

**Test Mode:** TX / IEEE 802.11n HT20 MHz (CH Mid)**Tested by:** Darry Wu**Ambient temperature:** 24°C **Relative humidity:** 52% RH **Date:** September 26, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1765.000	53.87	-6.35	47.52	74.00	-26.48	V	Peak
2566.000	45.09	-2.14	42.95	74.00	-31.05	V	Peak
3196.000	48.28	-1.03	47.25	74.00	-26.75	V	Peak
4879.000	53.85	4.59	58.44	74.00	-15.56	V	Peak
4879.000	44.97	4.59	49.56	54.00	-4.44	V	Peak
6193.000	41.19	6.39	47.58	74.00	-26.42	V	Peak
1891.000	46.61	-5.69	40.92	74.00	-33.08	H	Peak
2575.000	45.52	-2.12	43.40	74.00	-30.60	H	Peak
3250.000	44.77	-0.94	43.83	74.00	-30.17	H	Peak
3997.000	43.26	1.58	44.84	74.00	-29.16	H	Peak
4870.000	53.17	4.56	57.73	74.00	-16.27	H	AVG
4870.000	46.66	4.56	51.22	54.00	-2.78	H	Peak
6076.000	41.14	6.20	47.34	74.00	-26.66	H	Peak
7309.000	45.83	8.30	54.13	74.00	-19.87	H	AVG

**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:** September 26, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2125.000	47.62	-4.31	43.31	74.00	-30.69	V	Peak
3196.000	47.07	-1.03	46.04	74.00	-27.96	V	Peak
4186.000	42.37	2.24	44.61	74.00	-29.39	V	Peak
4924.000	52.28	4.73	57.01	74.00	-16.99	V	Peak
4924.000	43.90	4.73	48.63	54.00	-5.37	V	AVG
6454.000	42.30	6.82	49.12	74.00	-24.88	V	Peak
7381.000	45.23	8.44	53.67	74.00	-20.33	V	Peak
1765.000	52.06	-6.35	45.71	74.00	-28.29	H	Peak
3286.000	45.54	-0.88	44.66	74.00	-29.34	H	Peak
3916.000	43.35	1.24	44.59	74.00	-29.41	H	Peak
4924.000	52.34	4.73	57.07	74.00	-16.93	H	Peak
4924.000	46.95	4.73	51.68	54.00	-2.32	H	AVG
6373.000	41.61	6.68	48.29	74.00	-25.71	H	Peak
7390.000	43.94	8.46	52.40	74.00	-21.60	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).

**Combine with Antenna 0 and Antenna 1****Test Mode:** TX/ IEEE 802.11n HT40 MHz (CH Low)**Tested by:** Darry Wu**Ambient temperature:** 24°C **Relative humidity:** 52% RH **Date:** September 26, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1945.000	52.07	-5.35	46.72	74.00	-27.28	V	Peak
3196.000	47.37	-1.03	46.34	74.00	-27.66	V	Peak
3925.000	43.18	1.27	44.45	74.00	-29.55	V	Peak
4843.000	56.22	4.47	60.69	74.00	-13.31	V	Peak
4843.000	44.81	4.47	49.28	54.00	-4.72	V	AVG
6328.000	41.19	6.61	47.80	74.00	-26.20	V	Peak
7255.000	44.36	8.20	52.56	74.00	-21.44	V	Peak
1765.000	48.74	-6.35	42.39	74.00	-31.61	H	Peak
3232.000	47.06	-0.97	46.09	74.00	-27.91	H	Peak
3997.000	43.03	1.58	44.61	74.00	-29.39	H	Peak
4852.000	56.15	4.50	60.65	74.00	-13.35	H	Peak
4852.000	46.78	4.50	51.28	54.00	-2.72	H	AVG
6418.000	41.19	6.76	47.95	74.00	-26.05	H	Peak
7282.000	45.44	8.25	53.69	74.00	-20.31	H	Peak

**Remark:**

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
- Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
- 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.
- 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.
- 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:** September 26, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2233.000	46.89	-3.72	43.17	74.00	-30.83	V	Peak
3196.000	48.56	-1.03	47.53	74.00	-26.47	V	Peak
4177.000	42.03	2.21	44.24	74.00	-29.76	V	Peak
4870.000	55.31	4.56	59.87	74.00	-14.13	V	Peak
4870.000	44.12	4.56	48.68	54.00	-5.32	V	AVG
6085.000	41.22	6.22	47.44	74.00	-26.56	V	Peak
7309.000	45.82	8.30	54.12	74.00	-19.88	V	Peak
7309.000	37.06	8.30	45.36	54.00	-8.64	V	AVG
1909.000	44.46	-5.58	38.88	74.00	-35.12	H	Peak
2647.000	45.05	-2.00	43.05	74.00	-30.95	H	Peak
3754.000	43.44	0.55	43.99	74.00	-30.01	H	Peak
4879.000	55.05	4.59	59.64	74.00	-14.36	H	Peak
4879.000	46.64	4.59	51.23	54.00	-2.77	H	AVG
6418.000	41.46	6.76	48.22	74.00	-25.78	H	Peak
7309.000	46.38	8.30	54.68	74.00	-19.32	H	Peak
7309.000	37.03	8.30	45.33	54.00	-8.67	H	AVG

**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 High)**Tested by:** Darry Wu**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** September 26, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1945.000	48.48	-5.35	43.13	74.00	-30.87	V	Peak
2503.000	46.75	-2.25	44.50	74.00	-29.50	V	Peak
3196.000	48.34	-1.03	47.31	74.00	-26.69	V	Peak
4915.000	53.67	4.70	58.37	74.00	-15.63	V	Peak
4915.000	42.93	4.70	47.63	54.00	-6.37	V	AVG
5545.000	41.74	5.89	47.63	74.00	-26.37	V	Peak
7363.000	45.00	8.41	53.41	74.00	-20.59	V	Peak
2440.000	47.21	-2.59	44.62	74.00	-29.38	H	Peak
3268.000	46.29	-0.91	45.38	74.00	-28.62	H	Peak
4015.000	42.80	1.64	44.44	74.00	-29.56	H	Peak
4906.000	55.89	4.67	60.56	74.00	-13.44	H	Peak
4906.000	45.16	4.67	49.83	54.00	-4.17	H	AVG
6355.000	41.19	6.66	47.85	74.00	-26.15	H	Peak
7363.000	44.99	8.41	53.40	74.00	-20.60	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

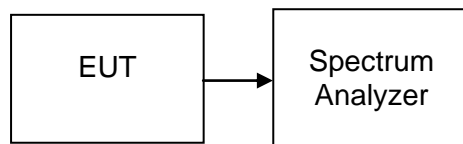
Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Spectrum Analyzer	Agilent	N9010A	MY52221469	02/21/2017	02/20/2018

### 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 0	Antenna 1		
Low	2412	8094	8084	>500	PASS
Mid	2437	8086	8098		PASS
High	2462	8107	8054		PASS

**Test mode: IEEE 802.11g**

Channel	Frequency (MHz)	Bandwidth (kHz)		Limit (kHz)	Test Result
		Antenna 0	Antenna 1		
Low	2412	14710	15090	>500	PASS
Mid	2437	15080	15070		PASS
High	2462	15100	15110		PASS

**Test mode: IEEE 802.11n HT20 MHz**

Channel	Frequency (MHz)	Bandwidth (kHz)		Limit (kHz)	Test Result
		Antenna 0	Antenna 1		
Low	2412	15120	15700	>500	PASS
Mid	2437	15100	15710		PASS
High	2462	15120	15110		PASS

**Test mode: IEEE 802.11n HT40 MHz**

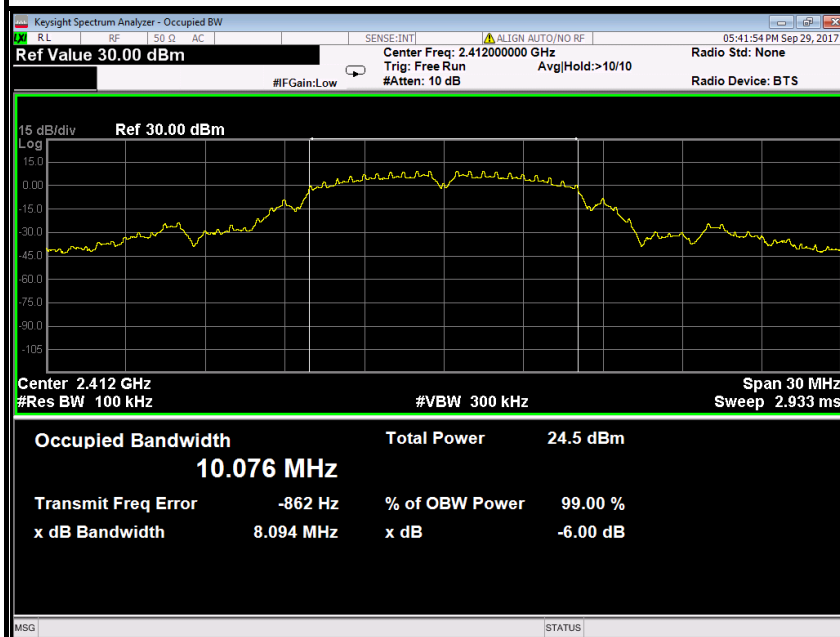
Channel	Frequency (MHz)	Bandwidth (kHz)		Limit (kHz)	Test Result
		Antenna 0	Antenna 1		
Low	2422	35790	36330	>500	PASS
Mid	2437	35800	35760		PASS
High	2452	35800	36100		PASS



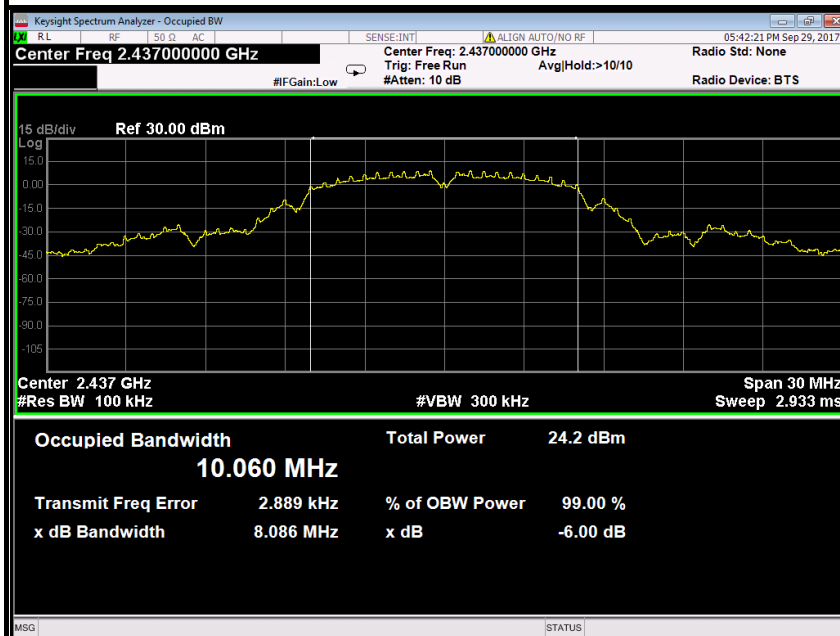
**Test Plot**  
**Antenna 0**

**IEEE 802.11b mode**

**6dB Bandwidth (CH Low)**



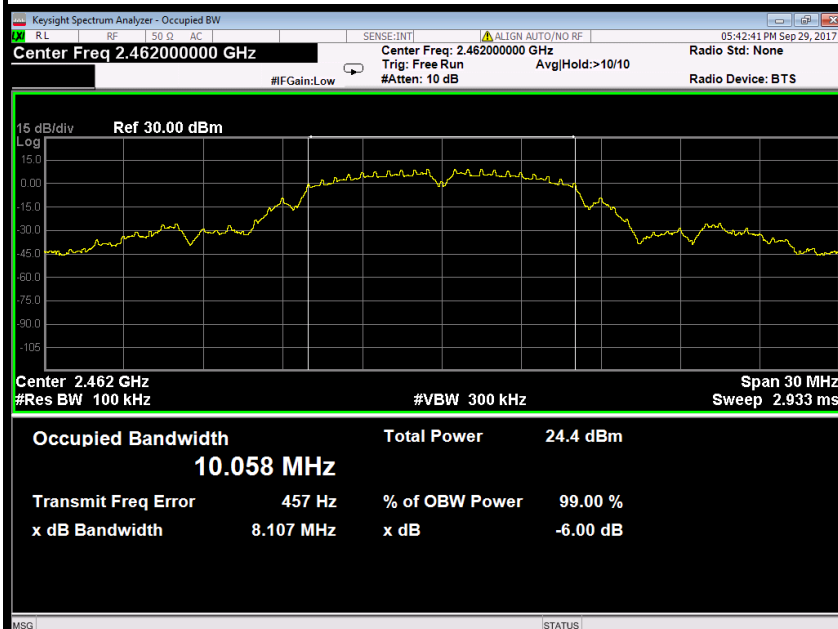
**6dB Bandwidth (CH Mid)**





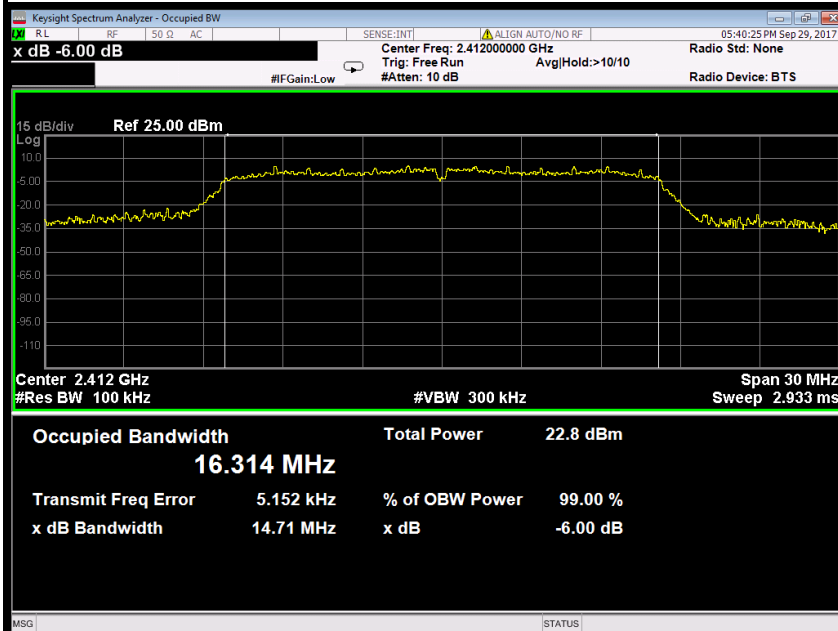


### 6dB Bandwidth (CH High)



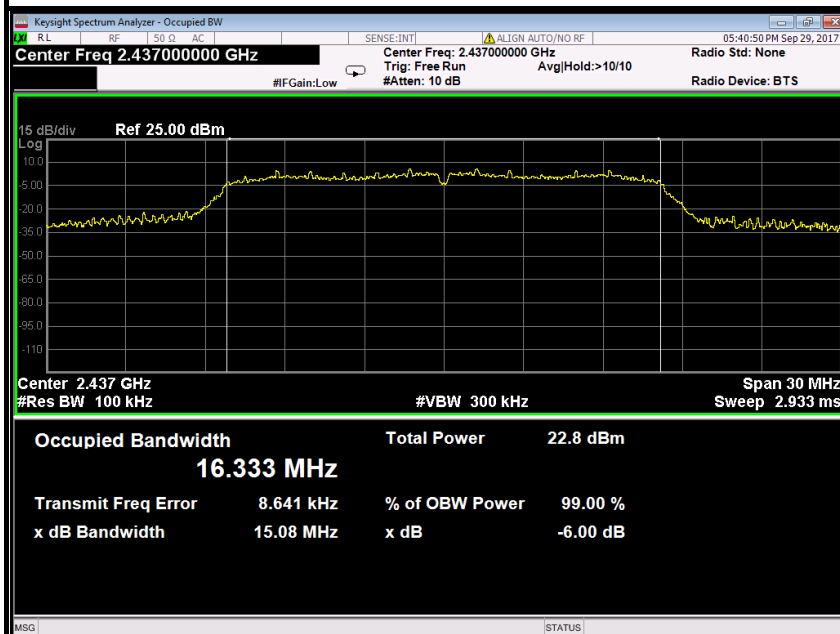
### IEEE 802.11g mode

### 6dB Bandwidth (CH Low)

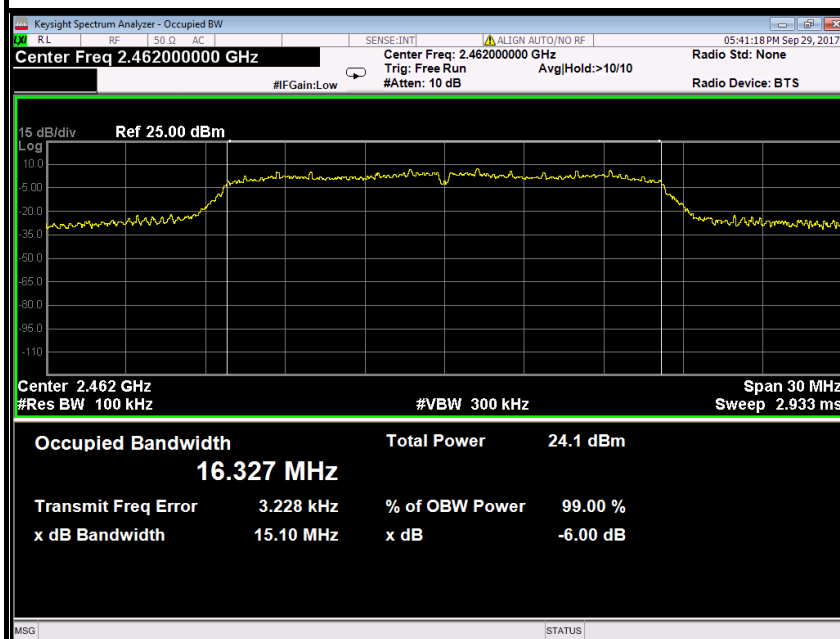




### 6dB Bandwidth (CH Mid)



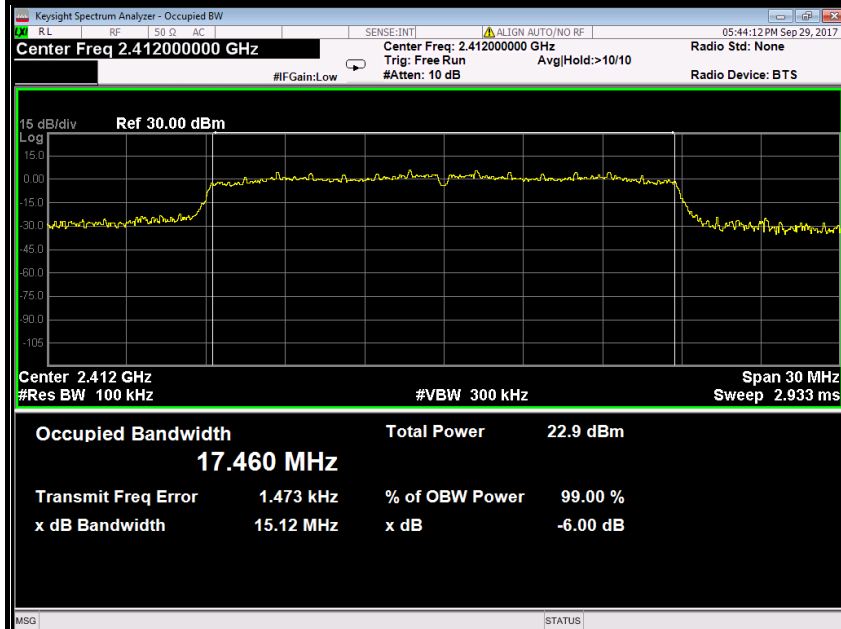
### 6dB Bandwidth (CH High)



