

Test Mode: TX / IEEE 802.11n HT20 MHz (CH Mid)Tested by: Saber HuangAmbient temperature: 24°CRelative humidity: 52% RHDate: August 12, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2521.000	45.21	-2.22	42.99	74.00	-31.01	V	Peak
3196.000	47.47	-1.03	46.44	74.00	-27.56	V	Peak
3871.000	43.27	1.05	44.32	74.00	-29.68	V	Peak
4258.000	41.87	2.50	44.37	74.00	-29.63	V	Peak
4915.000	45.12	4.70	49.82	74.00	-24.18	V	Peak
5797.000	41.25	5.99	47.24	74.00	-26.76	V	Peak
1738.000	51.34	-6.40	44.94	74.00	-29.06	H	Peak
3196.000	49.05	-1.03	48.02	74.00	-25.98	H	Peak
3997.000	43.75	1.58	45.33	74.00	-28.67	H	Peak
4717.000	41.75	4.06	45.81	74.00	-28.19	H	Peak
4870.000	46.63	4.56	51.19	74.00	-22.81	H	Peak
5437.000	41.43	5.76	47.19	74.00	-26.81	H	Peak

**Remark:**

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

**Test Mode:** TX / EEE 802.11n HT20 MHz (CH High)**Tested by:** Saber Huang**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** August 12, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
2521.000	46.17	-2.22	43.95	74.00	-30.05	V	Peak
3196.000	47.47	-1.03	46.44	74.00	-27.56	V	Peak
3871.000	43.27	1.05	44.32	74.00	-29.68	V	Peak
4402.000	42.23	3.01	45.24	74.00	-28.76	V	Peak
4915.000	45.12	4.70	49.82	74.00	-24.18	V	Peak
5959.000	41.52	6.06	47.58	74.00	-26.42	V	Peak
2602.000	44.46	-2.08	42.38	74.00	-31.62	H	Peak
3196.000	45.36	-1.03	44.33	74.00	-29.67	H	Peak
3601.000	45.39	-0.09	45.30	74.00	-28.70	H	Peak
4033.000	42.81	1.71	44.52	74.00	-29.48	H	Peak
4348.000	42.20	2.81	45.01	74.00	-28.99	H	Peak
5014.000	41.80	5.00	46.80	74.00	-27.20	H	Peak

**Remark:**

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

**Combine with Antenna 0 and Antenna 1****Test Mode:** TX/ IEEE 802.11n HT40 MHz (CH Low)**Tested by:** Saber Huang**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** August 12, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
3196.000	48.47	-1.03	47.44	74.00	-26.56	V	Peak
3601.000	43.24	-0.09	43.15	74.00	-30.85	V	Peak
4411.000	42.48	3.04	45.52	74.00	-28.48	V	Peak
4834.000	43.81	4.44	48.25	74.00	-25.75	V	Peak
5401.000	41.87	5.69	47.56	74.00	-26.44	V	Peak
5680.000	40.96	5.95	46.91	74.00	-27.09	V	Peak
2116.000	45.34	-4.36	40.98	74.00	-33.02	H	Peak
2512.000	45.79	-2.24	43.55	74.00	-30.45	H	Peak
2818.000	43.88	-1.69	42.19	74.00	-31.81	H	Peak
3196.000	45.36	-1.03	44.33	74.00	-29.67	H	Peak
3601.000	45.39	-0.09	45.30	74.00	-28.70	H	Peak
4033.000	42.81	1.71	44.52	74.00	-29.48	H	Peak

**Remark:**

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

**Test Mode:** TX / IEEE 802.11n HT40 MHz (CH Mid)**Tested by:** Saber Huang**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** August 12, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1765.000	49.45	-6.35	43.10	74.00	-30.90	V	Peak
2251.000	46.31	-3.62	42.69	74.00	-31.31	V	Peak
2548.000	45.13	-2.17	42.96	74.00	-31.04	V	Peak
3196.000	47.51	-1.03	46.48	74.00	-27.52	V	Peak
3601.000	43.03	-0.09	42.94	74.00	-31.06	V	Peak
4672.000	42.36	3.91	46.27	74.00	-27.73	V	Peak
2611.000	45.18	-2.06	43.12	74.00	-30.88	H	Peak
3196.000	43.76	-1.03	42.73	74.00	-31.27	H	Peak
3997.000	42.99	1.58	44.57	74.00	-29.43	H	Peak
4483.000	41.09	3.29	44.38	74.00	-29.62	H	Peak
4897.000	44.35	4.64	48.99	74.00	-25.01	H	Peak
5383.000	41.36	5.66	47.02	74.00	-26.98	H	Peak

**Remark:**

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

Test Mode: TX / IEEE 802.11n HT40 MHz (CH High)Tested by: Saber HuangAmbient temperature: 24°CRelative humidity: 52% RHDate: August 12, 2017

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1738.000	49.49	-6.40	43.09	74.00	-30.91	V	Peak
3196.000	47.27	-1.03	46.24	74.00	-27.76	V	Peak
3997.000	42.51	1.58	44.09	74.00	-29.91	V	Peak
4492.000	40.95	3.32	44.27	74.00	-29.73	V	Peak
5086.000	41.65	5.13	46.78	74.00	-27.22	V	Peak
5563.000	41.90	5.90	47.80	74.00	-26.20	V	Peak
2233.000	44.85	-3.72	41.13	74.00	-32.87	H	Peak
2818.000	44.26	-1.69	42.57	74.00	-31.43	H	Peak
3601.000	44.19	-0.09	44.10	74.00	-29.90	H	Peak
4276.000	41.64	2.56	44.20	74.00	-29.80	H	Peak
4924.000	43.33	4.73	48.06	74.00	-25.94	H	Peak
5716.000	40.97	5.96	46.93	74.00	-27.07	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

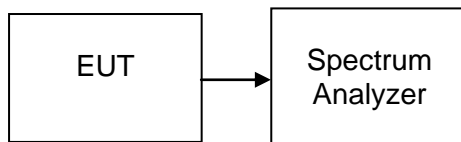
Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Spectrum Analyzer	Agilent	N9010A	MY52221469	02/21/2017	02/20/2018

#### 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	8092	8102	>500	PASS
Mid	2437	8120	8124		PASS
High	2462	8104	8083		PASS

**Test mode: IEEE 802.11g**

Channel	Frequency (MHz)	Bandwidth (kHz)		Limit (kHz)	Test Result
		Antenna 0	Antenna 1		
Low	2412	15120	15120	>500	PASS
Mid	2437	15120	15130		PASS
High	2462	15130	14210		PASS

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

Channel	Frequency (MHz)	Bandwidth (kHz)		Limit (kHz)	Test Result
		Antenna 0	Antenna 1		
Low	2412	15100	15130	>500	PASS
Mid	2437	15120	15120		PASS
High	2462	15130	15040		PASS

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

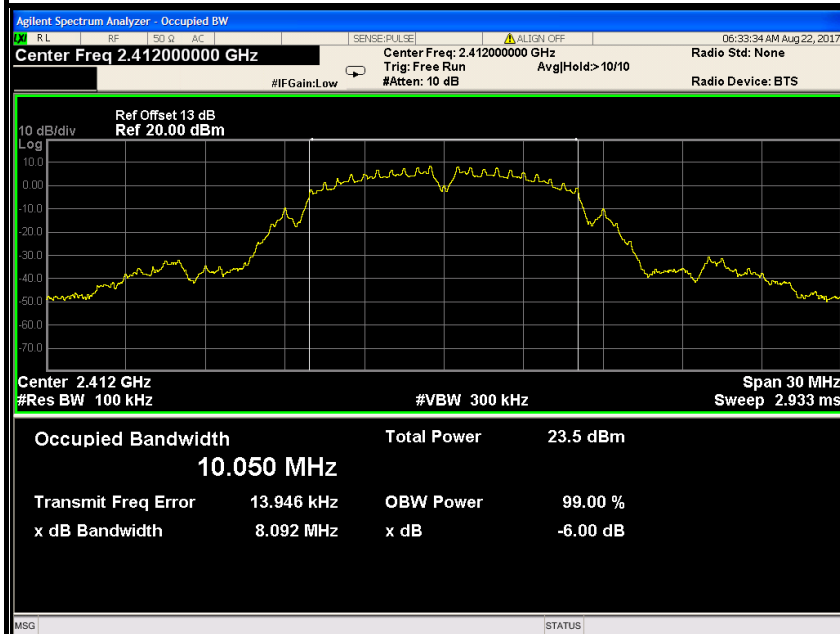
Channel	Frequency (MHz)	Bandwidth (kHz)		Limit (kHz)	Test Result
		Antenna 0	Antenna 1		
Low	2422	36340	36350	>500	PASS
Mid	2437	36340	36370		PASS
High	2452	36360	36370		PASS



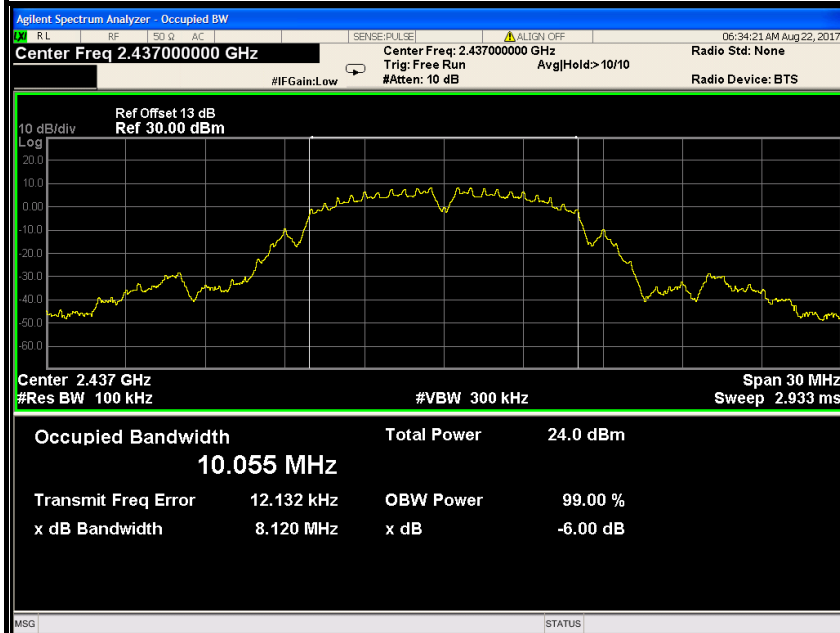
## Test Plot

## IEEE 802.11b mode (Antenna 0)

## 6dB Bandwidth (CH Low)



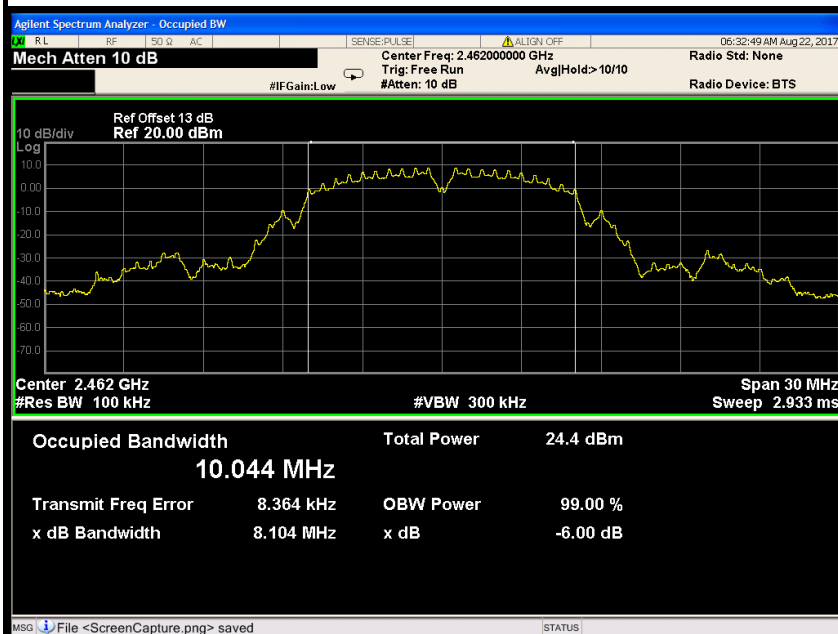
## 6dB Bandwidth (CH Mid)





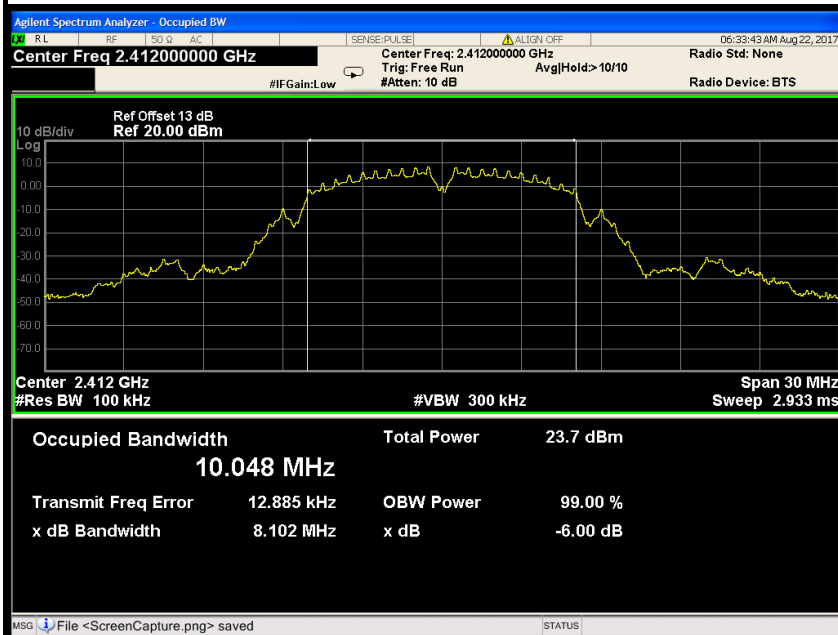


### 6dB Bandwidth (CH High)



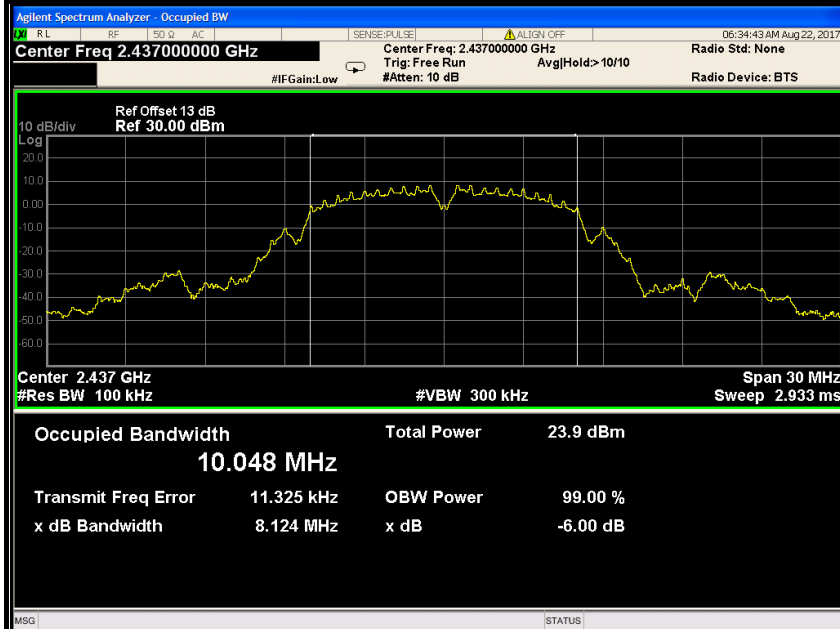
### IEEE 802.11b mode (Antenna 1)

### 6dB Bandwidth (CH Low)

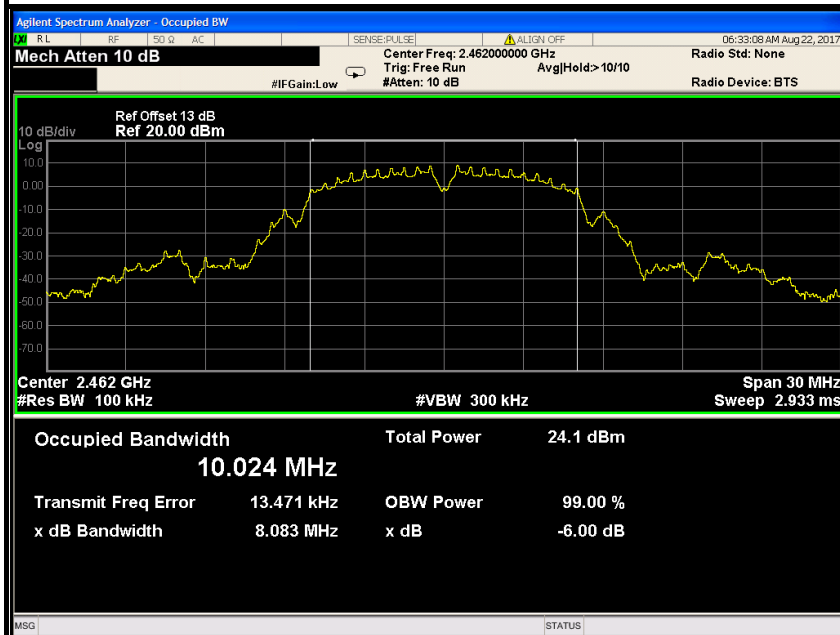




### 6dB Bandwidth (CH Mid)



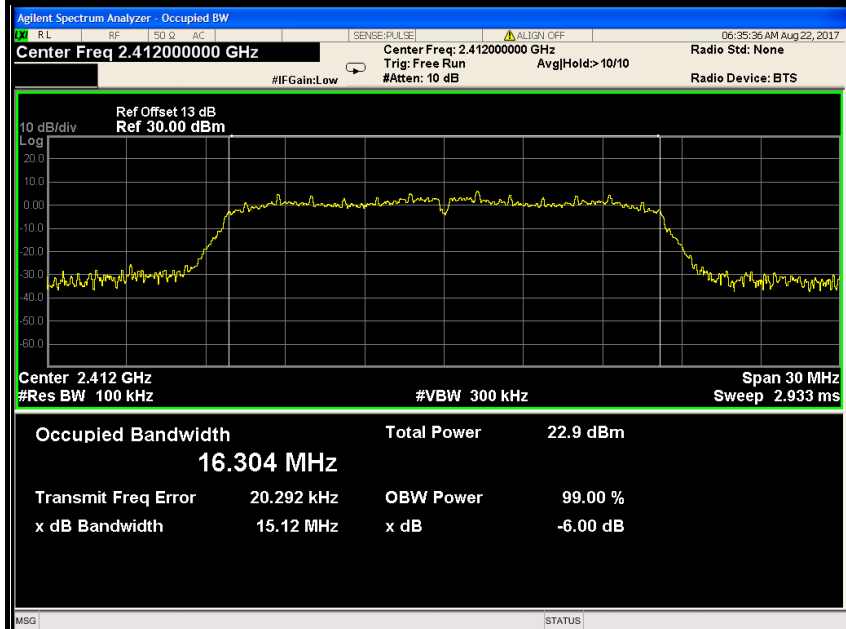
### 6dB Bandwidth (CH High)



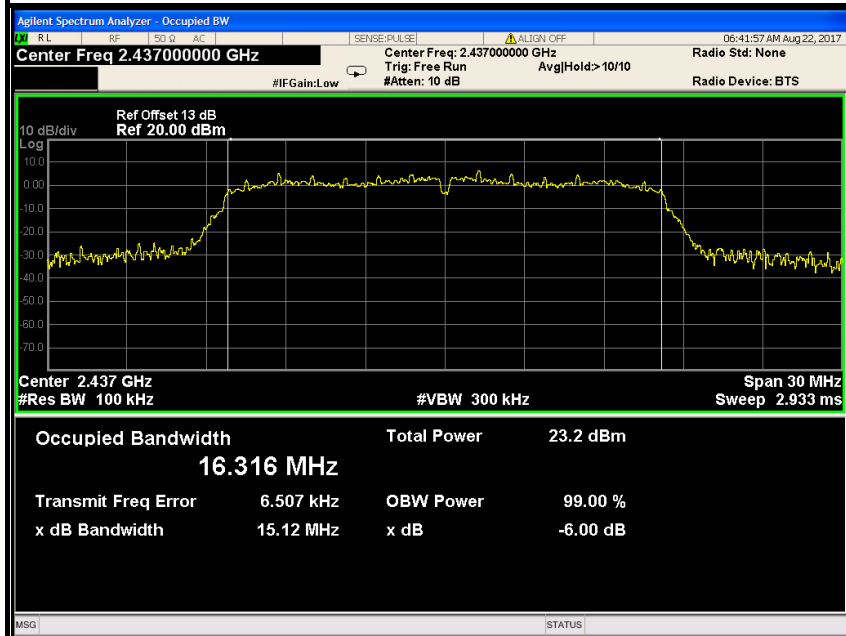


## IEEE 802.11g mode (Antenna 0)

### 6dB Bandwidth (CH Low)

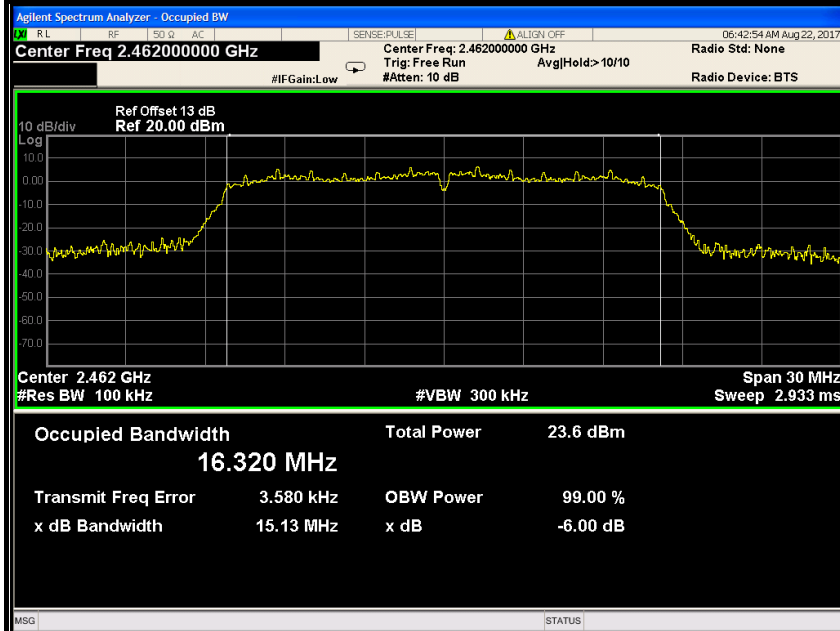


### 6dB Bandwidth (CH Mid)



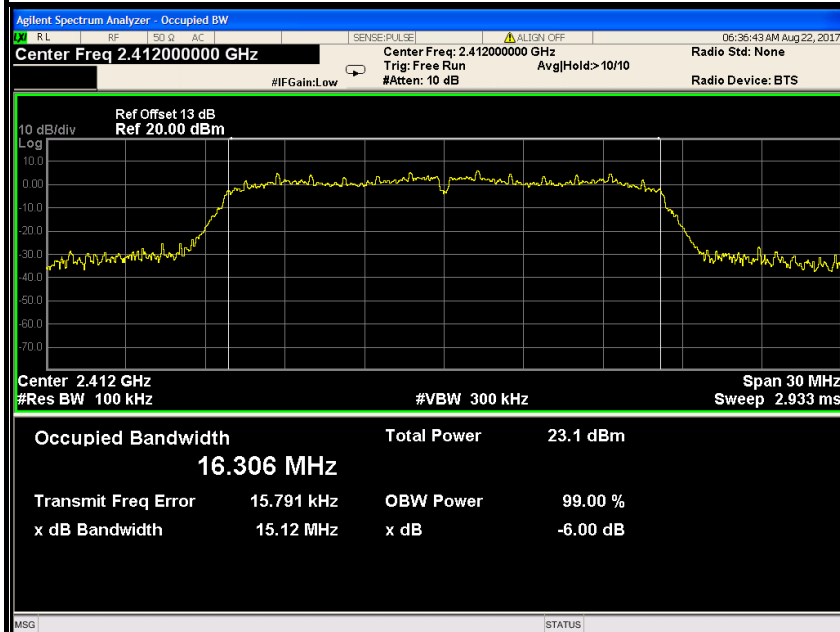


### 6dB Bandwidth (CH High)



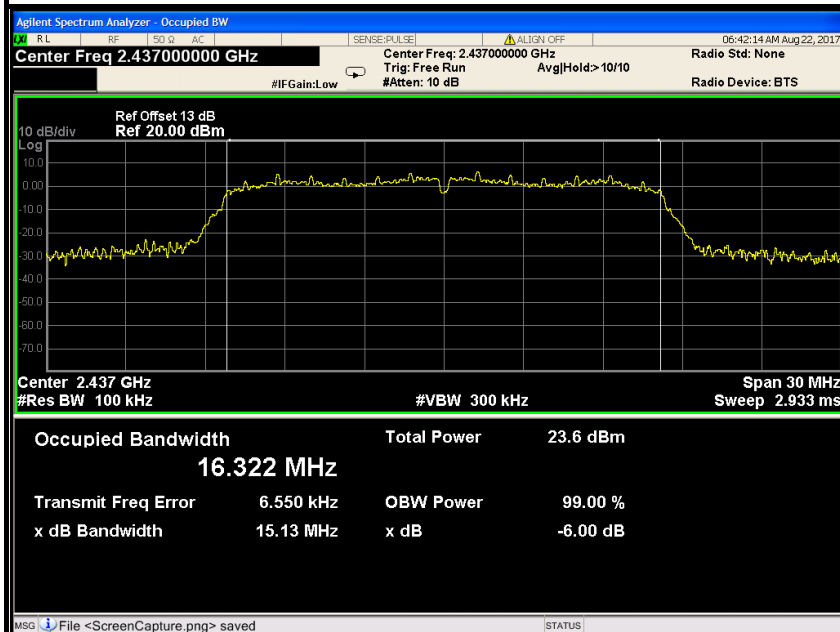
### IEEE 802.11g mode (Antenna 1)

