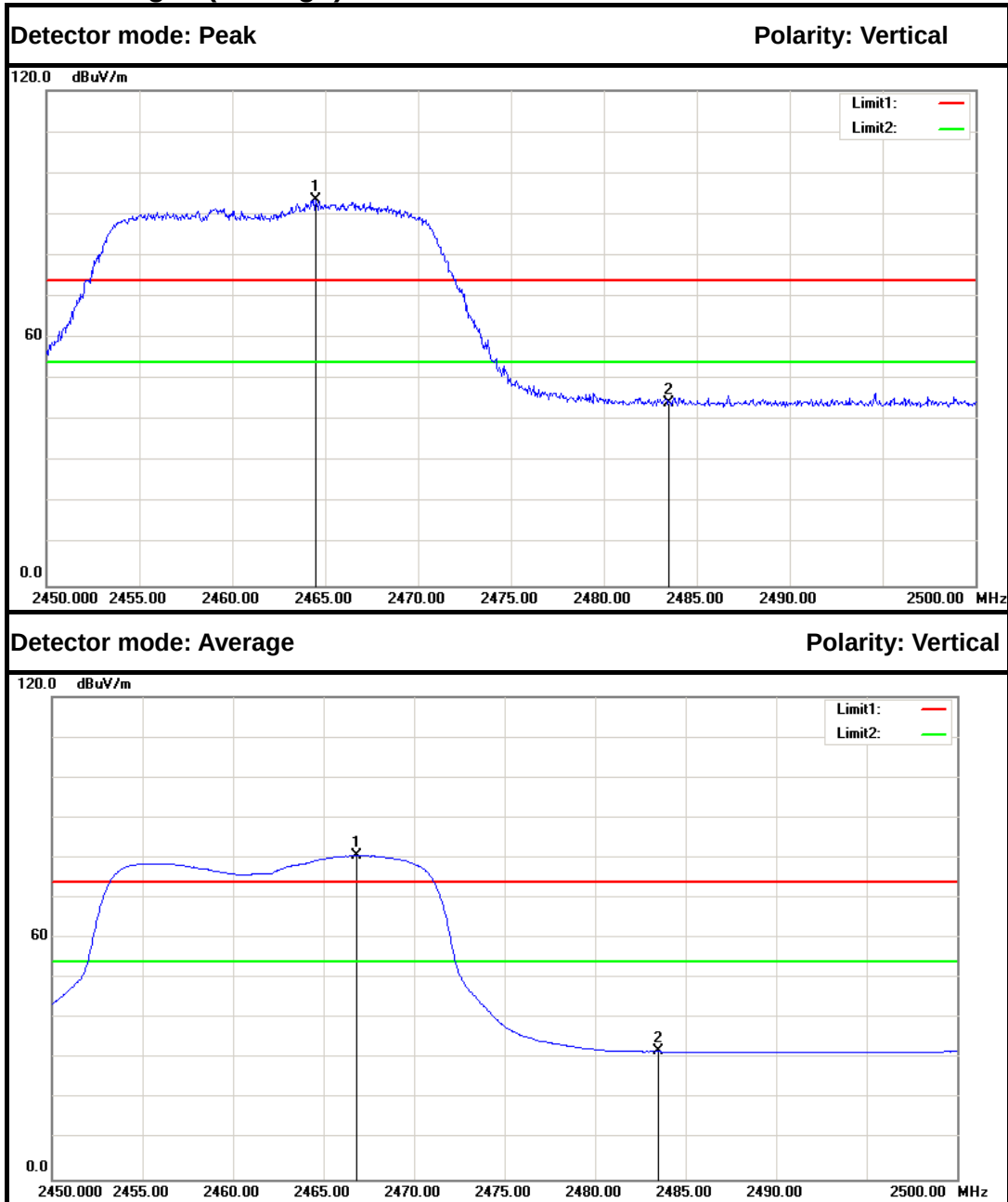
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	46.56	-2.86	43.70	74.00	-30.30	Peak	Vertical
2.	2409.720	93.69	-2.75	90.94	---	---	Peak	Vertical
1.	2390.000	33.97	-2.86	31.11	54.00	-22.89	Average	Vertical
2.	2417.280	81.42	-2.71	78.71	---	---	Average	Vertical



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2390.000	56.34	-2.86	53.48	74.00	-20.52	Peak	Horizontal
2.	2414.280	105.43	-2.73	102.70	---	---	Peak	Horizontal
1.	2390.000	36.31	-2.86	33.45	54.00	-20.55	Average	Horizontal
2.	2415.120	91.68	-2.73	88.95	---	---	Average	Horizontal



Band Edges (CH High)