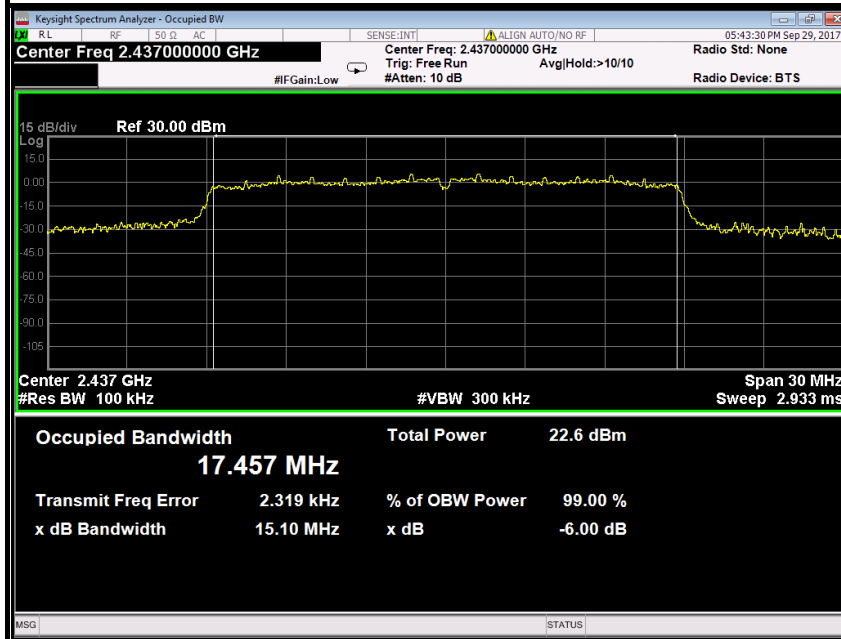


## IEEE 802.11n HT20 MHz mode

### 6dB Bandwidth (CH Low)

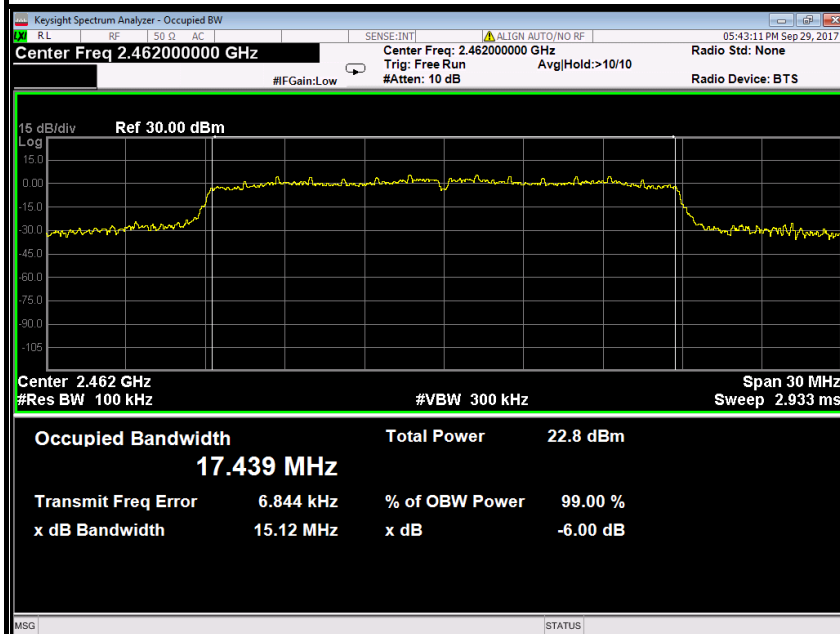


### 6dB Bandwidth (CH Mid)



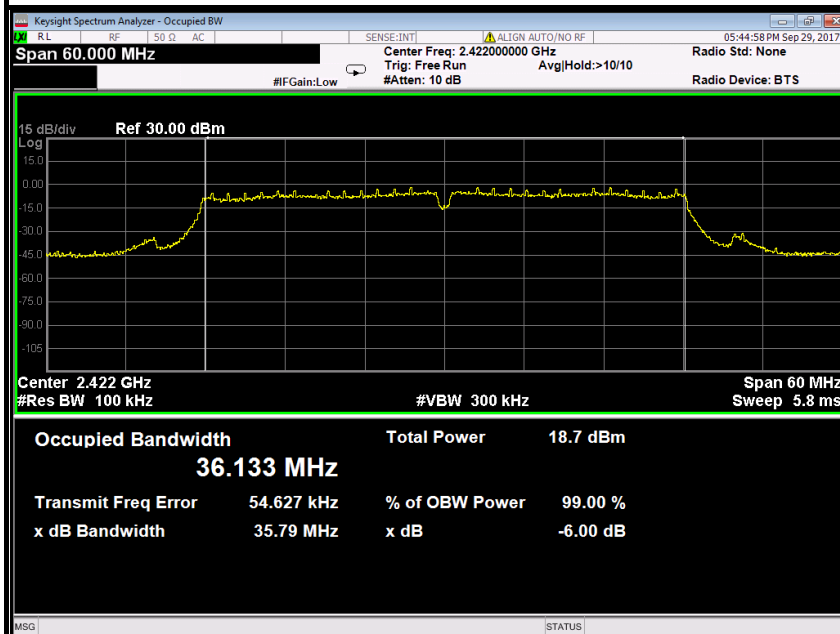


### 6dB Bandwidth (CH High)



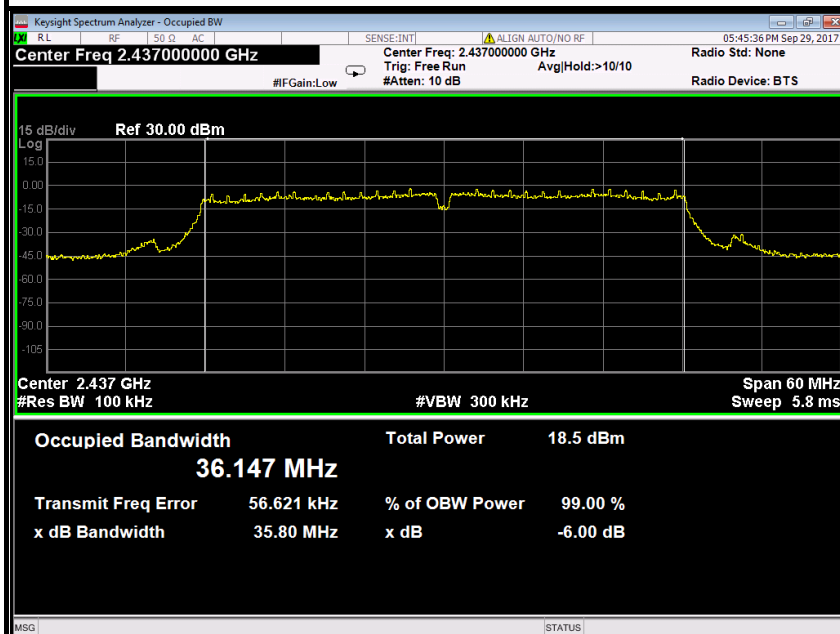
### IEEE 802.11n HT40 MHz mode

### 6dB Bandwidth (CH Low)

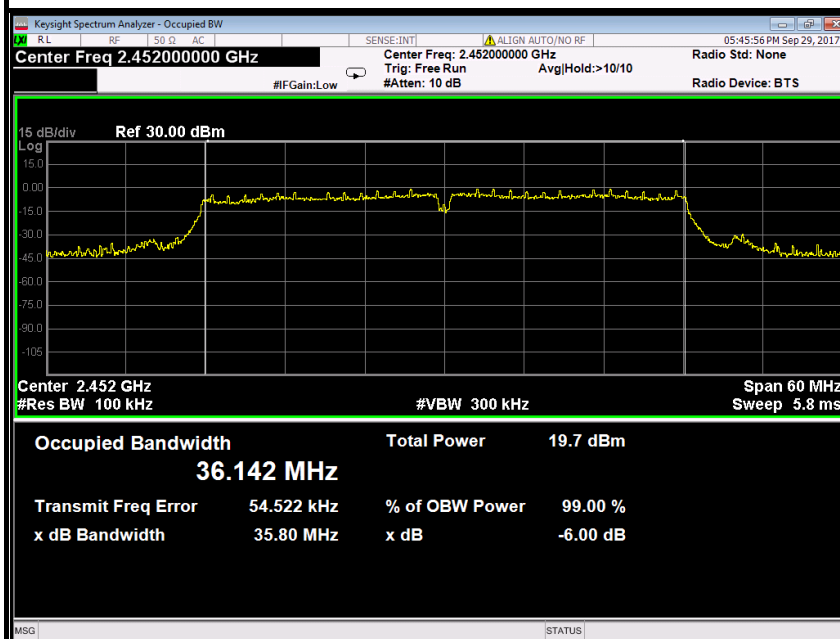




### 6dB Bandwidth (CH Mid)



### 6dB Bandwidth (CH High)

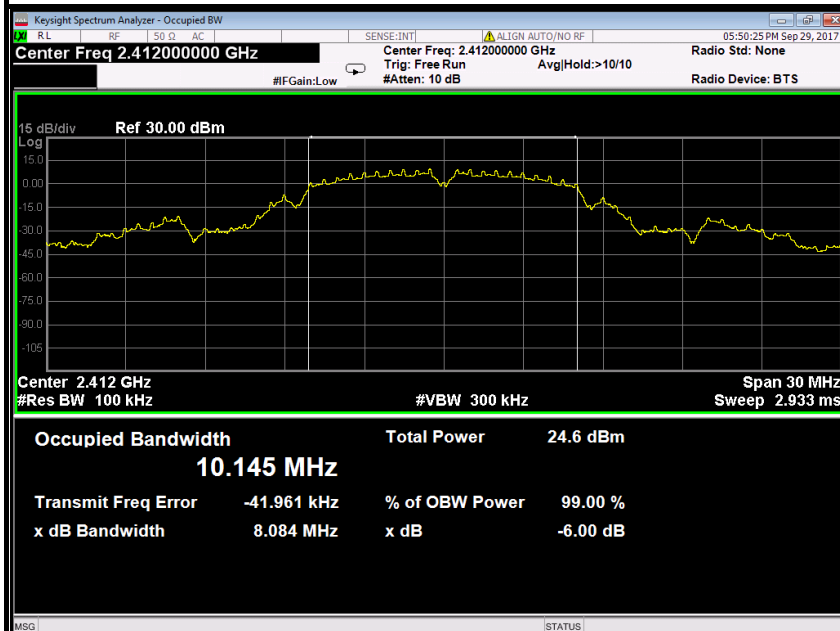




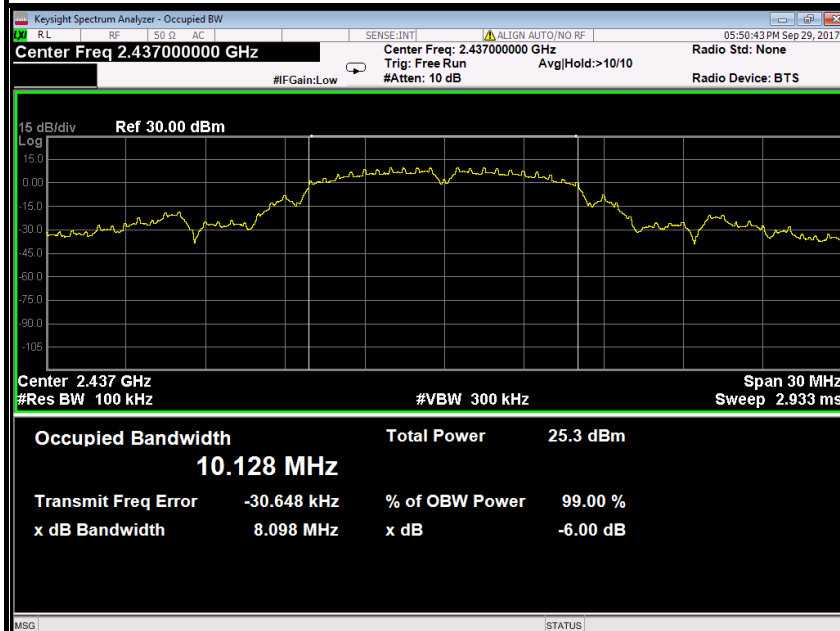
## Antenna 1

IEEE 802.11b mode

### 6dB Bandwidth (CH Low)

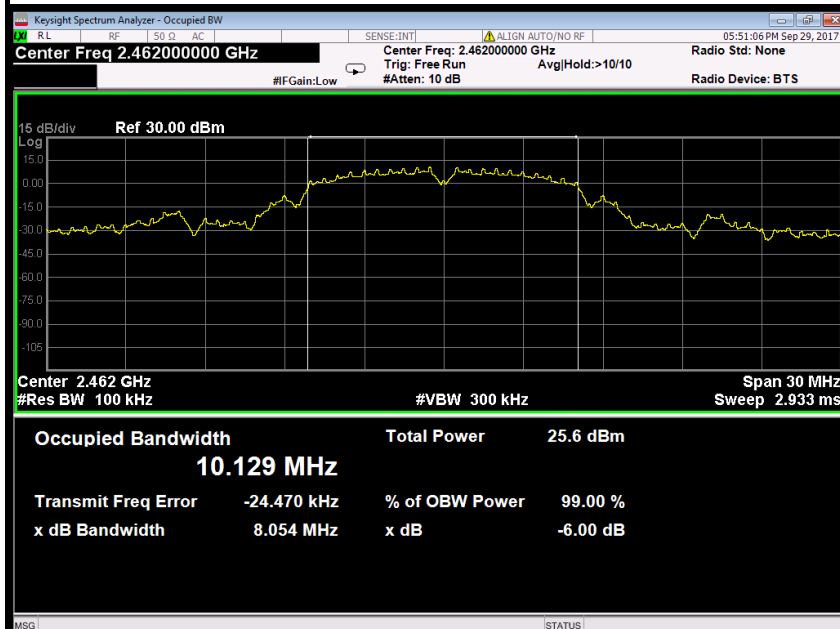


### 6dB Bandwidth (CH Mid)



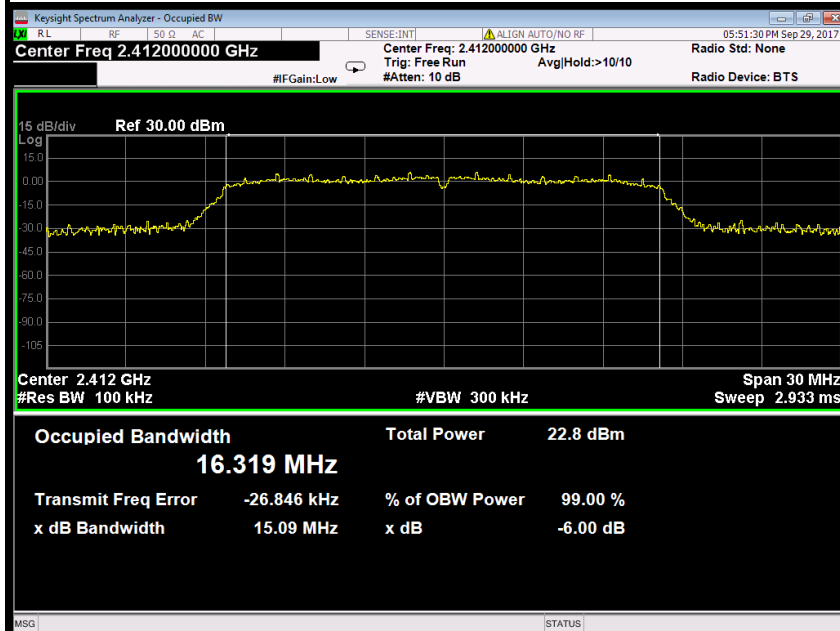


### 6dB Bandwidth (CH High)



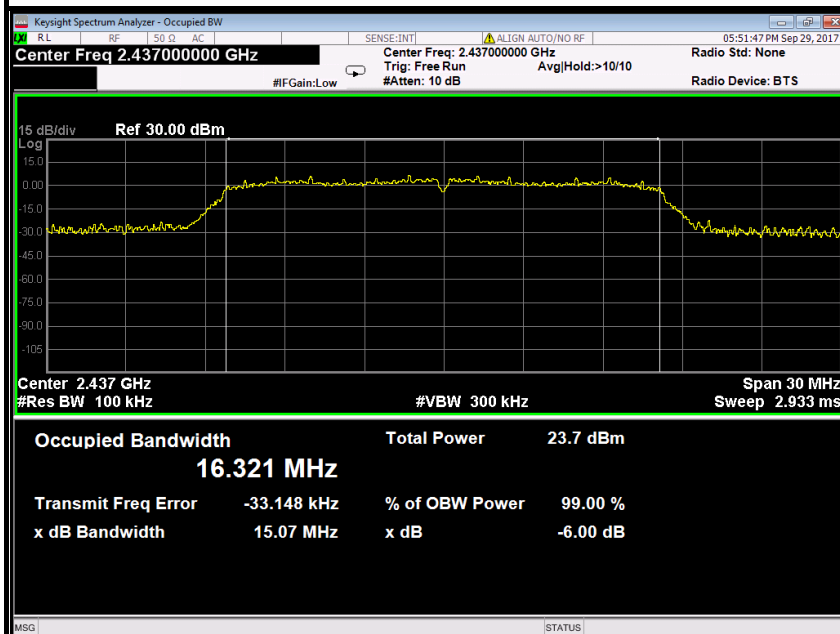
### IEEE 802.11g mode

### 6dB Bandwidth (CH Low)

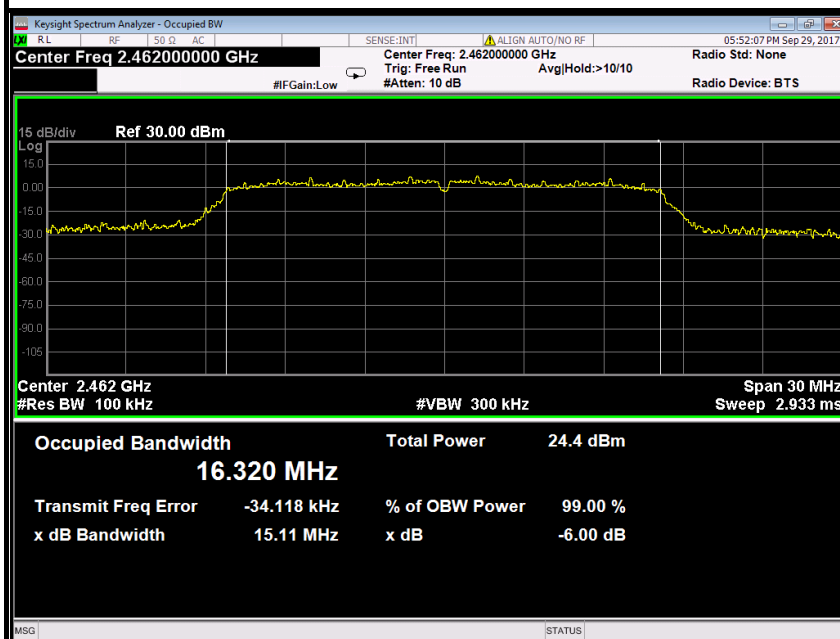




### 6dB Bandwidth (CH Mid)



### 6dB Bandwidth (CH High)

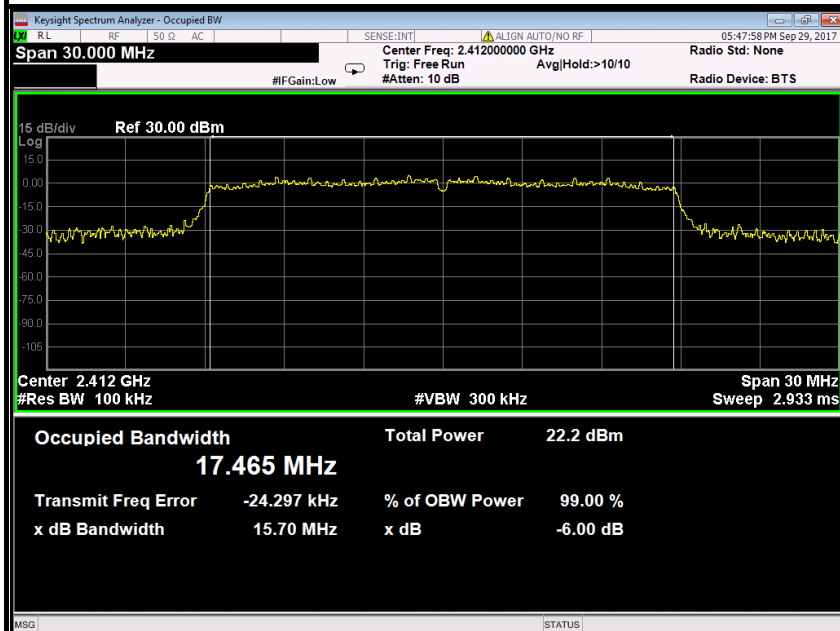




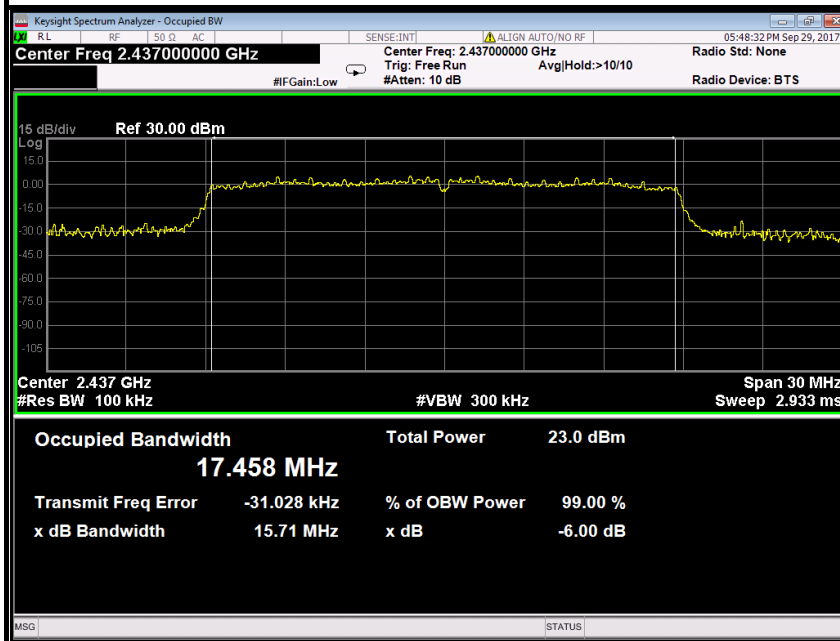


## IEEE 802.11n HT20 MHz mode

### 6dB Bandwidth (CH Low)

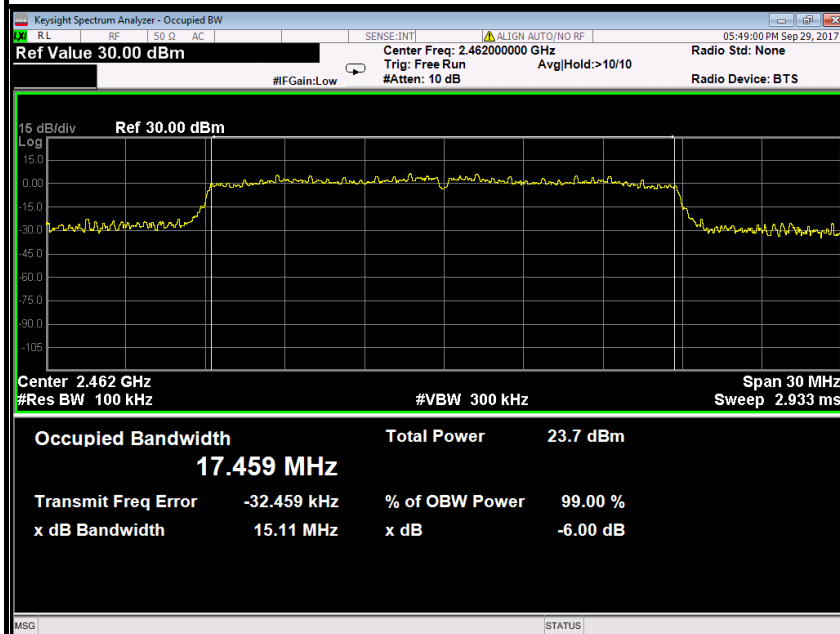


### 6dB Bandwidth (CH Mid)



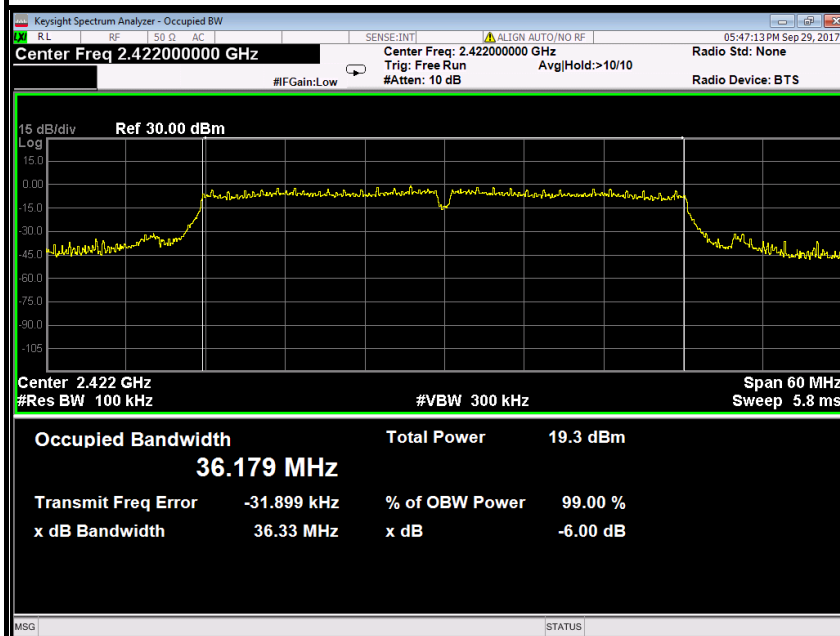


### 6dB Bandwidth (CH High)



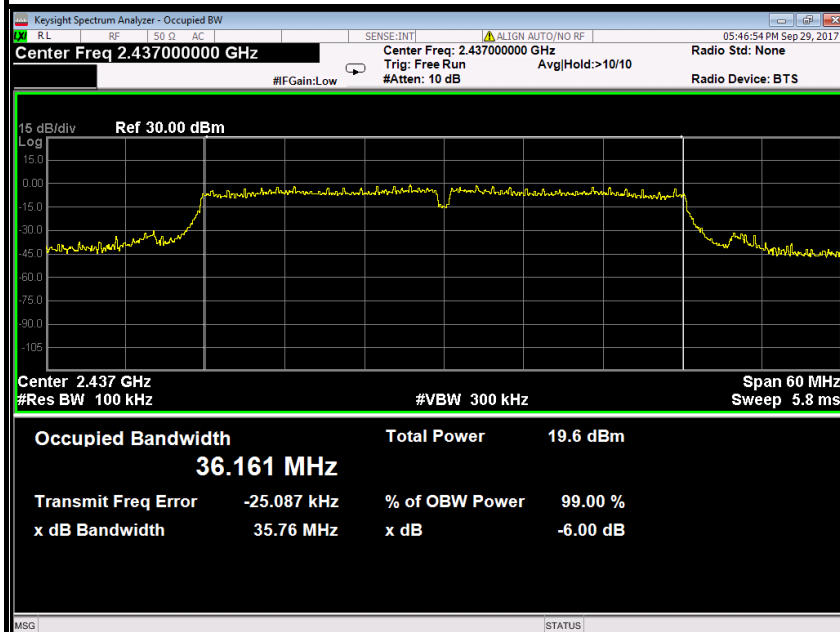
### IEEE 802.11n HT40 MHz mode

### 6dB Bandwidth (CH Low)

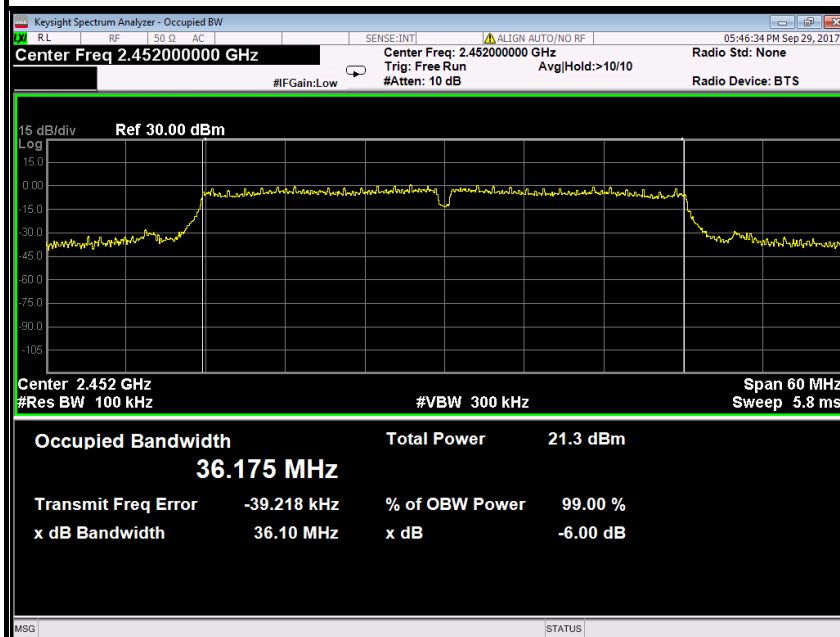




### 6dB Bandwidth (CH Mid)



### 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

### Antenna 0

$T_{nom}$	$V_{nom}$	Lowest channel 2412MHz	Middle channel 2437MHz	Highest channel 2462MHz
Conducted power [dBm/MHz] Measured with DSSS modulation		10.71	10.48	10.54
Radiated power [dBm/MHz] Measured with DSSS modulation		11.50	11.85	12.20
Gain [dBi] Calculated		0.79	1.37	1.66
Measurement uncertainty		$\pm 1.5$ dB (cond.) / $\pm 3$ dB (rad.)		

