

5.3 Bandwidth Measurement

5.3.1 Regulation

According to §15.403,(i) *Emission bandwidth*. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

According to §15.407,(e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

5.3.2 Measurement Procedure

1. Emission Bandwidth (EBW)

- a) Set RBW = approximately 1% of the emission bandwidth.
- b) Set the VBW > RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

2. Minimum Emission Bandwidth for the band 5.725-5.85 GHz

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 kHz for the band 5.715-5.85 GHz.

The following procedure shall be used for measuring this bandwidth:

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

5.3.3 Test Result

-Complied

*802.11a_ANT 1

Frequency	26 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	21.02	17.54
5 200	21.14	17.60
5 240	21.14	17.60

Frequency	6 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	16.42	17.54
5 200	16.42	17.60
5 240	16.42	17.54

*802.11a_ANT 2

Frequency	26 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	21.06	17.54
5 200	20.94	17.60
5 240	21.14	17.60

Frequency	6 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	16.42	17.54
5 200	16.38	17.54
5 240	16.42	17.54

*802.11a_ANT 3

Frequency	26 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	20.98	17.48
5 200	21.14	17.60
5 240	20.86	17.60

Frequency	6 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	16.58	17.54
5 200	16.38	17.54
5 240	13.46	17.54

*802.11an20_ANT 1

Frequency	26 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	21.30	18.29
5 200	21.22	18.41
5 240	21.46	18.35

Frequency	6 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	17.65	18.35
5 200	17.62	18.41
5 240	17.62	18.35

*802.11an20_ANT 2

Frequency	26 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	21.22	18.35
5 200	21.46	18.29
5 240	21.46	18.41

Frequency	6 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	17.61	18.35
5 200	17.62	18.29
5 240	17.62	18.35

*802.11an20_ANT 3

Frequency	26 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	21.22	18.29
5 200	21.30	18.41
5 240	21.38	18.41

Frequency	6 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	17.62	18.35
5 200	17.62	18.41
5 240	17.62	18.41

*802.11an20_ANT 1+2

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 180	21.14	20.94	18.29	18.00
5 200	21.30	20.90	18.41	18.00
5 240	21.22	20.90	18.35	18.00

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 180	17.62	17.62	18.35	18.00
5 200	17.62	17.66	18.35	18.00
5 240	17.62	17.66	18.35	18.00

*802.11an20_ANT 2+3

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 180	21.14	20.82	18.29	18.00
5 200	21.10	21.02	18.29	18.00
5 240	20.98	20.98	18.35	18.00

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 180	17.58	17.62	18.41	18.00
5 200	17.62	17.70	18.35	18.00
5 240	17.58	17.66	18.29	18.00

*802.11an20_ANT 1+3

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 180	20.98	20.90	18.35	18.00
5 200	21.10	20.98	18.29	10.00
5 240	21.30	20.90	18.35	18.00

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 180	17.66	17.66	18.35	18.00
5 200	17.66	17.66	18.35	18.00
5 240	17.66	17.66	18.29	18.00

*802.11an20_ANT 1+2+3

Frequency	26 dB Bandwidth			OBW		
	ANT 1	ANT 2	ANT 3	ANT 1	ANT 2	ANT 3
5 180	20.98	20.78	20.98	18.35	18.00	18.06
5 200	21.10	20.90	20.94	18.35	18.00	18.12
5 240	21.06	20.82	20.94	18.35	18.00	18.12

Frequency	6 dB Bandwidth			OBW		
	ANT 1	ANT 2	ANT 3	ANT 1	ANT 2	ANT 3
5 180	17.70	17.62	17.62	17.95	17.95	18.12
5 200	17.62	17.62	17.66	18.35	17.95	18.12
5 240	17.66	17.66	17.62	18.35	18.00	18.12