### 6dB Bandwidth (CH Low)

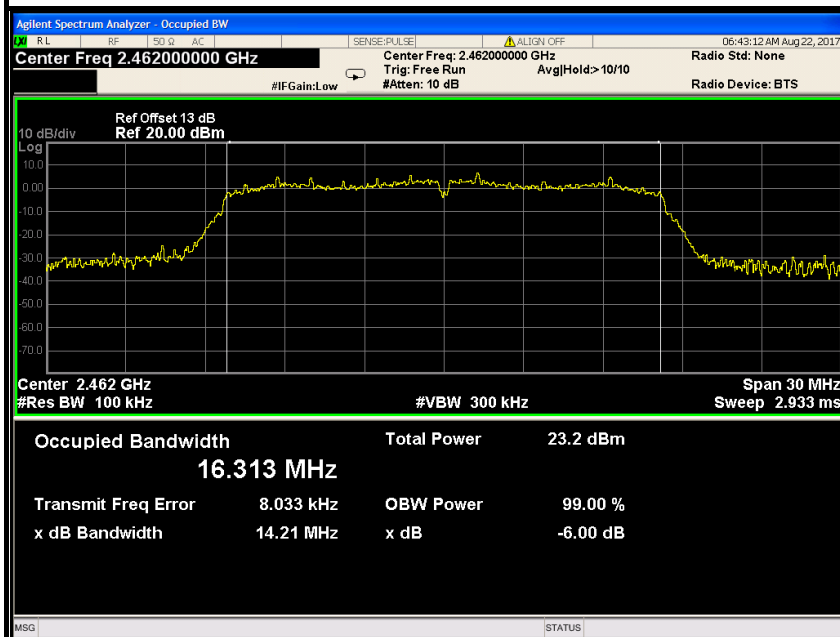




## 6dB Bandwidth (CH Mid)



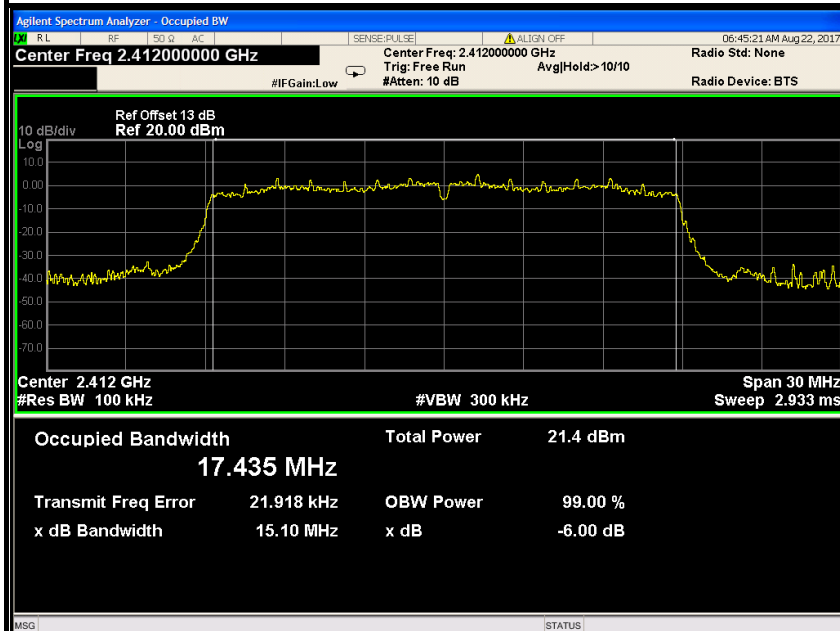
## 6dB Bandwidth (CH High)



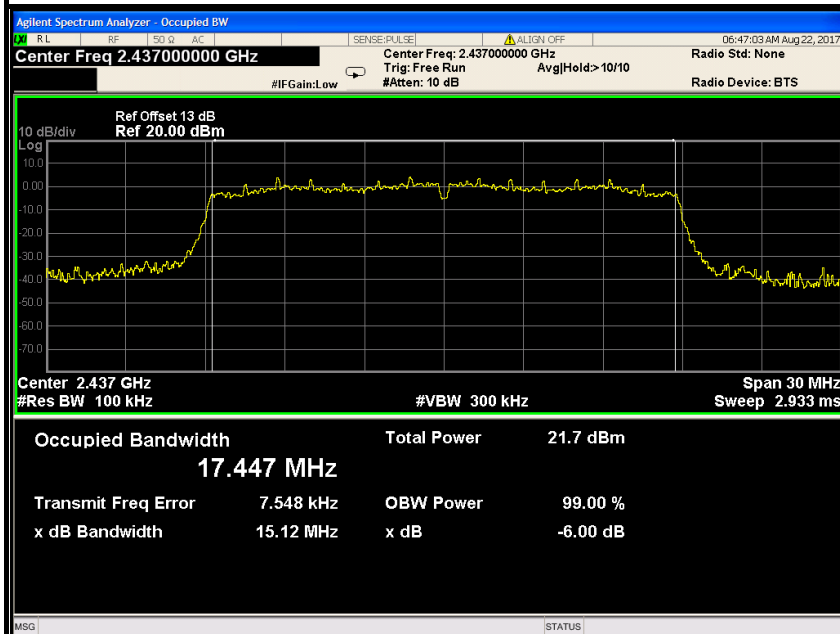


## IEEE 802.11n HT20 MHz mode (Antenna 0)

### 6dB Bandwidth (CH Low)

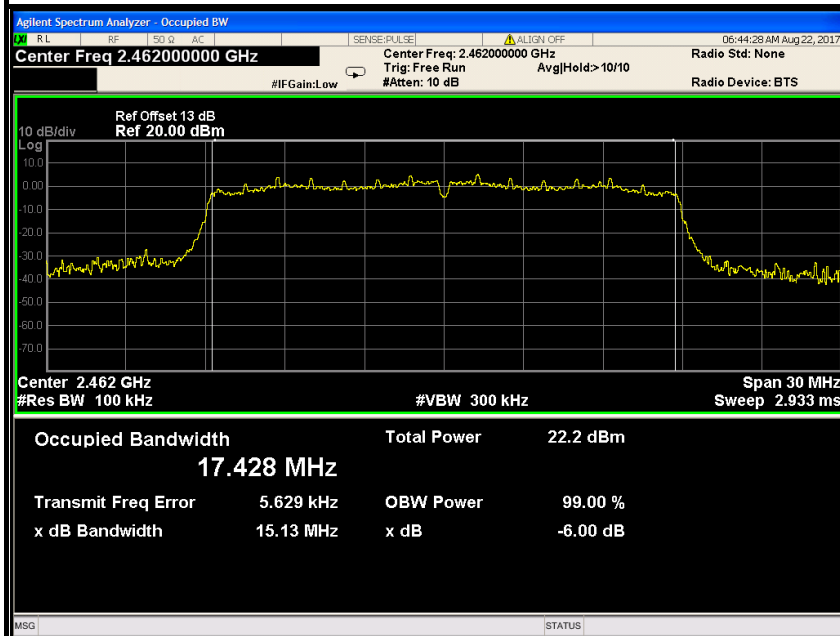


### 6dB Bandwidth (CH Mid)



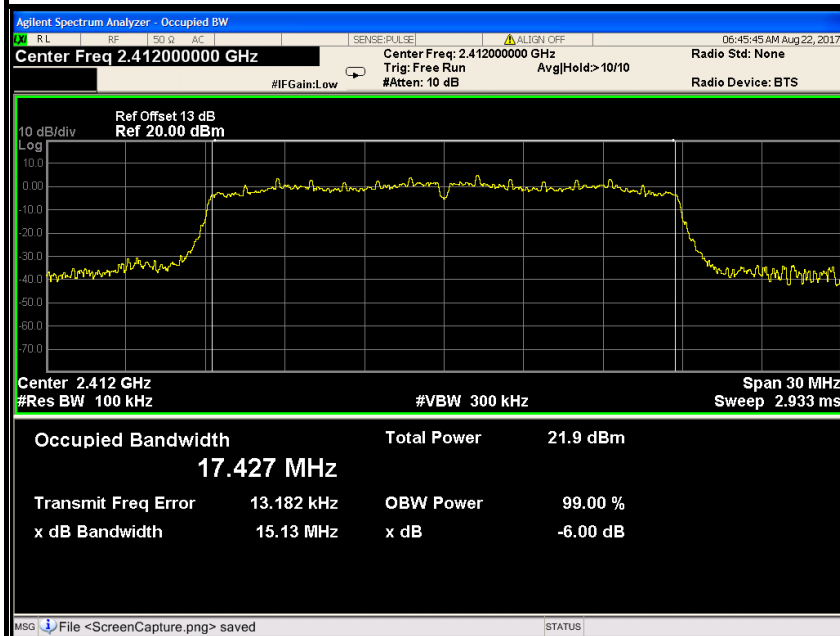


### 6dB Bandwidth (CH High)



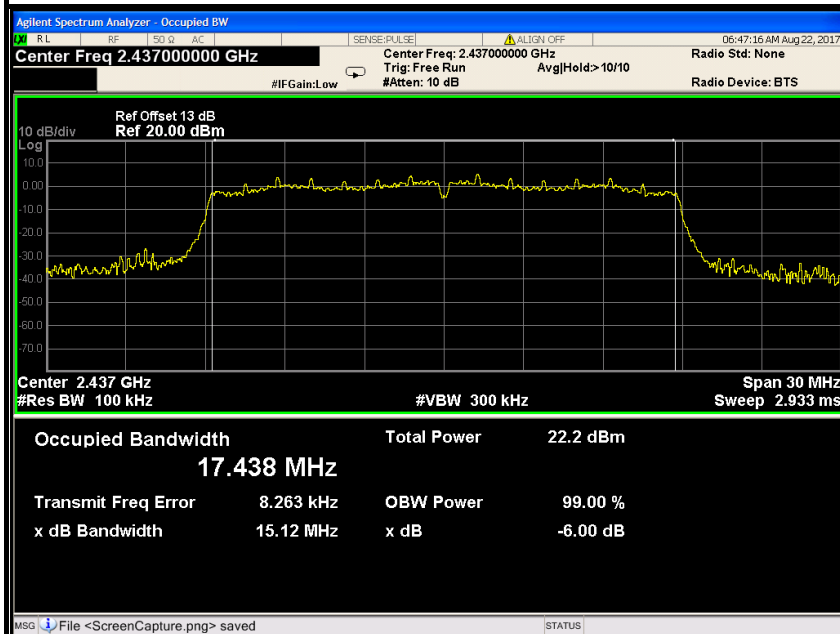
### IEEE 802.11n HT20 MHz mode (Antenna 1)

### 6dB Bandwidth (CH Low)

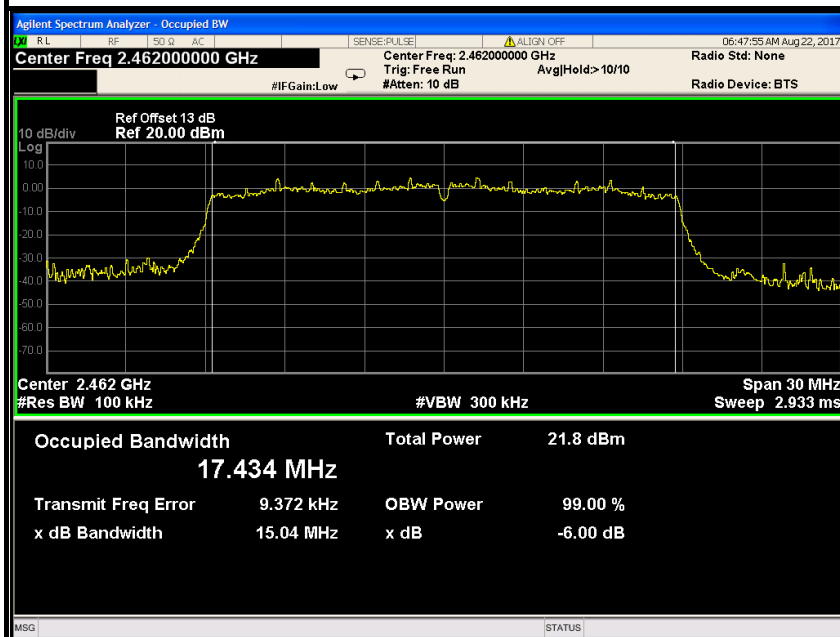




## 6dB Bandwidth (CH Mid)



## 6dB Bandwidth (CH High)

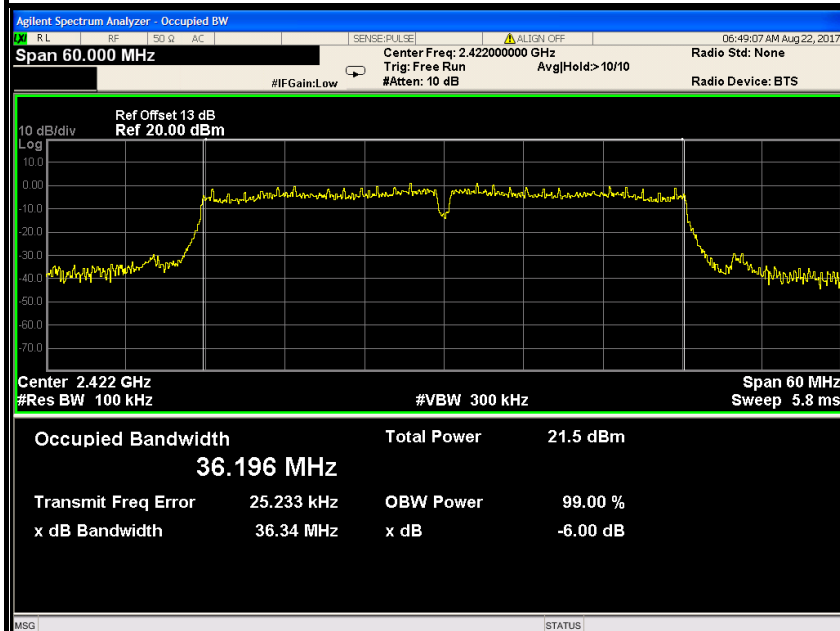




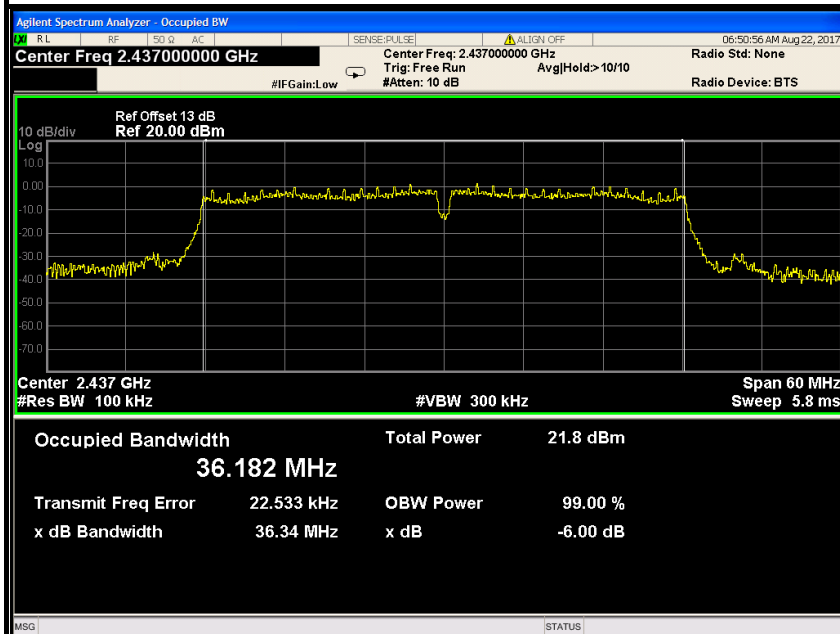


## IEEE 802.11n HT40 MHz mode (Antenna 0)

### 6dB Bandwidth (CH Low)

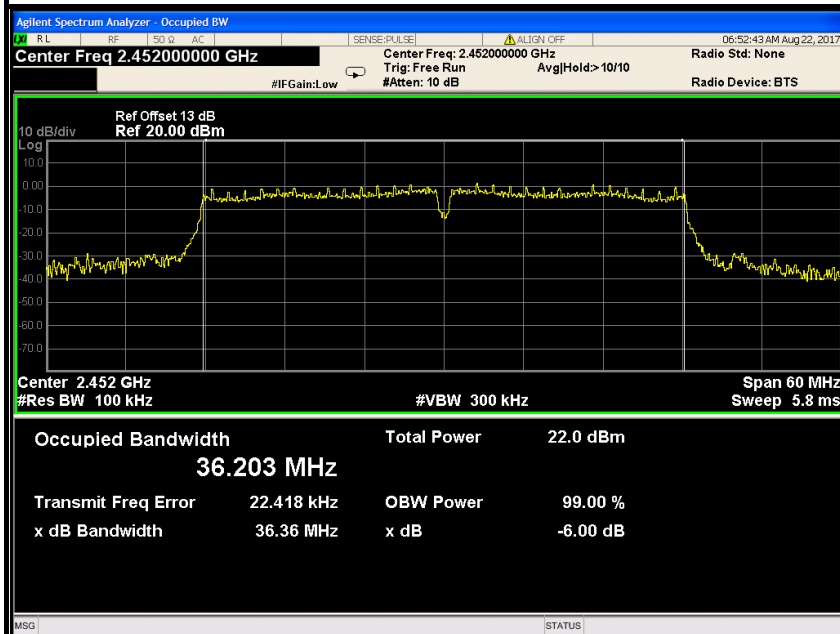


### 6dB Bandwidth (CH Mid)



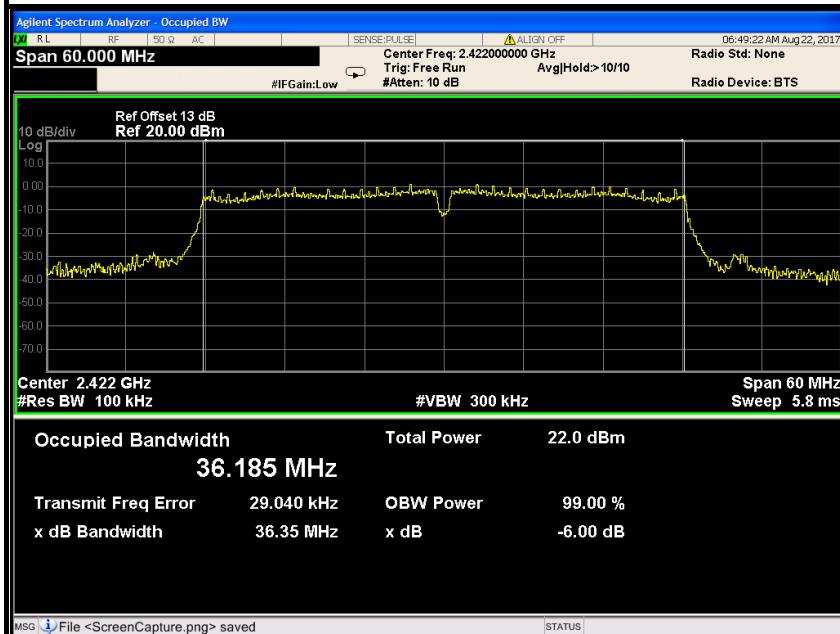


### 6dB Bandwidth (CH High)



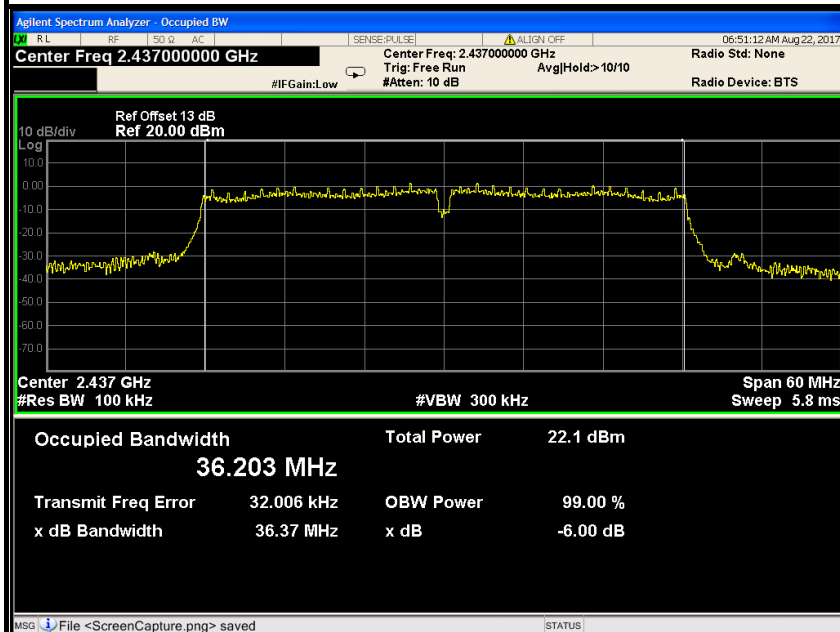
### IEEE 802.11n HT40 MHz mode (Antenna 1)

### 6dB Bandwidth (CH Low)

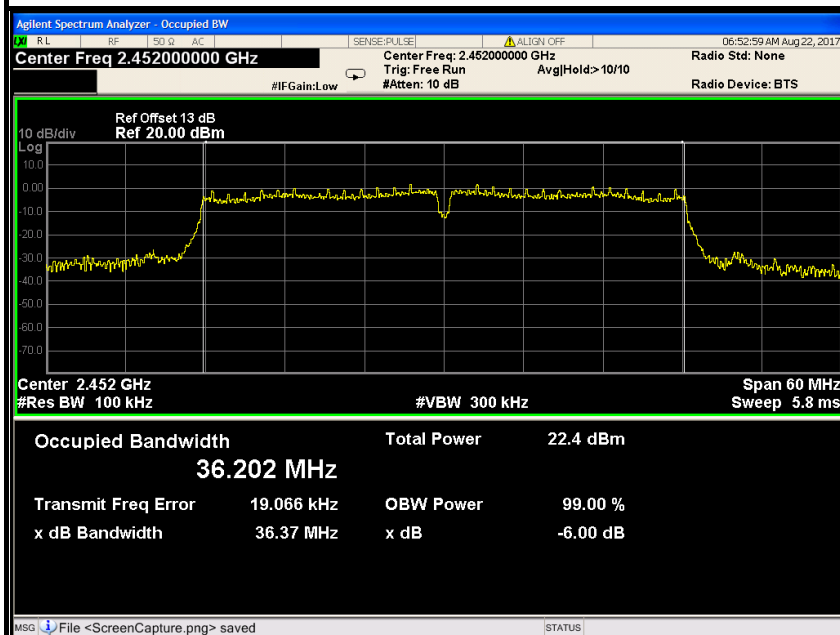




## 6dB Bandwidth (CH Mid)



## 6dB Bandwidth (CH High)





## 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**

<b>T<sub>nom</sub></b>	<b>V<sub>nom</sub></b>	<b>Lowest channel 2412MHz</b>	<b>Middle channel 2437MHz</b>	<b>Highest channel 2462MHz</b>
Conducted power [dBm/MHz] Measured with DSSS modulation		10.37	10.15	9.74
Radiated power [dBm/MHz] Measured with DSSS modulation		11.86	11.93	11.09
Gain [dBi] Calculated		1.49	1.78	1.35
Measurement uncertainty		± 1.5 dB (cond.) / ± 3 dB (rad.)		