### Antenna 1

$T_{nom}$	$V_{nom}$	Lowest channel 2412MHz	Middle channel 2437MHz	Highest channel 2462MHz
Conducted power [dBm/MHz] Measured with DSSS modulation		13.16	13.29	12.08
Radiated power [dBm/MHz] Measured with DSSS modulation		14.68	14.5	13.55
Gain [dBi] Calculated		1.52	1.21	1.47
Measurement uncertainty		$\pm 1.5$ dB (cond.) / $\pm 3$ dB (rad.)		



## 7.5. PEAK OUTPUT POWER

### 7.5.1. LIMITS

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

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

### 7.5.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Power Meter	Anritsu	ML2495A	1204003	02/21/2017	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

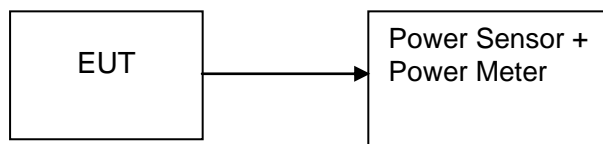
This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the *DTS bandwidth*.

- 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

Channel	Frequency (MHz)	Output Power (dBm)		Output Power (W)		Peak / AVG	Limit (W)	Result
		Antenna 0	Antenna 1	Antenna 0	Antenna 1			
Low	2412	20.71	23.16	0.11776	0.20701	Peak	1	PASS
Mid	2437	20.48	23.29	0.11169	0.21330			PASS
High	2462	20.54	22.08	0.11324	0.16144			PASS
Low	2412	17.02	19.36	0.05035	0.08630	AVG	1	PASS
Mid	2437	16.58	19.14	0.04550	0.08204			PASS
High	2462	16.72	18.19	0.04699	0.06592			PASS

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Output Power (dBm)		Output Power (W)		Peak / AVG	Limit (W)	Result
		Antenna 0	Antenna 1	Antenna 0	Antenna 1			
Low	2412	20.52	21.41	0.11272	0.13836	Peak	1	PASS
Mid	2437	21.42	21.58	0.13868	0.14388			PASS
High	2462	21.43	21.38	0.13900	0.13740			PASS
Low	2412	16.61	17.63	0.04581	0.05794	AVG	1	PASS
Mid	2437	17.71	17.75	0.05902	0.05957			PASS
High	2462	17.57	17.49	0.05715	0.05610			PASS

Test mode: IEEE 802.11n HT20 MHz

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Peak / AVG	Limit (W)	Result
		Antenna 0	Antenna 1	Total				
Low	2412	19.47	18.13	21.86	0.15352	Peak	1	PASS
Mid	2437	19.05	18.55	21.82	0.15197			PASS
High	2462	18.91	18.37	21.66	0.14651			PASS
Low	2412	19.45	13.41	20.42	0.11003	AVG	1	PASS
Mid	2437	15.17	14.71	17.96	0.06247			PASS
High	2462	14.99	14.45	17.74	0.05941			PASS

**Test mode: IEEE 802.11n HT40 MHz**

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Peak / AVG	Limit (W)	Result
		Antenna 0	Antenna 1	Total				
Low	2422	15.05	16.04	18.58	0.07217	Peak	1	PASS
Mid	2437	14.83	16.25	18.61	0.07258			PASS
High	2452	14.64	17.08	19.04	0.08016			PASS
Low	2422	10.92	12.06	14.54	0.02843	AVG	1	PASS
Mid	2437	10.89	12.31	14.67	0.02930			PASS
High	2452	10.72	13.23	15.16	0.03284			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	N9010A	MY52221469	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	09/25/2017	09/24/2018
Bilog Antenna	SCHAFFNER	CBL6143	5082	02/21/2017	02/20/2018
Horn Antenna	SCHWARZBECK	BBHA9120	D286	02/27/2017	02/27/2018
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	02/27/2017	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			

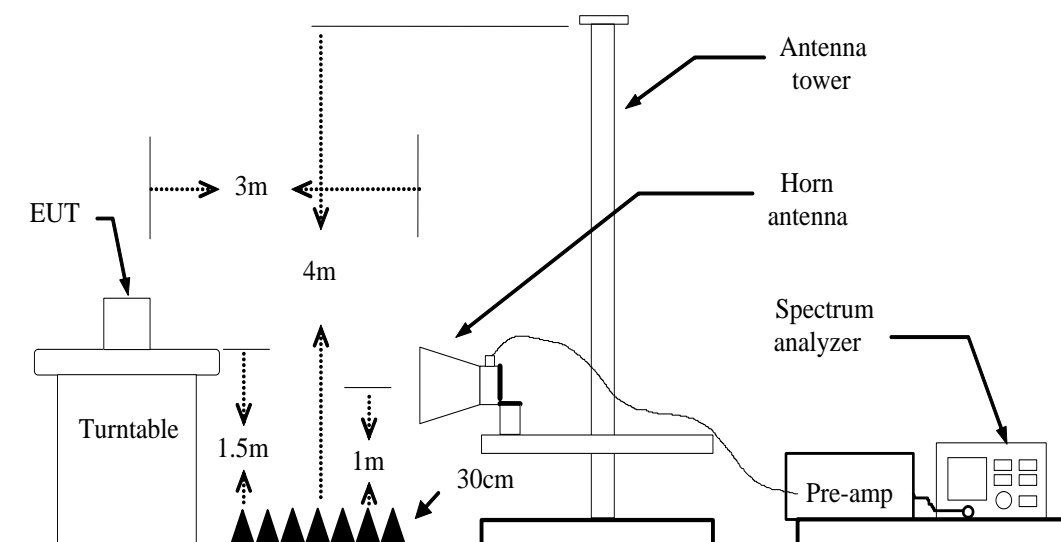
- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
2. The FCC Site Registration number is 101879.  
3. N.C.R = No Calibration Required.



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

### 7.6.4. TEST SETUP



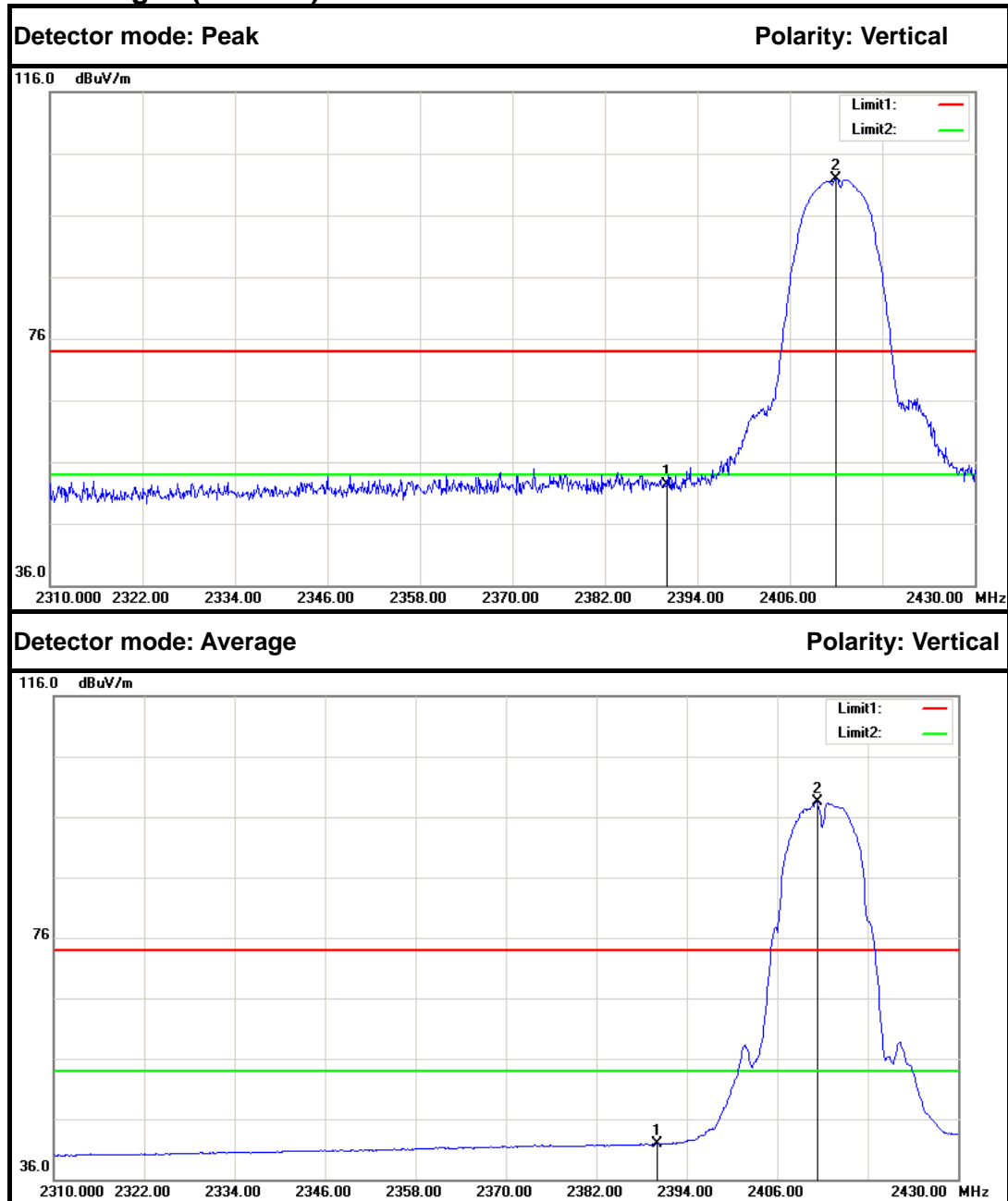


## 7.6.5. TEST RESULTS

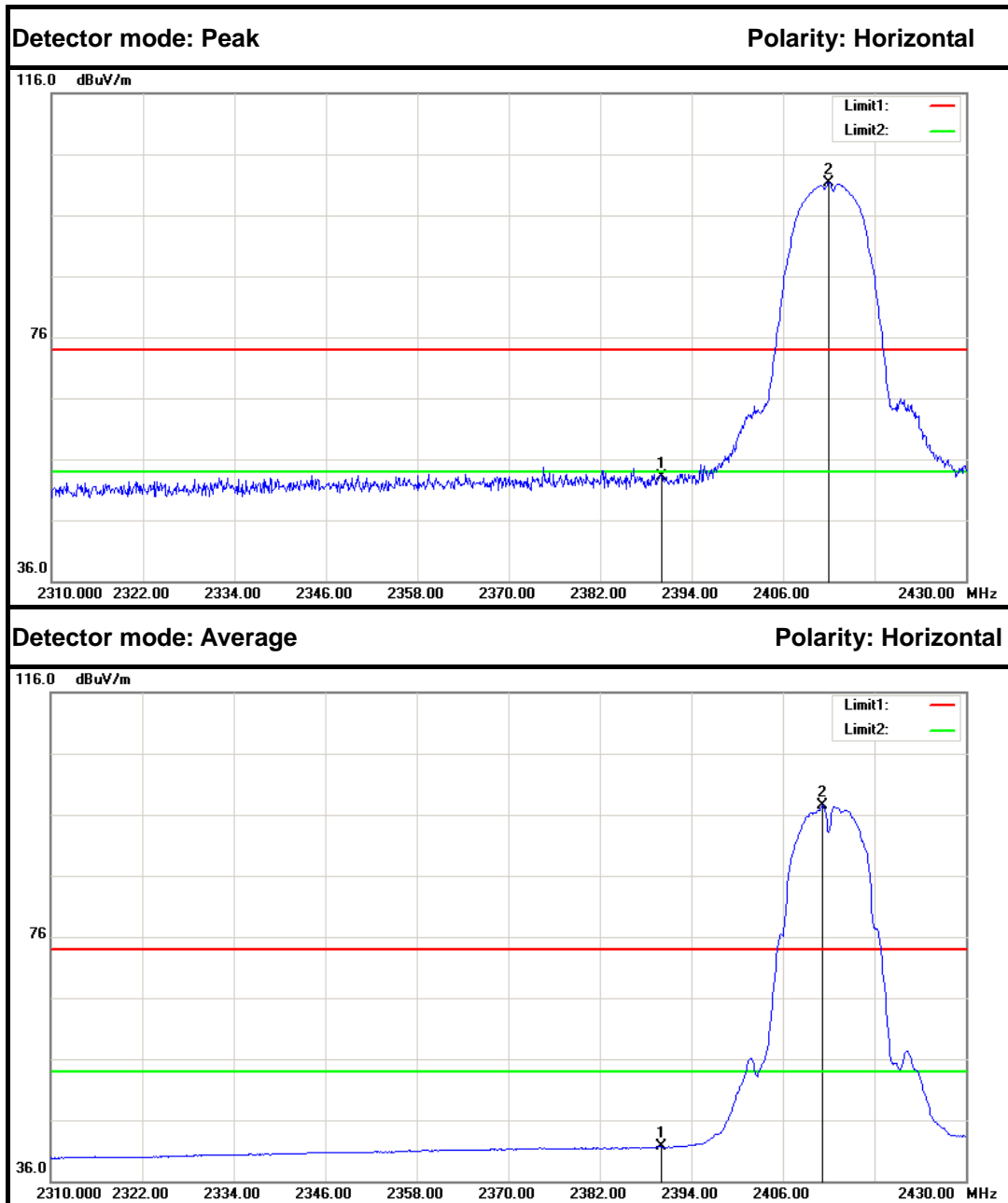
### Test Plot

IEEE 802.11b mode (Antenna 0)

Band Edges (CH Low)



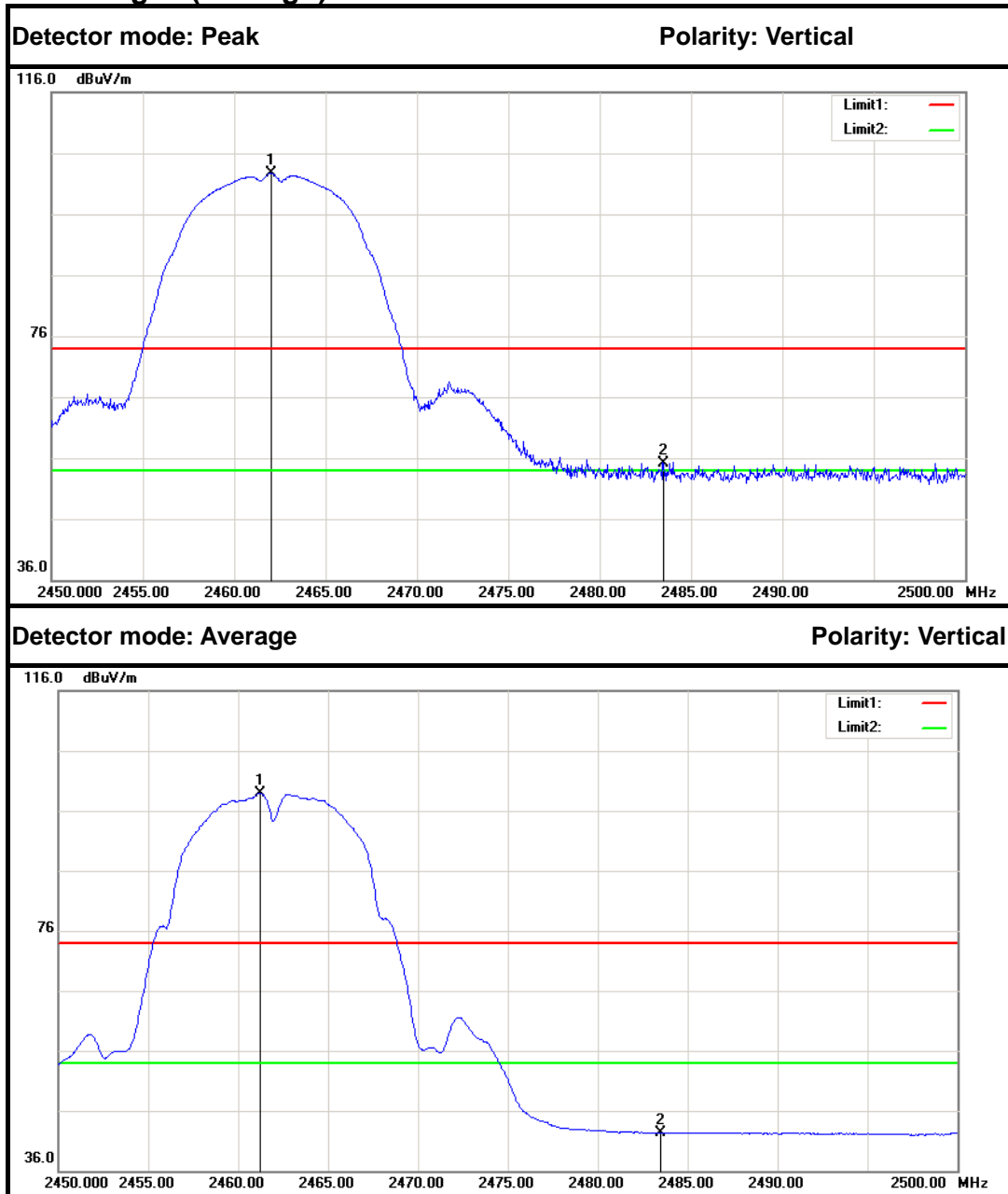
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	55.24	-2.86	52.38	74.00	-21.62	Peak	Vertical
2	2412.000	104.70	-2.74	101.96	---	---	Peak	Vertical
1	2390.000	44.69	-2.86	41.83	54.00	-12.17	Average	Vertical
2	2411.280	101.22	-2.75	98.47	---	---	Average	Vertical



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	55.91	-2.86	53.05	74.00	-20.95	Peak	Horizontal
2	2412.000	104.06	-2.74	101.32	---	---	Peak	Horizontal
1	2390.000	44.48	-2.86	41.62	54.00	-12.38	Average	Horizontal
2	2411.160	100.16	-2.75	97.41	---	---	Average	Horizontal



### Band Edges (CH High)

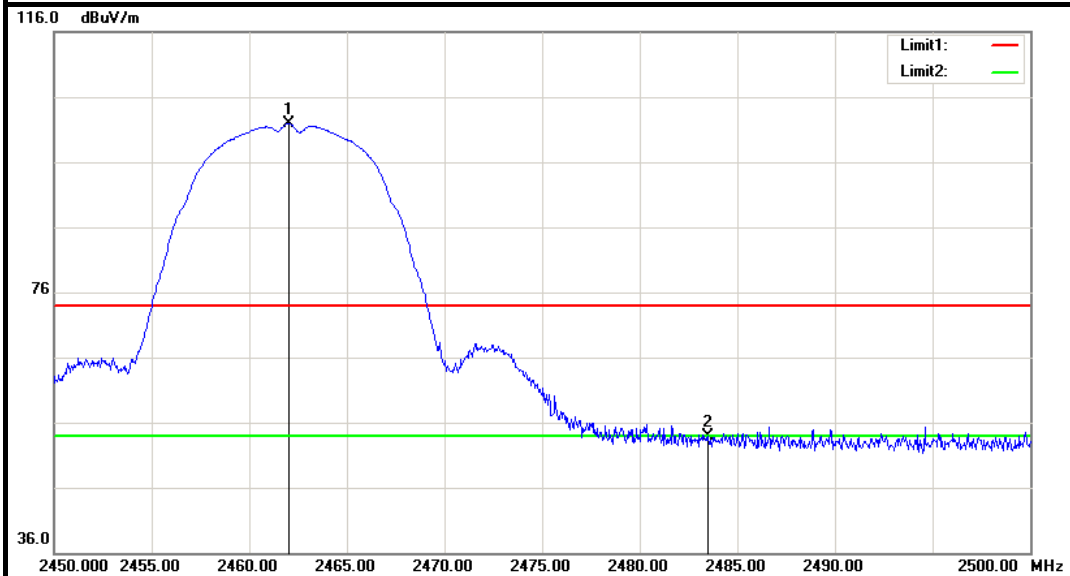


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2462.000	105.17	-2.47	102.70	---	---	Peak	Vertical
2	2483.500	57.52	-2.35	55.17	74.00	-18.83	Peak	Vertical
1	2461.200	101.36	-2.47	98.89	---	---	Average	Vertical
2	2483.500	44.74	-2.35	42.39	54.00	-11.61	Average	Vertical



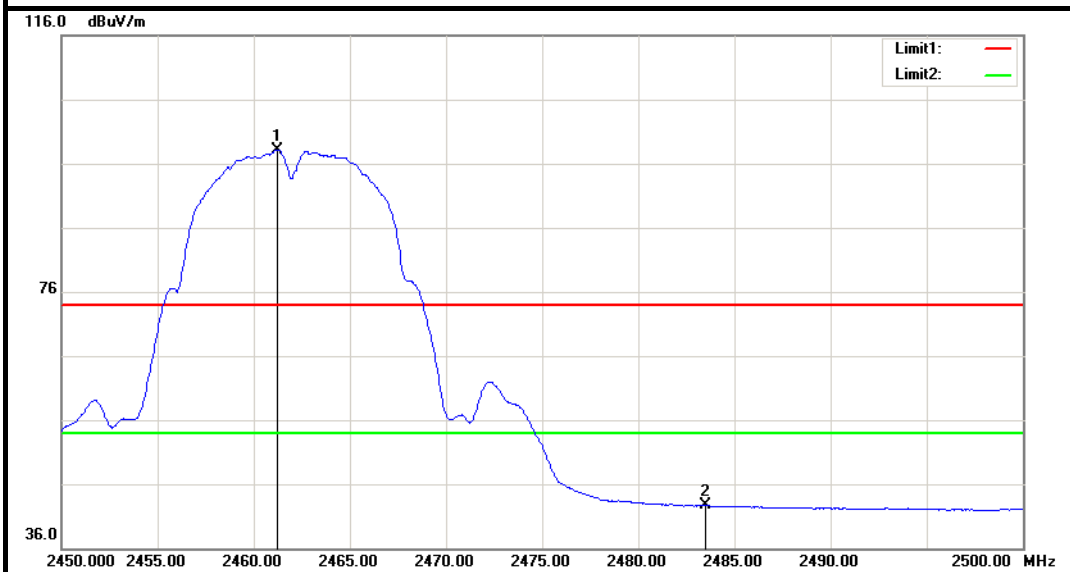
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

Polarity: Horizontal

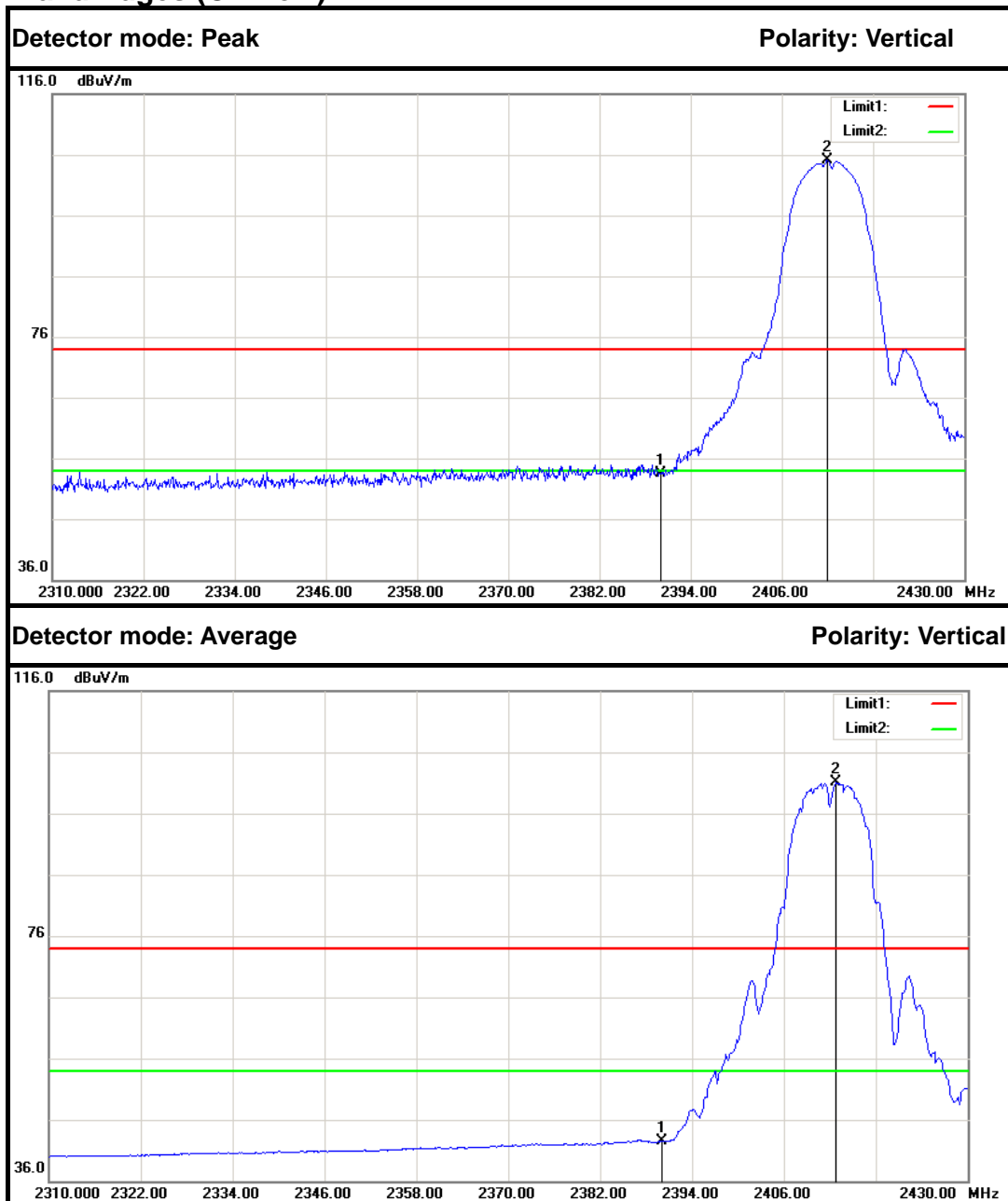


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2462.000	104.40	-2.47	101.93	---	---	Peak	Horizontal
2	2483.500	56.26	-2.35	53.91	74.00	-20.09	Peak	Horizontal
1	2461.250	100.62	-2.47	98.15	---	---	Average	Horizontal
2	2483.500	44.97	-2.35	42.62	54.00	-11.38	Average	Horizontal