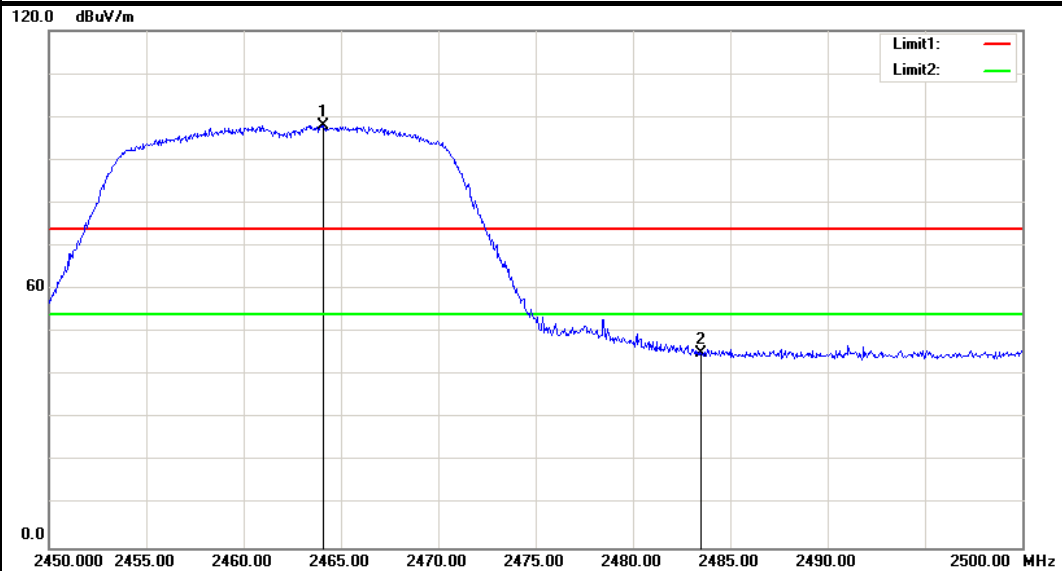


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1.	2464.500	95.99	-2.45	93.54	---	---	Peak	Vertical
2.	2483.500	46.75	-2.35	44.40	74.00	-29.60	Peak	Vertical
1.	2466.800	83.00	-2.44	80.56	---	---	Average	Vertical
2.	2483.500	34.18	-2.35	31.83	54.00	-22.17	Average	Vertical



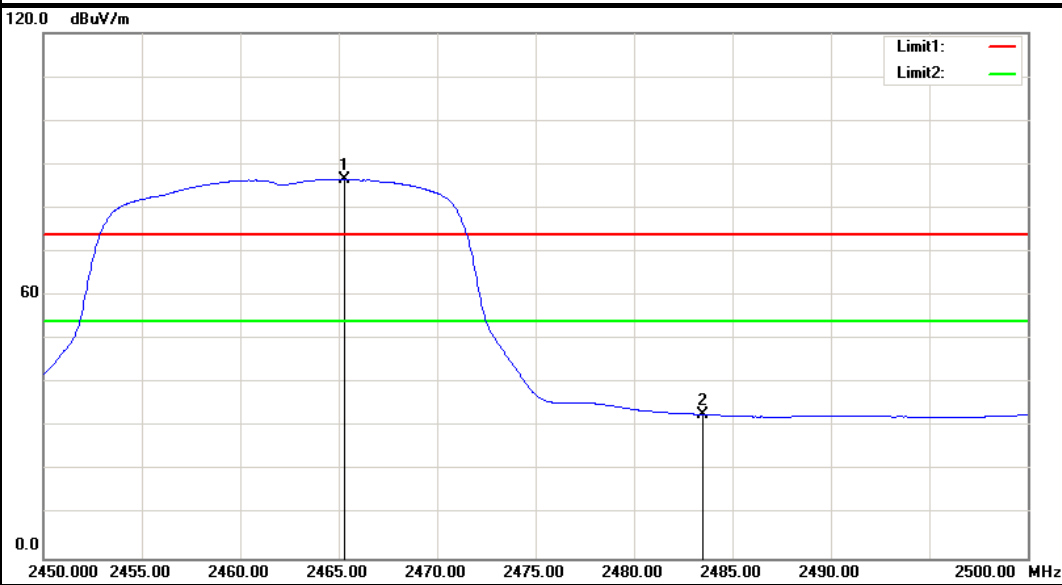
Detector mode: Peak

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.	2464.100	100.47	-2.46	98.01	---	---	Peak	Horizontal
2.	2483.500	47.62	-2.35	45.27	74.00	-28.73	Peak	Horizontal
1.	2465.300	89.05	-2.45	86.60	---	---	Average	Horizontal
2.	2483.500	35.25	-2.35	32.90	54.00	-21.10	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	02/21/2017	02/20/2018

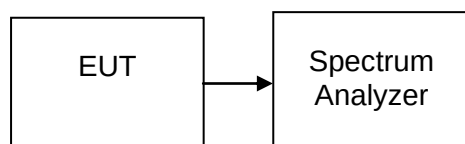
7.7.3. TEST PROCEDURES (please refer to measurement standard)

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

7.7.4. TEST SETUP



**7.7.5. TEST RESULTS***No non-compliance noted***Test Data****Test mode: IEEE 802.11b (Antenna 1)**

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-8.86	8	PASS
Mid	2437	-9.32		PASS
High	2462	-9.42		PASS