### **Antenna 1**

<b>T<sub>nom</sub></b>	<b>V<sub>nom</sub></b>	<b>Lowest channel 2412MHz</b>	<b>Middle channel 2437MHz</b>	<b>Highest channel 2462MHz</b>
Conducted power [dBm/MHz] Measured with DSSS modulation		10.44	10.15	9.85
Radiated power [dBm/MHz] Measured with DSSS modulation		11.85	11.76	11.34
Gain [dBi] Calculated		1.41	1.61	1.49
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

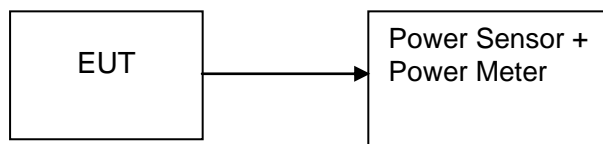
This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the *DTS bandwidth*.

- 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 0)

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	19.45	0.08810	Peak	1	PASS
Mid	2437	19.25	0.08414			PASS
High	2462	18.83	0.07638			PASS
Low	2412	15.97	0.03954	AVG	1	PASS
Mid	2437	16.14	0.04111			PASS
High	2462	15.82	0.03819			PASS

##### Test mode: IEEE 802.11b (Antenna 1)

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	19.53	0.08974	Peak	1	PASS
Mid	2437	19.25	0.08414			PASS
High	2462	18.93	0.07816			PASS
Low	2412	16.05	0.04027	AVG	1	PASS
Mid	2437	16.28	0.04246			PASS
High	2462	15.80	0.03802			PASS

##### Test mode: IEEE 802.11g (Antenna 0)

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	19.25	0.08414	Peak	1	PASS
Mid	2437	22.37	0.17258			PASS
High	2462	22.09	0.16181			PASS
Low	2412	15.67	0.03690	AVG	1	PASS
Mid	2437	15.76	0.03767			PASS
High	2462	15.64	0.03664			PASS



## Test mode: IEEE 802.11g (Antenna 1)

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	20.49	0.11194	Peak	1	PASS
Mid	2437	21.26	0.13366			PASS
High	2462	21.05	0.12735			PASS
Low	2412	15.72	0.03733	AVG	1	PASS
Mid	2437	15.56	0.03597			PASS
High	2462	15.73	0.03741			PASS

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

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Peak / AVG	Limit (W)	Result
		Antenna 0	Antenna 1	Total				
Low	2412	19.85	19.99	22.93	0.19638	Peak	1	PASS
Mid	2437	23.70	23.50	26.61	0.45829			PASS
High	2462	20.15	19.21	22.72	0.18688			PASS
Low	2412	14.92	15.07	18.01	0.06318	AVG	1	PASS
Mid	2437	16.99	16.80	19.91	0.09787			PASS
High	2462	14.91	14.97	17.95	0.06238			PASS

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

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Peak / AVG	Limit (W)	Result
		Antenna 0	Antenna 1	Total				
Low	2422	20.18	18.42	22.40	0.17373	Peak	1	PASS
Mid	2437	23.18	23.65	26.43	0.43971			PASS
High	2452	19.33	17.03	21.34	0.13617			PASS
Low	2422	14.00	13.97	17.00	0.05006	AVG	1	PASS
Mid	2437	16.47	16.27	19.38	0.08673			PASS
High	2452	13.93	13.95	16.95	0.04955			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

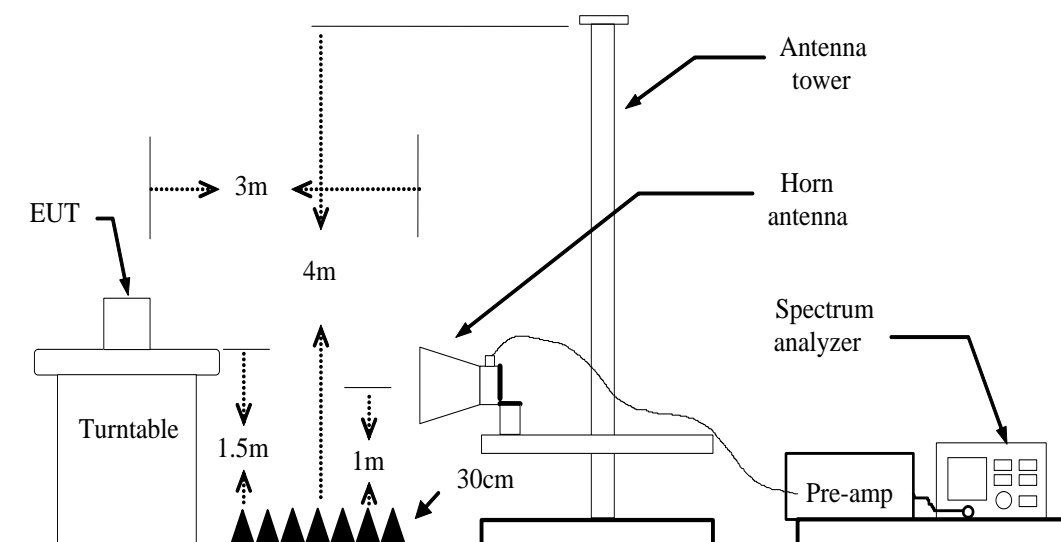
Radiated Emission Test Site 966 (2)					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
PSA Series Spectrum Analyzer	Agilent	N9010A	MY52221469	02/21/2017	02/20/2018
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/21/2017	02/20/2018
Amplifier	EMEC	EM330	060661	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	09/25/2016	09/24/2017
Bilog Antenna	SCHAFFNER	CBL6143	5082	02/21/2017	02/20/2018
Horn Antenna	SCHWARZBECK	BBHA9120	D286	02/27/2018	02/27/2018
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	02/27/2018	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



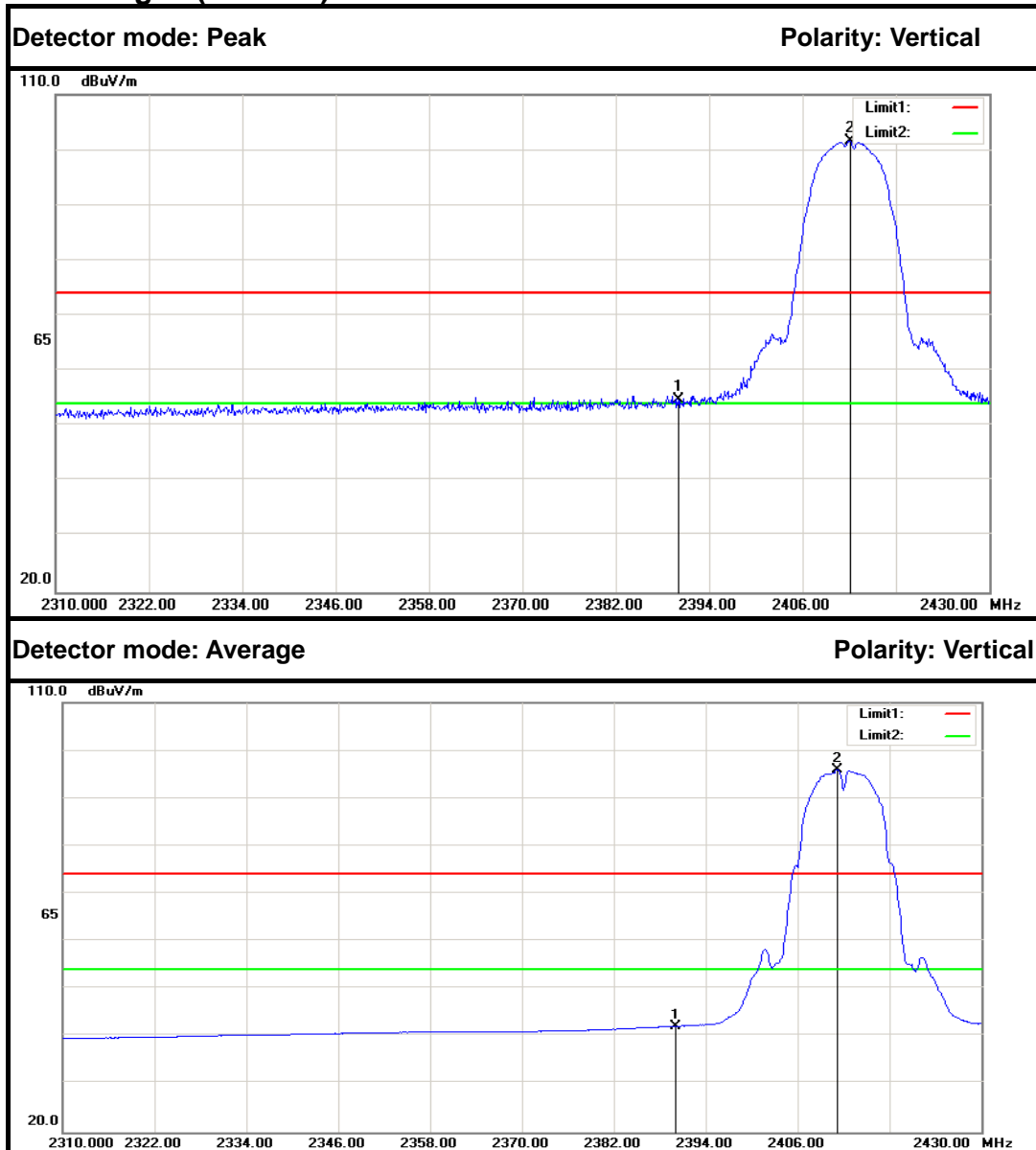


## 7.6.5. TEST RESULTS

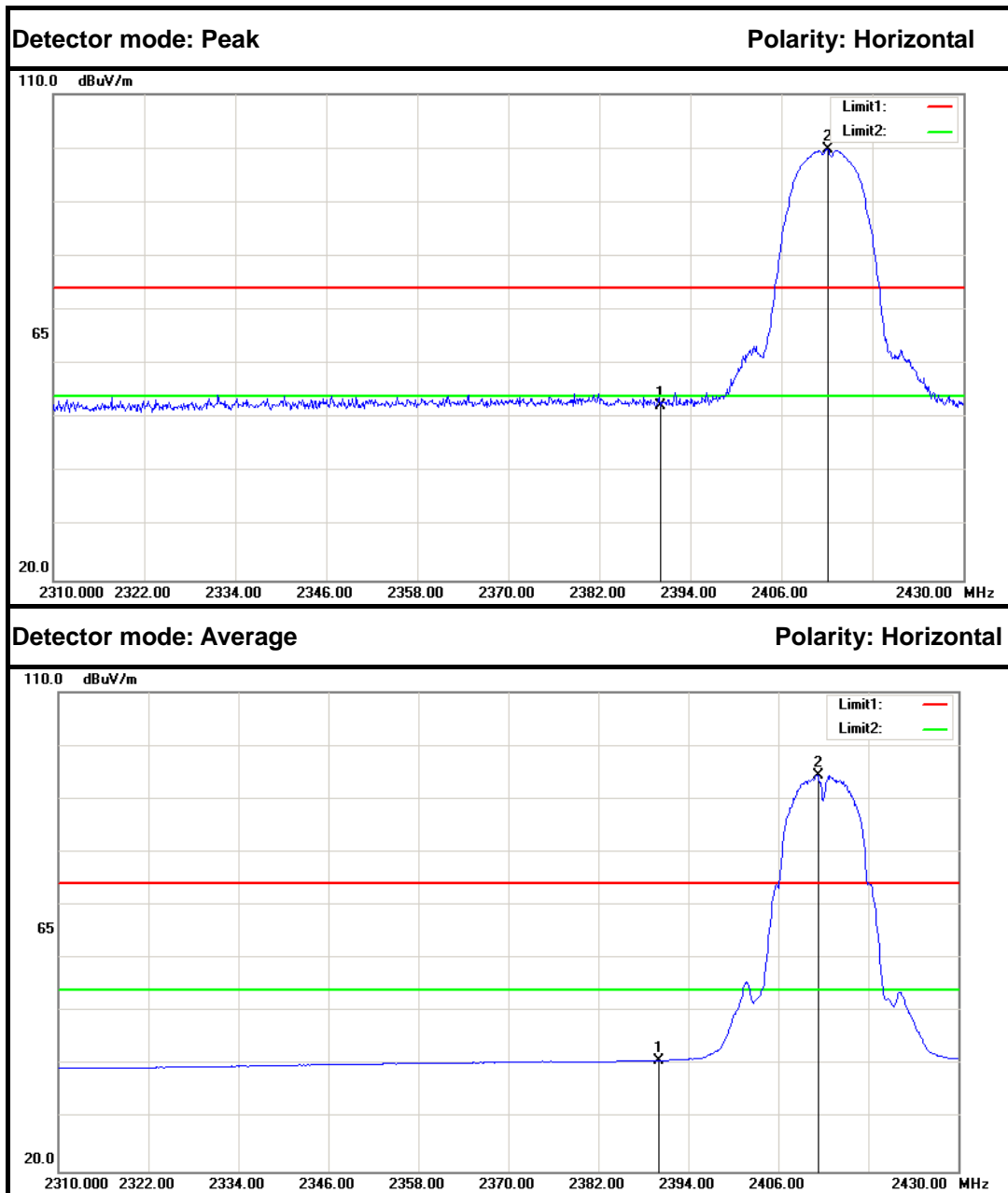
### Test Plot

IEEE 802.11b mode (Antenna 0)

Band Edges (CH Low)



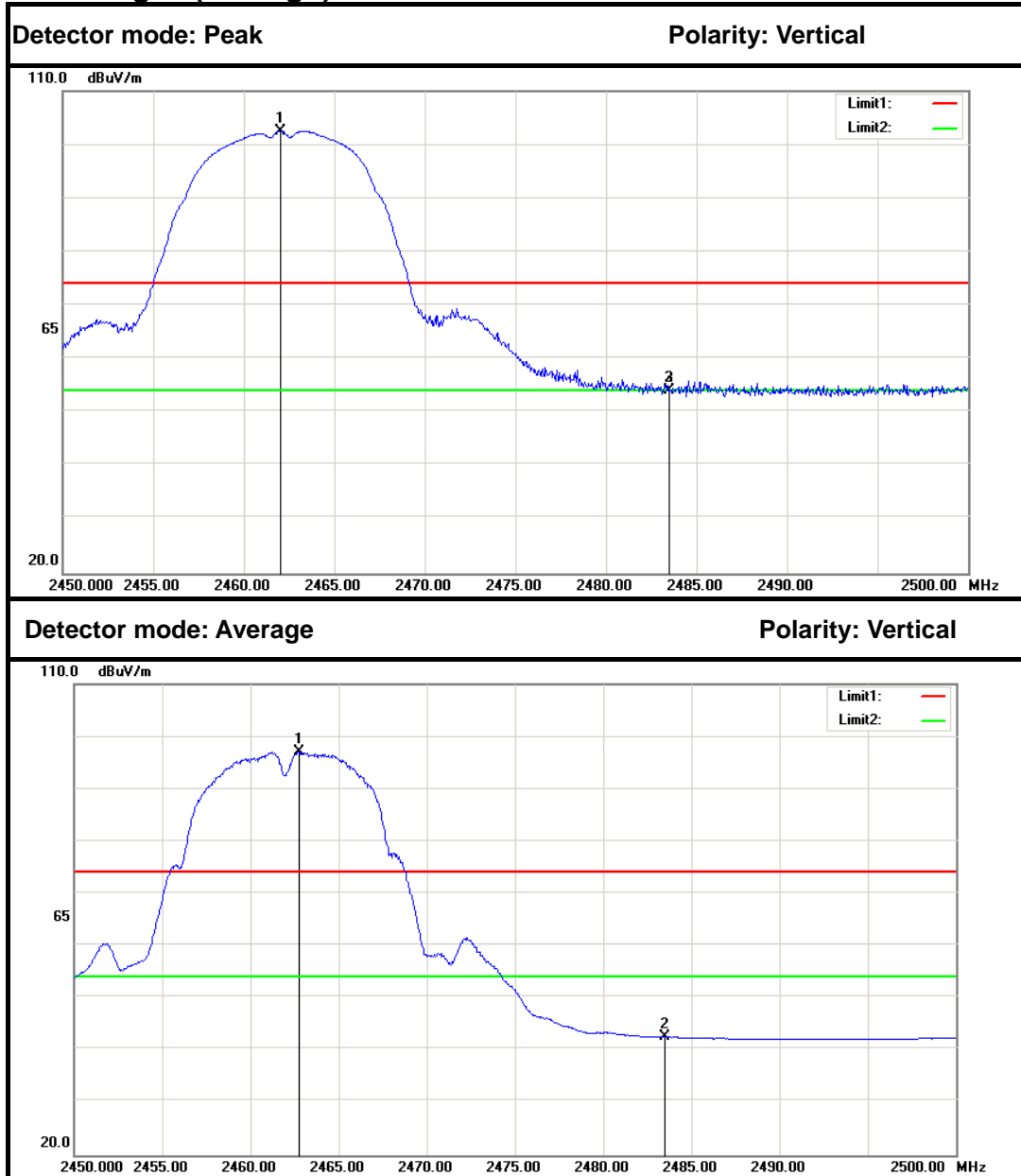
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	57.68	-2.86	54.82	74.00	-19.18	Peak	Vertical
2	2412.120	104.37	-2.74	101.63	---	---	Peak	Vertical
1	2390.000	45.04	-2.86	42.18	54.00	-11.82	Average	Vertical
2	2411.160	98.74	-2.75	95.99	---	---	Average	Vertical



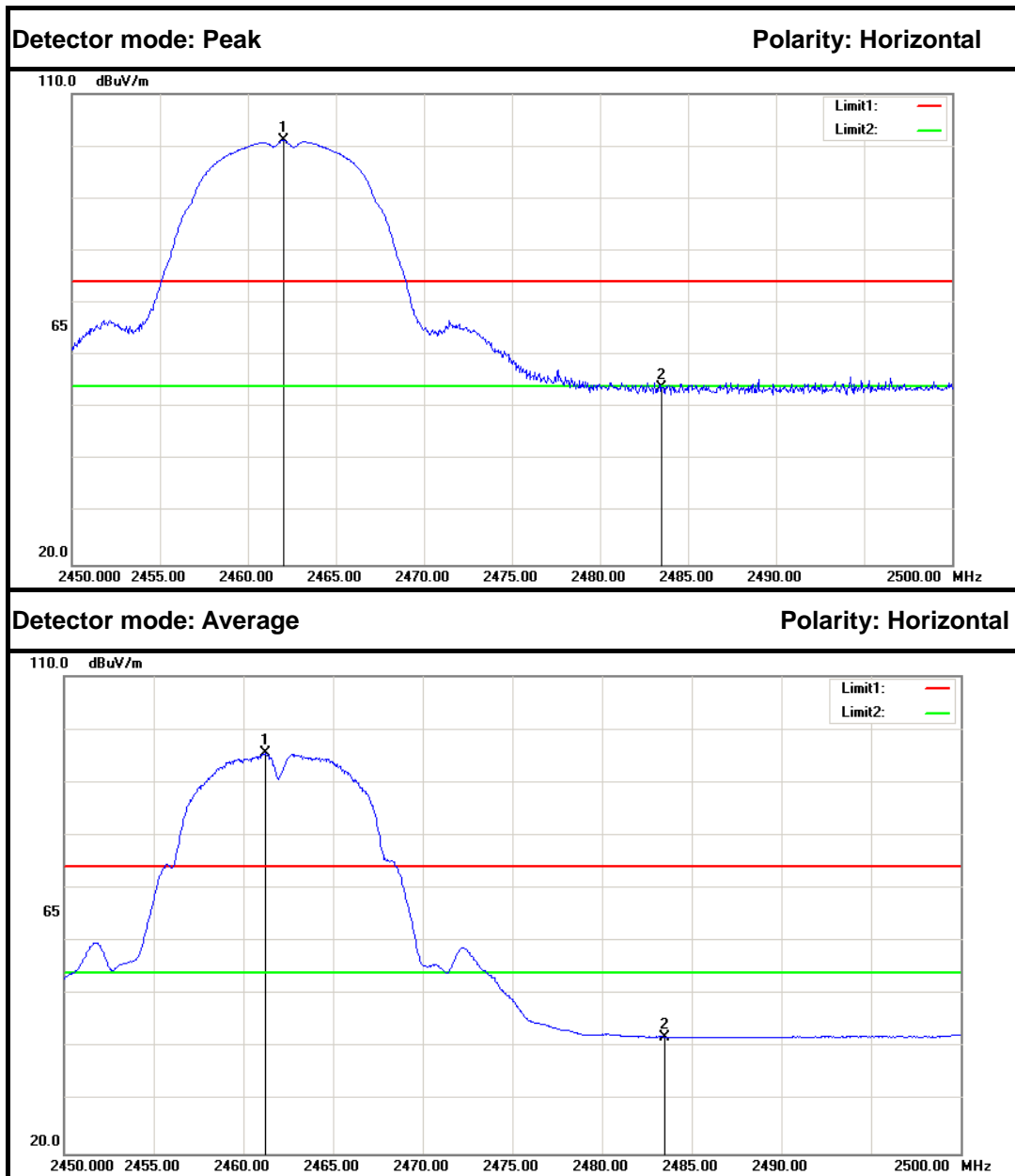
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	55.06	-2.86	52.20	74.00	-21.80	Peak	Horizontal
2	2412.120	102.57	-2.74	99.83	---	---	Peak	Horizontal
1	2390.000	43.72	-2.86	40.86	54.00	-13.14	Average	Horizontal
2	2411.280	97.16	-2.75	94.41	---	---	Average	Horizontal



### Band Edges (CH High)



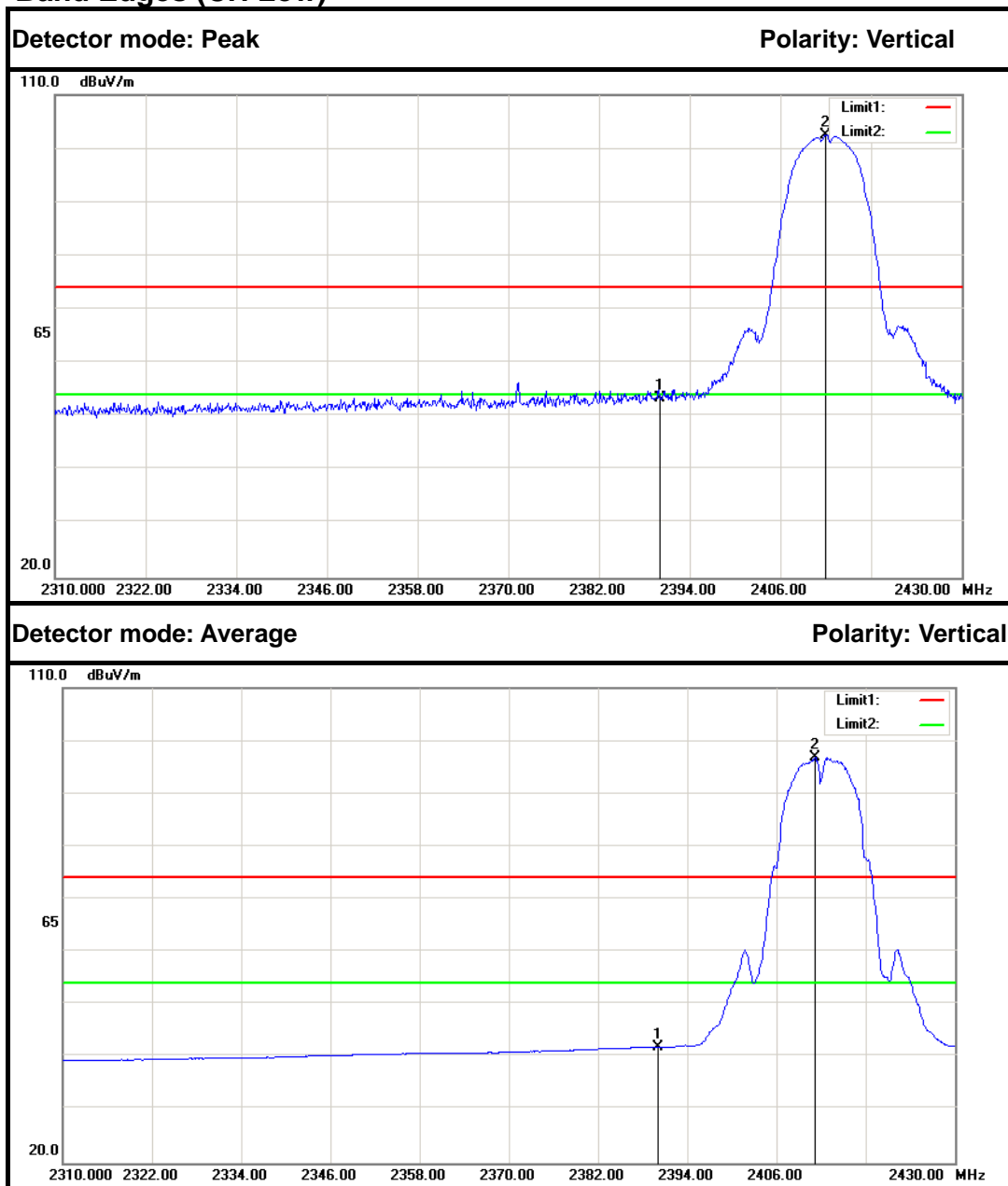
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2462.050	105.01	-2.47	102.54	---	---	Peak	Vertical
2	2483.500	56.37	-2.35	54.02	74.00	-19.98	Peak	Vertical
1	2462.750	99.58	-2.46	97.12	---	---	Average	Vertical
2	2483.500	44.92	-2.35	42.57	54.00	-11.43	Average	Vertical