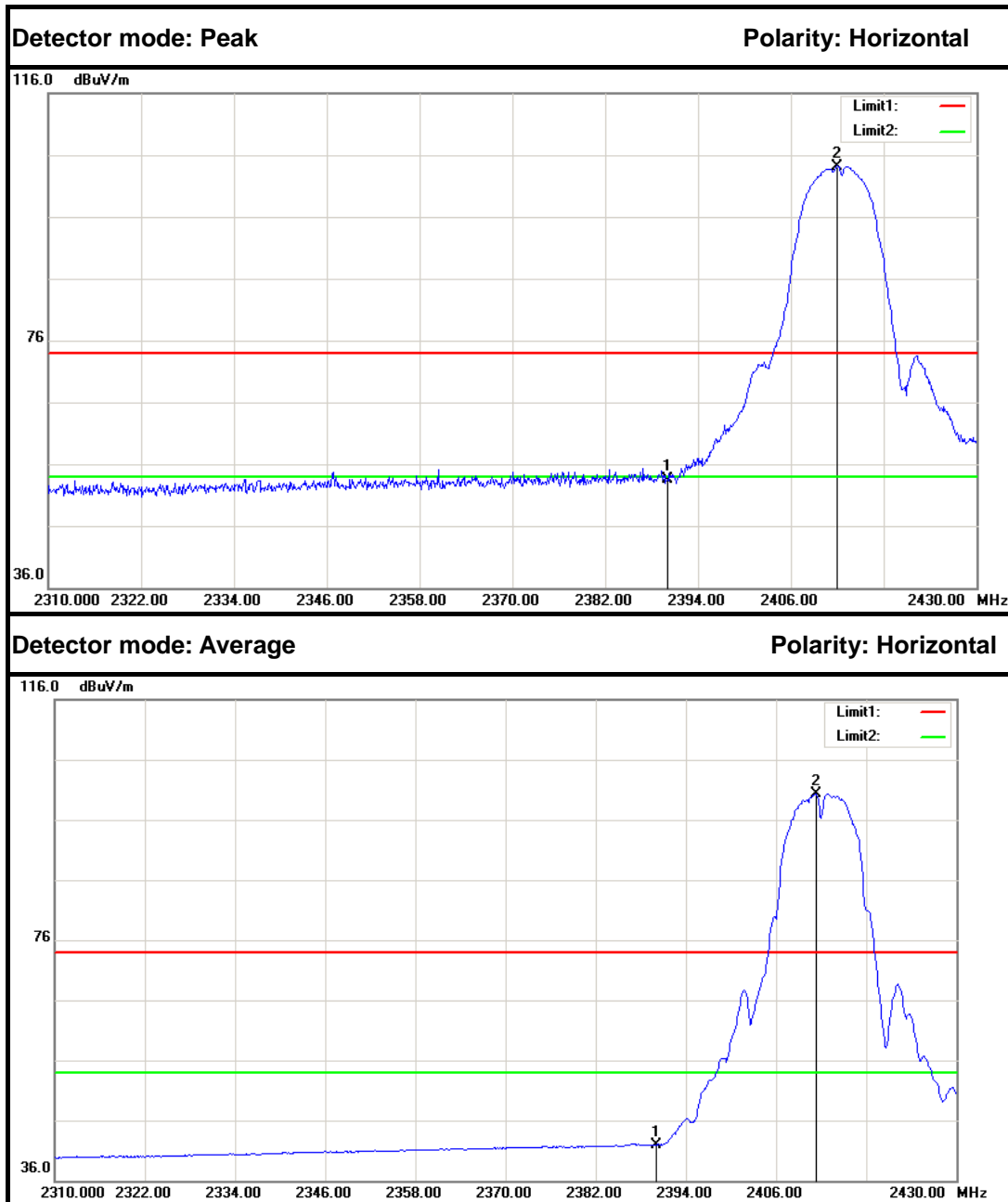


IEEE 802.11b mode (Antenna 1)

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	56.39	-2.86	53.53	74.00	-20.47	Peak	Vertical
2	2412.000	107.75	-2.74	105.01	---	---	Peak	Vertical
1	2390.000	45.34	-2.86	42.48	54.00	-11.52	Average	Vertical
2	2412.840	103.76	-2.74	101.02	---	---	Average	Vertical

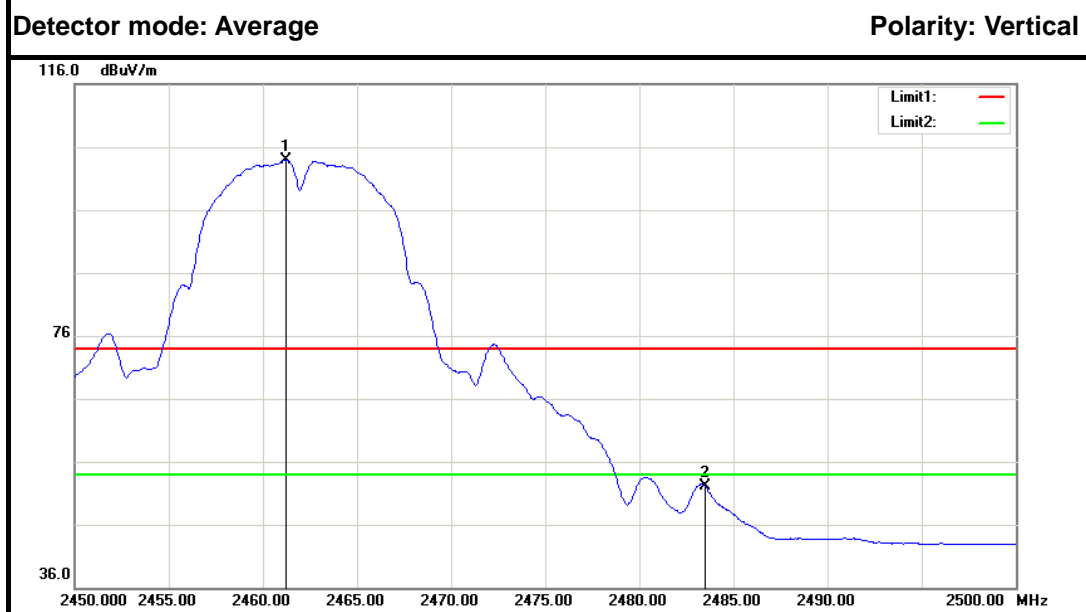
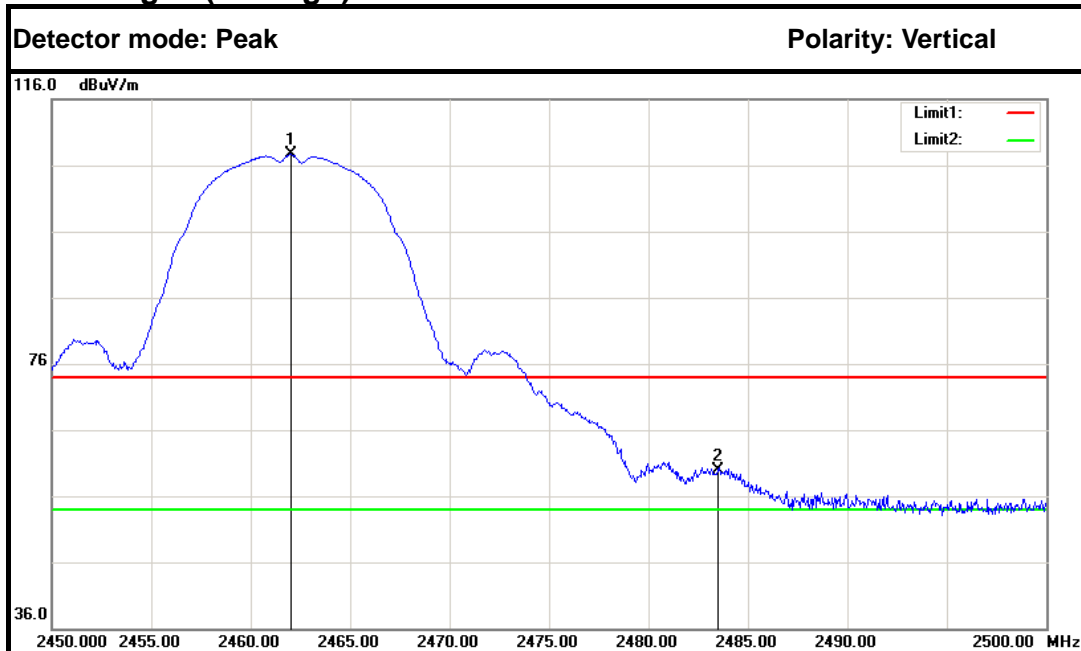


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	56.44	-2.86	53.58	74.00	-20.42	Peak	Horizontal
2	2412.000	106.94	-2.74	104.20	---	---	Peak	Horizontal
1	2390.000	44.85	-2.86	41.99	54.00	-12.01	Average	Horizontal
2	2411.280	103.12	-2.75	100.37	---	---	Average	Horizontal





### Band Edges (CH High)

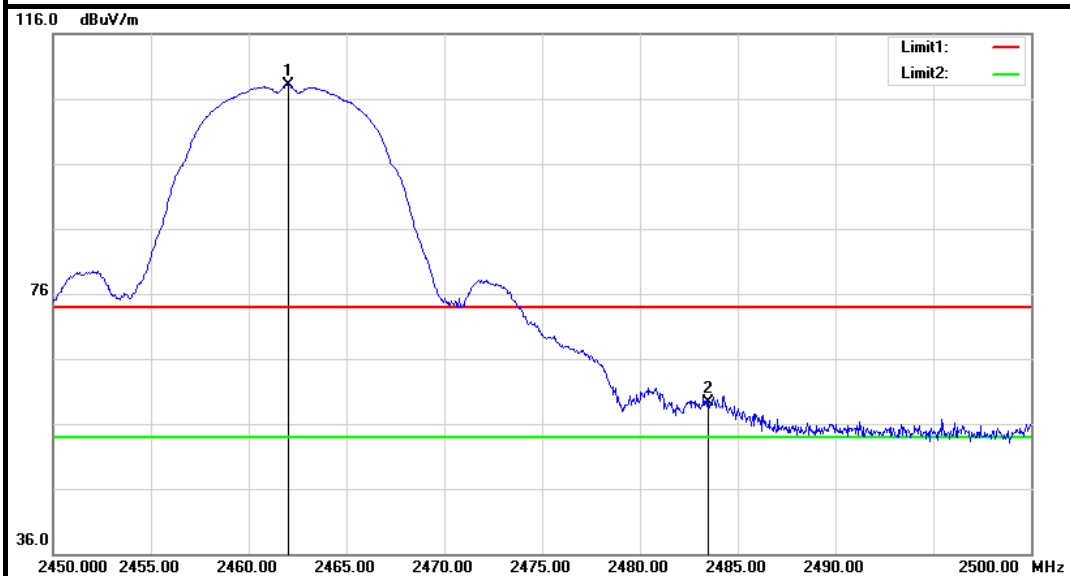


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2462.000	110.09	-2.47	107.62	---	---	Peak	Vertical
2	2483.500	62.32	-2.35	59.97	74.00	-14.03	Peak	Vertical
1	2461.250	106.43	-2.47	103.96	---	---	Average	Vertical
2	2483.500	54.45	-2.35	52.10	54.00	-1.90	Average	Vertical



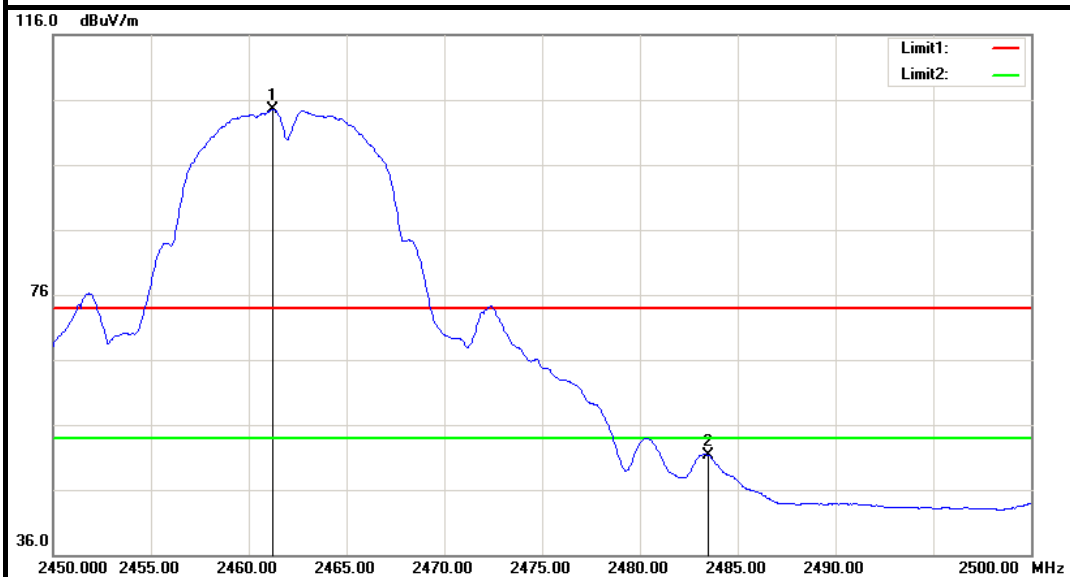
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

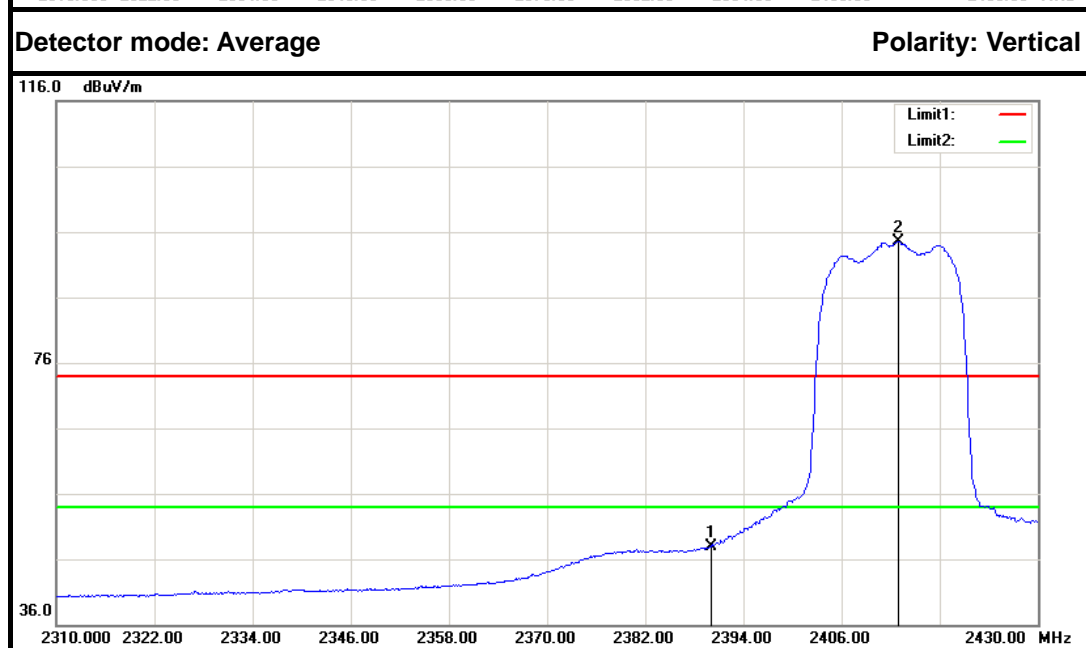
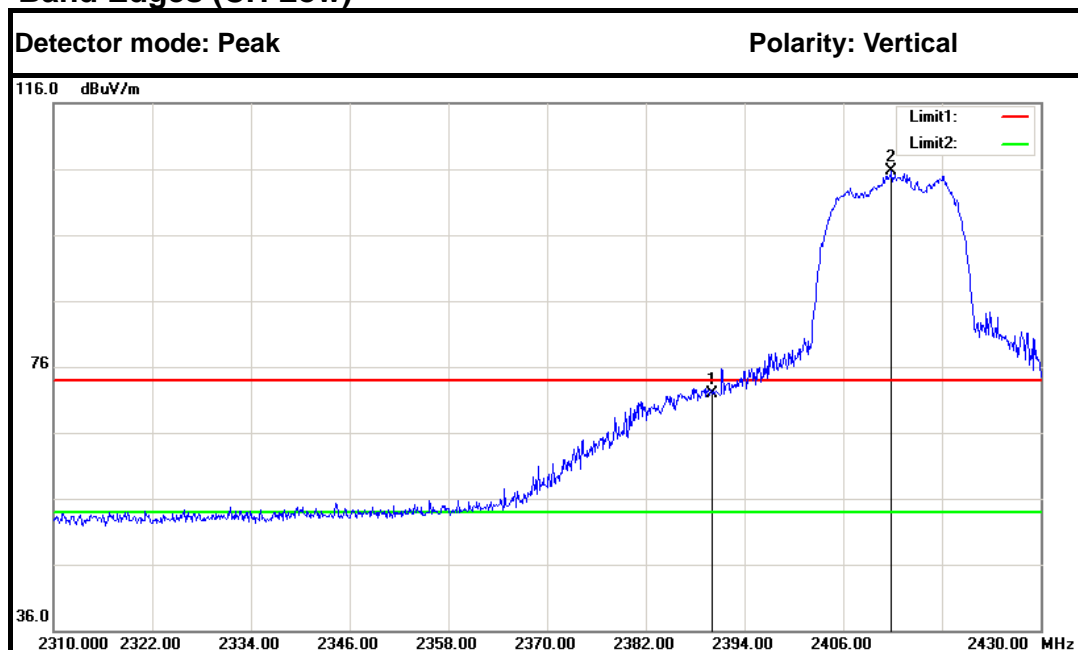
Polarity: Horizontal



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2462.050	110.56	-2.47	108.09	---	---	Peak	Horizontal
2	2483.500	61.65	-2.35	59.30	74.00	-14.70	Peak	Horizontal
1	2461.250	106.98	-2.47	104.51	---	---	Average	Horizontal
2	2483.500	53.65	-2.35	51.30	54.00	-2.70	Average	Horizontal



IEEE 802.11g mode (Antenna 0)  
Band Edges (CH Low)

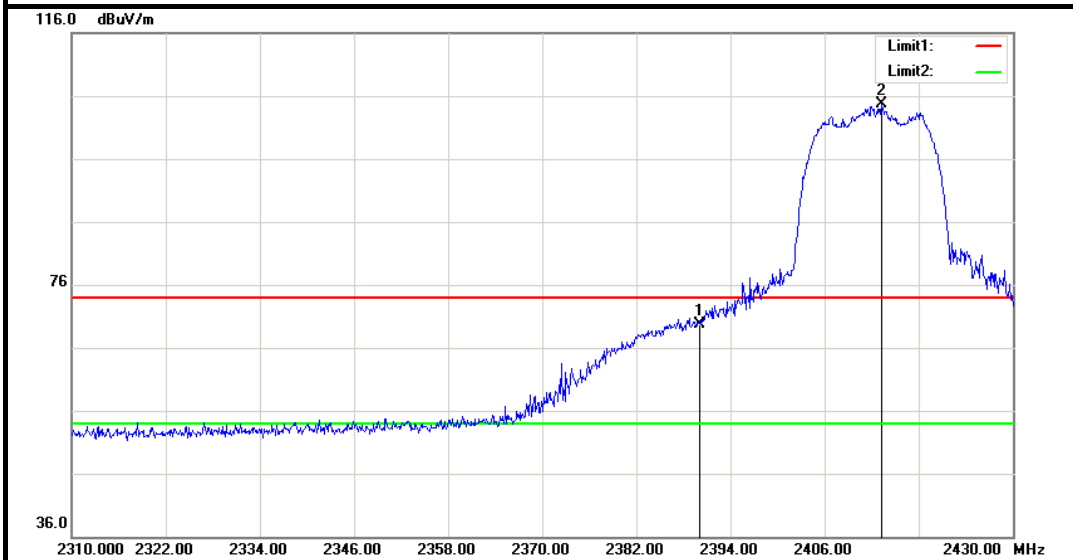


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	74.75	-2.86	71.89	74.00	-2.11	Peak	Vertical
2	2411.880	108.49	-2.74	105.75	---	---	Peak	Vertical
1	2390.000	50.73	-2.86	47.87	74.00	-26.13	Average	Vertical
2	2412.960	97.32	-2.74	94.58	---	---	Average	Vertical



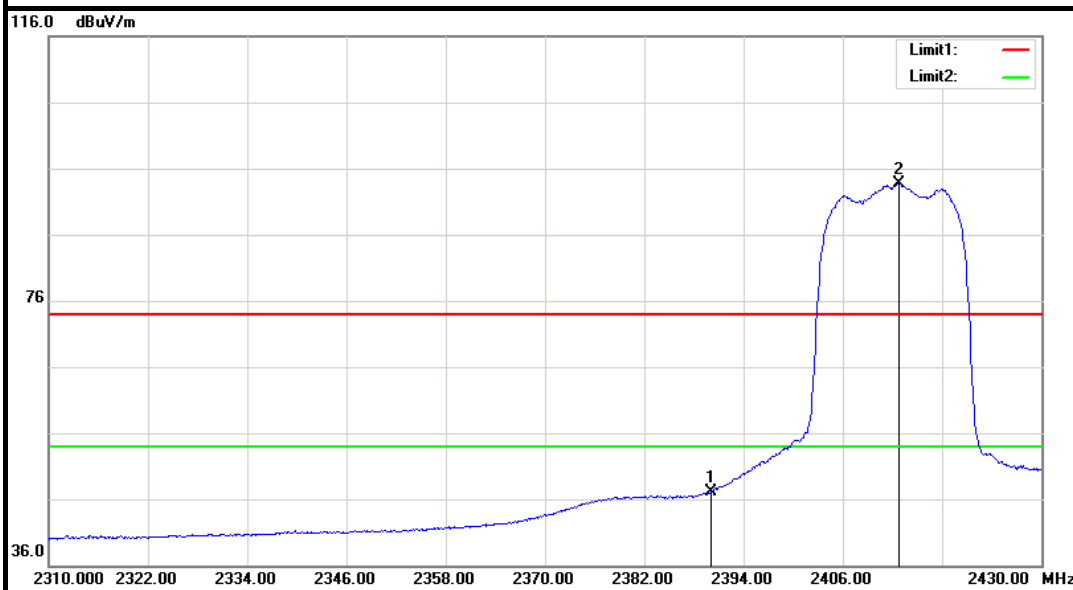
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