Test mode: IEEE 802.11b (Antenna 2)

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-9.81	8	PASS
Mid	2437	-10.38		PASS
High	2462	-9.48		PASS

Test mode: IEEE 802.11g (Antenna 1)

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-9.57	8	PASS
Mid	2437	-10.20		PASS
High	2462	-10.05		PASS

Test mode: IEEE 802.11g (Antenna 2)

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-10.56	8	PASS
Mid	2437	-11.30		PASS
High	2462	-10.37		PASS

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

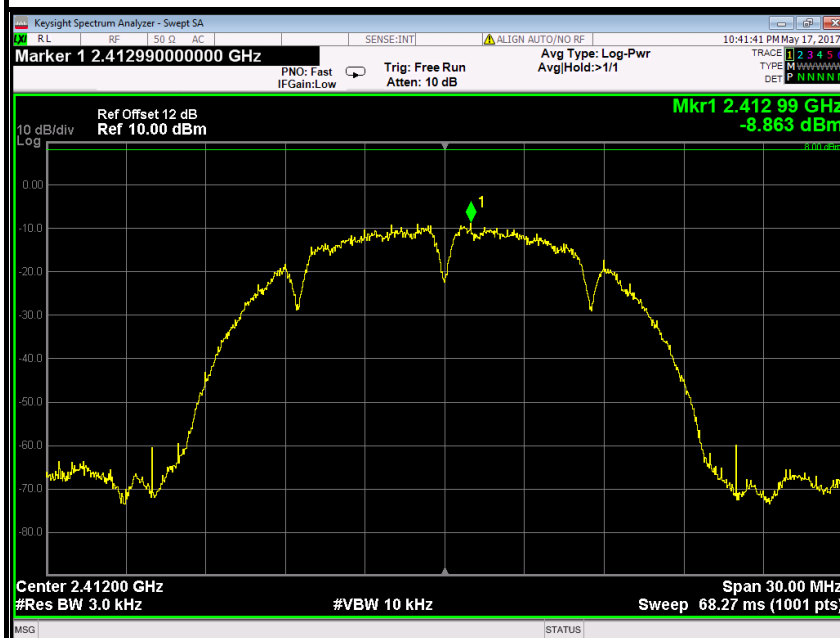
Channel	Frequency (MHz)	PPSD (dBm)			Limit (dBm)	Test Result
		Antenna 0	Antenna 1	Total		
Low	2412	-9.35	-10.73	-6.98	8	PASS
Mid	2437	-10.60	-11.30	-7.92		PASS
High	2462	-9.04	-10.76	-6.81		PASS



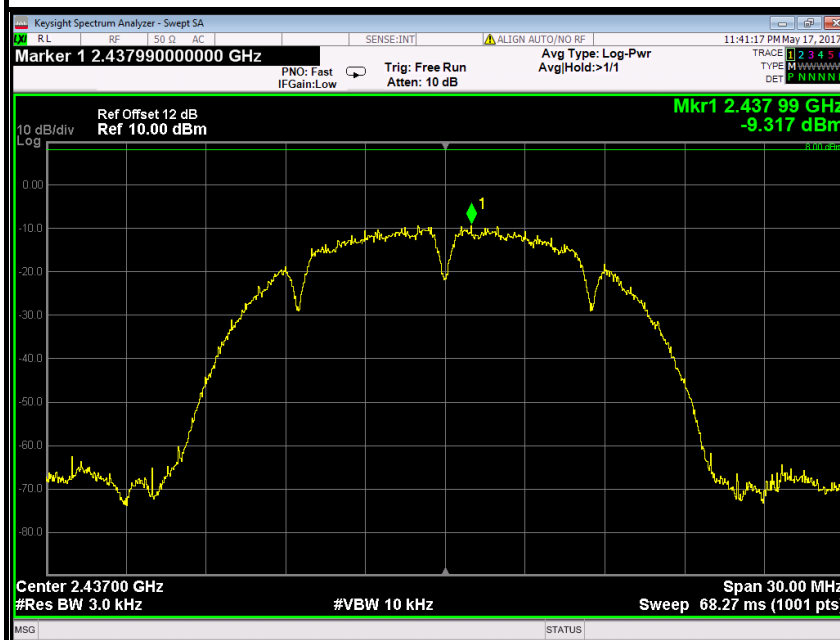
Test Plot

IEEE 802.11b mode (Antenna 1)

PPSD (CH Low)