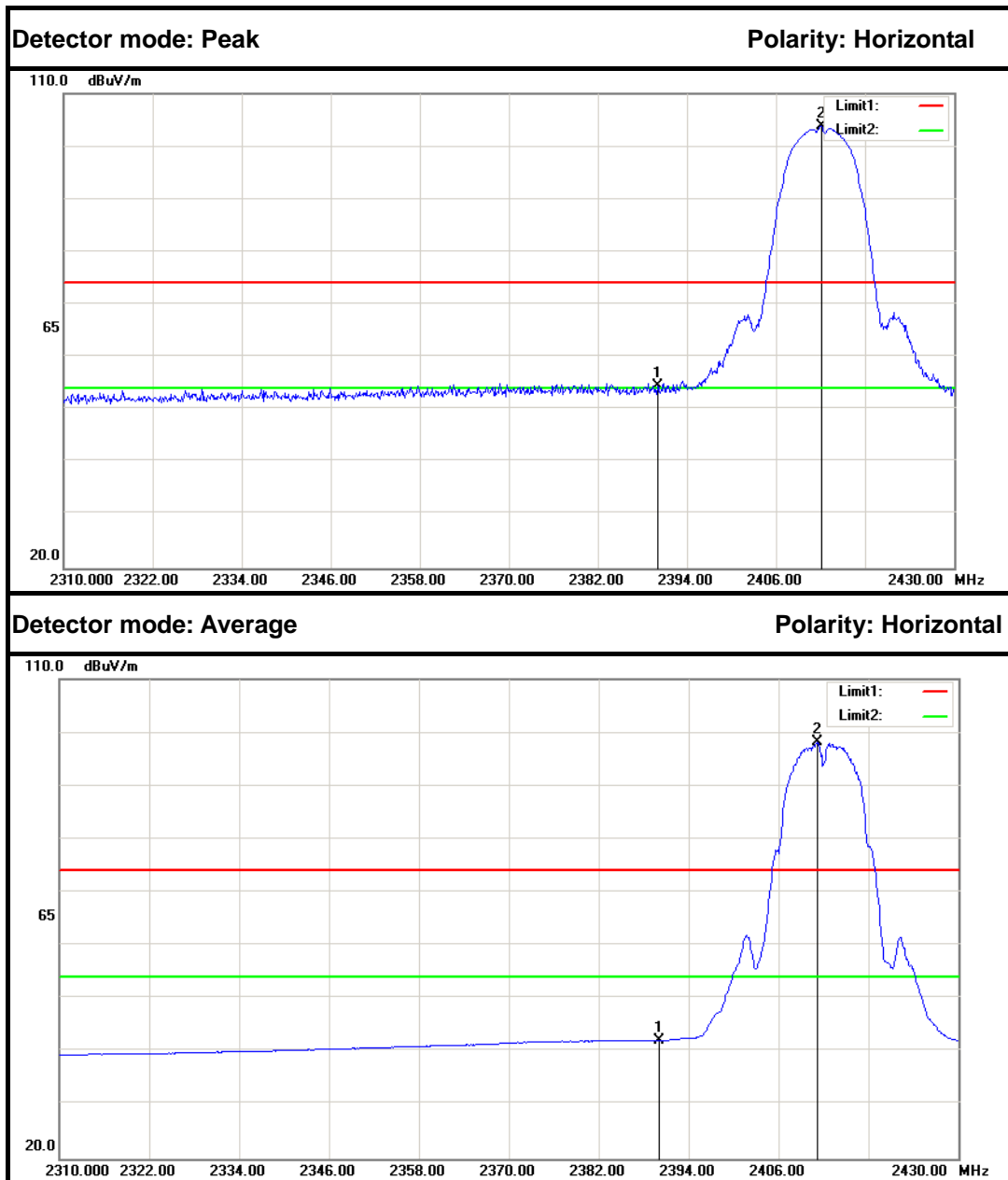
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2462.000	103.51	-2.47	101.04	---	---	Peak	Horizontal
2	2483.500	56.13	-2.35	53.78	74.00	-20.22	Peak	Horizontal
1	2461.250	97.92	-2.47	95.45	---	---	Average	Horizontal
2	2483.500	44.36	-2.35	42.01	54.00	-11.99	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	56.27	-2.86	53.41	74.00	-20.59	Peak	Vertical
2	2412.000	105.29	-2.74	102.55	---	---	Peak	Vertical
1	2390.000	44.78	-2.86	41.92	54.00	-12.08	Average	Vertical
2	2411.160	99.58	-2.75	96.83	---	---	Average	Vertical

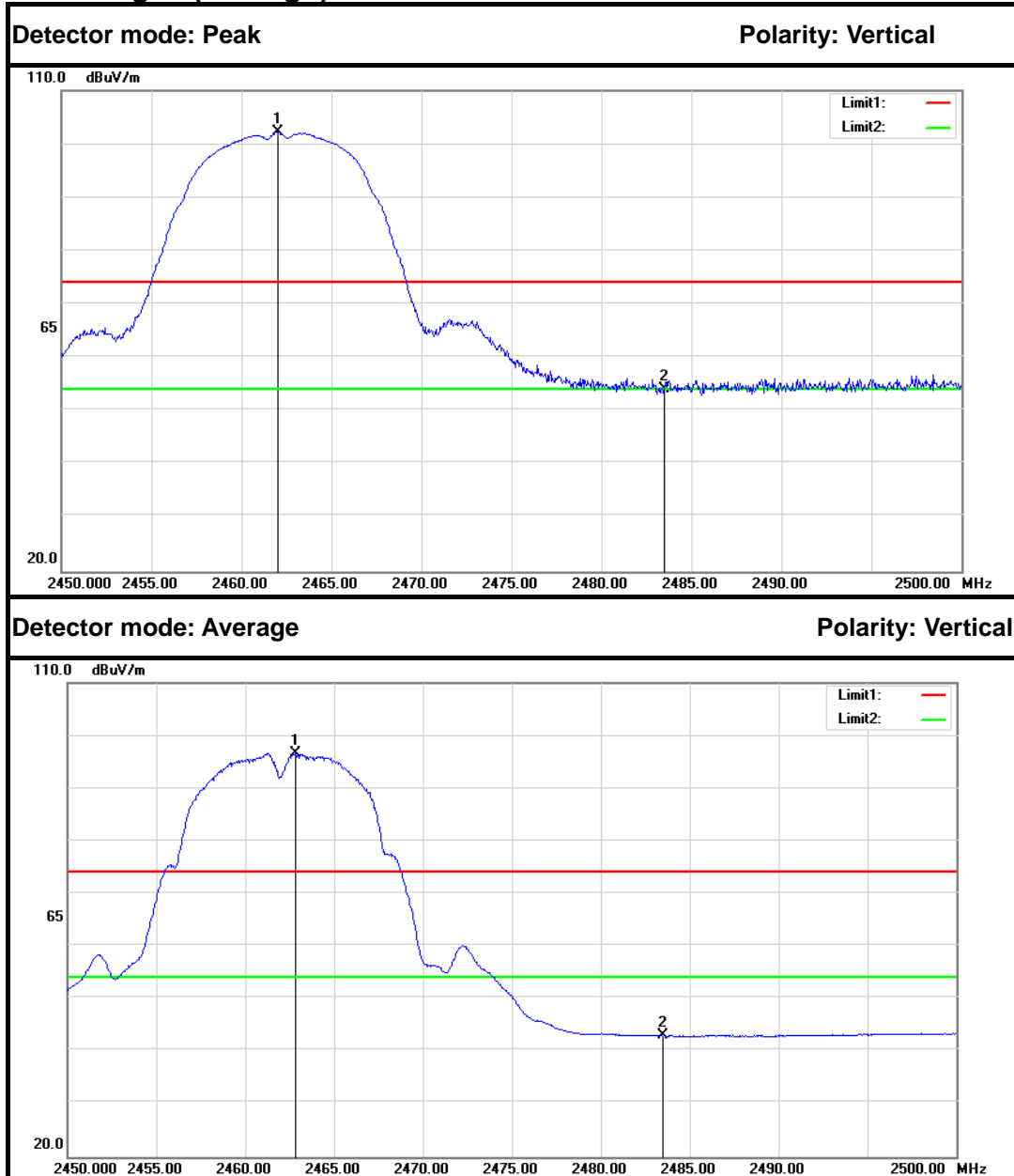


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	57.37	-2.86	54.51	74.00	-19.49	Peak	Horizontal
2	2412.120	106.45	-2.74	103.71	---	---	Peak	Horizontal
1	2390.000	45.08	-2.86	42.22	54.00	-11.78	Average	Horizontal
2	2411.160	100.85	-2.75	98.10	---	---	Average	Horizontal

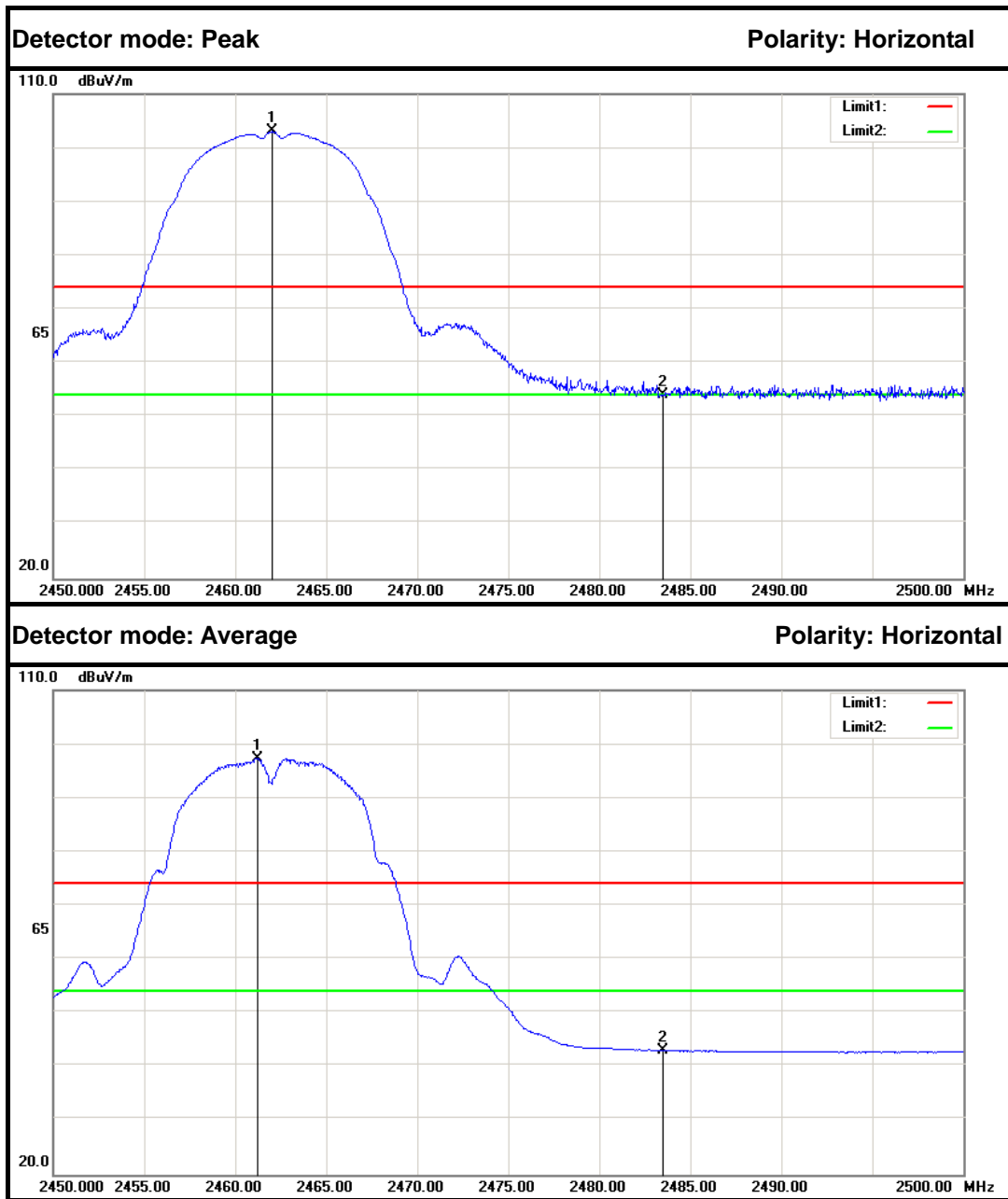




### Band Edges (CH High)



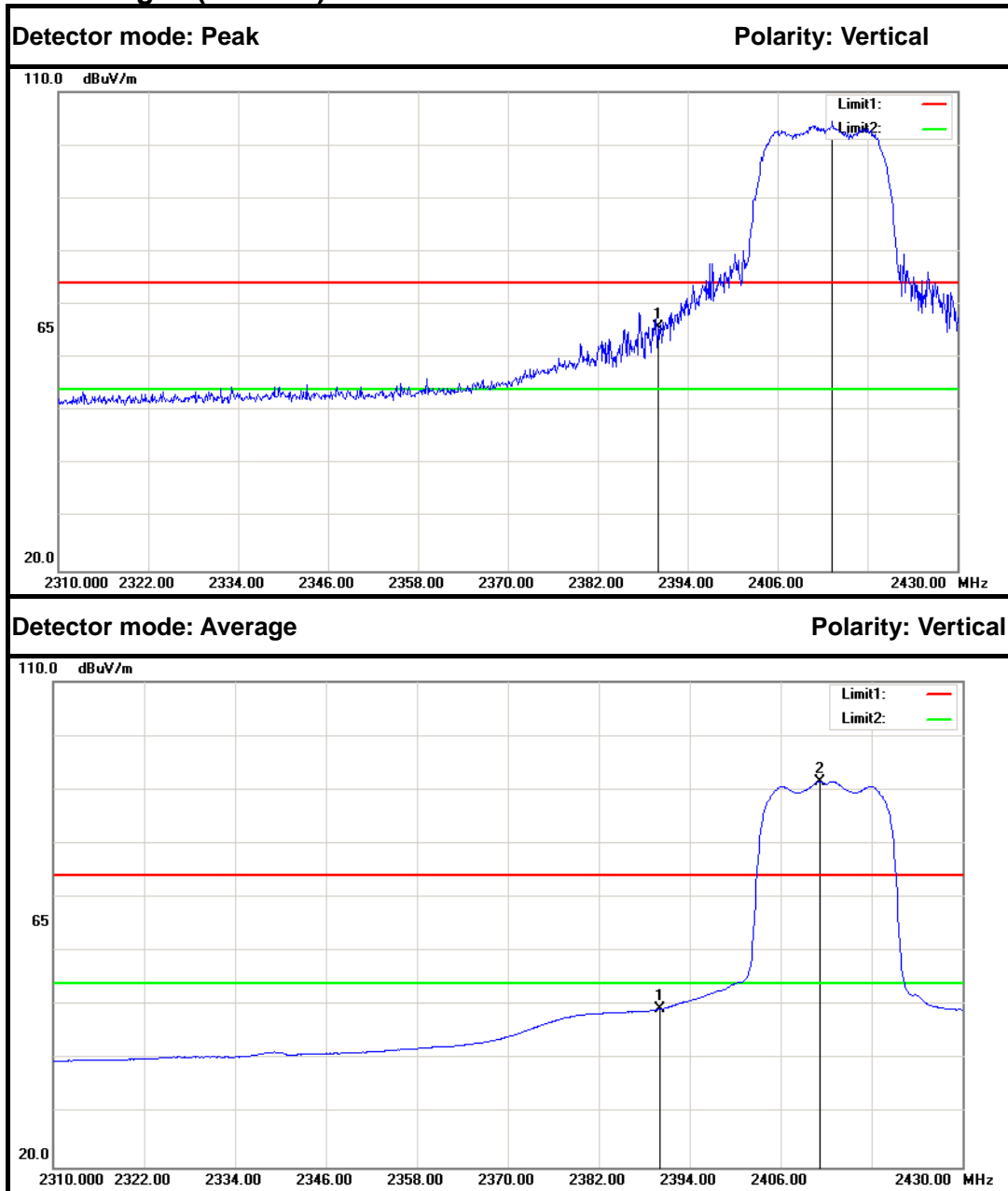
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2462.000	104.72	-2.47	102.25	---	---	Peak	Vertical
2	2483.500	56.45	-2.35	54.10	74.00	-19.90	Peak	Vertical
1	2462.800	99.03	-2.46	96.57	---	---	Average	Vertical
2	2483.500	45.30	-2.35	42.95	54.00	-11.05	Average	Vertical



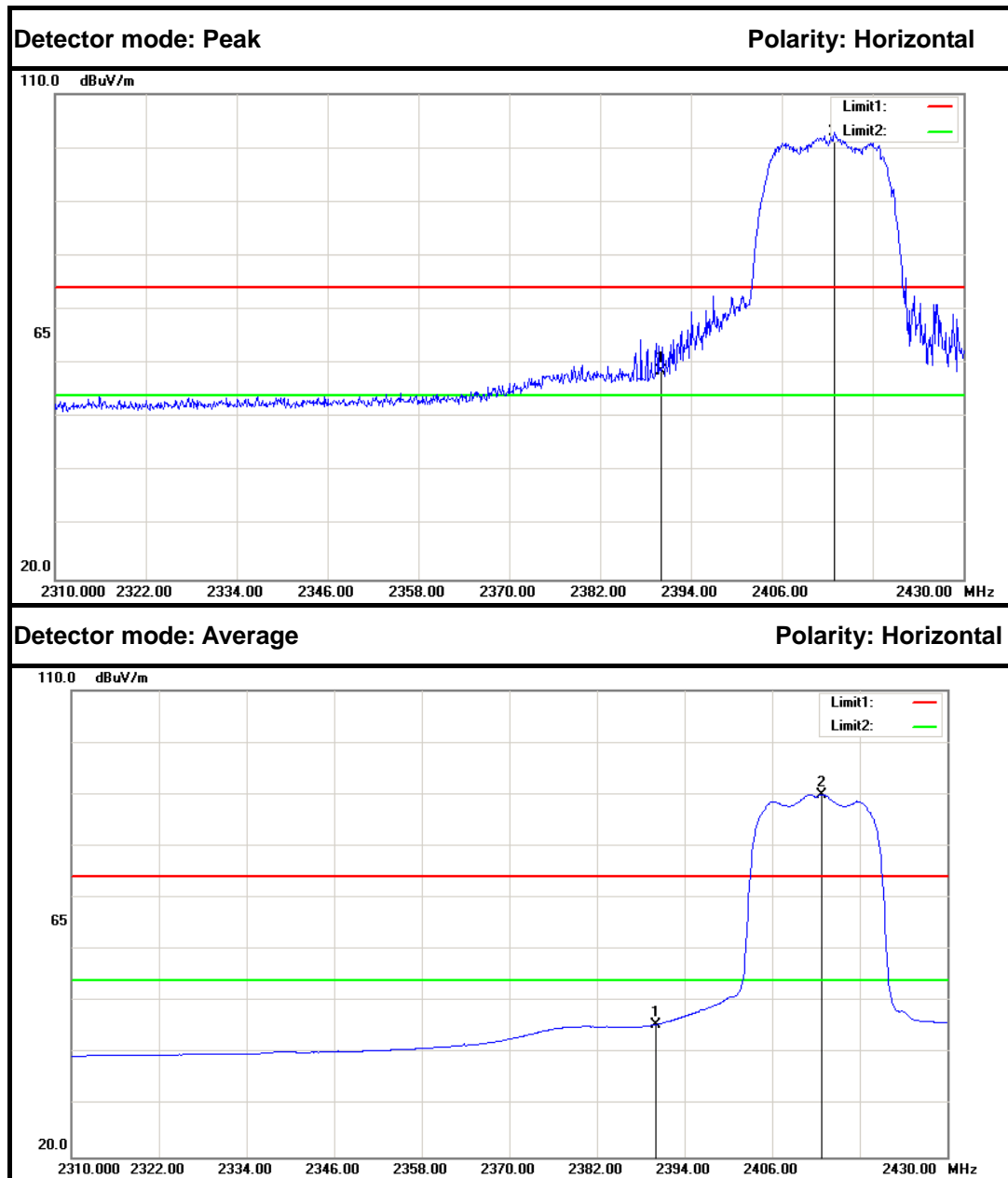
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2462.050	105.50	-2.47	103.03	---	---	Peak	Horizontal
2	2483.500	56.44	-2.35	54.09	74.00	-19.91	Peak	Horizontal
1	2461.250	99.78	-2.47	97.31	---	---	Average	Horizontal
2	2483.500	45.38	-2.35	43.03	54.00	-10.97	Average	Horizontal



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



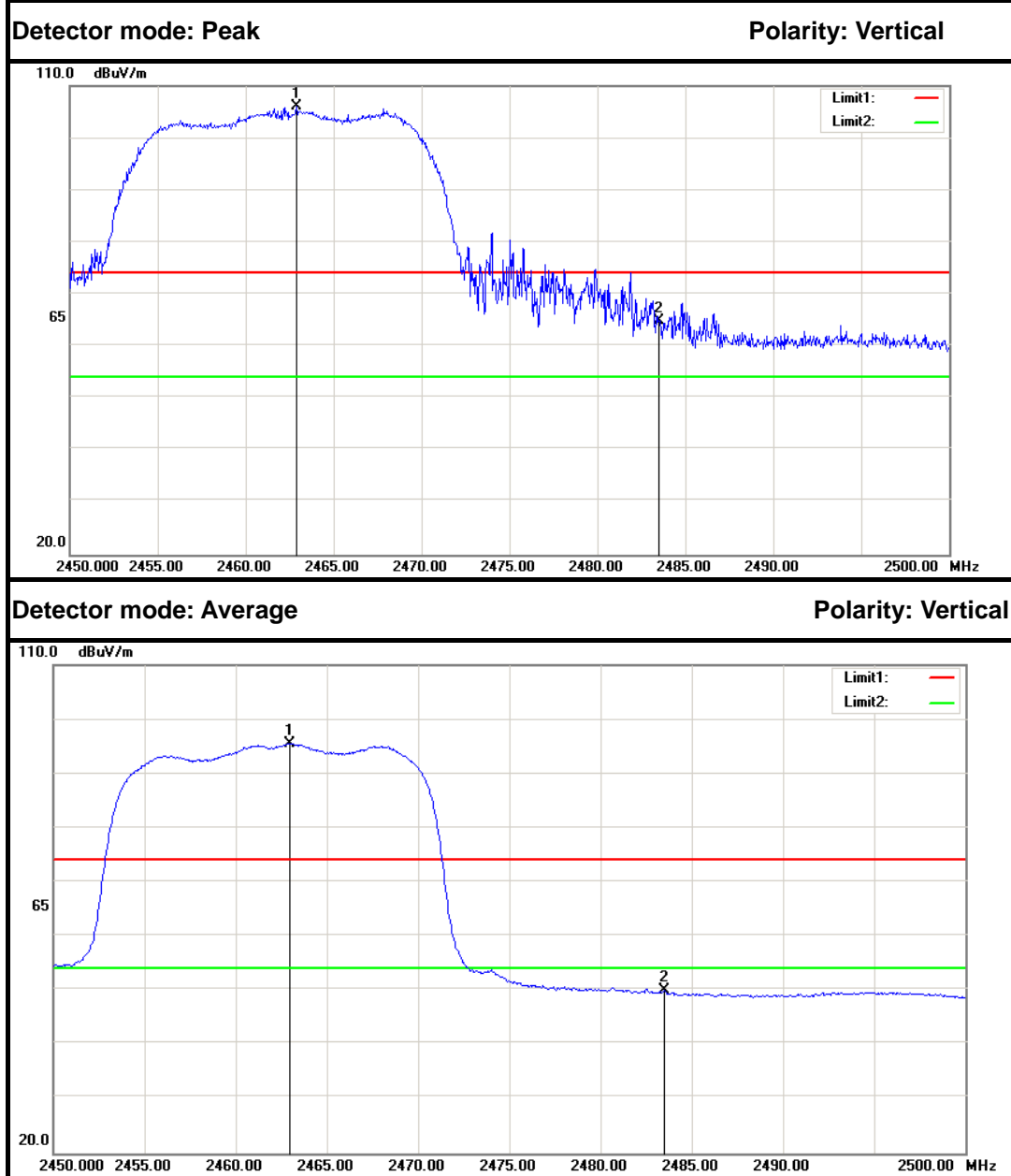
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	68.72	-2.86	65.86	74.00	-8.14	Peak	Vertical
2	2413.320	107.17	-2.73	104.44	---	---	Peak	Vertical
1	2390.000	52.18	-2.86	49.32	54.00	-4.68	Average	Vertical
2	2411.160	94.28	-2.75	91.53	---	---	Average	Vertical