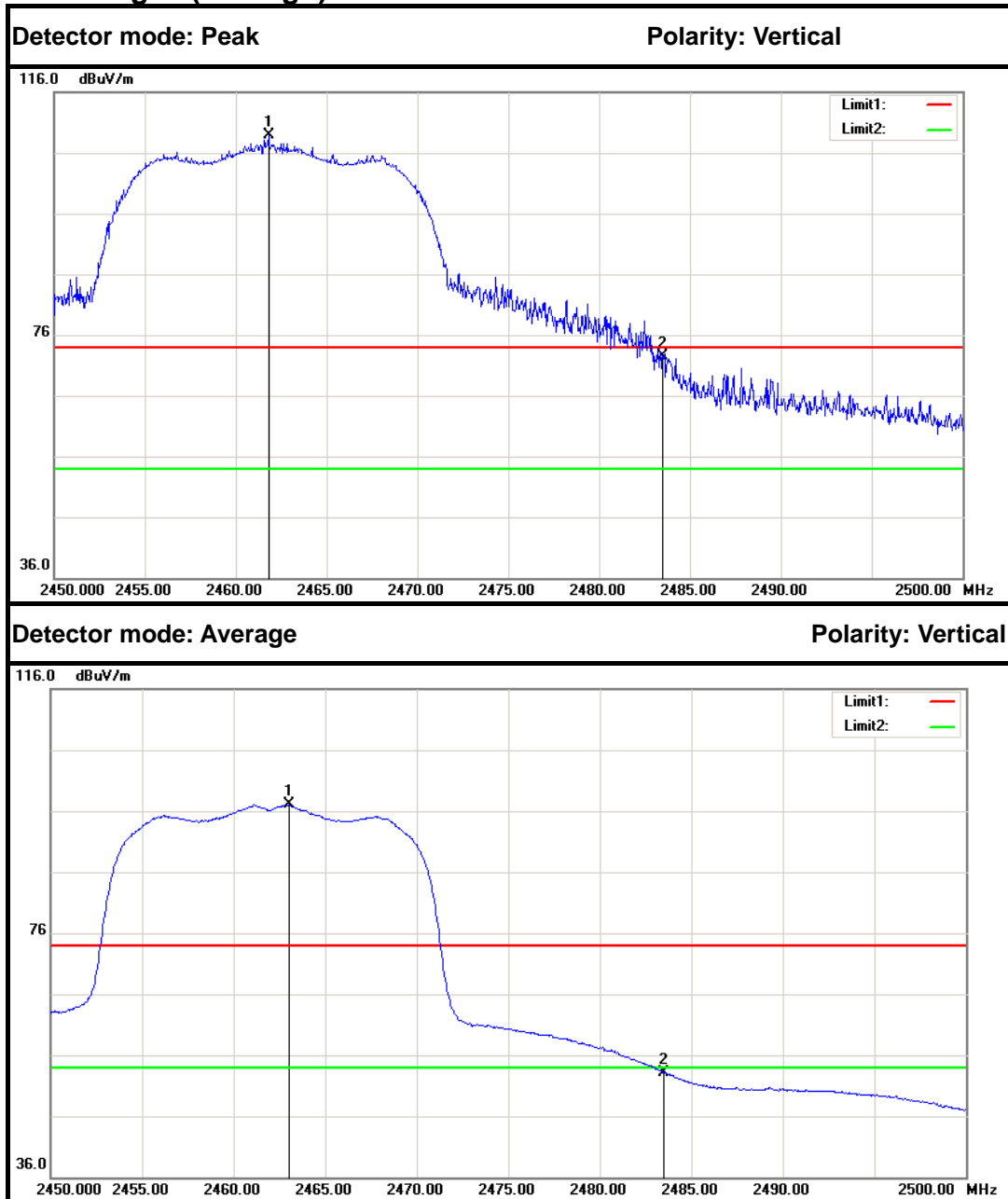
Polarity: Horizontal



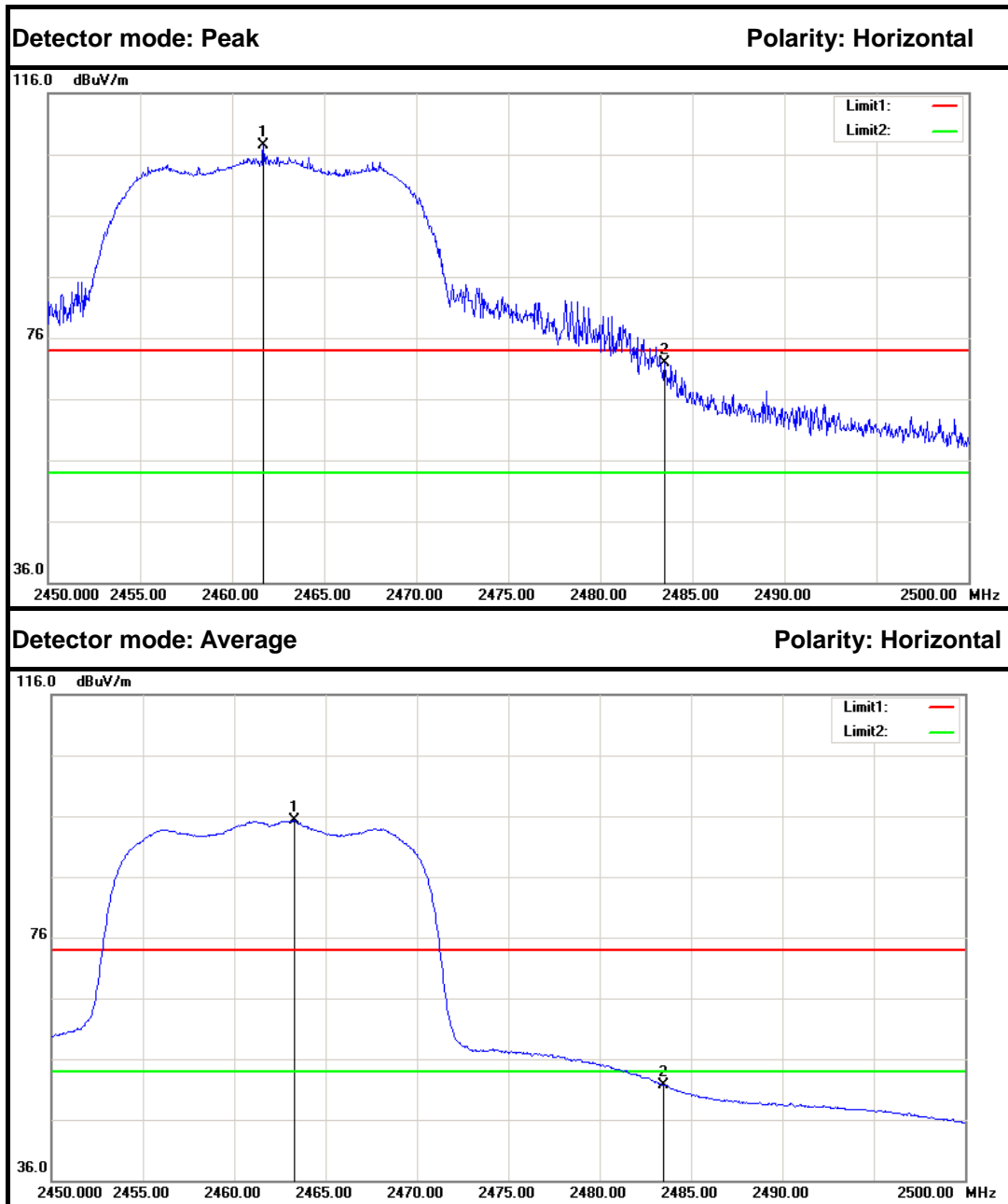
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	72.62	-2.86	69.76	74.00	-4.24	Peak	Horizontal
2	2413.200	107.35	-2.74	104.61	---	---	Peak	Horizontal
1	2390.000	49.96	-2.86	47.10	54.00	-6.90	Average	Horizontal
2	2412.720	96.52	-2.74	93.78	---	---	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	2461.800	111.32	-2.47	108.85	---	---	Peak	Vertical
2	2483.500	74.90	-2.35	72.55	74.00	-1.45	Peak	Vertical
1	2463.050	99.57	-2.46	97.11	---	---	Average	Vertical
2	2483.500	55.43	-2.35	53.08	54.00	-0.92	Average	Vertical

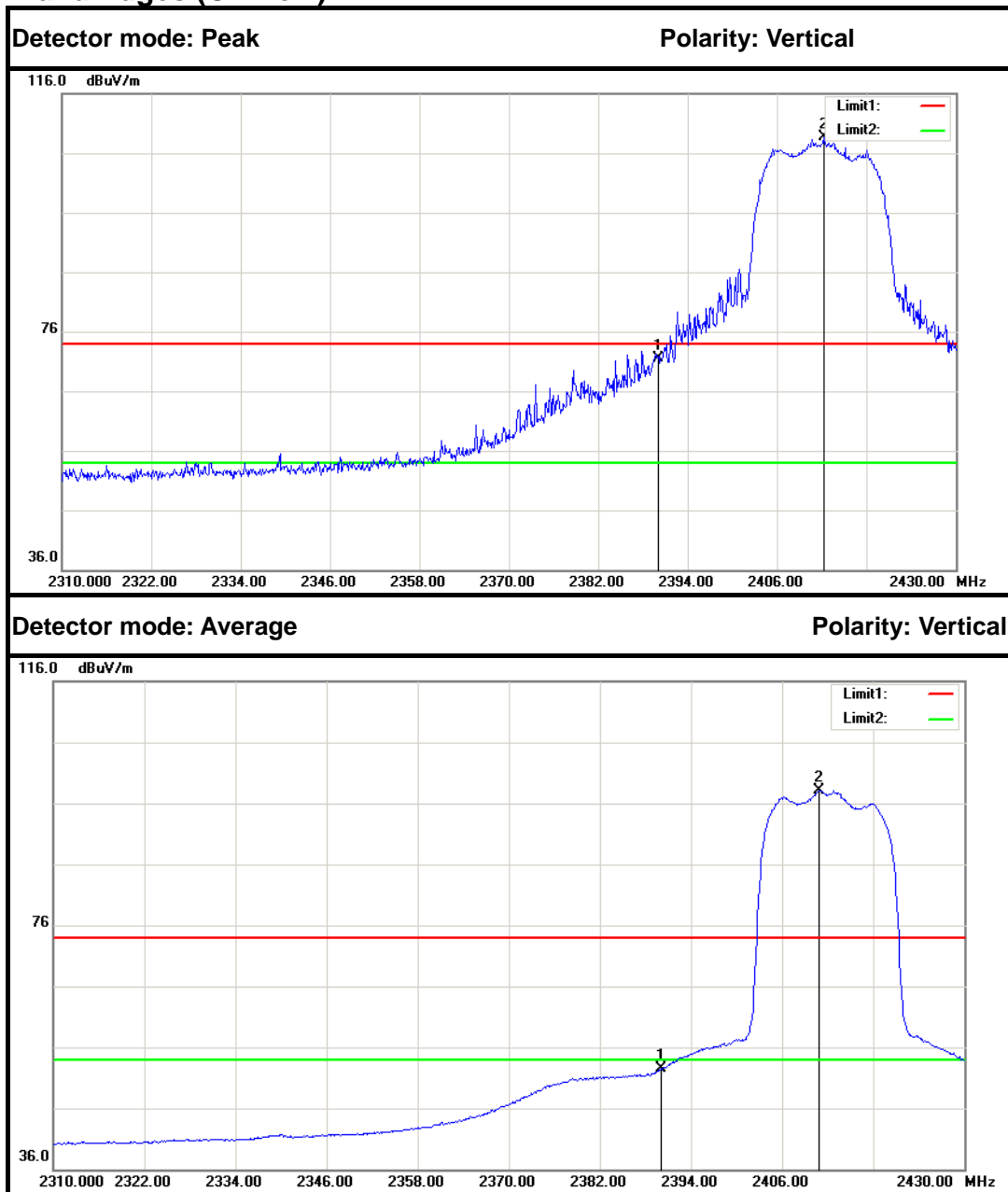


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2461.700	109.88	-2.47	107.41	---	---	Peak	Horizontal
2	2483.500	74.18	-2.35	71.83	74.00	-2.17	Peak	Horizontal
1	2463.300	97.73	-2.46	95.27	---	---	Average	Horizontal
2	2483.500	53.98	-2.35	51.63	54.00	-2.37	Average	Horizontal



IEEE 802.11g mode (Antenna 1)

Band Edges (CH Low)

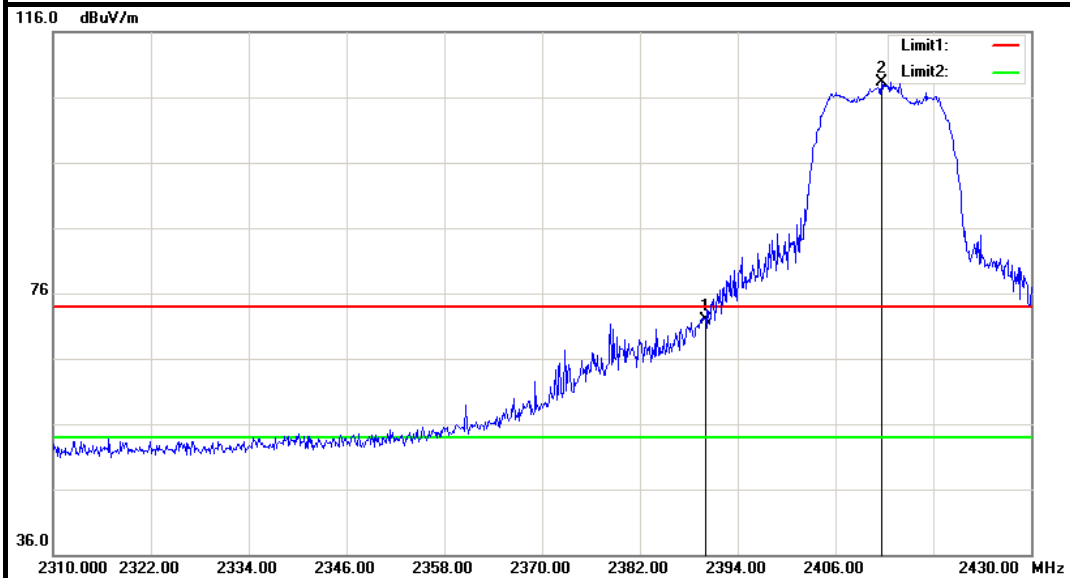


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	74.27	-2.86	71.41	74.00	-2.59	Peak	Vertical
2	2412.240	111.38	-2.74	108.64	---	---	Peak	Vertical
1	2390.000	55.37	-2.86	52.51	54.00	-1.49	Average	Vertical
2	2410.920	100.94	-2.75	98.19	---	---	Average	Vertical



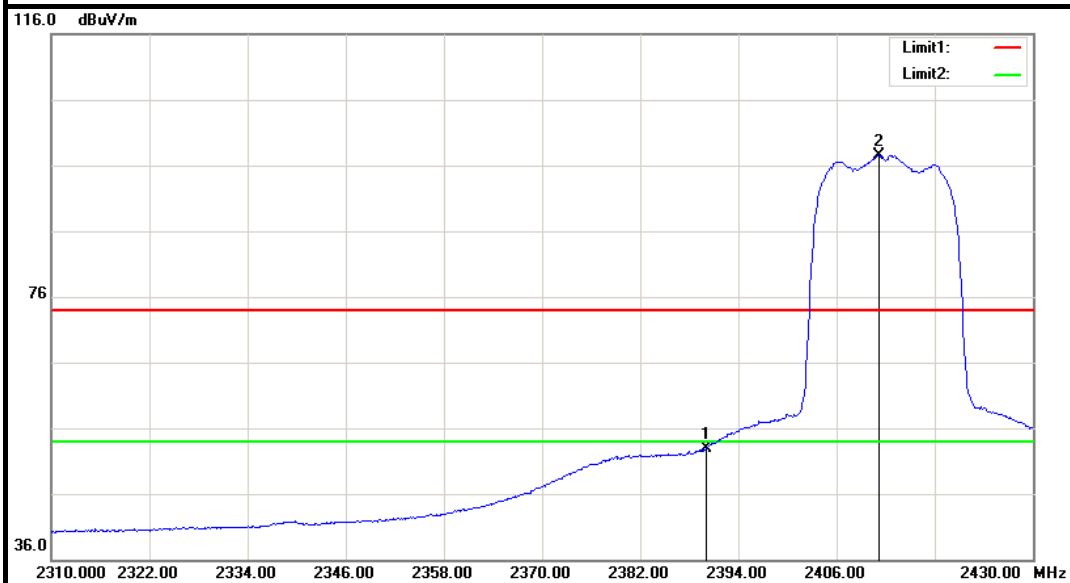
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

Polarity: Horizontal

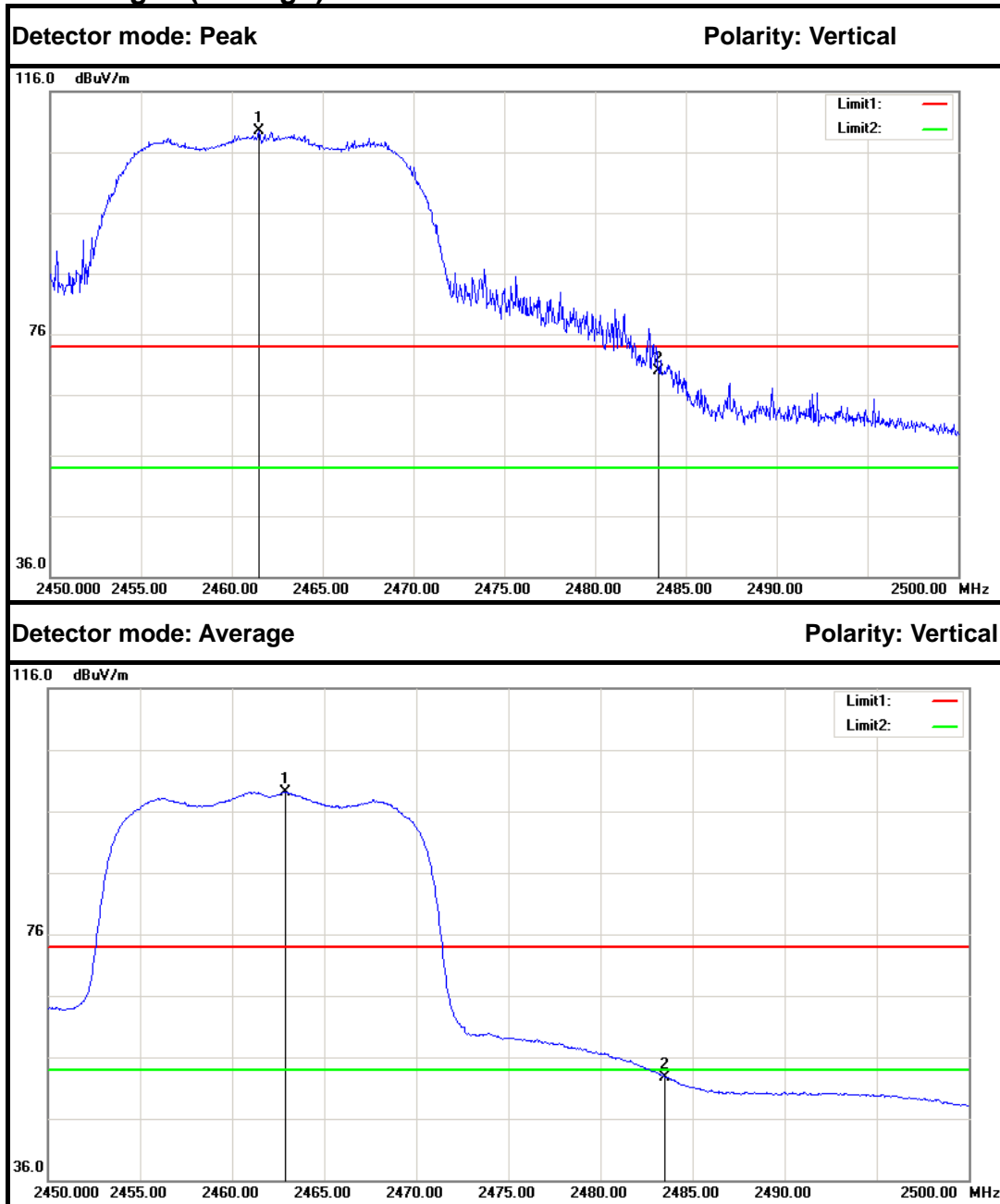


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	74.86	-2.86	72.00	74.00	-2.00	Peak	Horizontal
2	2411.640	110.95	-2.74	108.21	---	---	Peak	Horizontal
1	2390.000	55.86	-2.86	53.00	54.00	-1.00	Average	Horizontal
2	2411.160	100.24	-2.75	97.49	---	---	Average	Horizontal





### Band Edges (CH High)

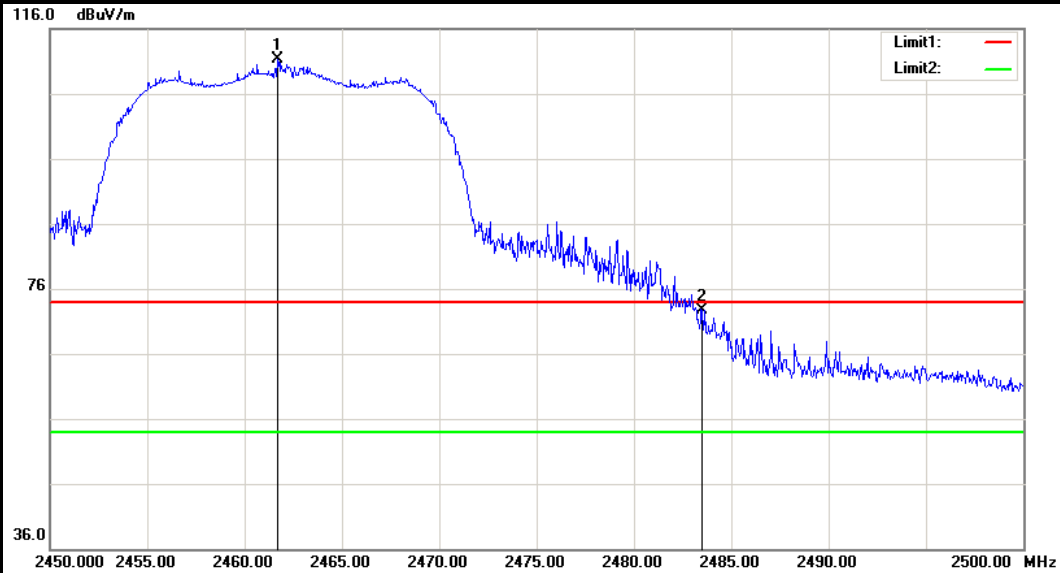


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2461.500	112.01	-2.47	109.54	---	---	Peak	Vertical
2	2483.500	72.29	-2.35	69.94	74.00	-4.06	Peak	Vertical
1	2462.900	101.56	-2.46	99.10	---	---	Average	Vertical
2	2483.500	55.07	-2.35	52.72	54.00	-1.28	Average	Vertical



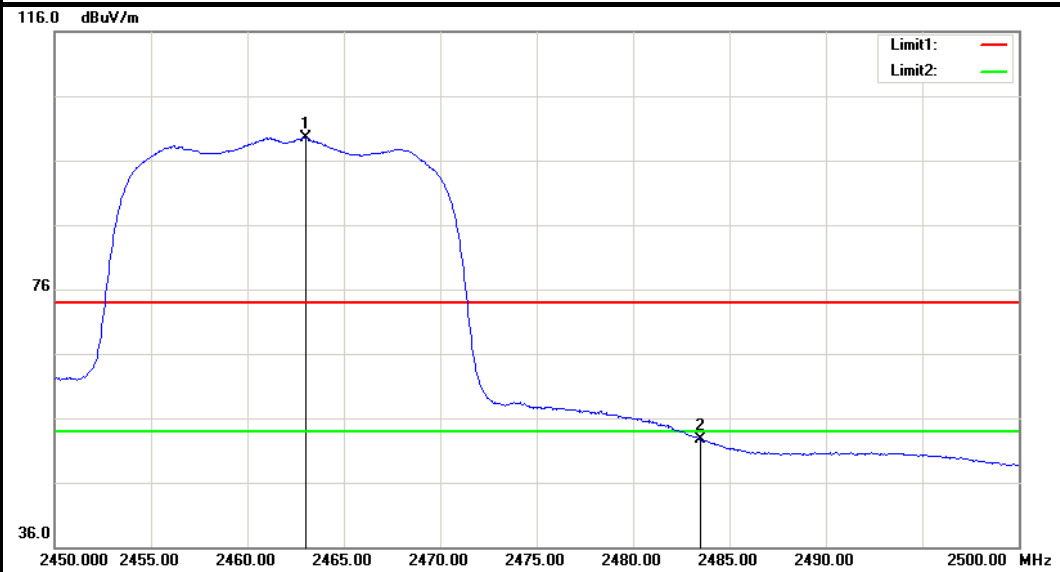
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