*802.11an40_ANT 1

Frequency	26 dB Bandwidth	OBW
	ANT 1	ANT 1
5 190	40.04	36.47
5 230	40.04	36.35

Frequency	6 dB Bandwidth	OBW
	ANT 1	ANT 1
5 190	36.36	36.47
5 230	36.40	36.47

*802.11an40_ANT 2

Frequency	26 dB Bandwidth	OBW
	ANT 1	ANT 1
5 190	39.88	36.35
5 230	40.12	36.35

Frequency	6 dB Bandwidth	OBW
	ANT 1	ANT 1
5 190	36.32	36.47
5 230	36.40	36.35

*802.11an40_ANT 3

Frequency	26 dB Bandwidth	OBW
	ANT 1	ANT 1
5 190	40.20	36.35
5 230	40.12	36.35

Frequency	6 dB Bandwidth	OBW
	ANT 1	ANT 1
5 190	36.40	36.47
5 230	36.32	36.47

*802.11an40_ANT 1+2

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	40.28	39.64	36.47	36.24
5 230	40.04	39.56	36.47	36.35

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	36.24	36.40	36.47	36.24
5 230	36.32	36.48	36.47	36.35

*802.11an40_ANT 2+3

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	40.20	39.32	36.47	36.24
5 230	40.12	39.56	36.47	36.35

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	36.32	36.48	36.47	36.24
5 230	36.40	36.48	36.47	36.24

*802.11an40_ANT 1+3

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	40.04	39.72	36.47	36.24
5 230	69.96	39.48	36.47	36.24

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	36.32	36.48	36.47	36.24
5 230	36.48	36.48	36.47	36.24

*802.11an40_ANT 1+2+3

Frequency	26 dB Bandwidth			OBW		
	ANT 1	ANT 2	ANT 3	ANT 1	ANT 2	ANT 3
5 180	40.02	39.48	39.72	36.47	36.35	.36.353
5 200	40.28	39.56	39.80	36.47	36.35	36.35

Frequency	6 dB Bandwidth			OBW		
	ANT 1	ANT 2	ANT 3	ANT 1	ANT 2	ANT 3
5 180	36.32	36.40	36.40	36.47	36.35	36.35
5 200	36.24	36.40	36.48	36.47	36.24	36.24

*802.11ac20_ANT 1

Frequency	26 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	21.06	18.53
5 200	21.14	18.35
5 240	21.22	18.29

Frequency	6 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	17.62	18.41
5 200	17.62	18.35
5 240	17.62	18.41

*802.11ac20_ANT 2

Frequency	26 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	21.10	18.23
5 200	20.86	18.41
5 240	21.18	18.41

Frequency	6 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	17.62	18.29
5 200	17.62	18.41
5 240	17.62	18.41

*802.11ac20_ANT 3

Frequency	26 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	21.18	18.35
5 200	21.26	18.35
5 240	21.26	18.41

Frequency	6 dB Bandwidth	OBW
	ANT 1	ANT 1
5 180	17.62	18.35
5 200	17.62	18.35
5 240	17.62	18.41

*802.11ac20_ANT 1+2

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 180	21.10	20.74	18.29	17.95
5 200	21.26	20.90	18.35	18.00
5 240	21.26	20.74	18.35	17.95

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 180	17.62	17.62	18.29	18.00
5 200	17.62	17.66	18.35	17.95
5 240	17.62	17.66	18.41	17.95

*802.11ac20_ANT 2+3

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 180	21.18	20.78	18.29	18.00
5 200	21.26	20.78	18.35	18.00
5 240	21.14	20.78	18.35	18.00

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 180	17.66	17.66	18.23	17.95
5 200	17.58	17.66	18.41	18.00
5 240	17.58	17.66	18.35	18.00

*802.11ac20_ANT 1+3

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 180	21.18	20.74	18.29	17.95
5 200	21.26	20.78	18.35	18.00
5 240	21.14	20.74	18.35	17.95

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 180	17.66	17.66	18.41	18.00
5 200	17.66	17.66	18.35	18.00
5 240	17.66	17.66	18.35	18.00