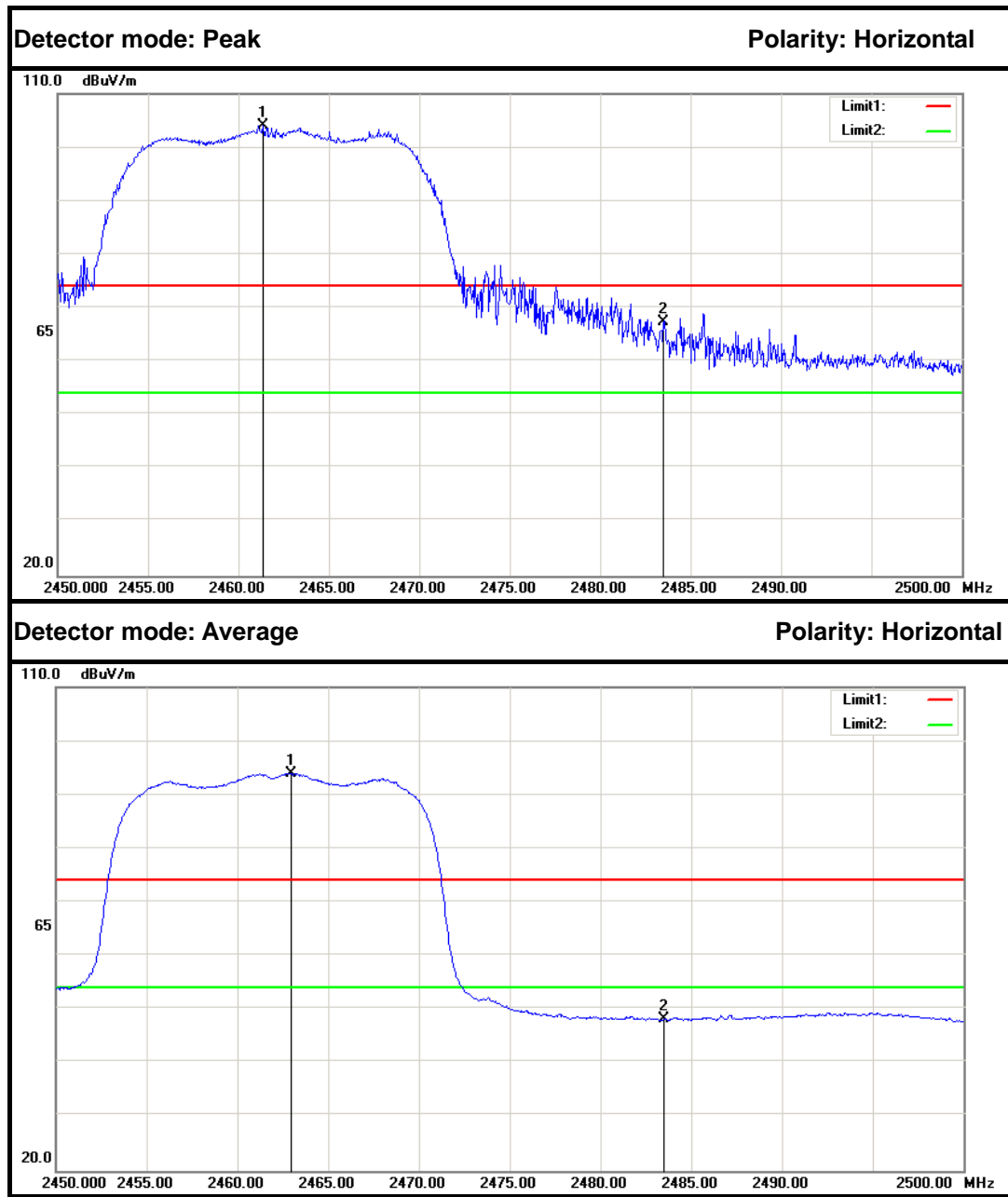
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	61.52	-2.86	58.66	74.00	-15.34	Peak	Horizontal
2	2412.960	105.65	-2.74	102.91	---	---	Peak	Horizontal
1	2390.000	48.40	-2.86	45.54	54.00	-8.46	Average	Horizontal
2	2412.840	92.70	-2.74	89.96	---	---	Average	Horizontal



### Band Edges (CH High)



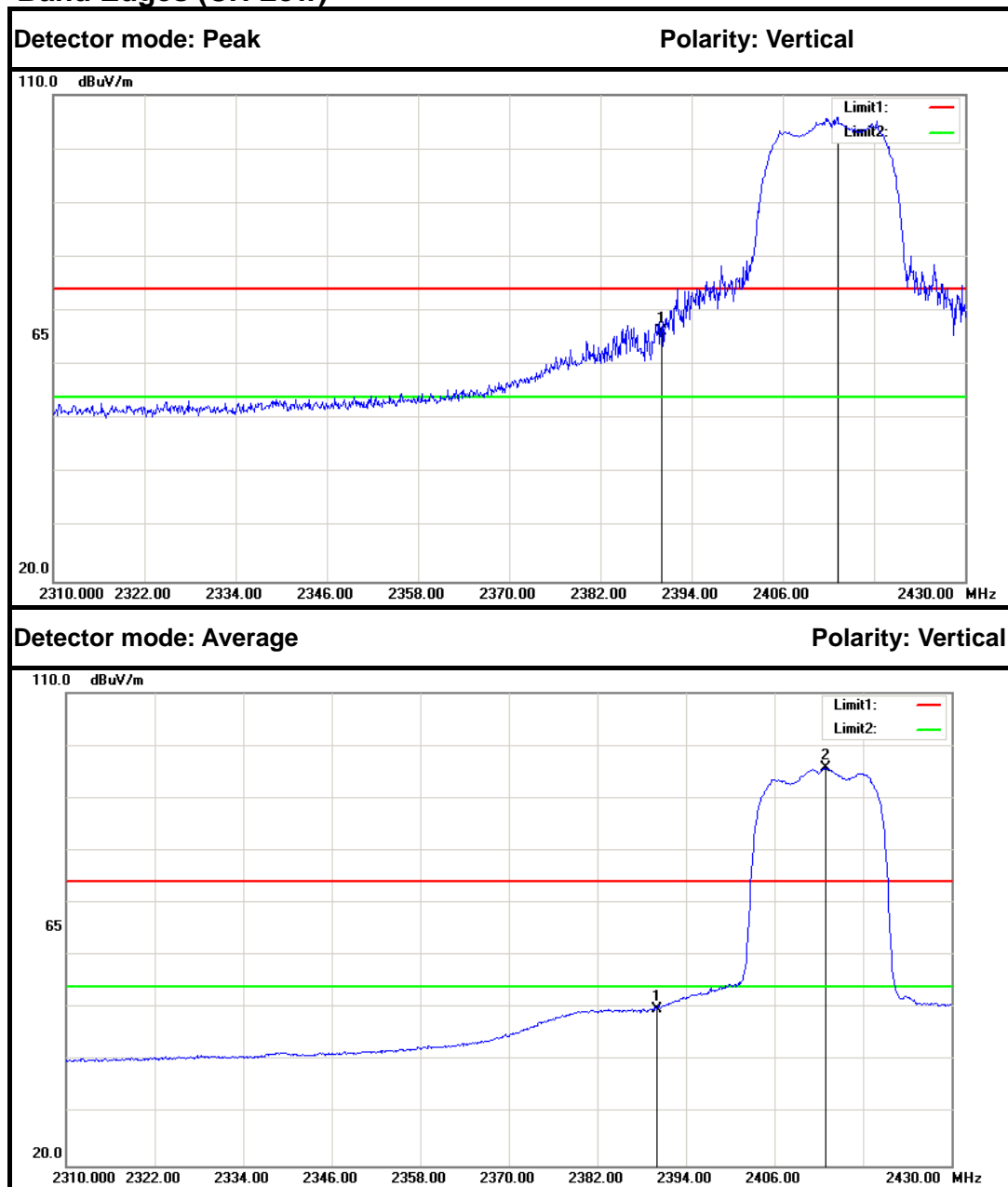
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2462.900	108.63	-2.46	106.17	---	---	Peak	Vertical
2	2483.500	67.23	-2.35	64.88	74.00	-9.12	Peak	Vertical
1	2462.950	98.02	-2.46	95.56	---	---	Average	Vertical
2	2483.500	52.31	-2.35	49.96	54.00	-4.04	Average	Vertical



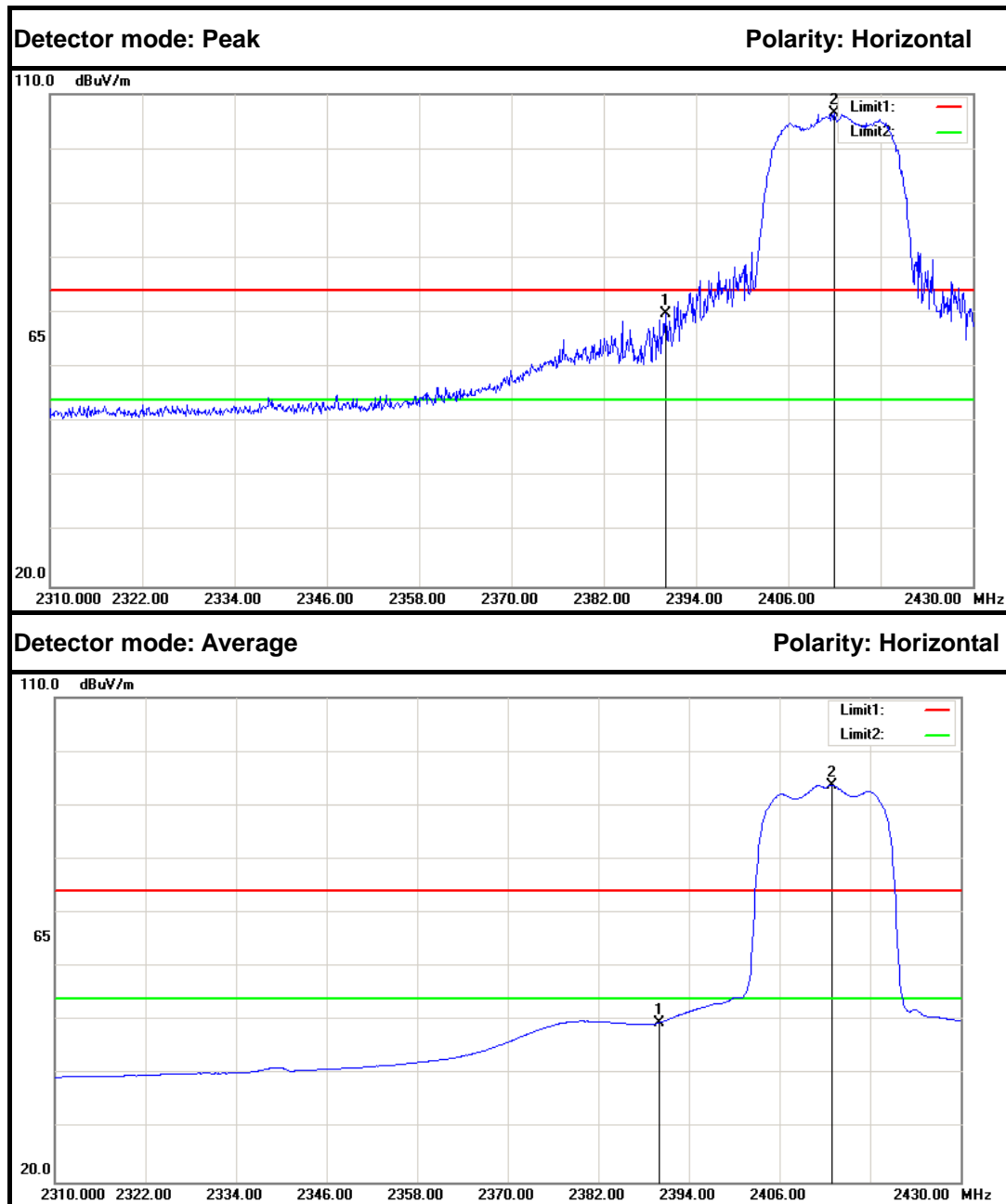
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2461.350	106.42	-2.47	103.95	---	---	Peak	Horizontal
2	2483.500	69.76	-2.35	67.41	74.00	-6.59	Peak	Horizontal
1	2462.950	96.43	-2.46	93.97	---	---	Average	Horizontal
2	2483.500	50.52	-2.35	48.17	54.00	-5.83	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	69.11	-2.86	66.25	74.00	-7.75	Peak	Vertical
2	2413.200	108.67	-2.74	105.93	---	---	Peak	Vertical
1	2390.000	52.77	-2.86	49.91	54.00	-4.09	Average	Vertical
2	2412.960	98.38	-2.74	95.64	---	---	Average	Vertical

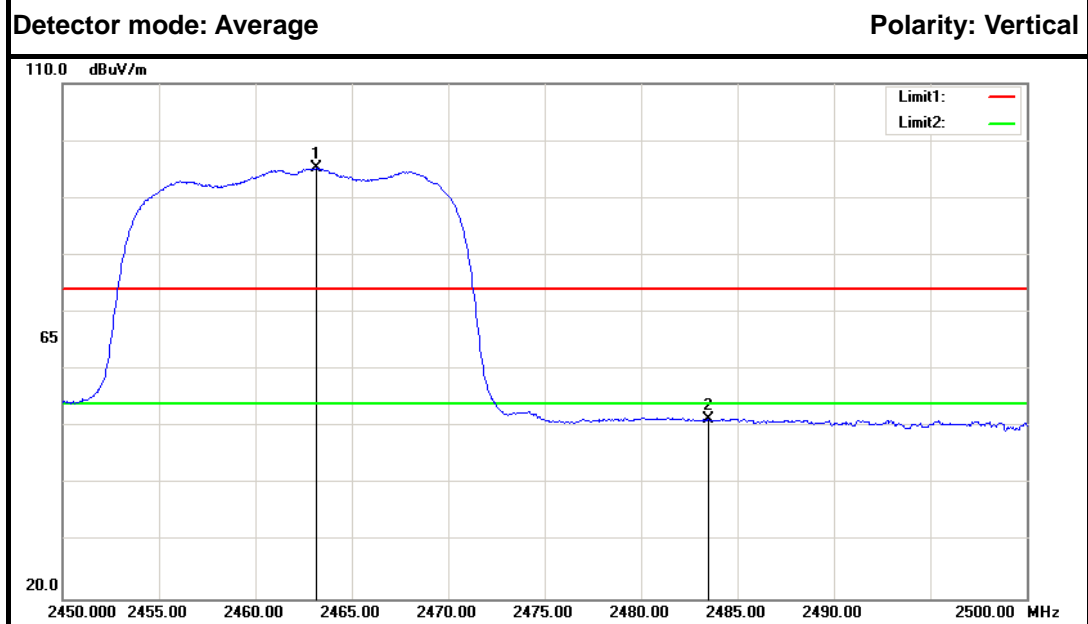
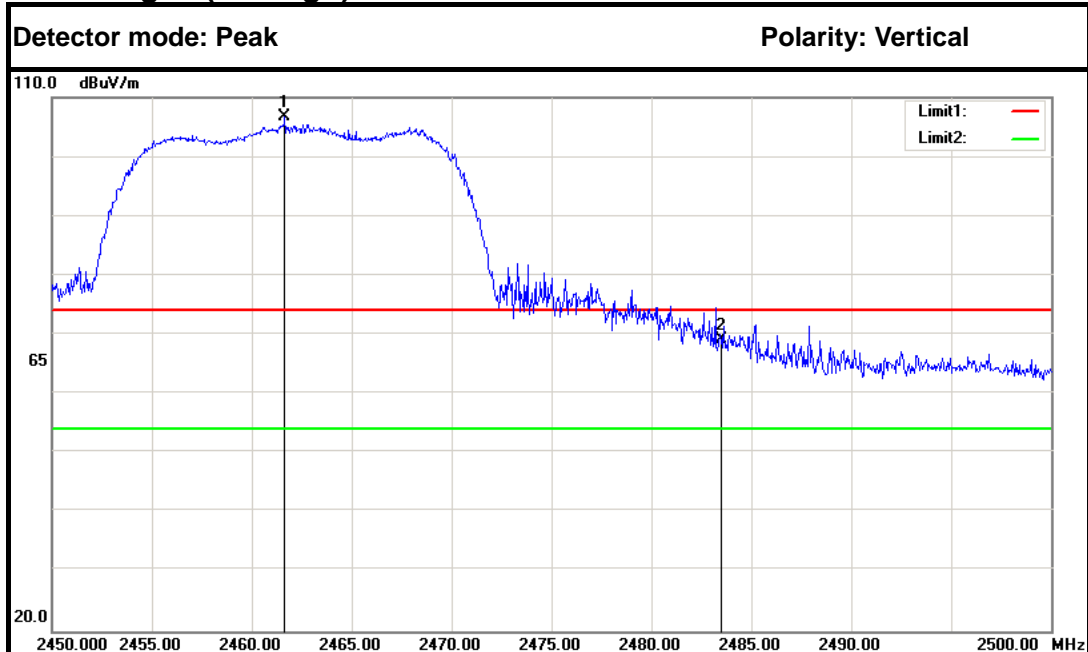


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	72.67	-2.86	69.81	74.00	-4.19	Peak	Horizontal
2	2412.000	109.22	-2.74	106.48	---	---	Peak	Horizontal
1	2390.000	52.54	-2.86	49.68	54.00	-4.32	Average	Horizontal
2	2412.960	96.53	-2.74	93.79	---	---	Average	Horizontal

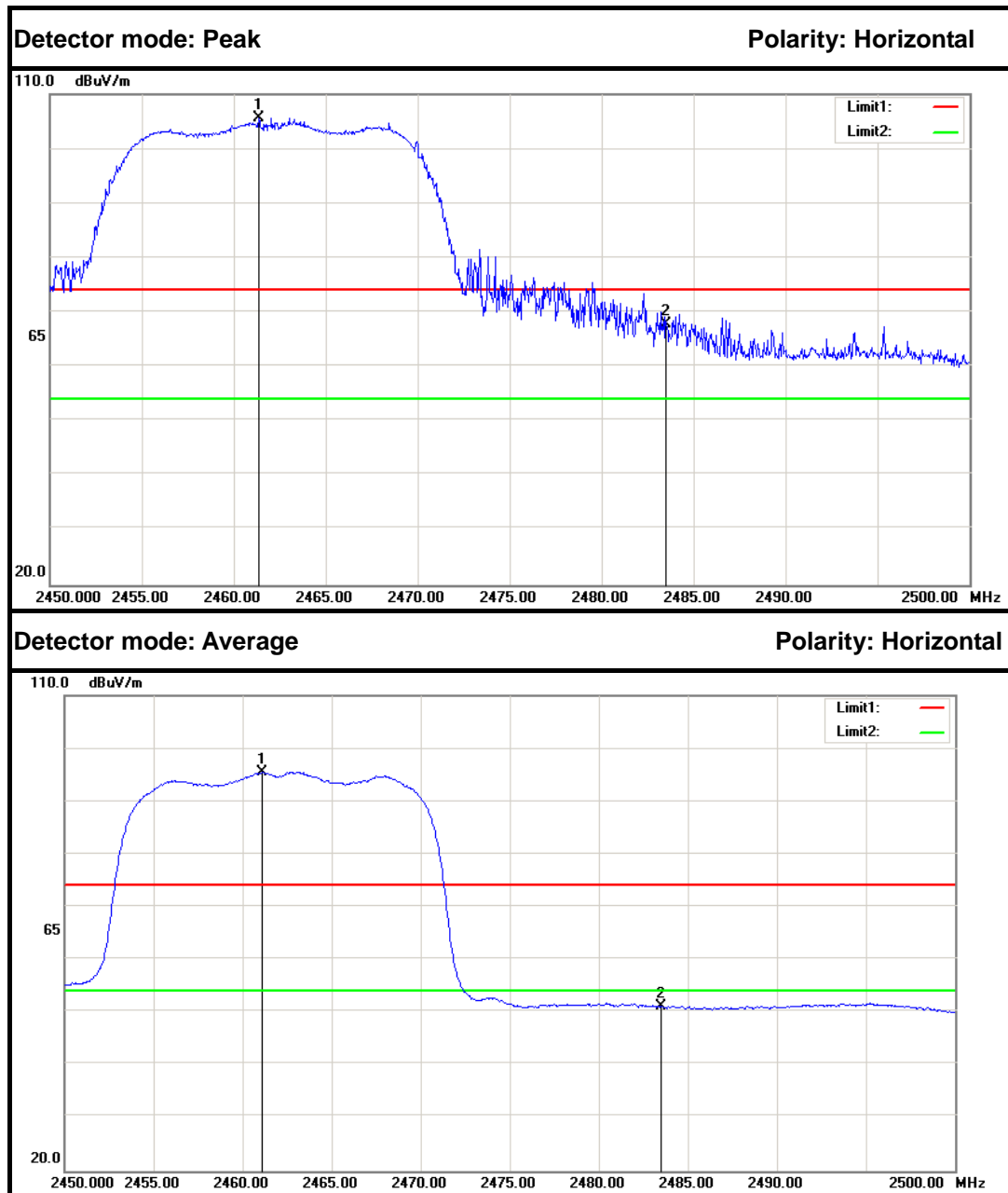




### Band Edges (CH High)



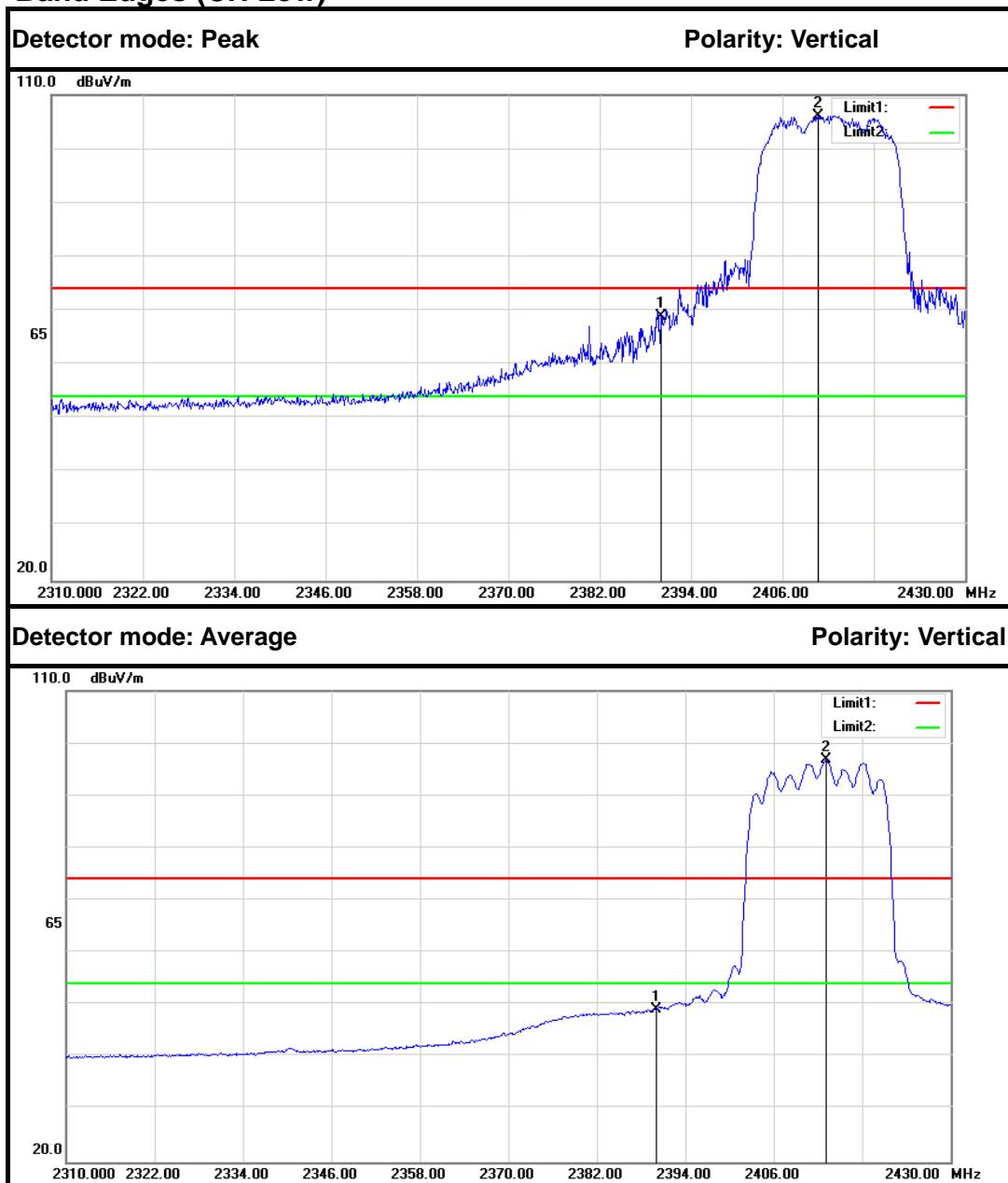
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2461.650	109.23	-2.47	106.76	---	---	Peak	Vertical
2	2483.500	71.61	-2.35	69.26	74.00	-4.74	Peak	Vertical
1	2463.150	97.74	-2.46	95.28	---	---	Average	Vertical
2	2483.500	53.65	-2.35	51.30	54.00	-2.70	Average	Vertical