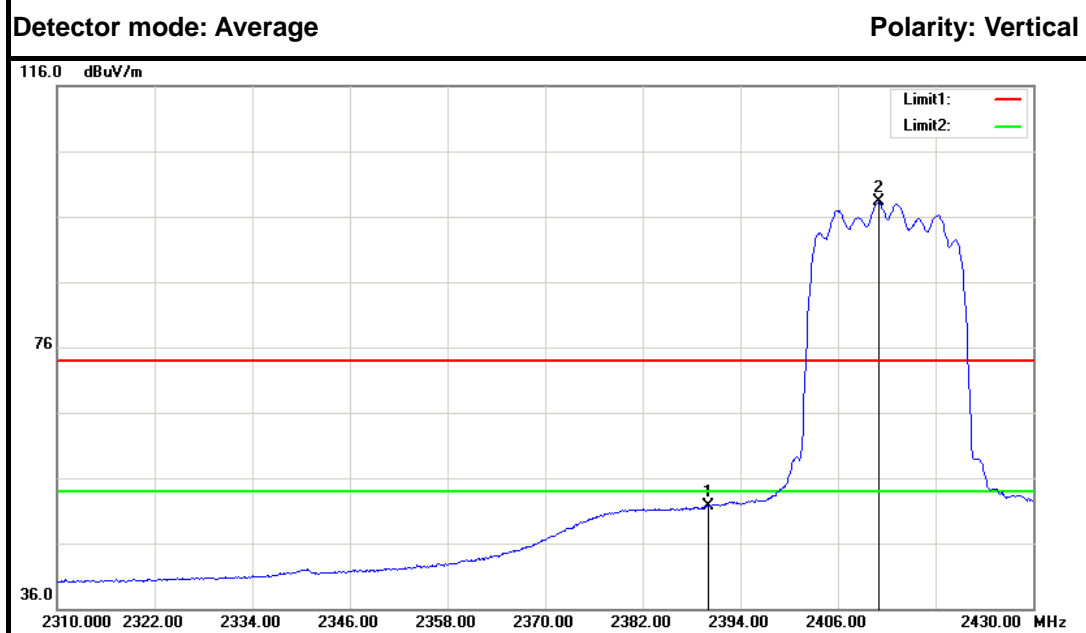
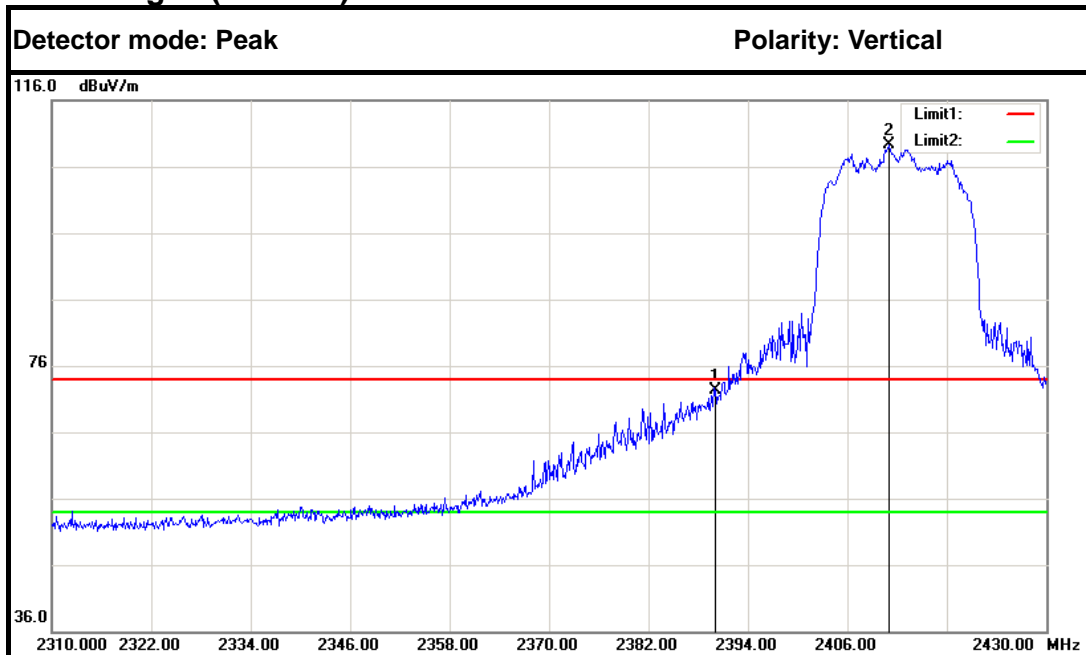
Polarity: Horizontal



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2461.700	113.75	-2.47	111.28	---	---	Peak	Horizontal
2	2483.500	75.08	-2.35	72.73	74.00	-1.27	Peak	Horizontal
1	2463.000	102.00	-2.46	99.54	---	---	Average	Horizontal
2	2483.500	54.96	-2.35	52.61	54.00	-1.39	Average	Horizontal



IEEE 802.11n HT20 MHz mode (Combine with Antenna 0 and Antenna 1)  
Band Edges (CH Low)

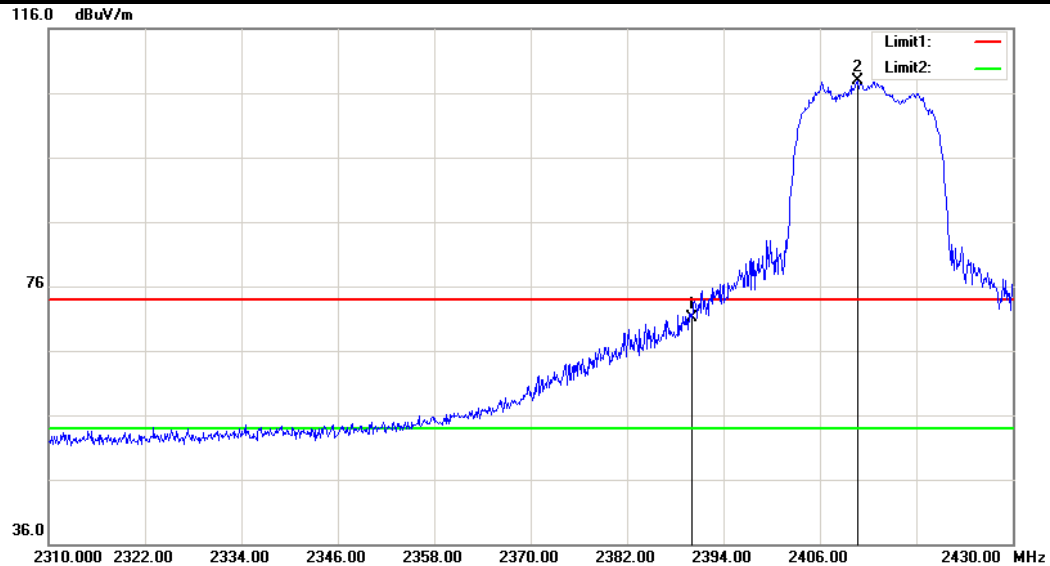


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	75.24	-2.86	72.38	74.00	-1.62	Peak	Vertical
2	2411.040	111.97	-2.75	109.22	---	---	Peak	Vertical
1	2390.000	54.61	-2.86	51.75	54.00	-2.25	Average	Vertical
2	2411.040	100.98	-2.75	98.23	---	---	Average	Vertical



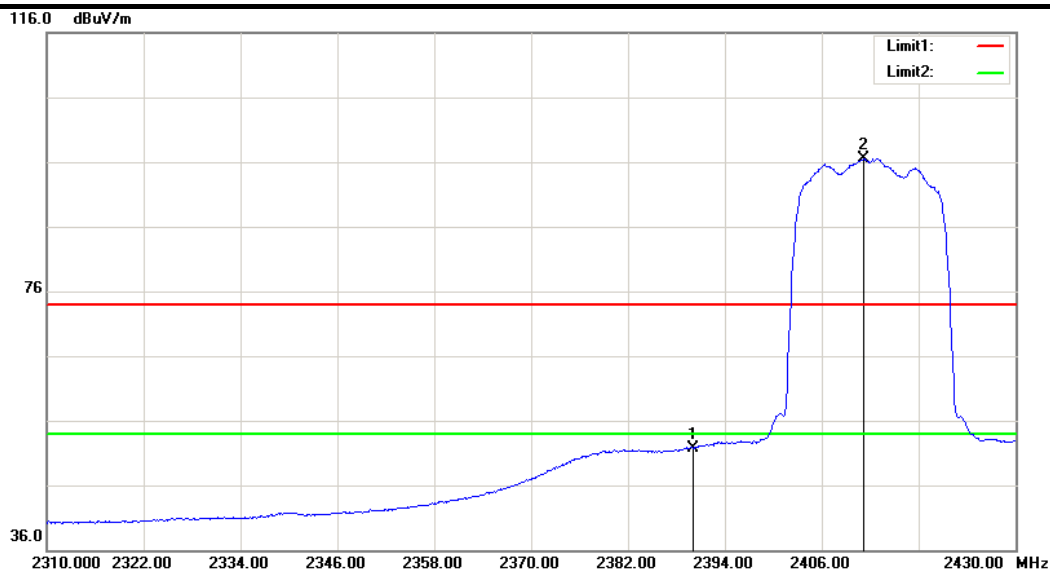
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

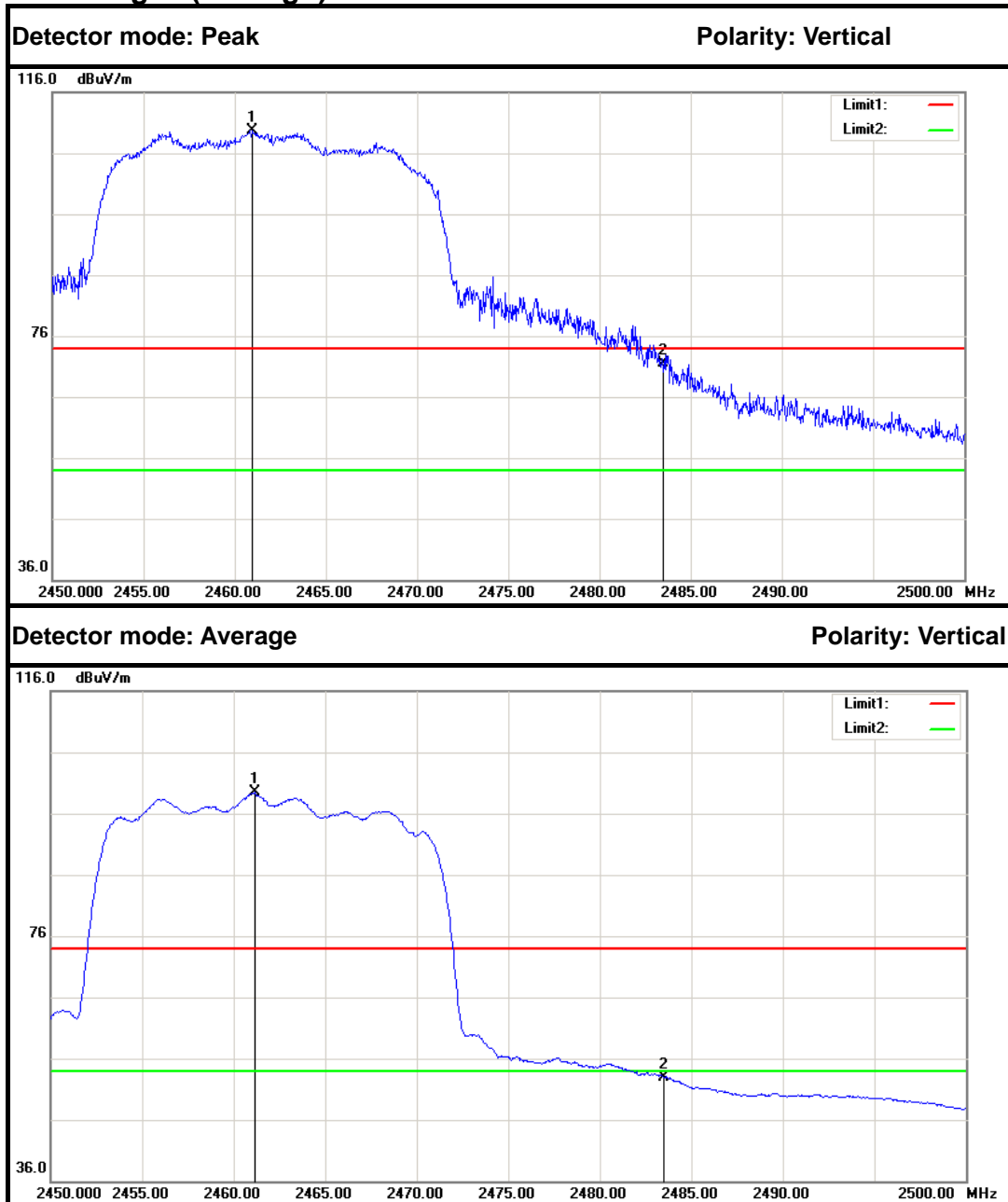
Polarity: Horizontal



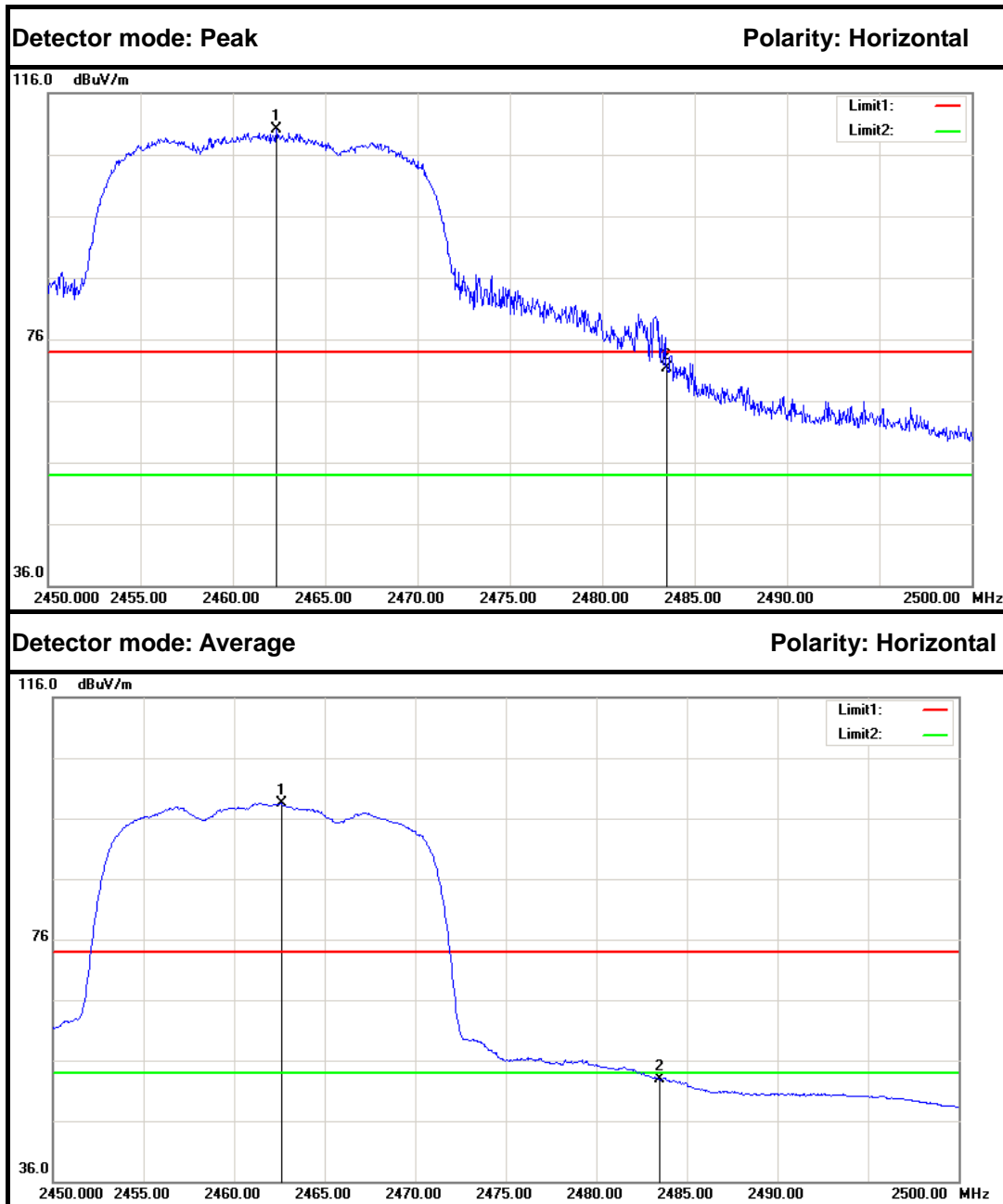
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	73.91	-2.86	71.05	74.00	-2.95	Peak	Horizontal
2	2410.680	110.73	-2.75	107.98	---	---	Peak	Horizontal
1	2390.000	54.64	-2.86	51.78	54.00	-2.22	Average	Horizontal
2	2411.160	99.28	-2.75	96.53	---	---	Average	Horizontal



### Band Edges (CH High)



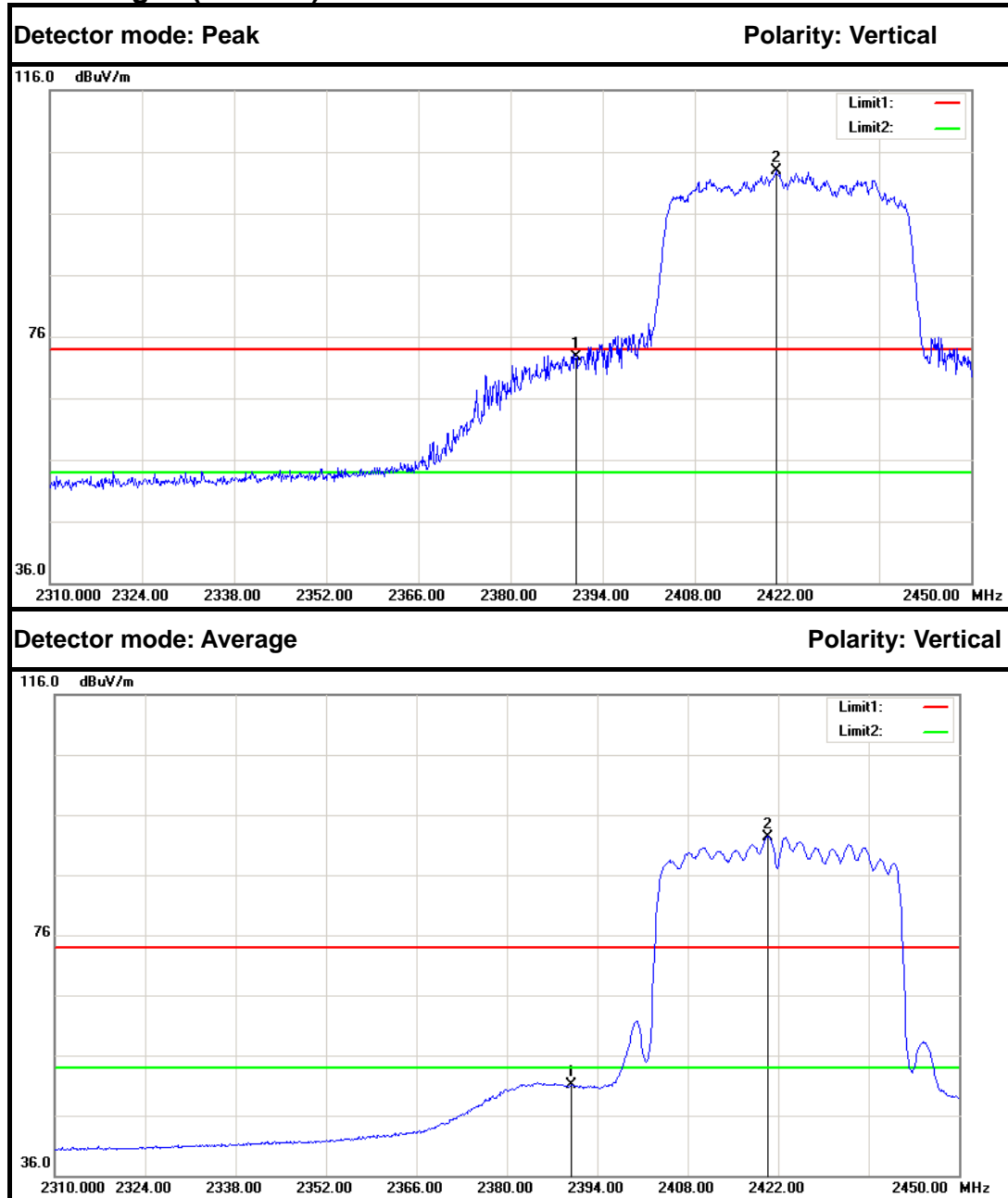
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2460.950	112.18	-2.47	109.71	---	---	Peak	Vertical
2	2483.500	73.91	-2.35	71.56	74.00	-2.44	Peak	Vertical
1	2461.150	101.90	-2.47	99.43	---	---	Average	Vertical
2	2483.500	55.28	-2.35	52.93	54.00	-1.07	Average	Vertical



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2462.350	112.50	-2.47	110.03	---	---	Peak	Horizontal
2	2483.500	73.63	-2.35	71.28	74.00	-2.72	Peak	Horizontal
1	2462.600	100.98	-2.46	98.52	---	---	Average	Horizontal
2	2483.500	55.16	-2.35	52.81	54.00	-1.19	Average	Horizontal



IEEE 802.11n HT40 MHz mode (Combine with Antenna 0 and Antenna 1)  
Band Edges (CH Low)

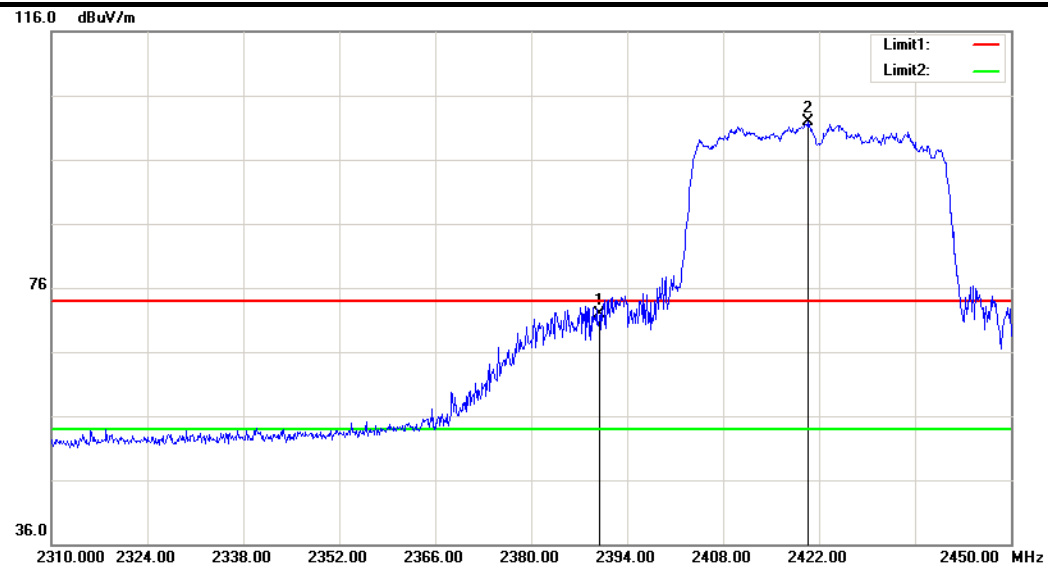


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	75.61	-2.86	72.75	74.00	-1.25	Peak	Vertical
2	2420.320	105.53	-2.70	102.83	---	---	Peak	Vertical
1	2390.000	53.92	-2.86	51.06	54.00	-2.94	Average	Vertical
2	2420.320	95.10	-2.70	92.40	---	---	Average	Vertical



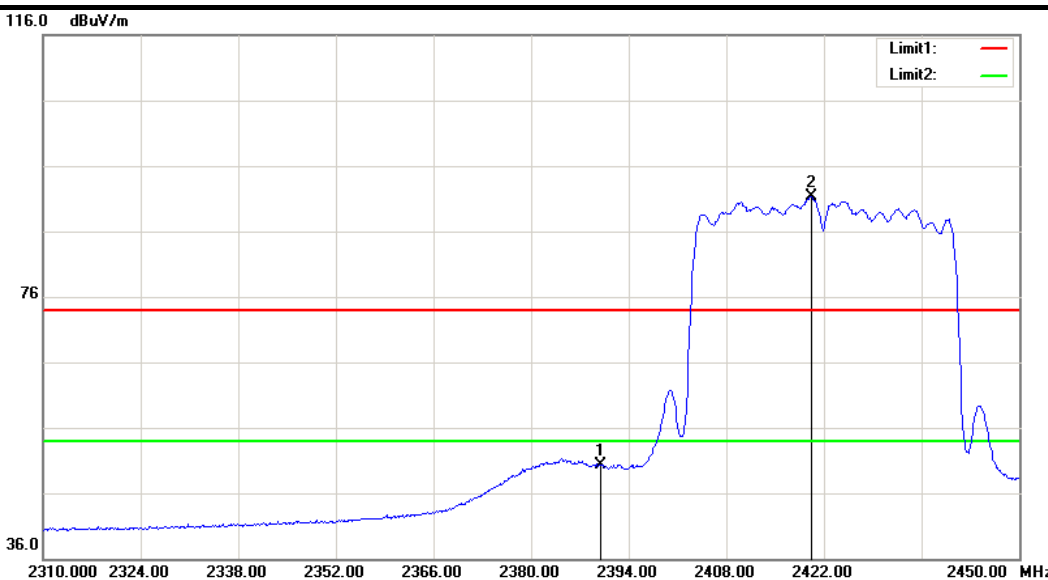
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