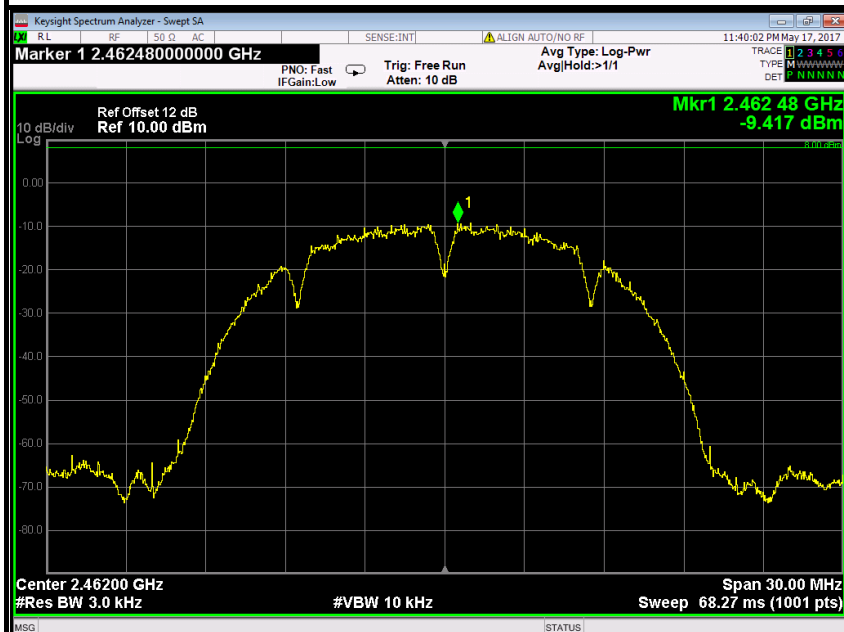


PPSD (CH Mid)



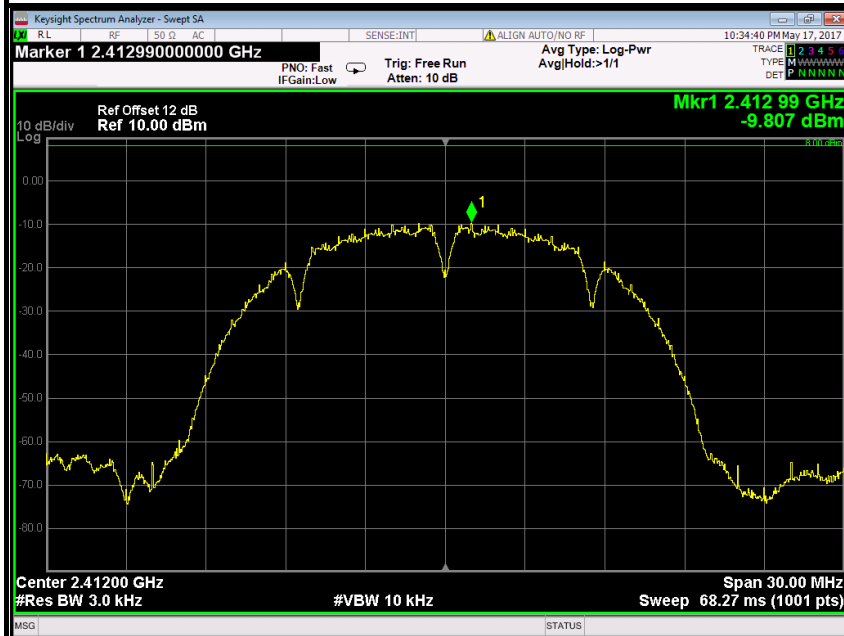


PPSD (CH High)



IEEE 802.11b mode (Antenna 2)

PPSD (CH Low)

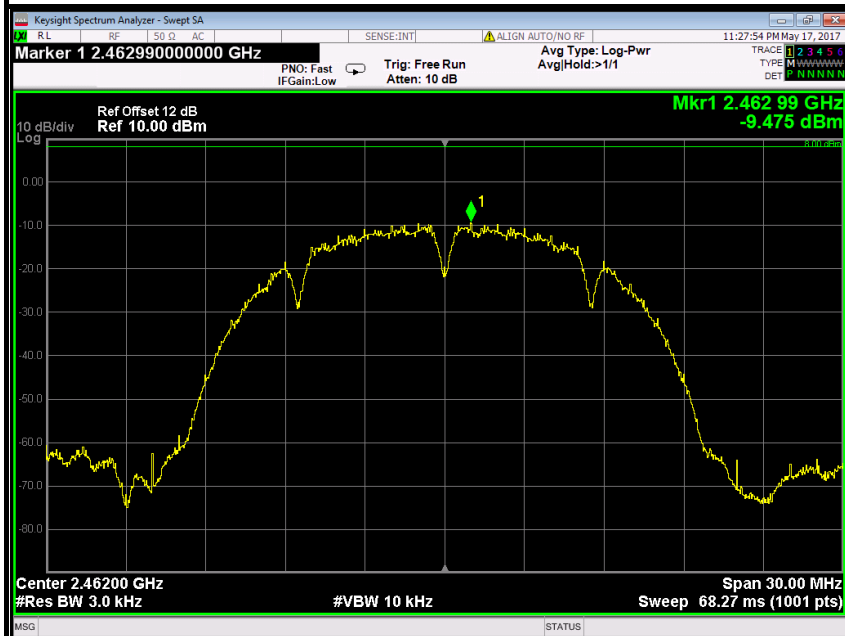




PPSD (CH Mid)