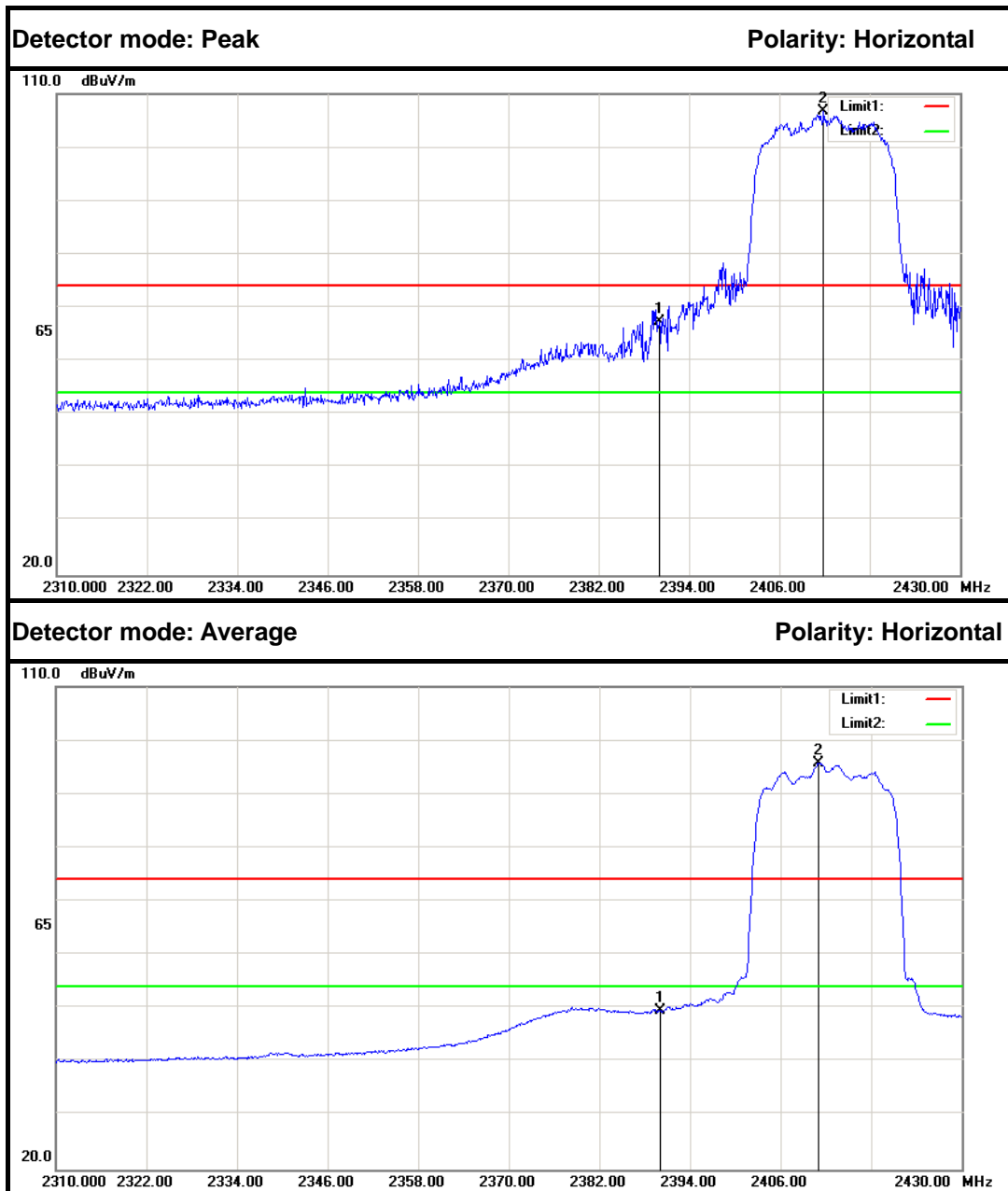
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2461.350	108.14	-2.47	105.67	---	---	Peak	Horizontal
2	2483.500	70.12	-2.35	67.77	74.00	-6.23	Peak	Horizontal
1	2461.100	97.94	-2.47	95.47	---	---	Average	Horizontal
2	2483.500	53.45	-2.35	51.10	54.00	-2.90	Average	Horizontal



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



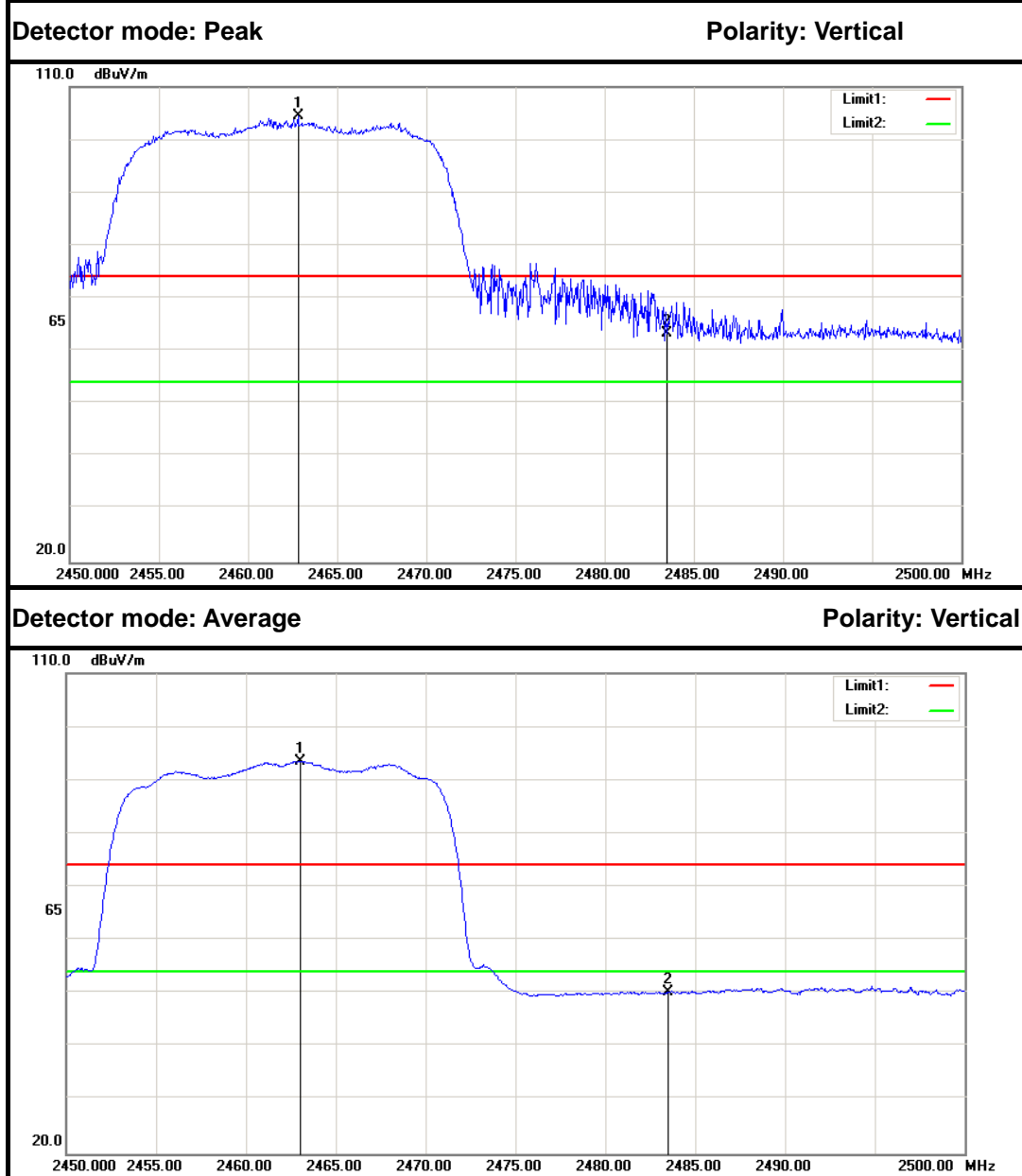
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	71.71	-2.86	68.85	74.00	-5.15	Peak	Vertical
2	2410.680	108.88	-2.75	106.13	---	---	Peak	Vertical
1	2390.000	52.10	-2.86	49.24	54.00	-4.76	Average	Vertical
2	2413.080	99.59	-2.74	96.85	---	---	Average	Vertical



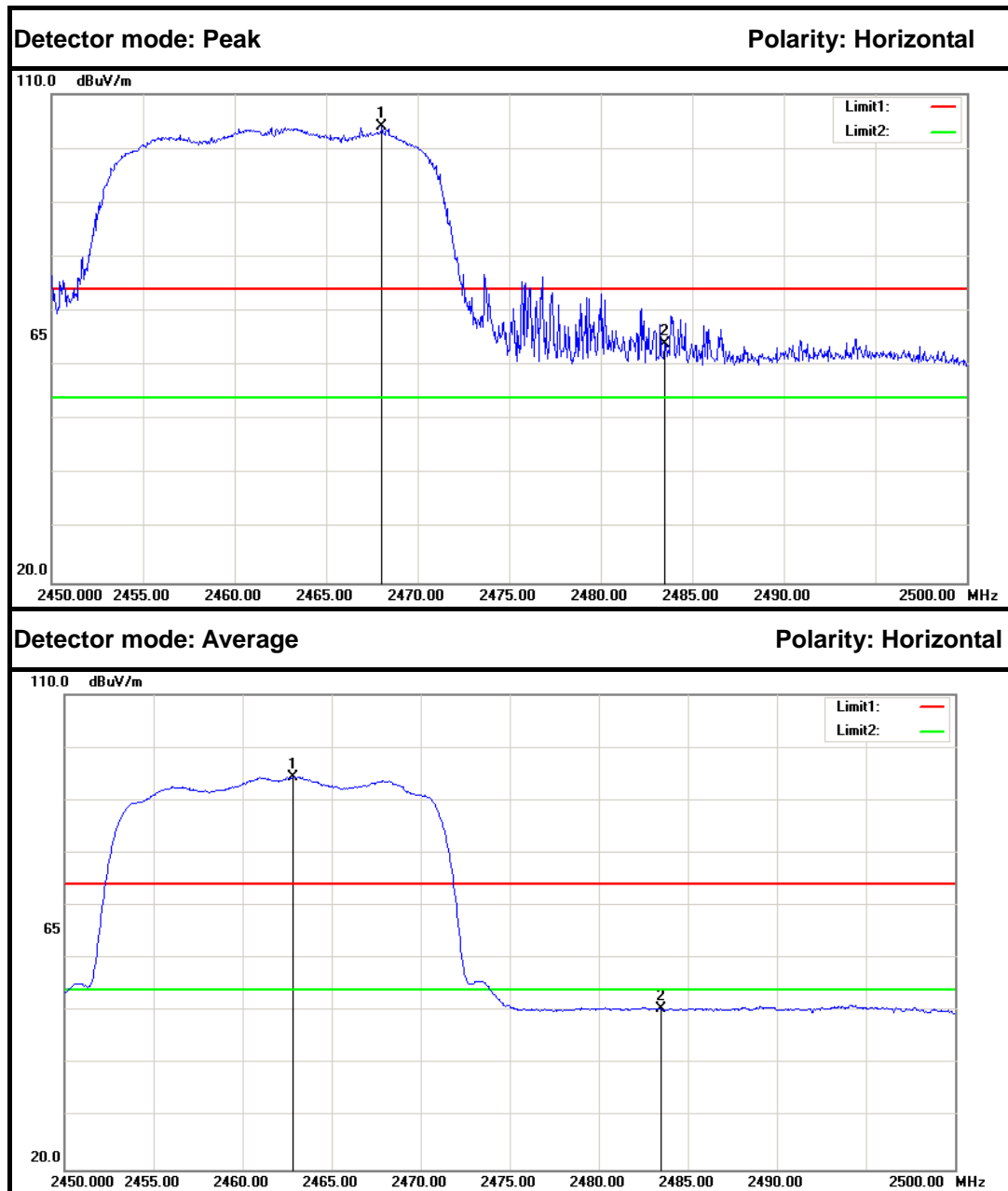
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	70.29	-2.86	67.43	74.00	-6.57	Peak	Horizontal
2	2411.880	109.37	-2.74	106.63	---	---	Peak	Horizontal
1	2390.000	52.46	-2.86	49.60	54.00	-4.40	Average	Horizontal
2	2411.040	98.52	-2.75	95.77	---	---	Average	Horizontal



### Band Edges (CH High)



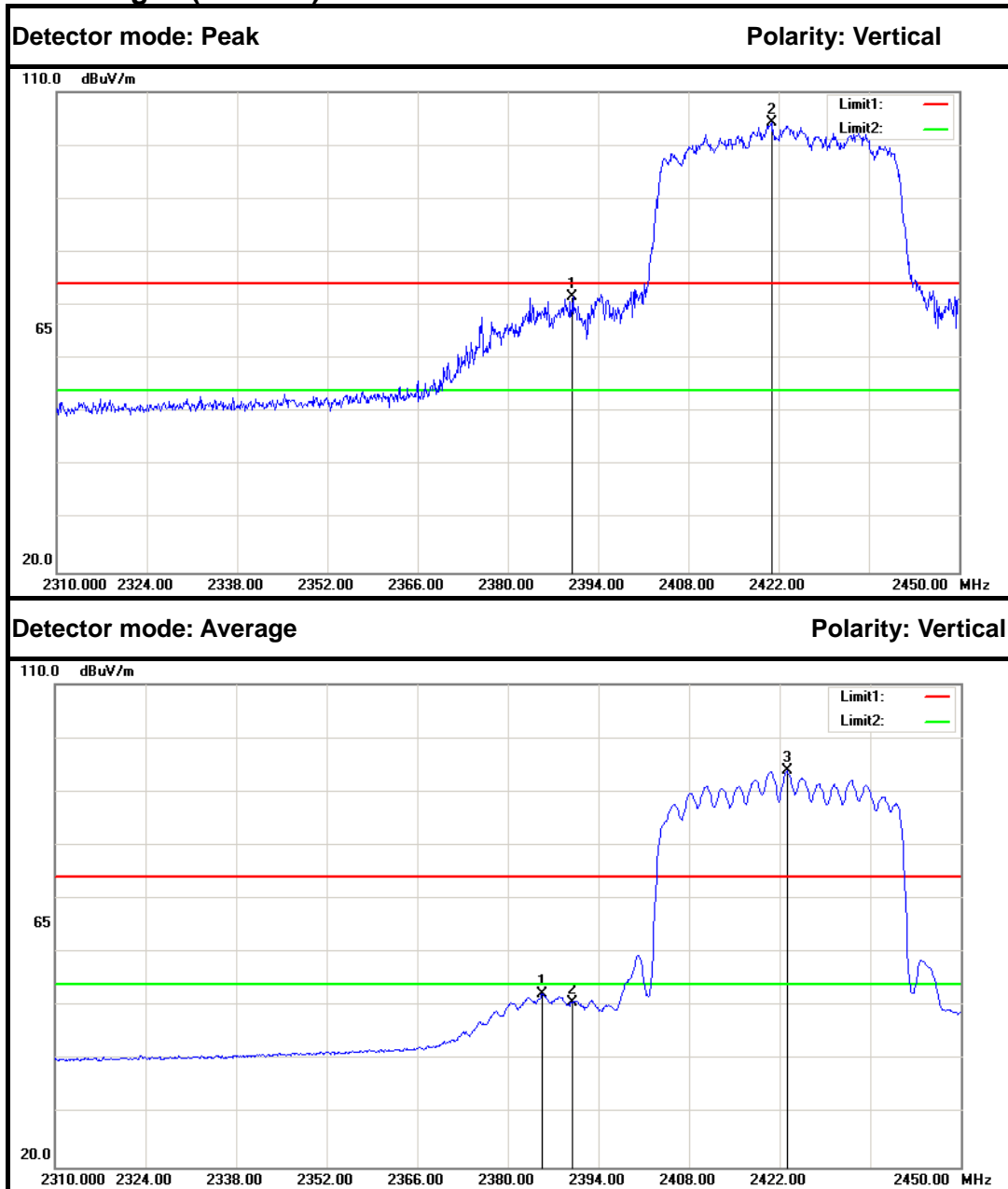
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2462.800	106.85	-2.46	104.39	---	---	Peak	Vertical
2	2483.500	65.69	-2.35	63.34	74.00	-10.66	Peak	Vertical
1	2463.050	95.90	-2.46	93.44	---	---	Average	Vertical
2	2483.500	52.66	-2.35	50.31	54.00	-3.69	Average	Vertical



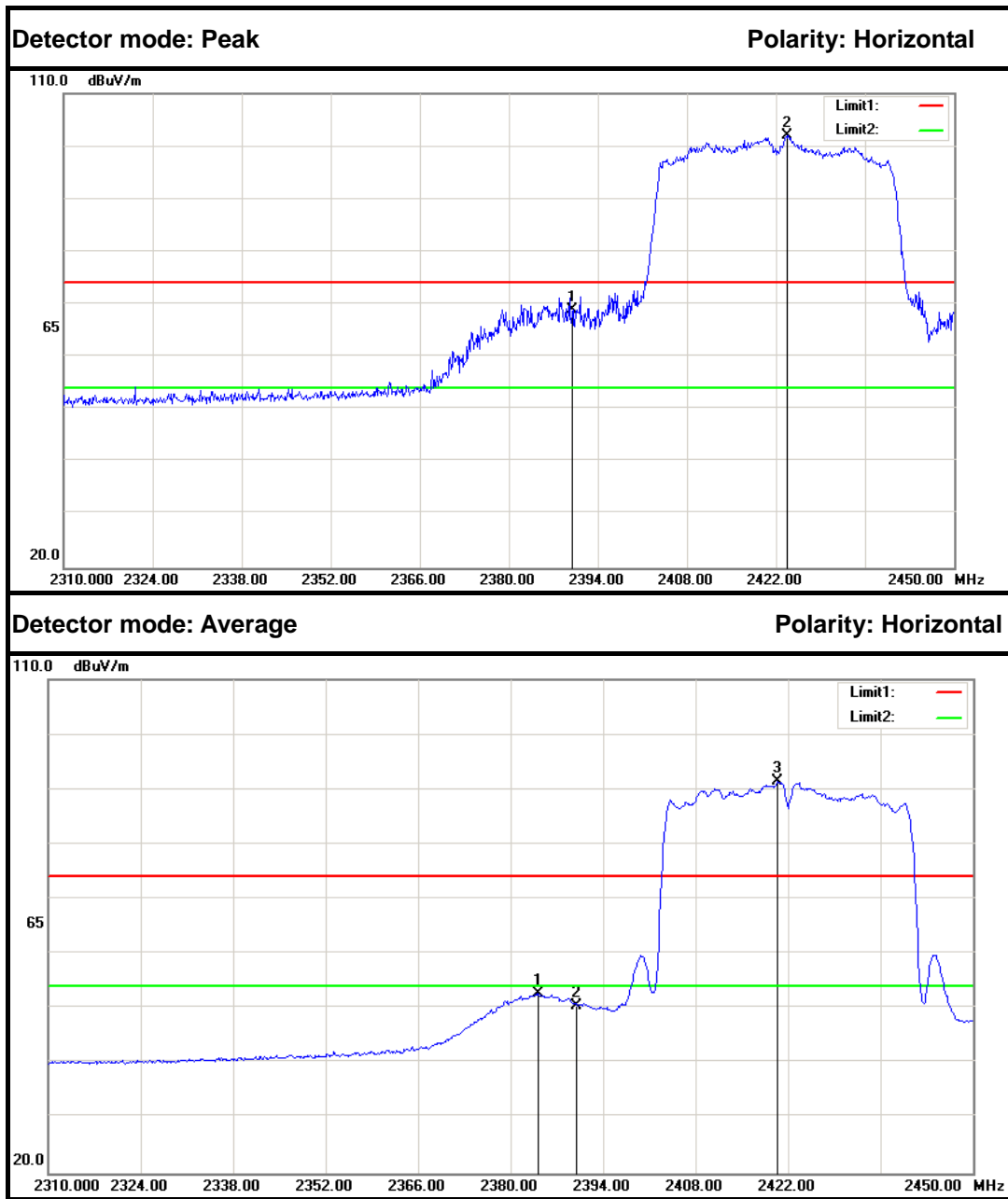
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2468.050	106.39	-2.43	103.96	---	---	Peak	Horizontal
2	2483.500	66.38	-2.35	64.03	74.00	-9.97	Peak	Horizontal
1	2462.800	96.85	-2.46	94.39	---	---	Average	Horizontal
2	2483.500	52.85	-2.35	50.50	54.00	-3.50	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	74.40	-2.86	71.54	74.00	-2.46	Peak	Vertical
2	2420.880	106.90	-2.69	104.21	---	---	Peak	Vertical
1	2385.320	55.18	-2.89	52.29	54.00	-1.71	Average	Vertical
2	2390.000	53.62	-2.86	50.76	54.00	-3.24	Average	Vertical
3	2423.120	96.49	-2.68	93.81	---	---	Average	Vertical