Polarity: Horizontal

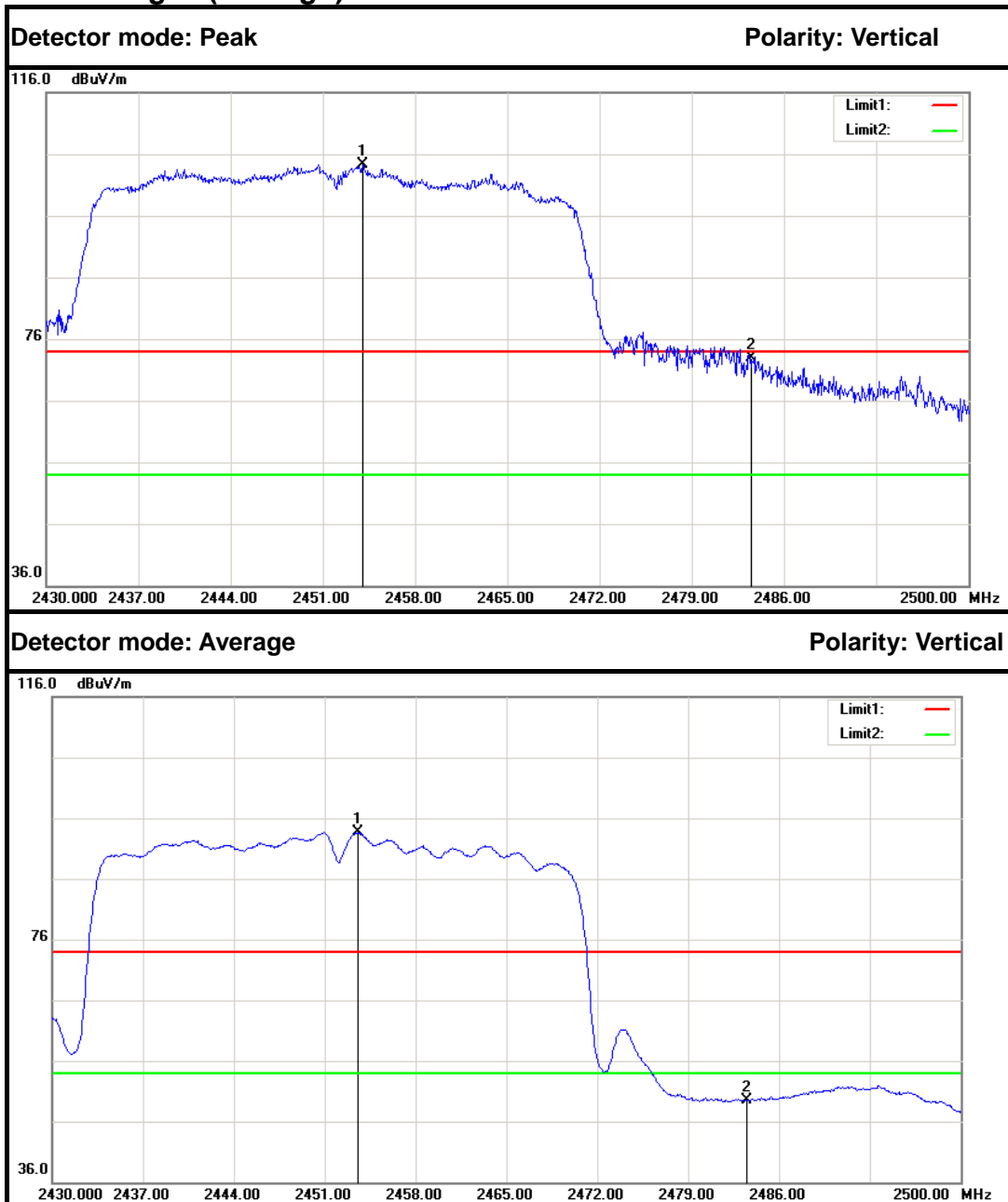


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	74.72	-2.86	71.86	74.00	-2.14	Peak	Horizontal
2	2420.320	104.54	-2.70	101.84	---	---	Peak	Horizontal
1	2390.000	53.08	-2.86	50.22	54.00	-3.78	Average	Horizontal
2	2420.180	94.04	-2.70	91.34	---	---	Average	Horizontal

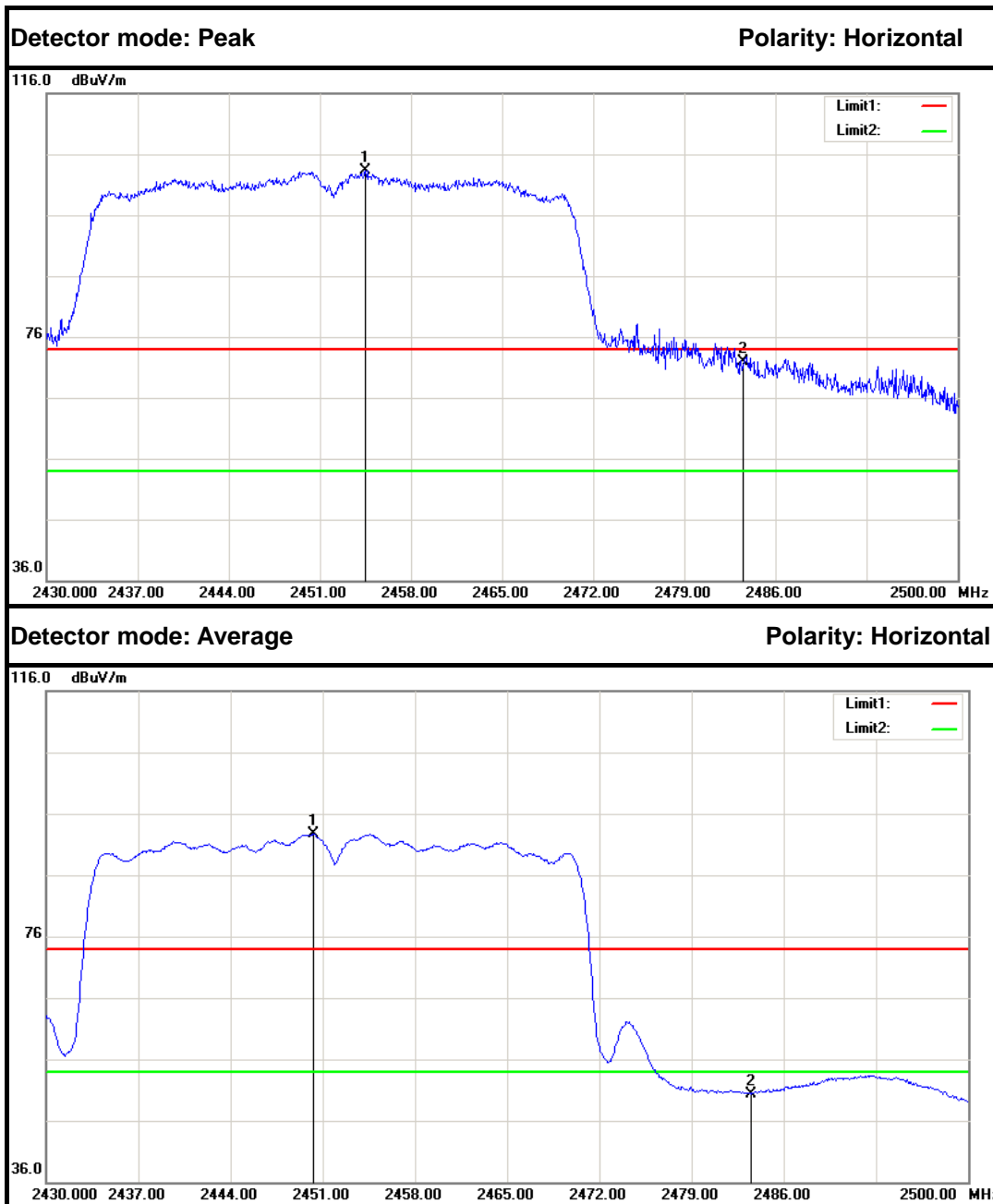




### Band Edges (CH High)



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2454.010	106.76	-2.51	104.25	---	---	Peak	Vertical
2	2483.500	75.16	-2.35	72.81	74.00	-1.19	Peak	Vertical
1	2453.520	96.13	-2.51	93.62	---	---	Average	Vertical
2	2483.500	51.91	-2.35	49.56	54.00	-4.44	Average	Vertical



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2454.500	105.80	-2.51	103.29	---	---	Peak	Horizontal
2	2483.500	74.33	-2.35	71.98	74.00	-2.02	Peak	Horizontal
1	2450.300	95.19	-2.53	92.66	---	---	Average	Horizontal
2	2483.500	52.72	-2.35	50.37	54.00	-3.63	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

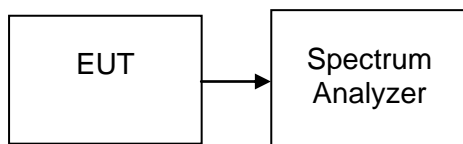
### 7.7.3. TEST PROCEDURES (please refer to measurement standard)

§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**

Channel	Frequency (MHz)	PPSD (dBm)		Limit (dBm)	Test Result
		Antenna 0	Antenna 1		
Low	2412	-4.325	-1.602	8	PASS
Mid	2437	-4.141	-1.328		PASS
High	2462	-4.683	-1.663		PASS

**Test mode: IEEE 802.11g**

Channel	Frequency (MHz)	PPSD (dBm)		Limit (dBm)	Test Result
		Antenna 0	Antenna 1		
Low	2412	-6.742	-6.910	8	PASS
Mid	2437	-6.869	-6.524		PASS
High	2462	-5.531	-5.460		PASS

**Test mode: IEEE 802.11n HT20 MHz (Combine with Antenna 0 and Antenna 1)**

Channel	Frequency (MHz)	PPSD (dBm)			Limit (dBm)	Test Result
		Antenna 0	Antenna 1	Total		
Low	2412	-7.674	-6.730	-4.166	8.00	PASS
Mid	2437	-6.911	-6.402	-3.639		PASS
High	2462	-7.019	-5.977	-3.457		PASS

**Test mode: IEEE 802.11n HT40 MHz (Combine with Antenna 0 and Antenna 1)**

Channel	Frequency (MHz)	PPSD (dBm)			Limit (dBm)	Test Result
		Antenna 0	Antenna 1	Total		
Low	2422	-14.740	-13.985	-11.336	8.00	PASS
Mid	2437	-14.276	-14.701	-11.473		PASS
High	2452	-12.663	-12.119	-9.372		PASS

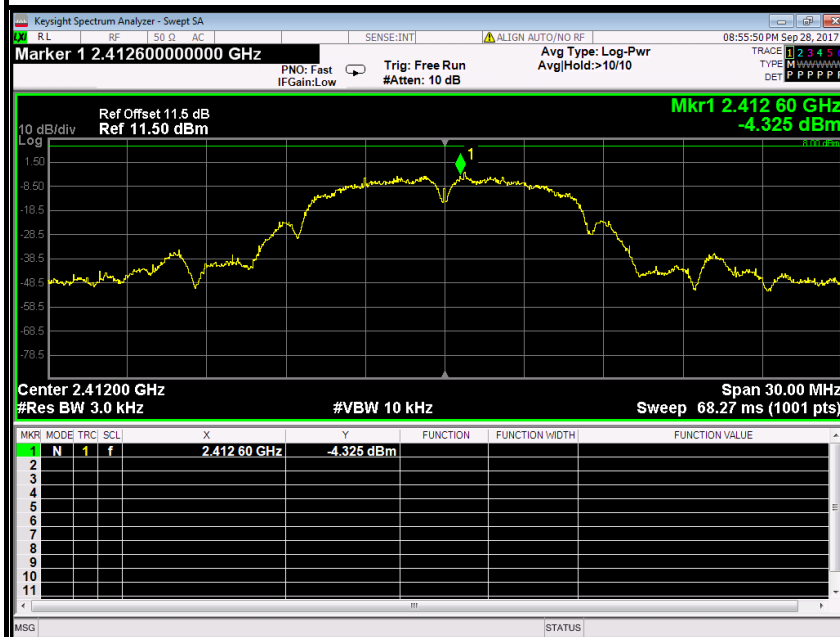


## Test Plot

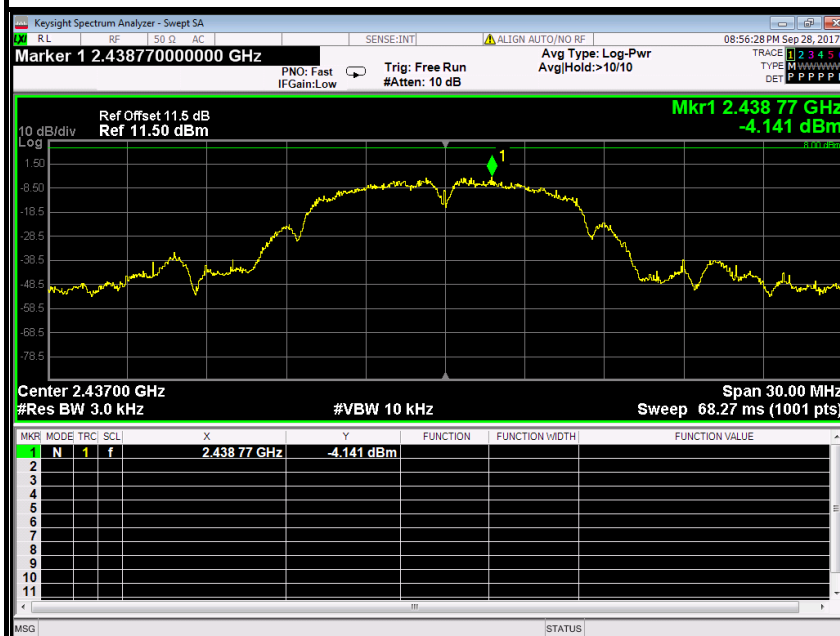
### Antenna 0

### IEEE 802.11b mode

#### PPSD (CH Low)

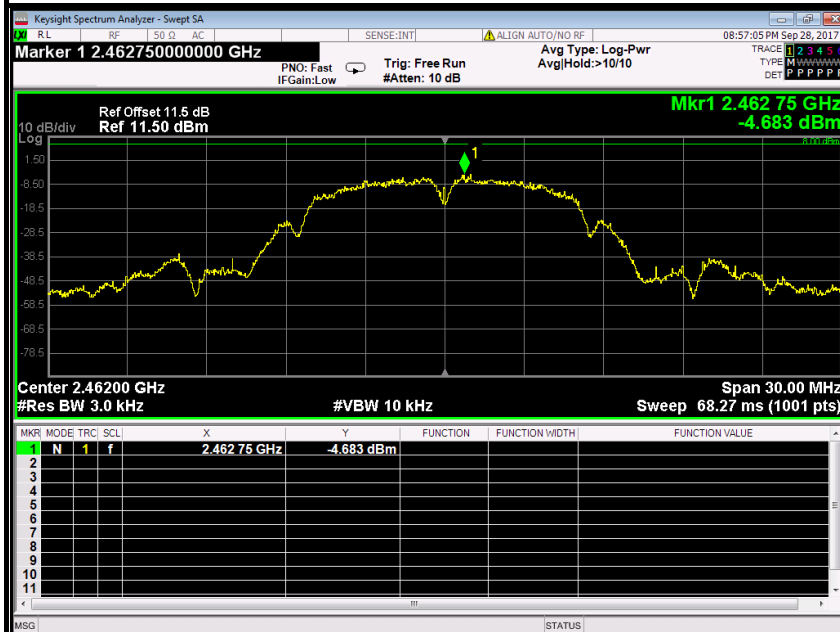


#### PPSD (CH Mid)



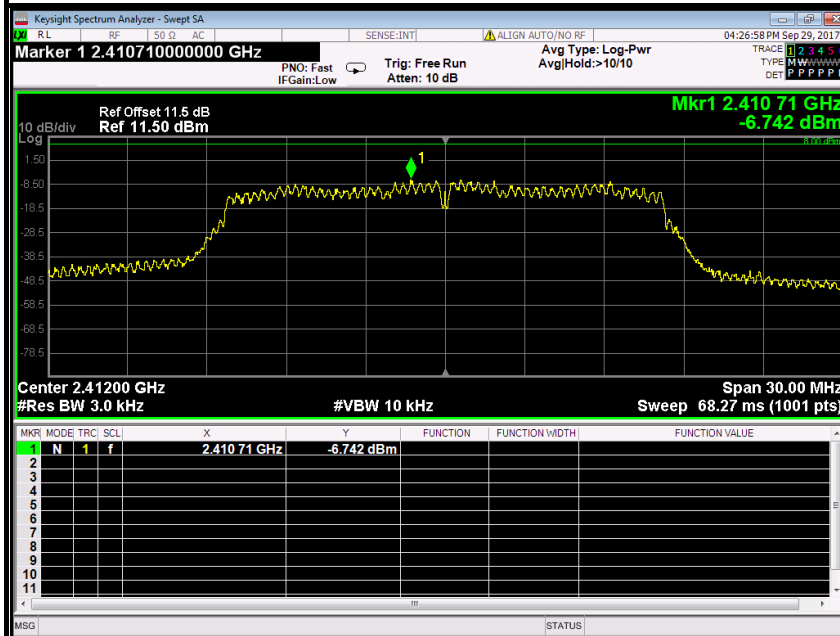


### PPSD (CH High)



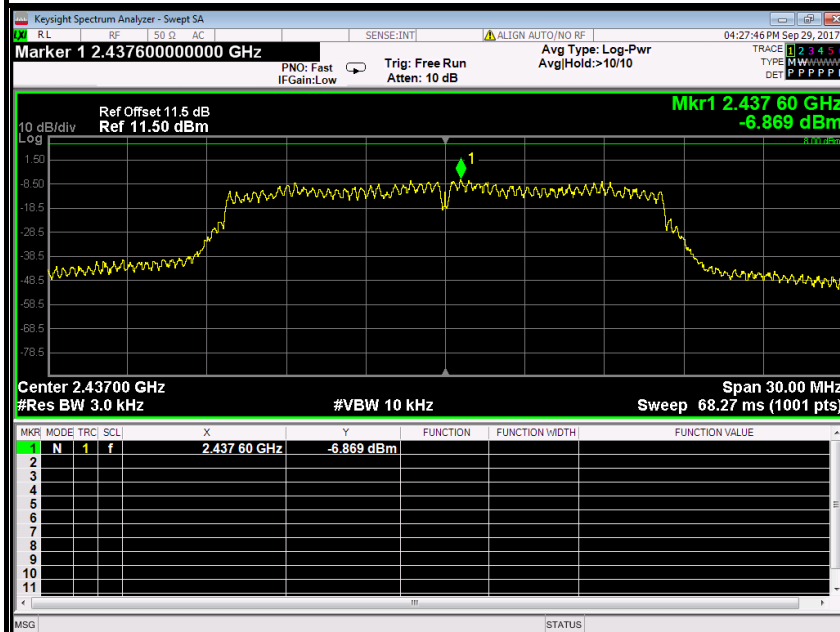
### IEEE 802.11g mode

### PPSD (CH Low)

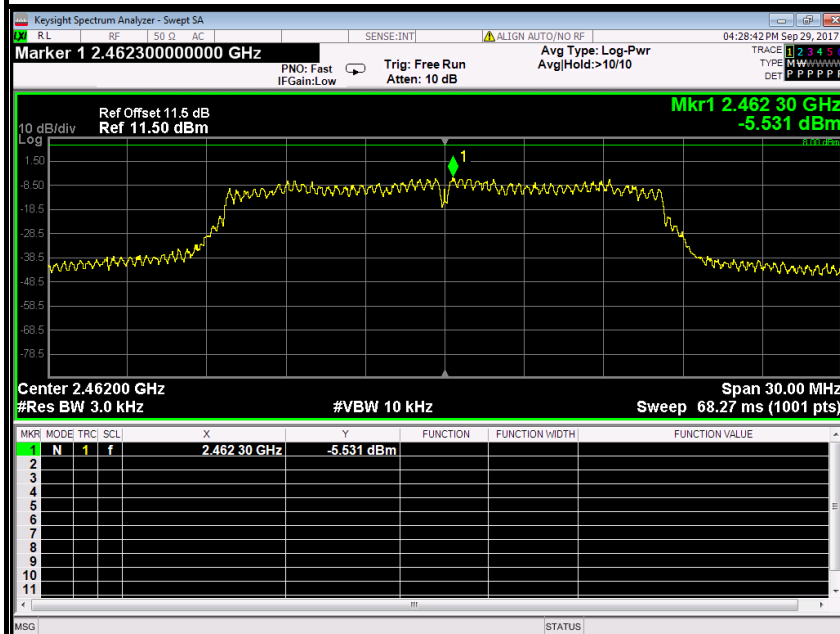




### PPSD (CH Mid)



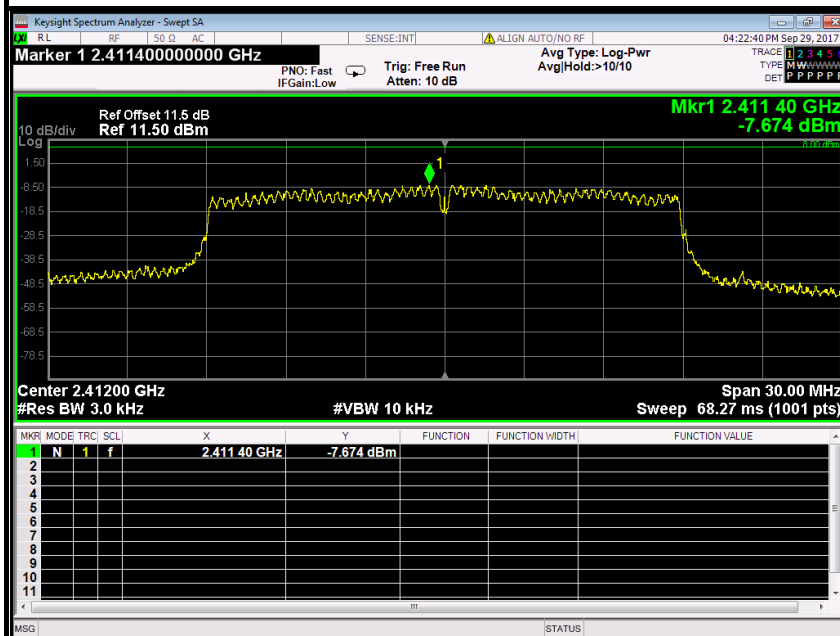
### PPSD (CH High)



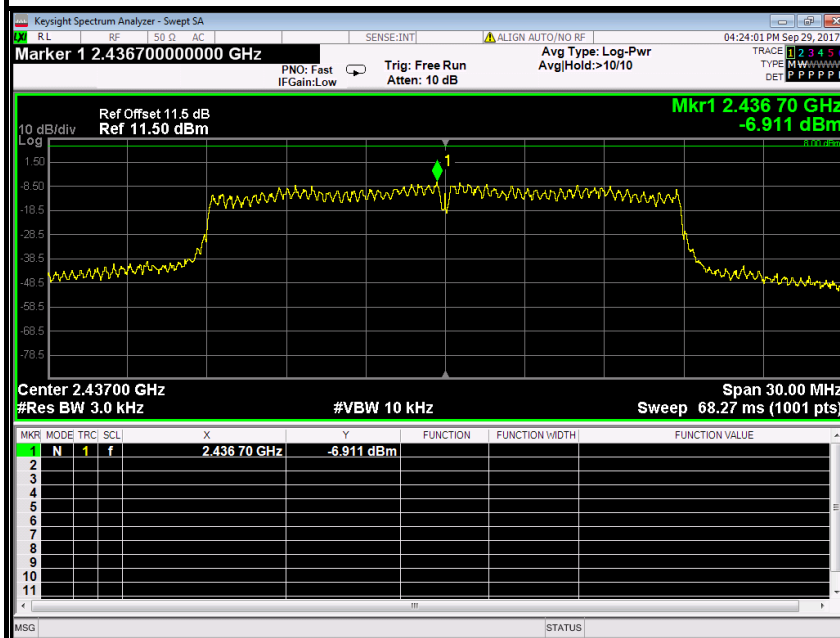


## IEEE 802.11n HT20 MHz mode

### PPSD (CH Low)



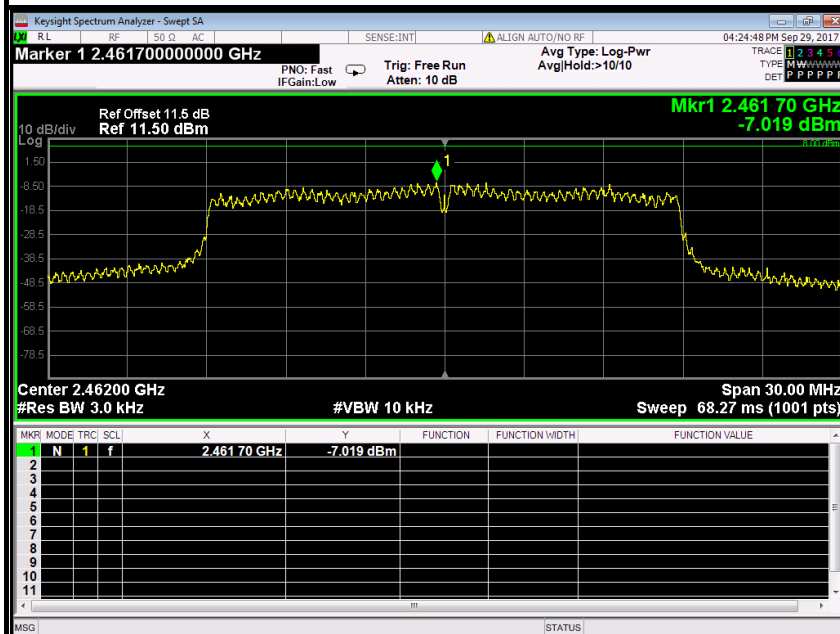
### PPSD (CH Mid)