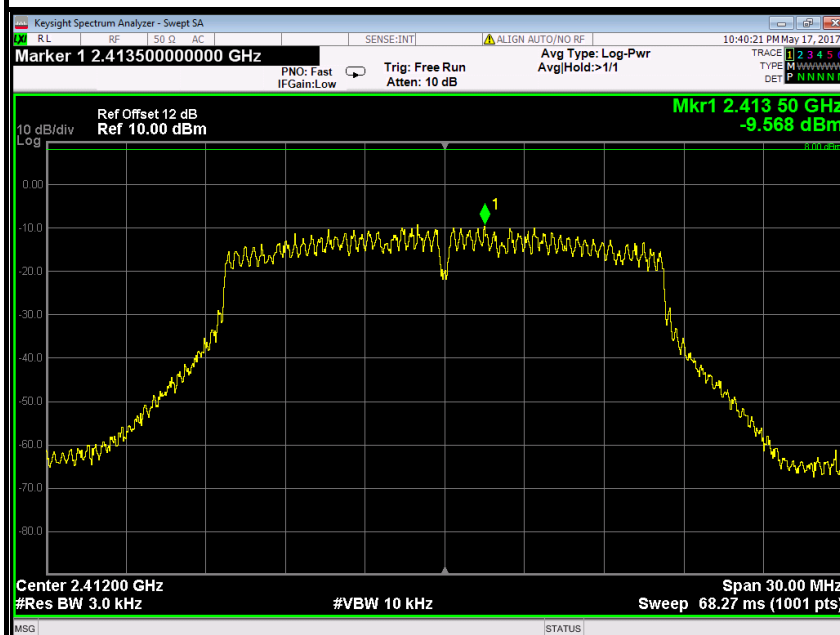
PPSD (CH High)



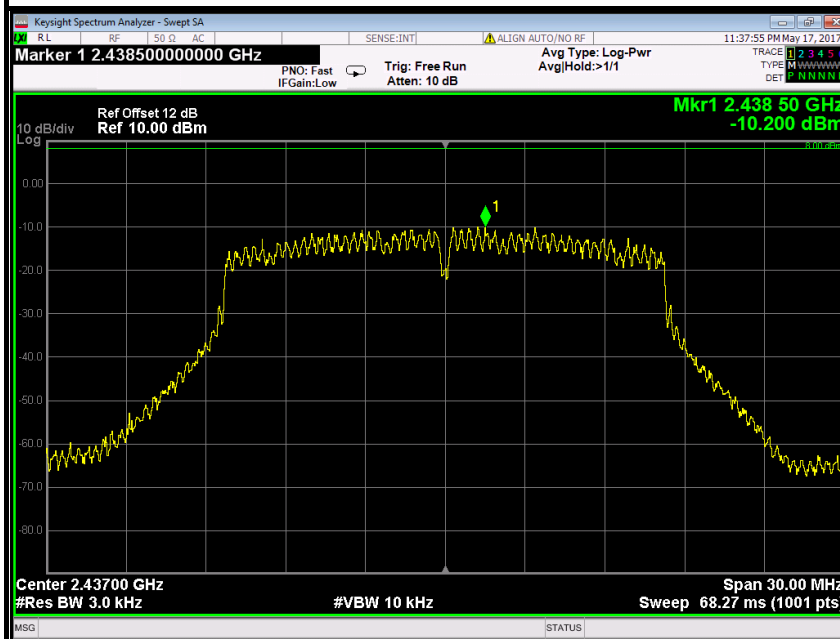


IEEE 802.11g mode (Antenna 1)

PPSD (CH Low)

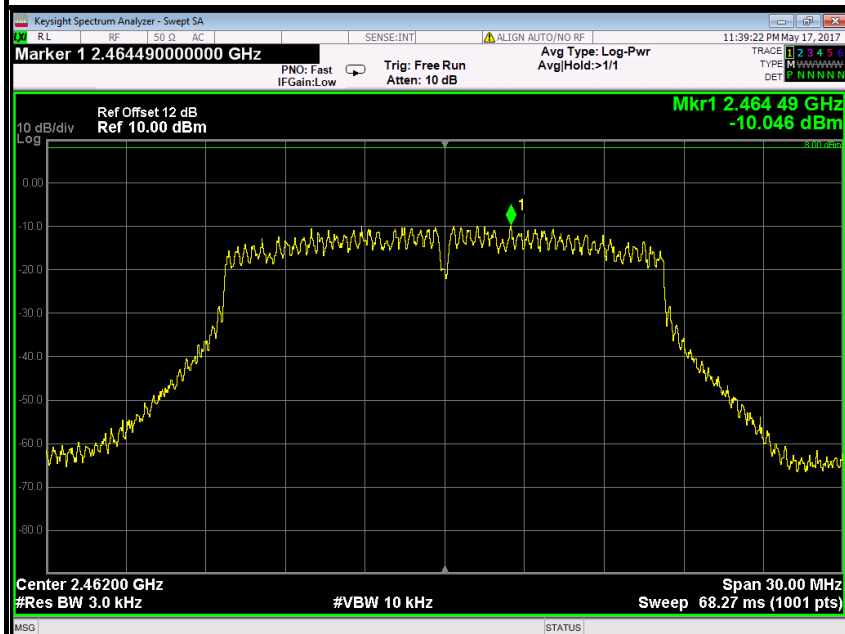


PPSD (CH Mid)