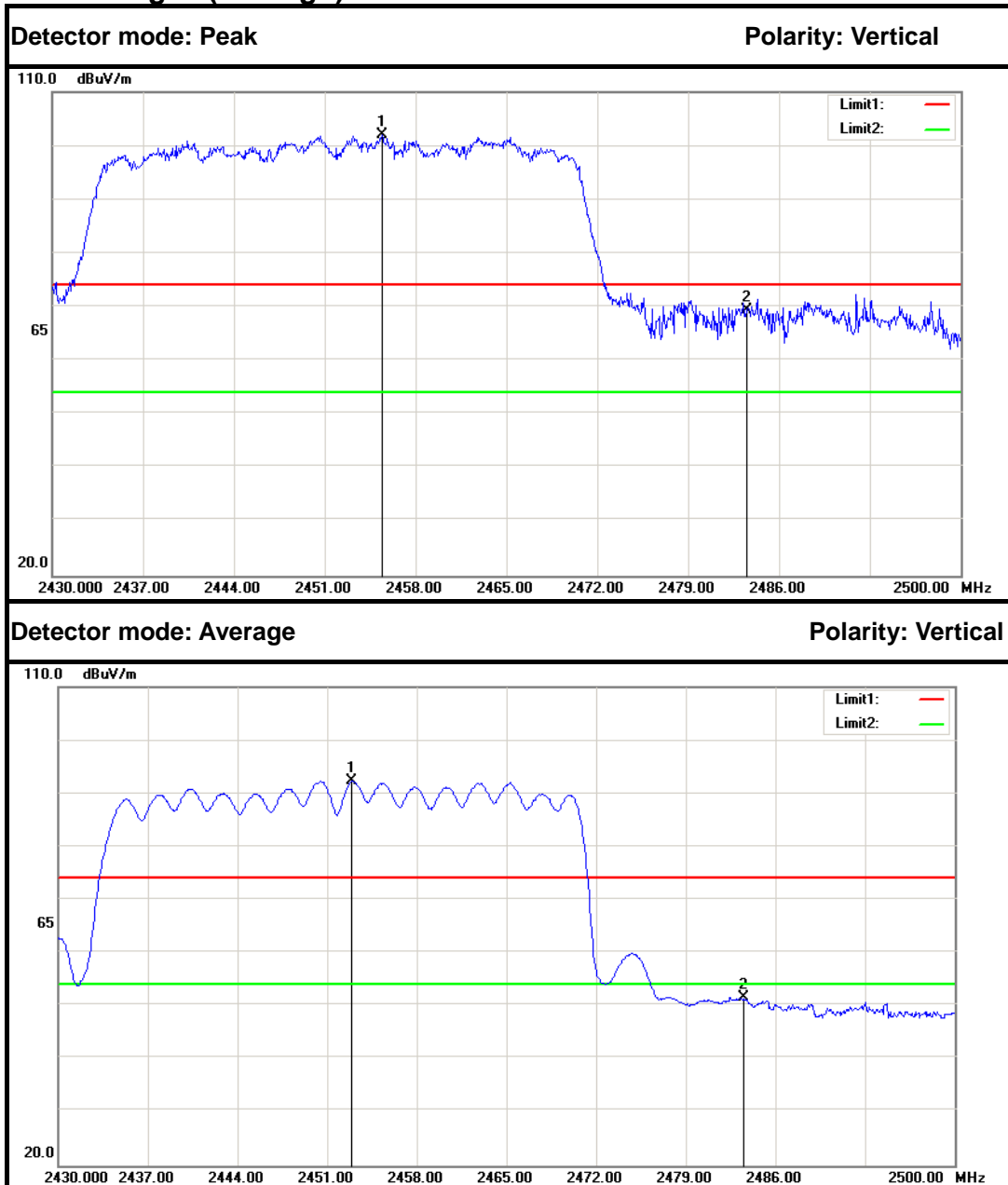


No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	71.91	-2.86	69.05	74.00	-4.95	Peak	Horizontal
2	2423.680	104.70	-2.68	102.02	---	---	Peak	Horizontal
1	2384.200	55.64	-2.89	52.75	54.00	-1.25	Average	Horizontal
2	2390.000	53.38	-2.86	50.52	54.00	-3.48	Average	Horizontal
3	2420.460	94.20	-2.70	91.50	---	---	Average	Horizontal

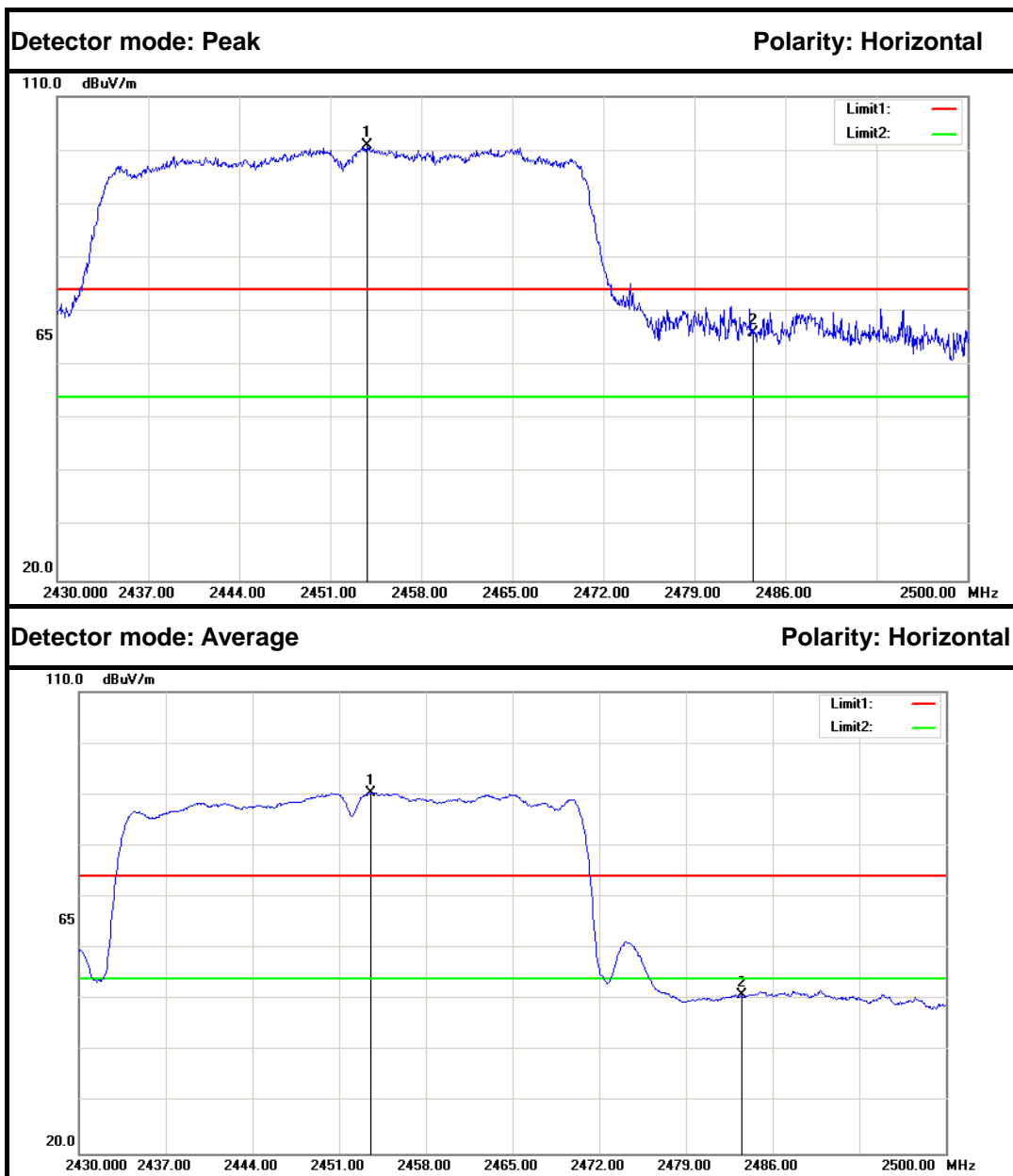




### Band Edges (CH High)



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2455.410	104.50	-2.50	102.00	---	---	Peak	Vertical
2	2483.500	71.75	-2.35	69.40	74.00	-4.60	Peak	Vertical
1	2452.890	94.88	-2.52	92.36	---	---	Average	Vertical
2	2483.500	54.04	-2.35	51.69	54.00	-2.31	Average	Vertical



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2453.800	103.46	-2.51	100.95	---	---	Peak	Horizontal
2	2483.500	68.39	-2.35	66.04	74.00	-7.96	Peak	Horizontal
1	2453.520	92.91	-2.51	90.40	---	---	Average	Horizontal
2	2483.500	53.33	-2.35	50.98	54.00	-3.02	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

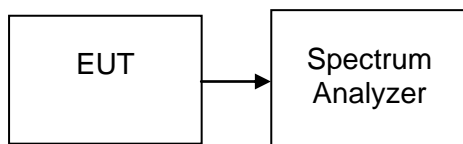
### 7.7.3. TEST PROCEDURES (please refer to measurement standard)

§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	-4.206	-5.874	8	PASS
Mid	2437	-5.779	-4.832		PASS
High	2462	-5.960	-5.104		PASS

**Test mode: IEEE 802.11g**

Channel	Frequency (MHz)	PPSD (dBm)		Limit (dBm)	Test Result
		Antenna 0	Antenna 1		
Low	2412	-8.033	-7.492	8	PASS
Mid	2437	-7.131	-7.671		PASS
High	2462	-6.959	-6.662		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	-10.387	-7.297	-5.562	8	PASS
Mid	2437	-8.918	-9.527	-6.202		PASS
High	2462	-8.498	-8.122	-5.296		PASS

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

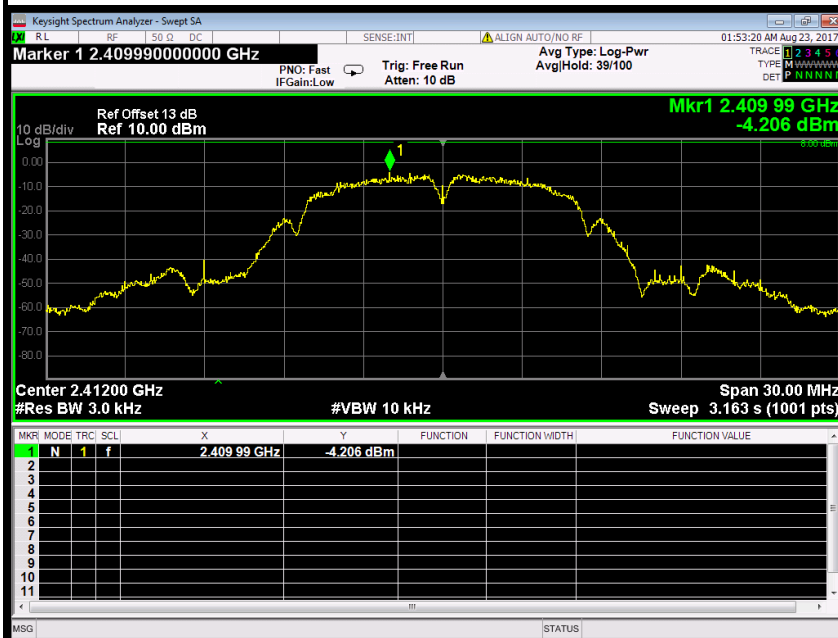
Channel	Frequency (MHz)	PPSD (dBm)			Limit (dBm)	Test Result
		Antenna 0	Antenna 1	Total		
Low	2422	-13.740	-12.462	-10.044	8	PASS
Mid	2437	-13.440	-11.746	-9.501		PASS
High	2452	-13.381	-11.515	-9.338		PASS



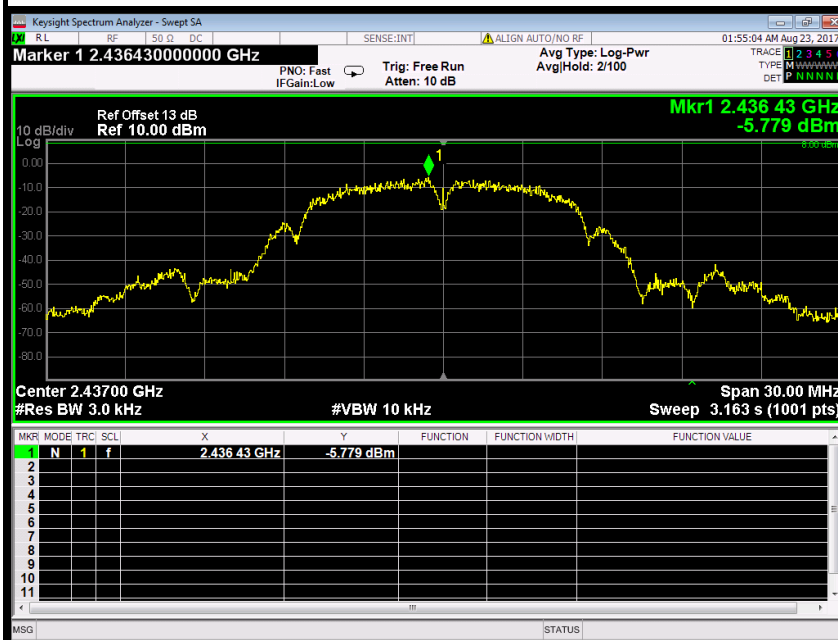
## Test Plot

### IEEE 802.11b mode (Antenna 0)

#### PPSD (CH Low)

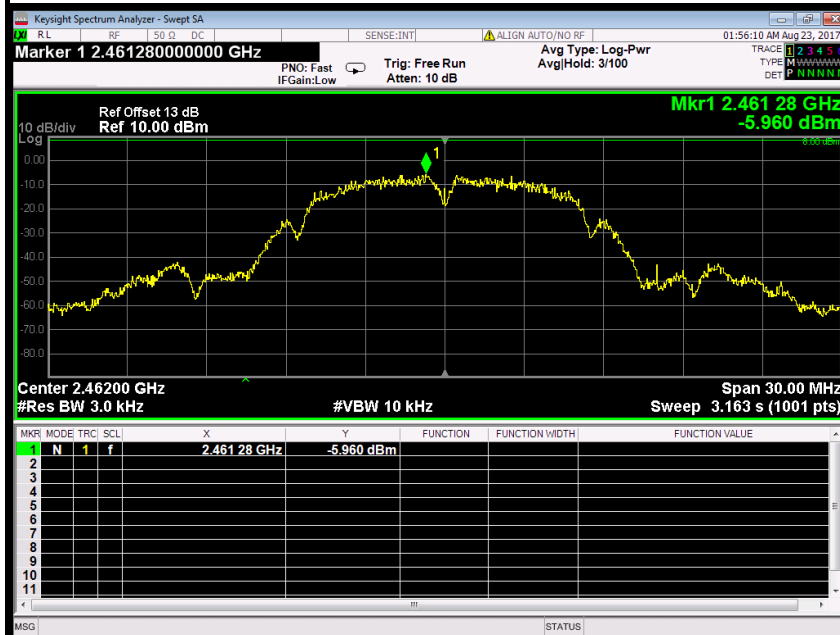


#### PPSD (CH Mid)



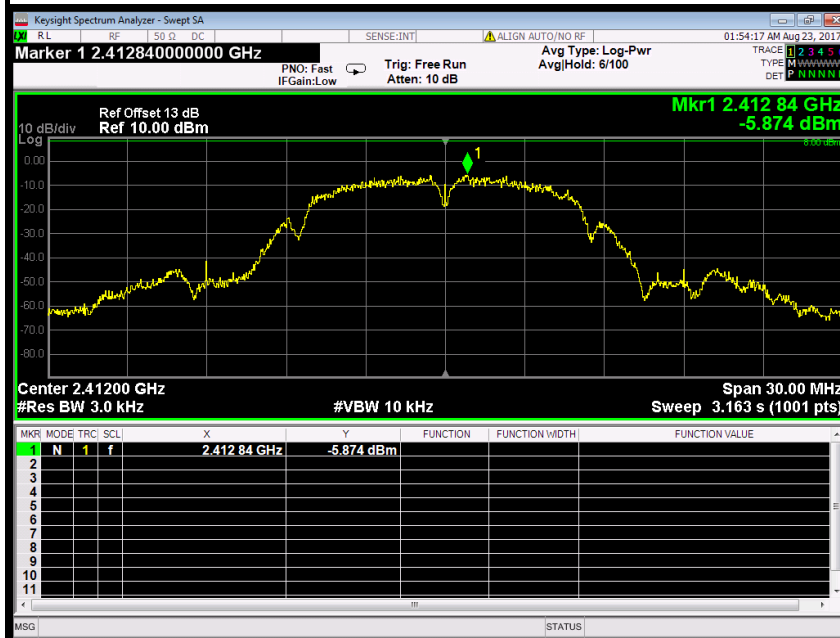


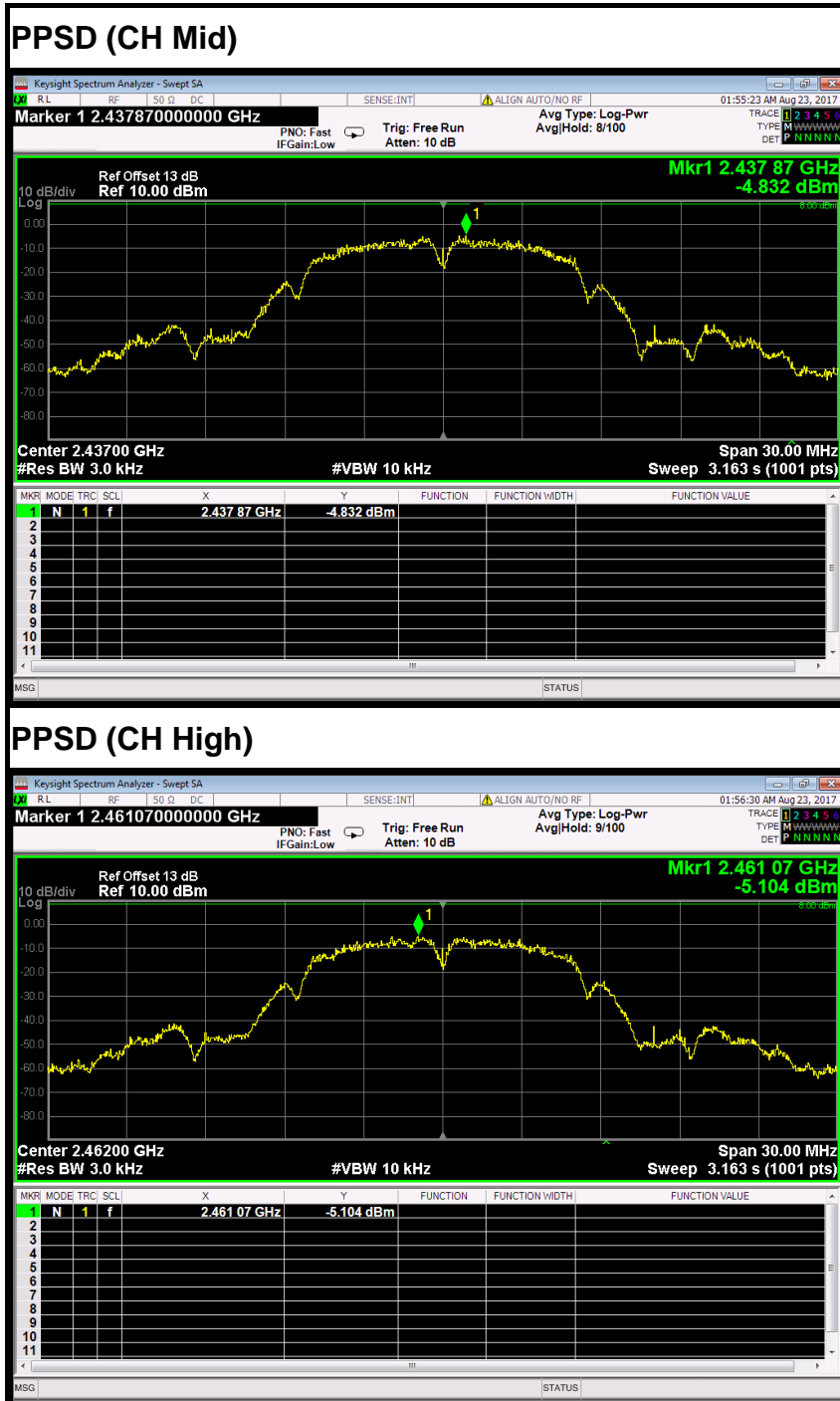
### PPSD (CH High)



### IEEE 802.11b mode (Antenna 1)

### PPSD (CH Low)

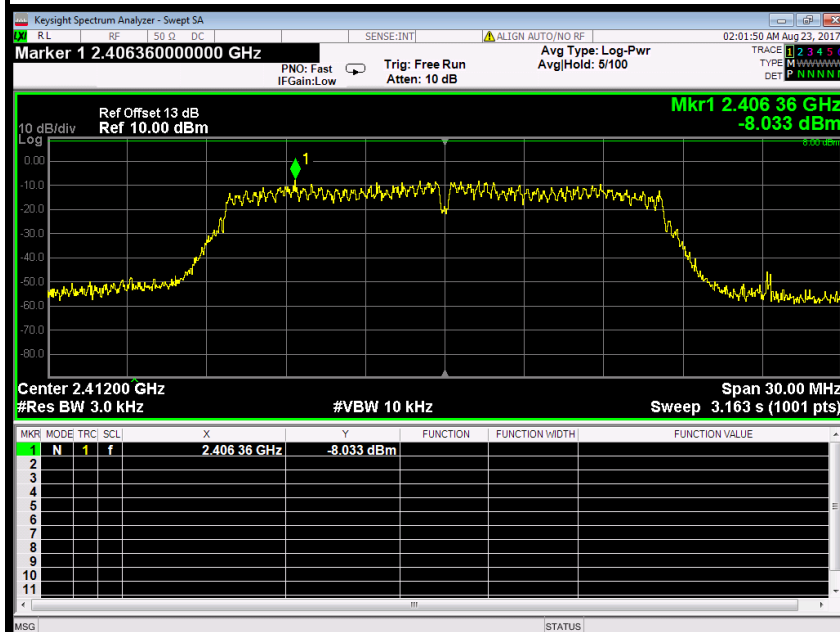




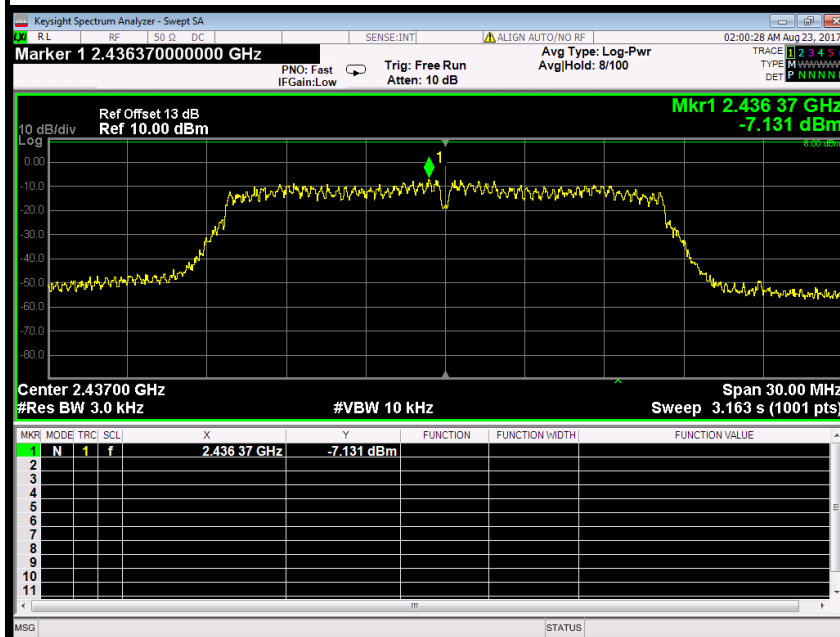


IEEE 802.11g mode (Antenna 0)

PPSD (CH Low)



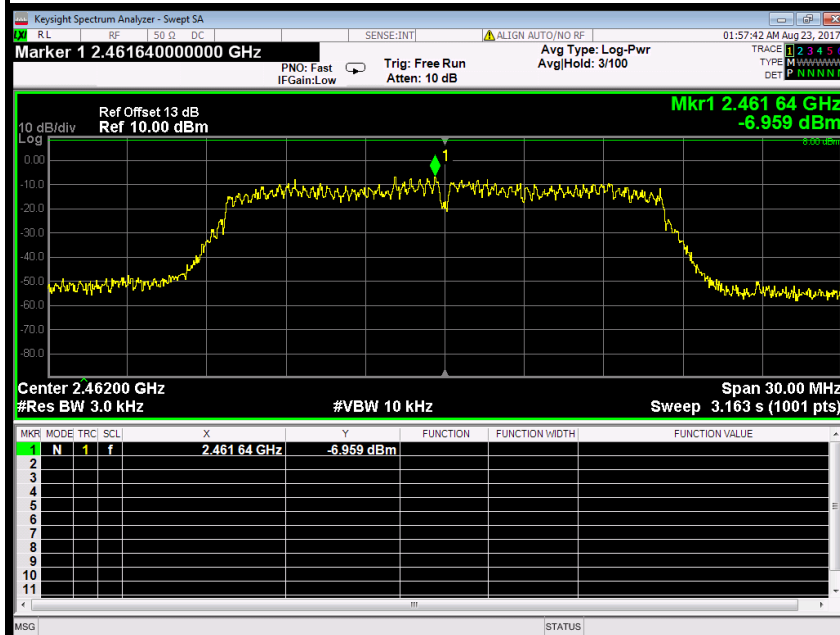
PPSD (CH Mid)