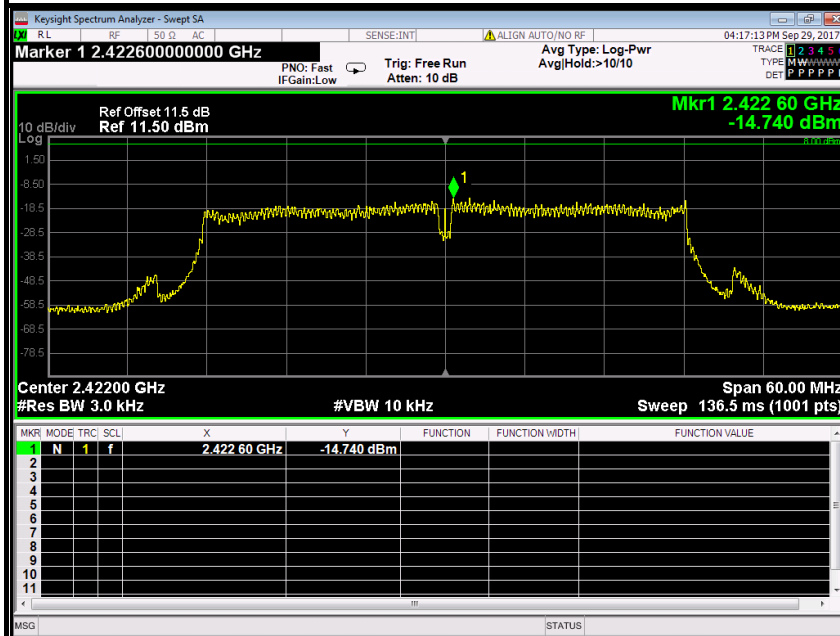


## PPSD (CH High)



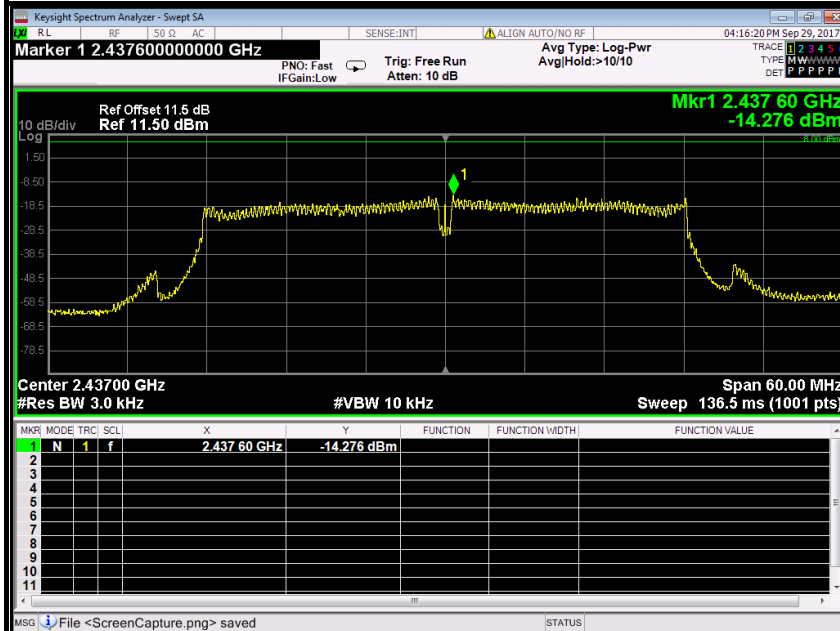
## IEEE 802.11n HT40 MHz mode

## PPSD (CH Low)

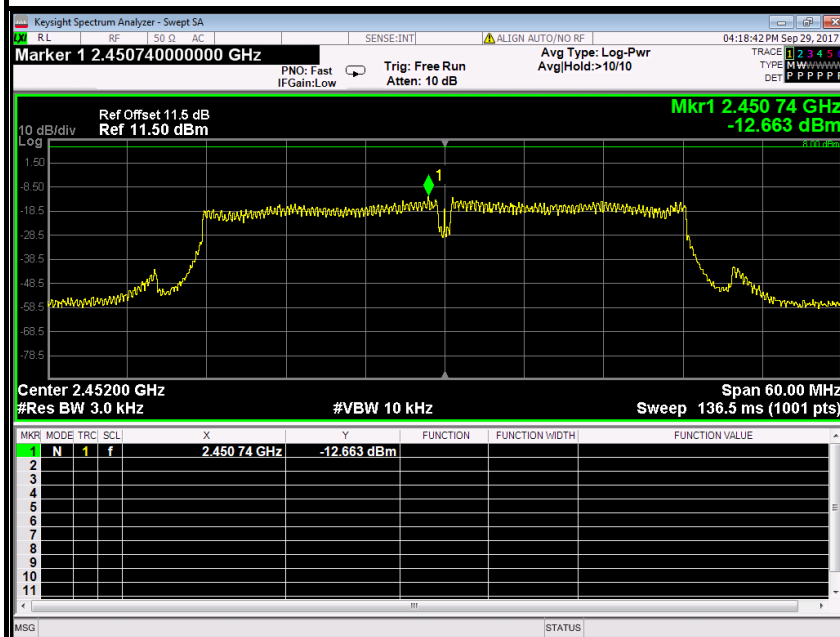




### PPSD (CH Mid)



### PPSD (CH High)

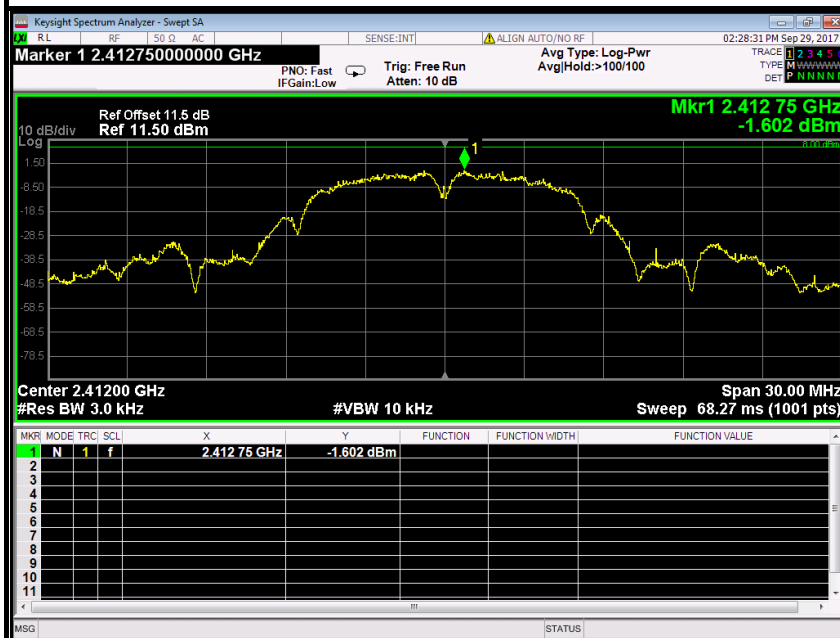




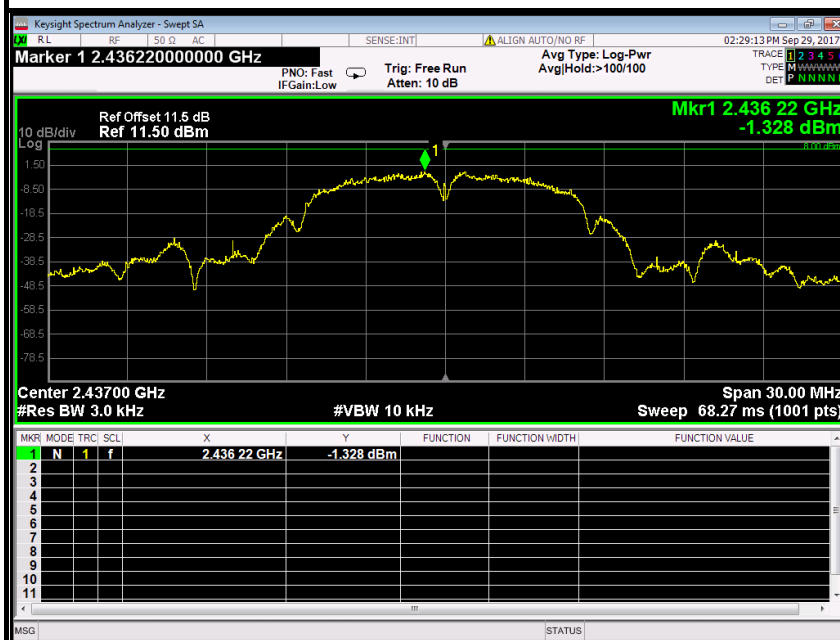
## Antenna 1

### IEEE 802.11b mode

#### PPSD (CH Low)

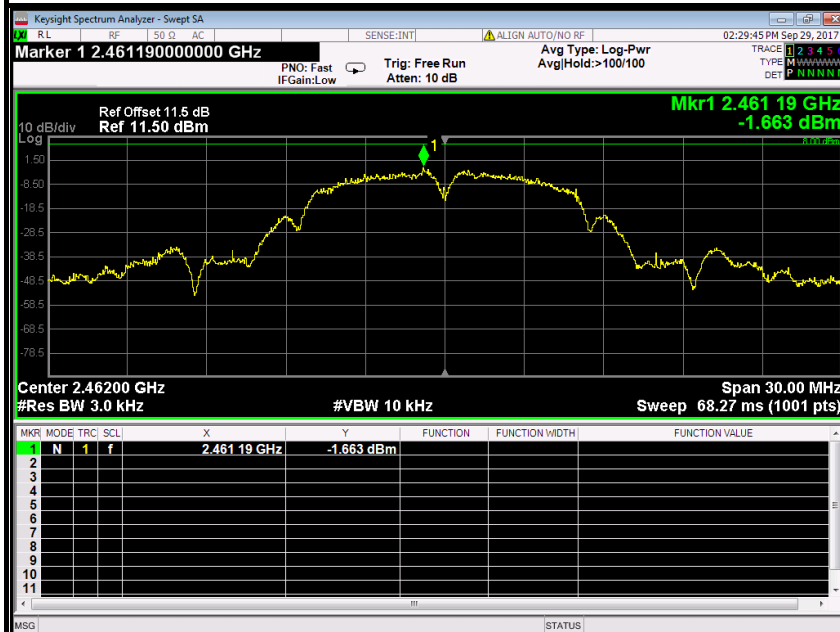


#### PPSD (CH Mid)



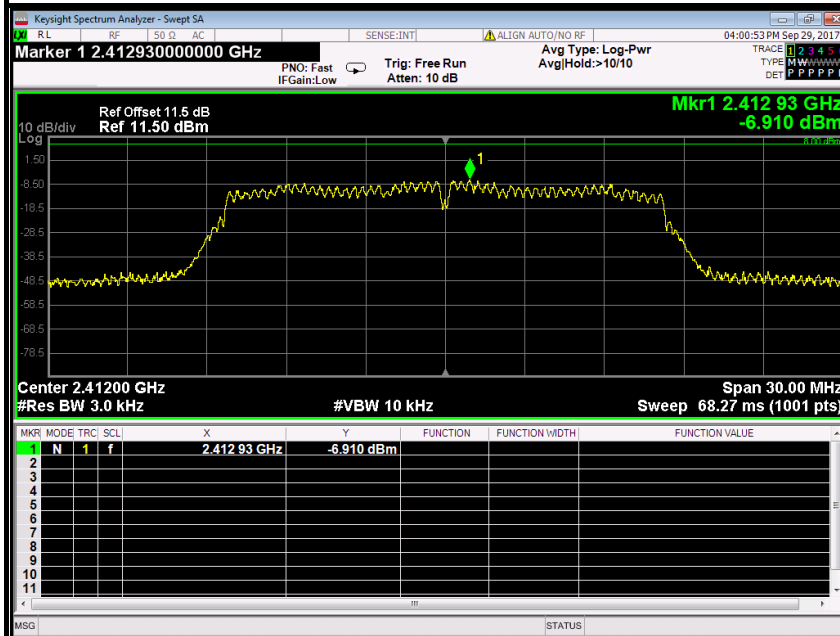


### PPSD (CH High)



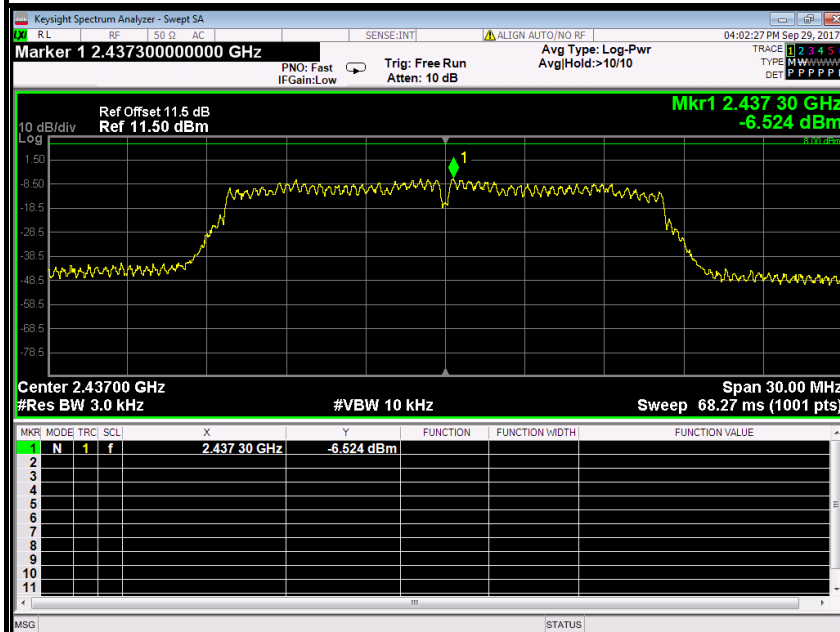
### IEEE 802.11g mode

### PPSD (CH Low)

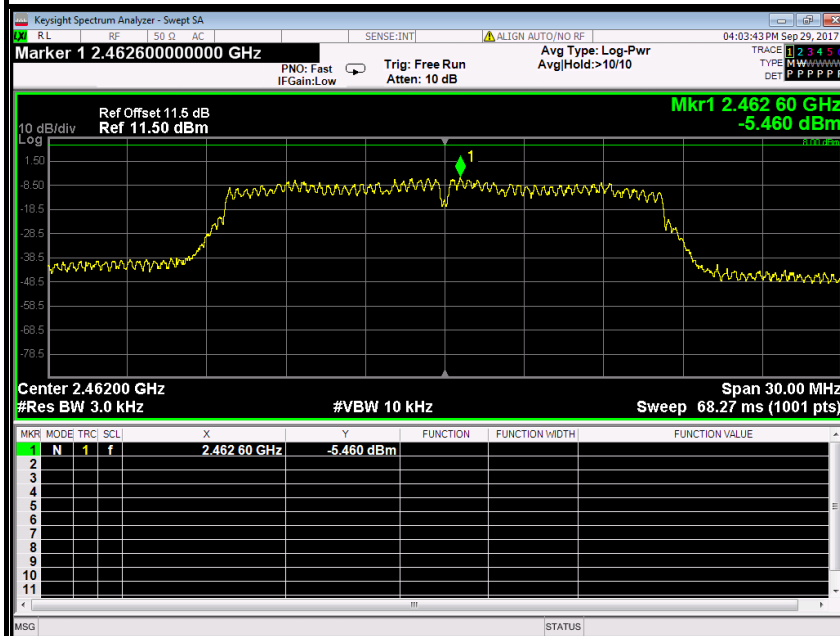




### PPSD (CH Mid)



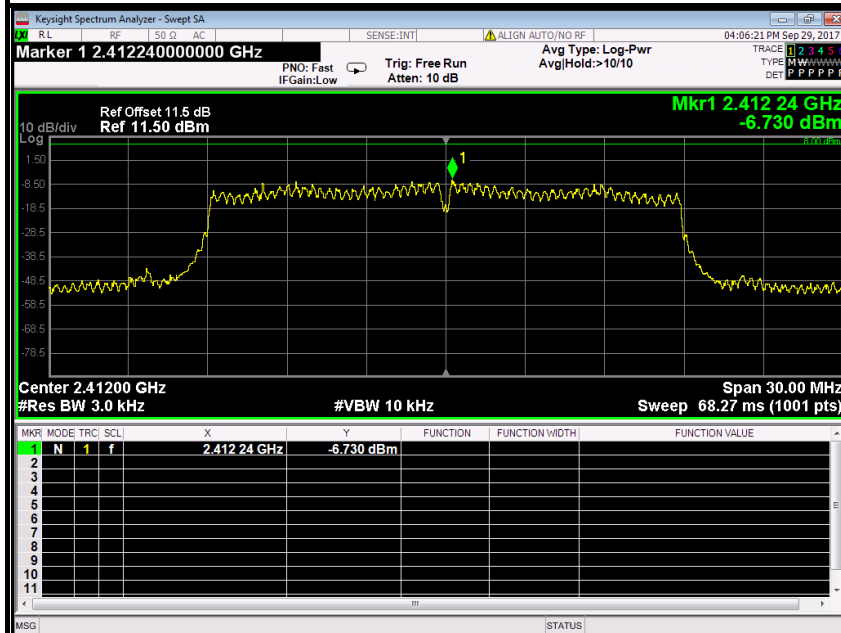
### PPSD (CH High)



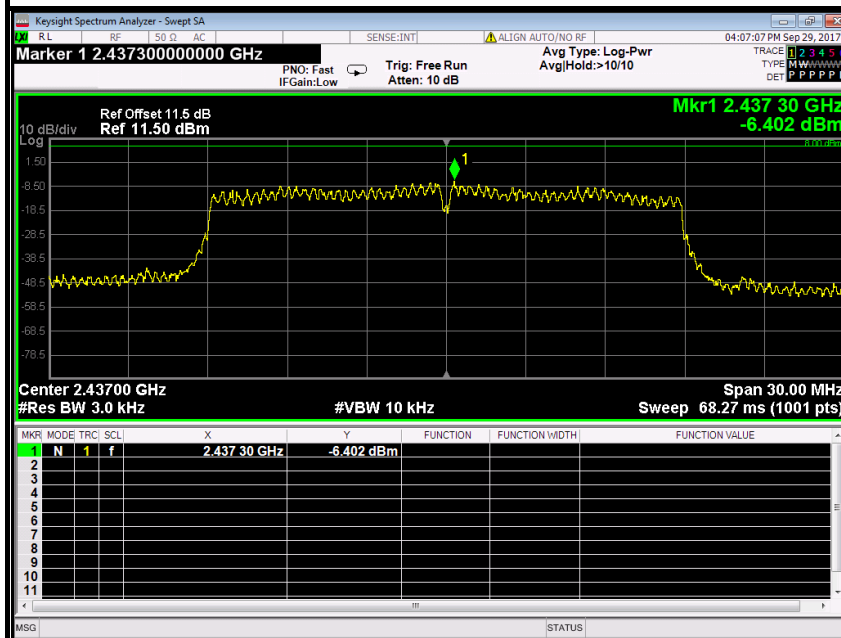


## IEEE 802.11n HT20 MHz mode

### PPSD (CH Low)

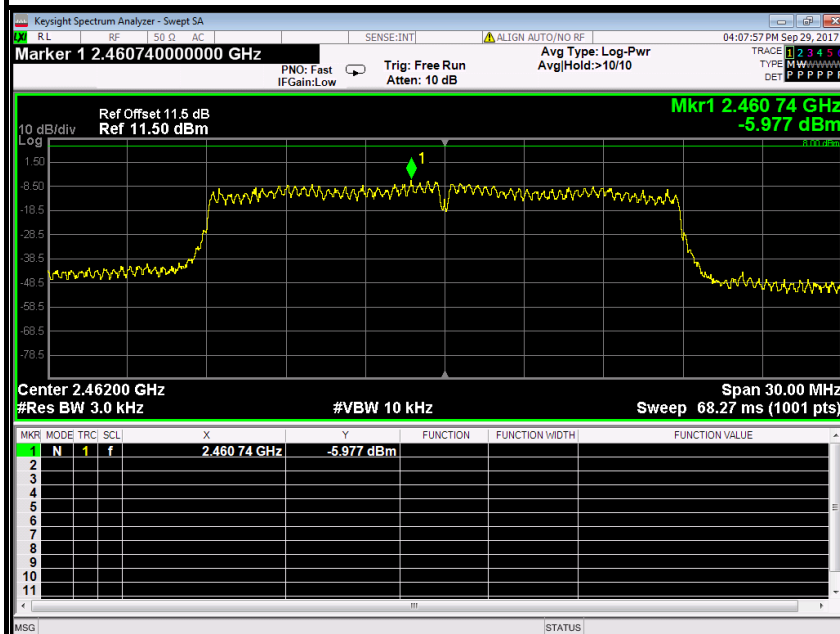


### PPSD (CH Mid)



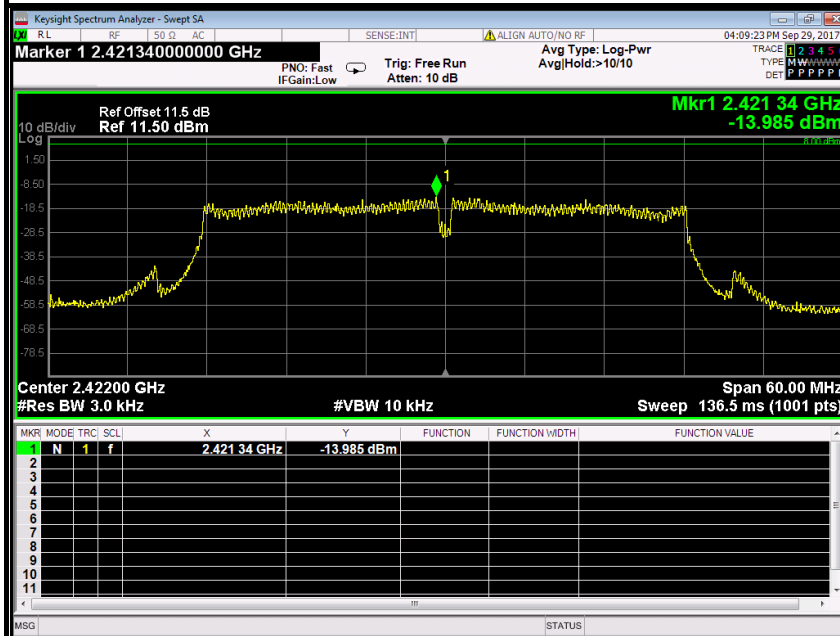


## PPSD (CH High)



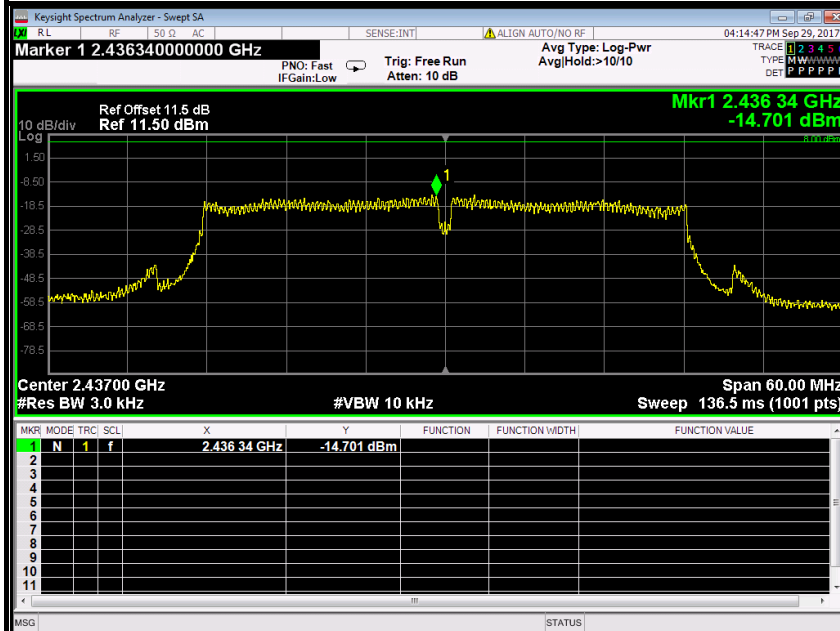
## IEEE 802.11n HT40 MHz mode

## PPSD (CH Low)





### PPSD (CH Mid)



### PPSD (CH High)