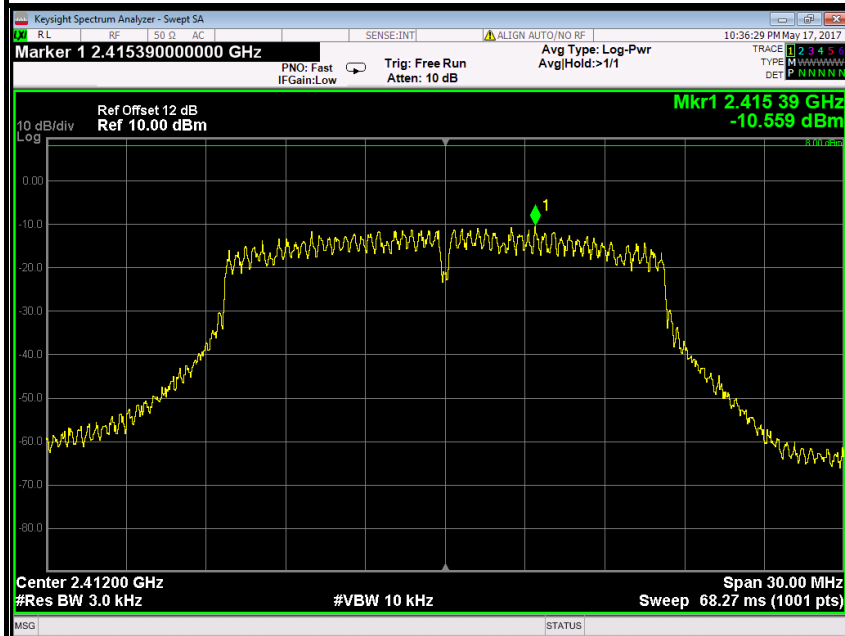


PPSD (CH High)



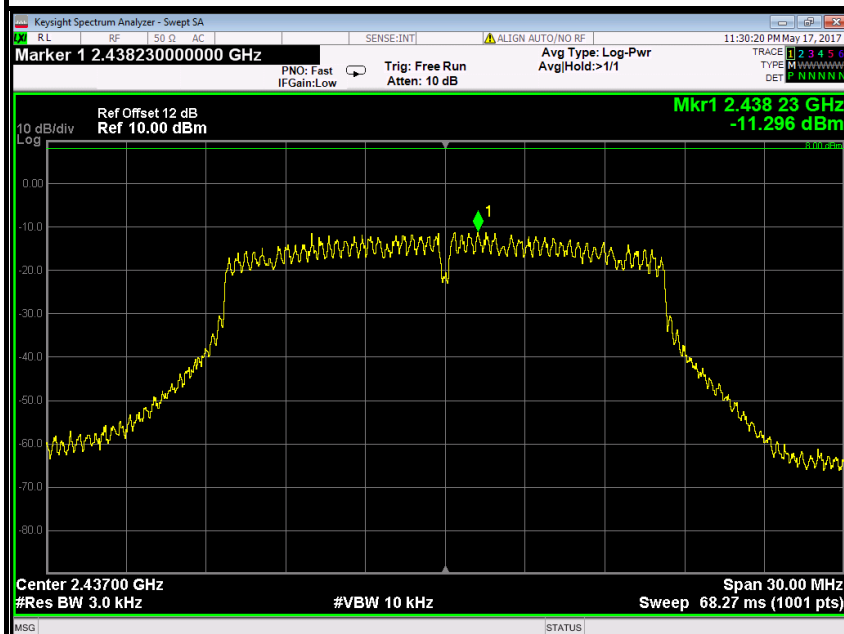
IEEE 802.11g mode (Antenna 2)

PPSD (CH Low)

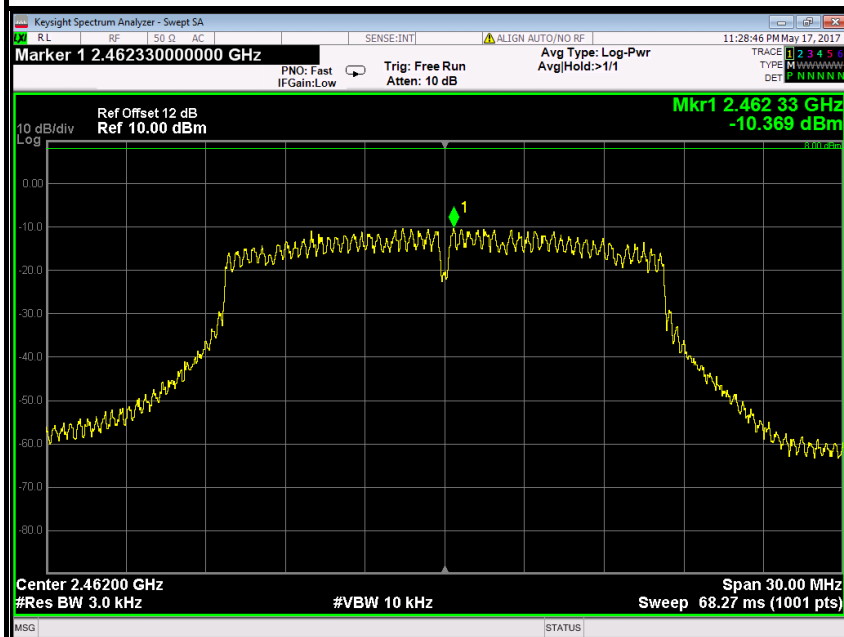




PPSD (CH Mid)