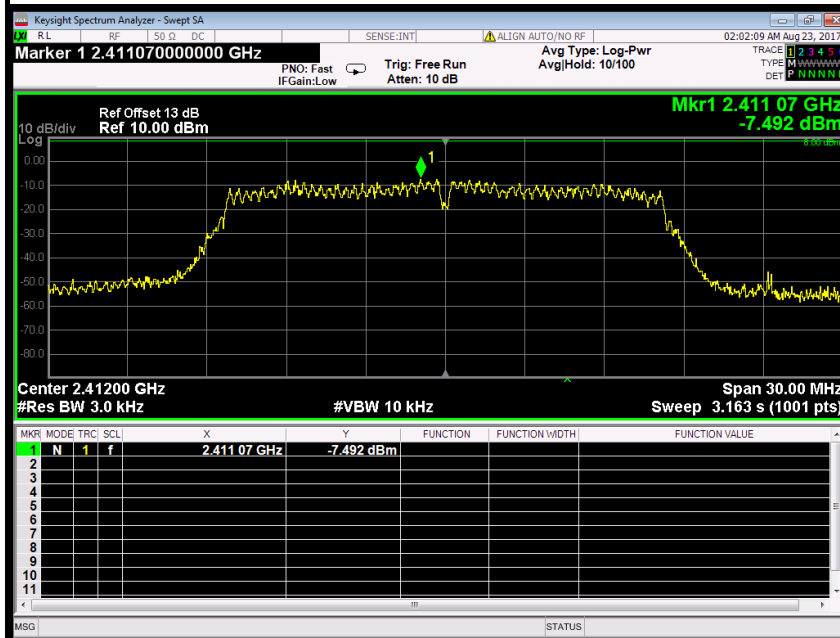


### PPSD (CH High)



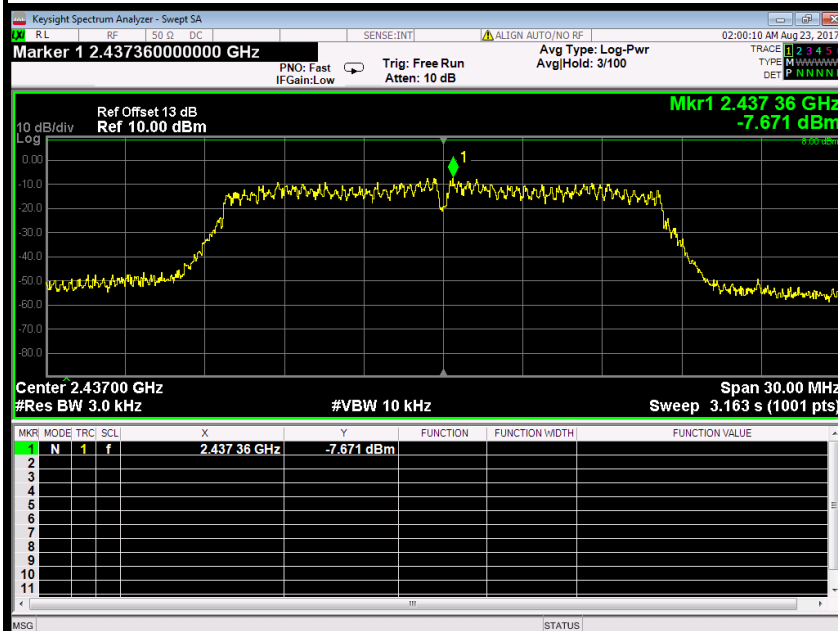
### IEEE 802.11g mode (Antenna 1)

### PPSD (CH Low)

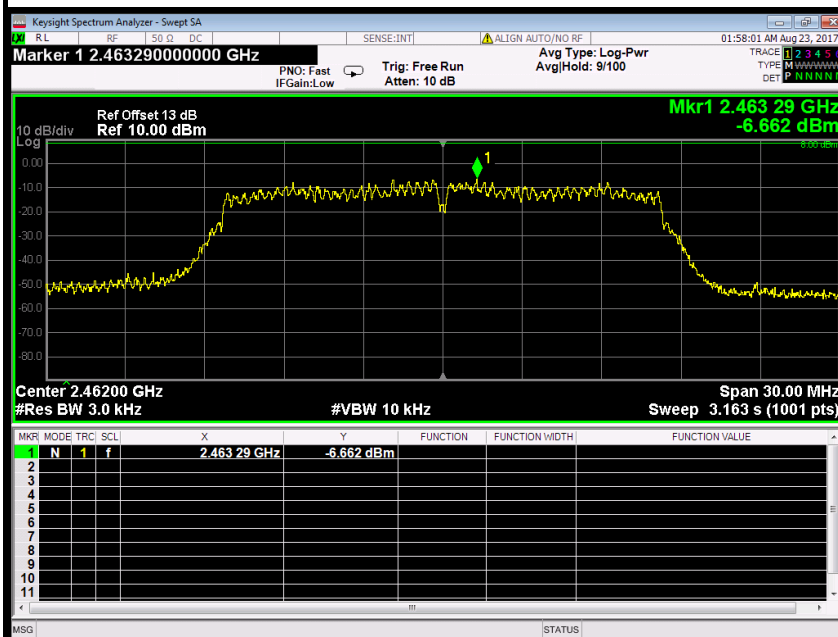




## PPSD (CH Mid)



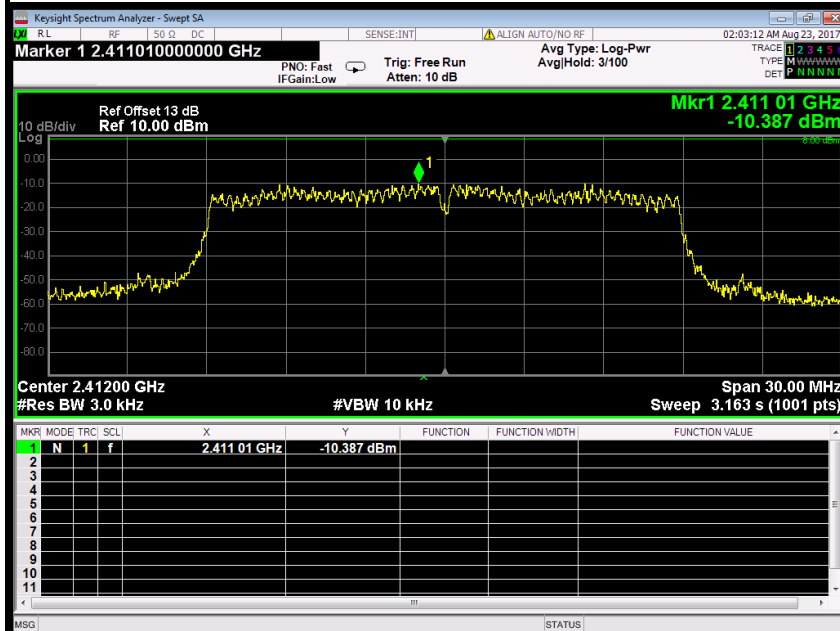
## PPSD (CH High)



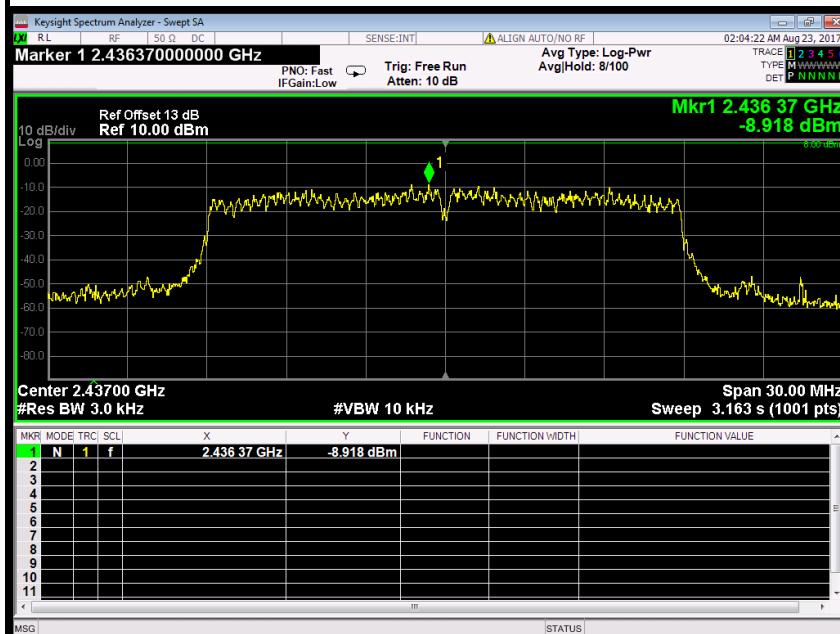


IEEE 802.11n HT20 MHz mode (Antenna 0)

PPSD (CH Low)

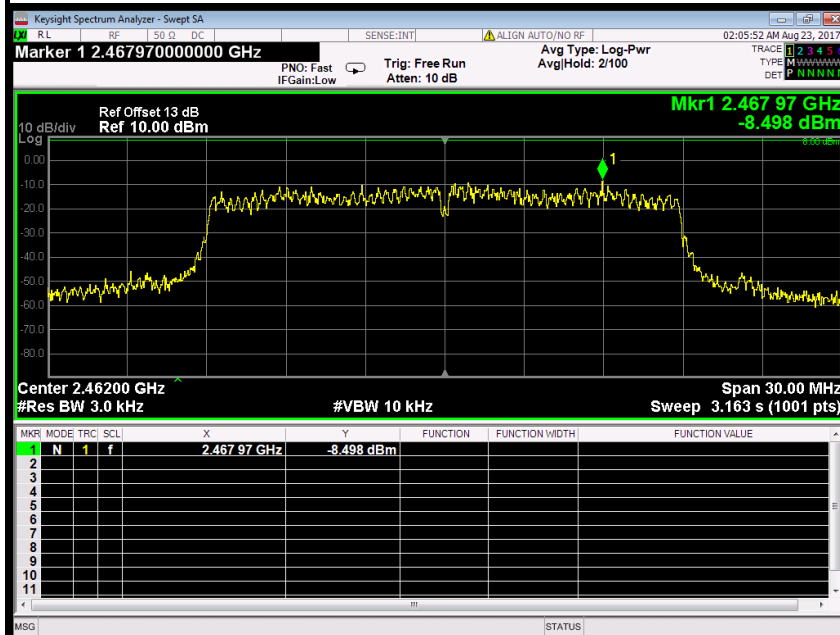


PPSD (CH Mid)



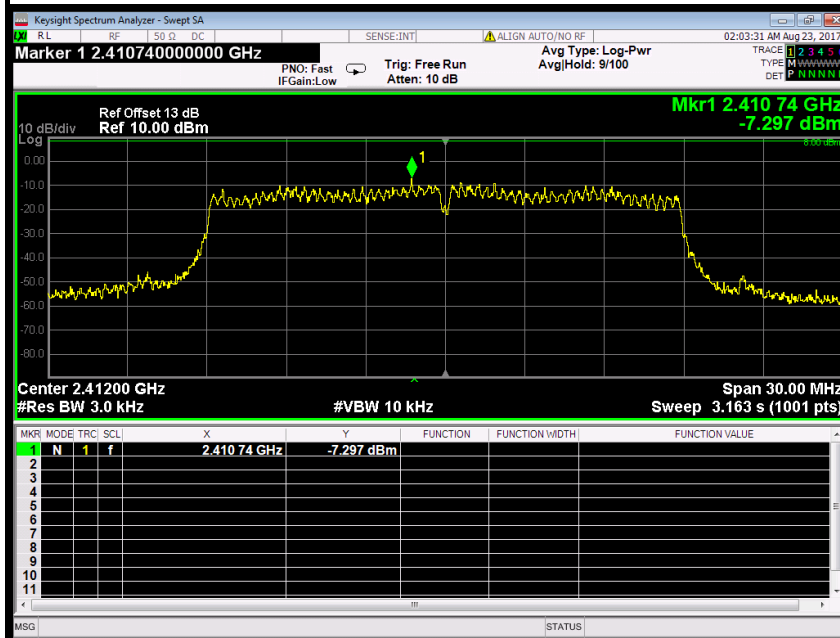


### PPSD (CH High)



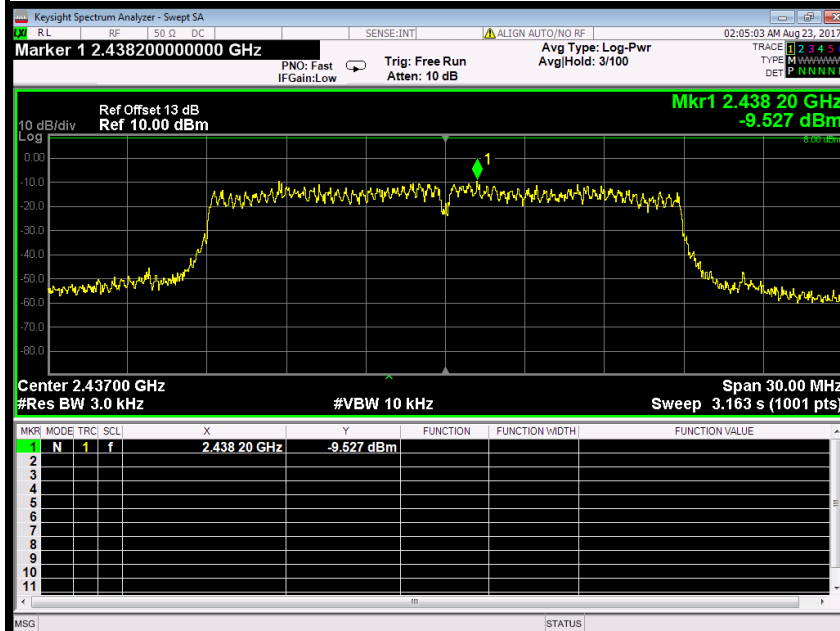
### IEEE 802.11n HT20 MHz mode (Antenna 1)

### PPSD (CH Low)

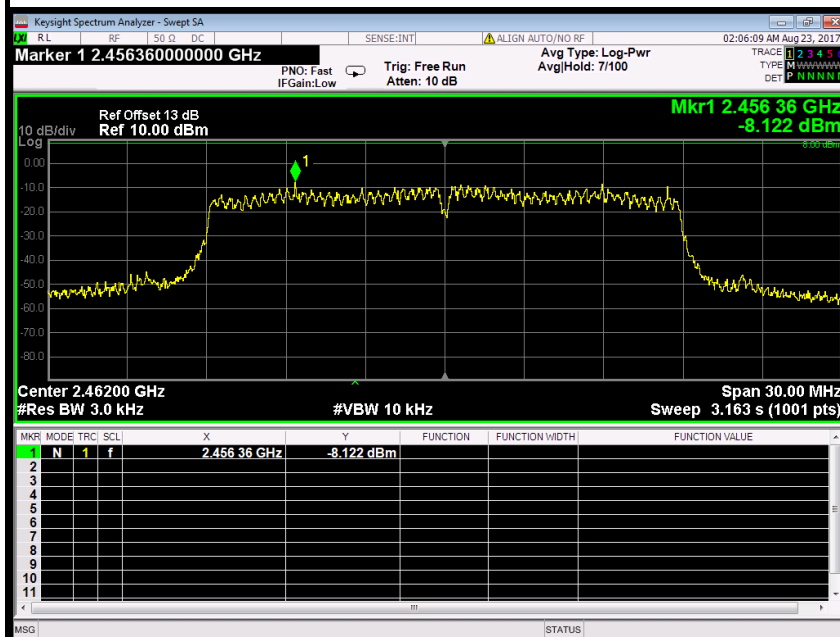




### PPSD (CH Mid)



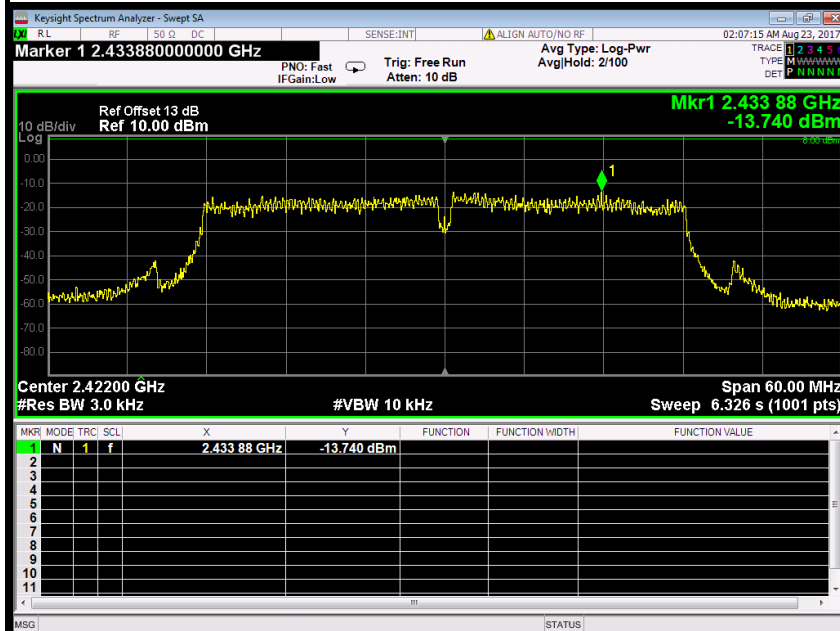
### PPSD (CH High)



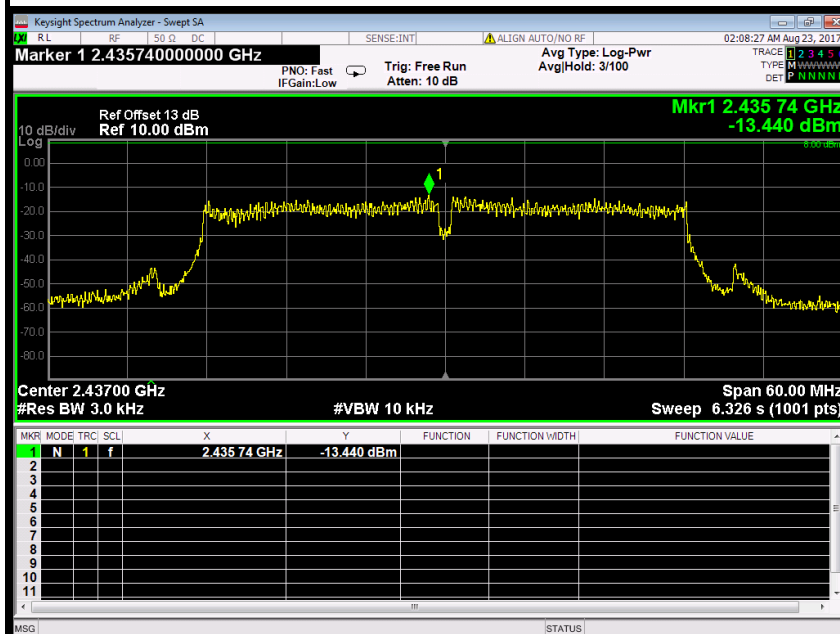


IEEE 802.11n HT40 MHz mode (Antenna 0)

PPSD (CH Low)

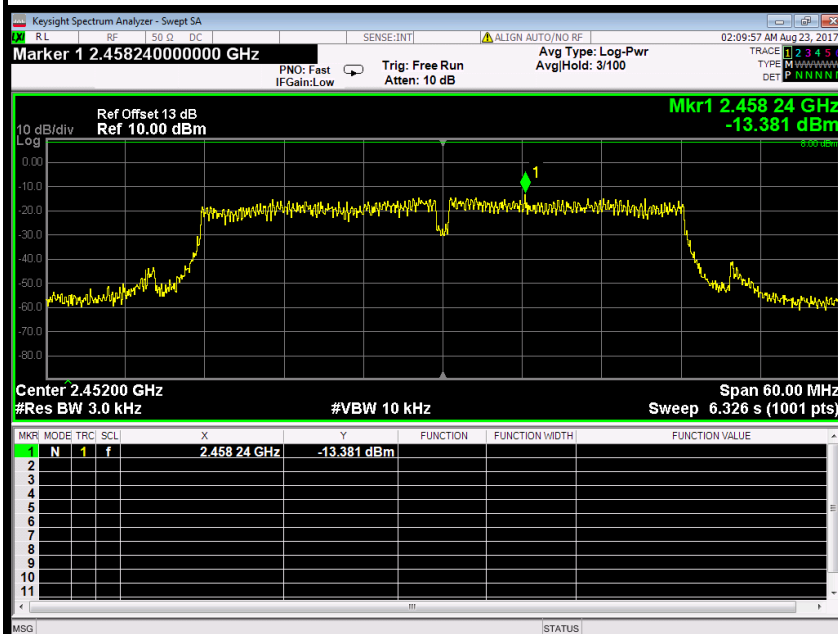


PPSD (CH Mid)



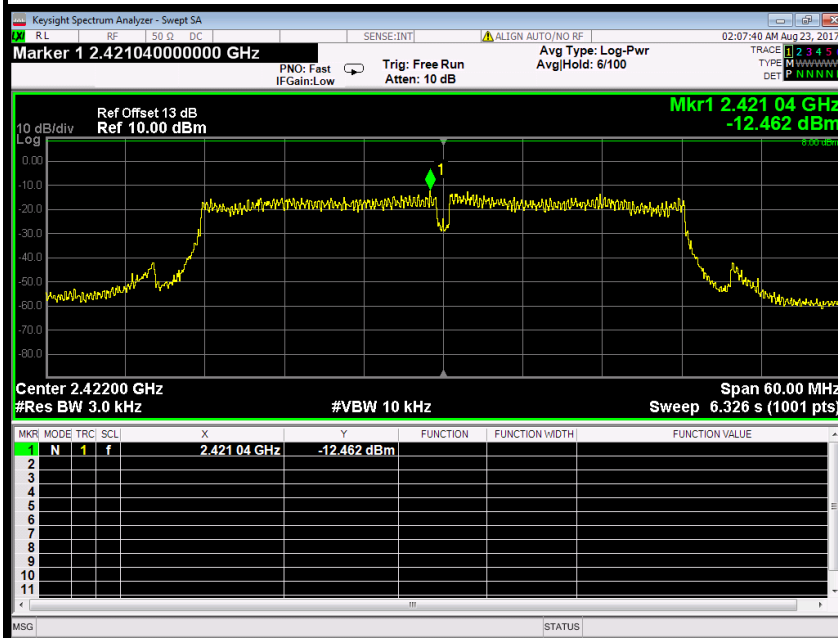


### PPSD (CH High)



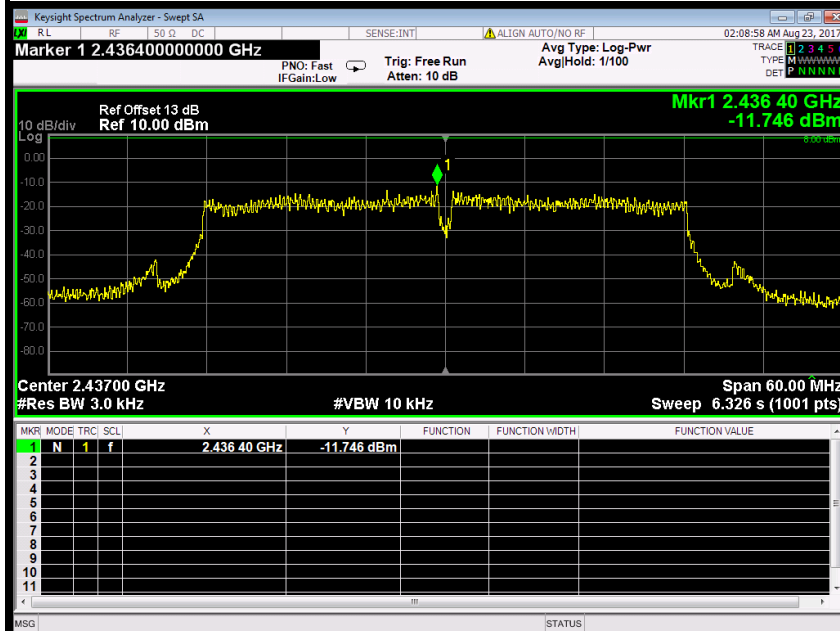
### IEEE 802.11n HT40 MHz mode (Antenna 1)

### PPSD (CH Low)





### PPSD (CH Mid)



### PPSD (CH High)