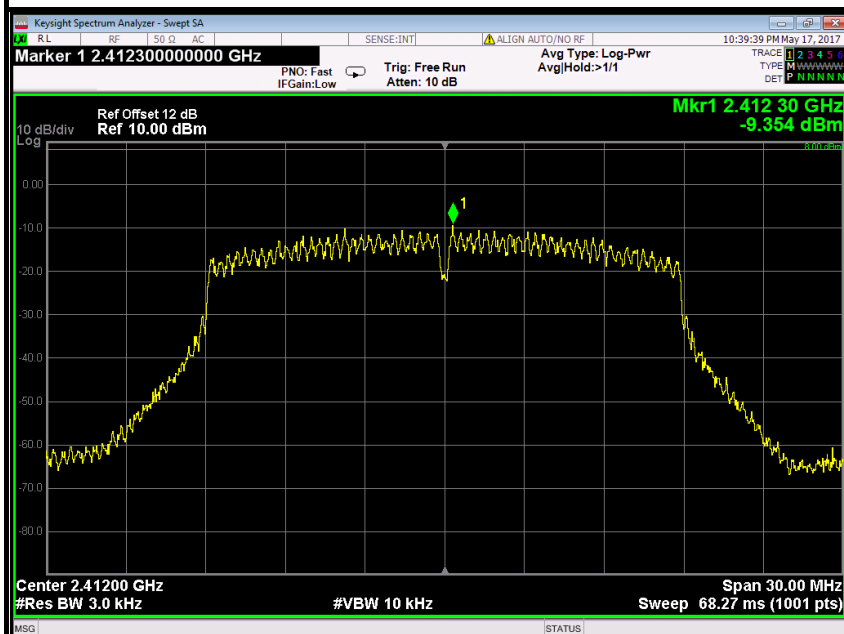
PPSD (CH High)



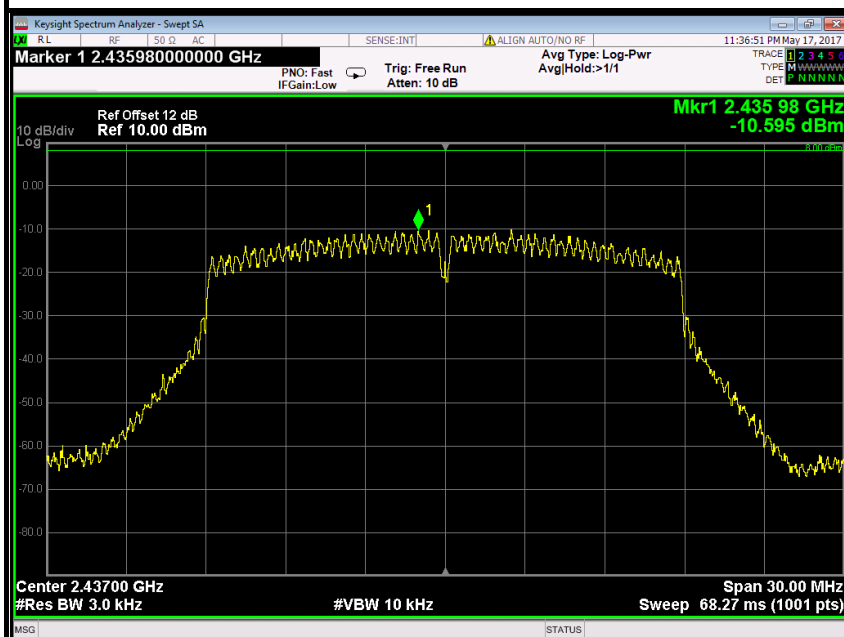


IEEE 802.11n HT20 MHz mode (Antenna 1)

PPSD (CH Low)

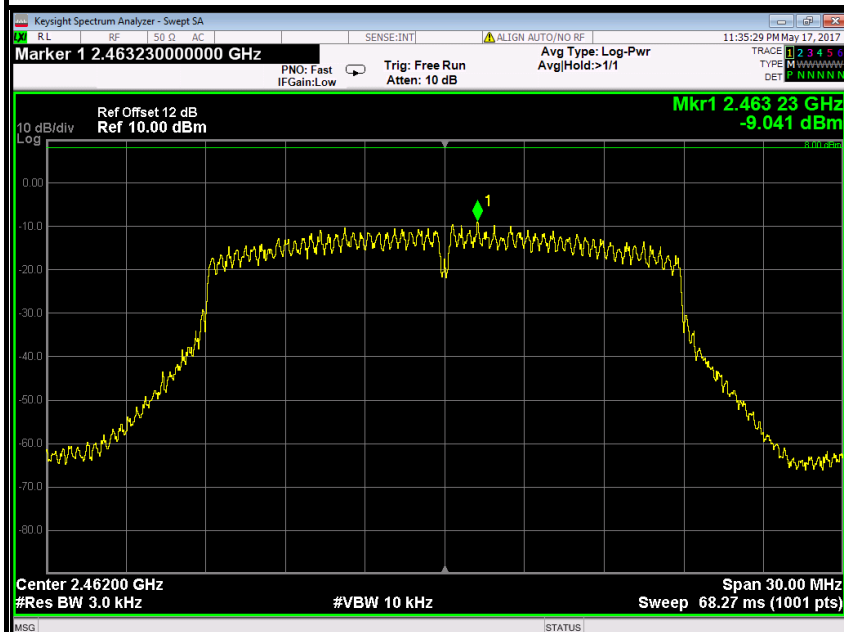


PPSD (CH Mid)



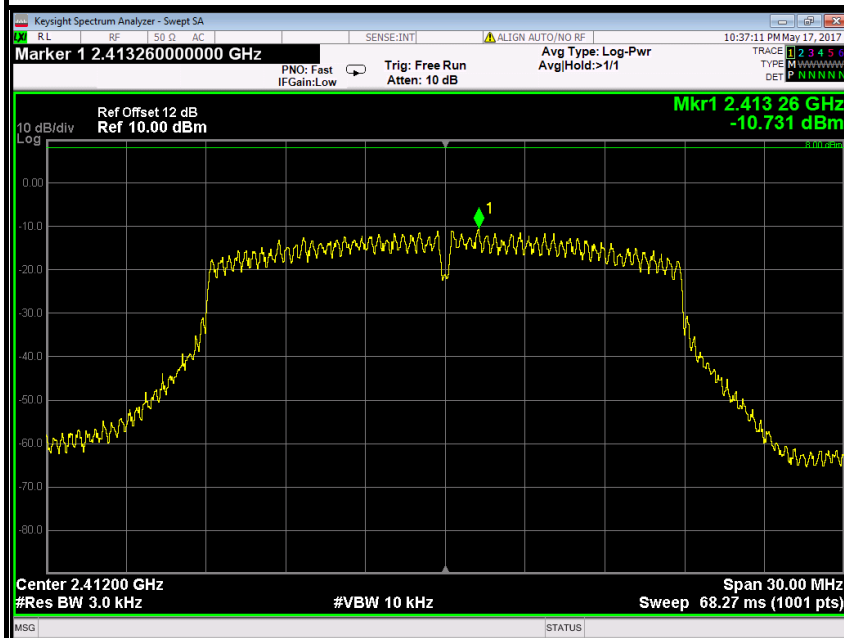


PPSD (CH High)



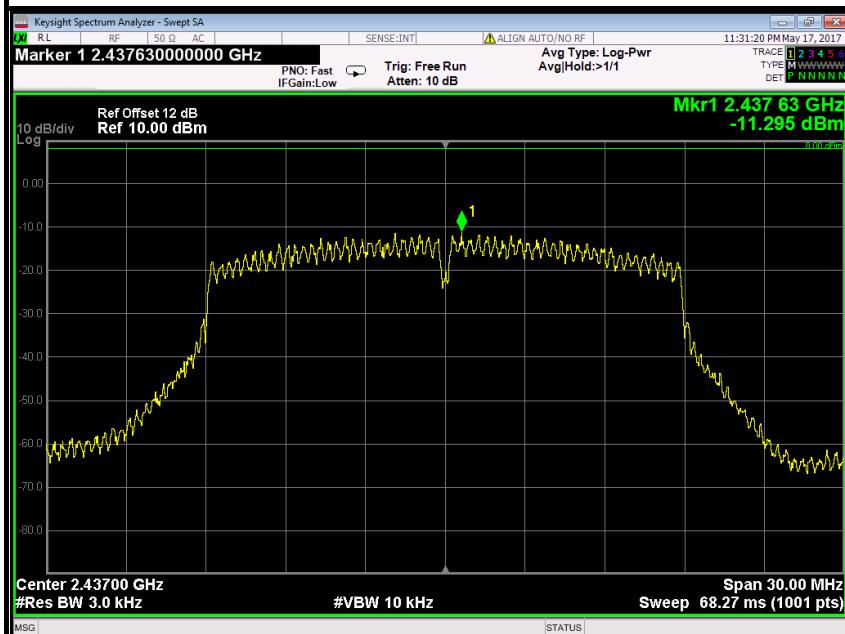
IEEE 802.11n HT20 MHz mode (Antenna 2)

PPSD (CH Low)





PPSD (CH Mid)



PPSD (CH High)