*802.11ac20_ANT 1+2+3

Frequency	26 dB Bandwidth			OBW		
	ANT 1	ANT 2	ANT 3	ANT 1	ANT 2	ANT 3
5 180	21.14	20.90	20.82	18.35	18.00	18.12
5 200	21.18	20.82	20.86	18.35	18.00	18.06
5 240	21.30	2.86	20.94	18.35	18.00	18.06

Frequency	6 dB Bandwidth			OBW		
	ANT 1	ANT 2	ANT 3	ANT 1	ANT 2	ANT 3
5 180	17.62	17.66	17.66	18.35	18.00	18.12
5 200	17.62	17.66	17.66	18.41	18.00	18.12
5 240	17.66	17.70	17.66	18.41	18.00	18.06

*802.11ac40_ANT 1

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	40.12		36.35	
5 230	40.28		36.47	

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	40.12		36.35	
5 230	40.28		36.47	

*802.11ac40_ANT 2

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	36.96		36.36	
5 230	40.20		36.35	

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	36.24		36.47	
5 230	36.47		36.35	

*802.11ac40_ANT 3

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	39.96		36.35	
5 230	40.04		36.35	

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	36.32		36.47	
5 230	36.40		36.47	

*802.11ac40_ANT 1+2

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	40.20	39.56	36.47	36.24
5 230	40.44	39.64	36.47	36.24

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	36.32	36.32	36.47	36.24
5 230	36.36	36.36	36.47	36.24

*802.11ac40_ANT 2+3

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	40.04	39.56	36.47	36.24
5 230	40.20	39.56	36.47	36.24

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	36.32	36.48	36.47	36.24
5 230	36.36	36.36	36.47	36.24

*802.11ac40_ANT 1+3

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	40.20	39.48	36.47	36.24
5 230	40.12	39.56	36.47	36.53

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	36.32	36.32	36.47	36.24
5 230	36.48	36.40	36.47	36.24

*802.11ac40_ANT 1+2+3

Frequency	26 dB Bandwidth			OBW		
	ANT 1	ANT 2	ANT 3	ANT 1	ANT 2	ANT 3
5 190	40.36	39.88	40.04	36.47	36.35	36.35
5 230	40.04	39.40	39.72	36.47	36.35	36.35

Frequency	6 dB Bandwidth			OBW		
	ANT 1	ANT 2	ANT 3	ANT 1	ANT 2	ANT 3
5 190	36.32	36.40	36.56	36.47	36.35	36.35
5 230	36.36	36.52	36.52	36.58	36.35	36.24

*802.11ac80_ANT 1

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	80.56		75.72	

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	75.80		75.72	

*802.11ac80_ANT 2

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	81.52		75.72	

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	75.80		75.72	

*802.11ac40_ANT 3

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	81.52		75.72	

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 190	75.80		75.72	

*802.11ac80_ANT 1+2

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 775	81.52	80.56	75.72	75.49

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 775	75.50	75.50	75.72	75.72

*802.11ac80_ANT 2+3

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 775	81.20	80.72	75.72	75.49

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 775	75.50	75.50	75.72	75.72

*802.11ac80_ANT 1+3

Frequency	26 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 775	81.52	80.56	75.72	75.49

Frequency	6 dB Bandwidth		OBW	
	ANT 1	ANT 2	ANT 1	ANT 2
5 775	75.50	75.98	75.72	75.72

*802.11ac80_ANT 1+2+3

Frequency	26 dB Bandwidth			OBW		
	ANT 1	ANT 2	ANT 3	ANT 1	ANT 2	ANT 3
5 775	81.68	81.52	80.72	75.72	75.72	75.72

Frequency	6 dB Bandwidth			OBW		
	ANT 1	ANT 2	ANT 3	ANT 1	ANT 2	ANT 3
5 775	75.98	76.14	75.82	75.72	75.72	75.49

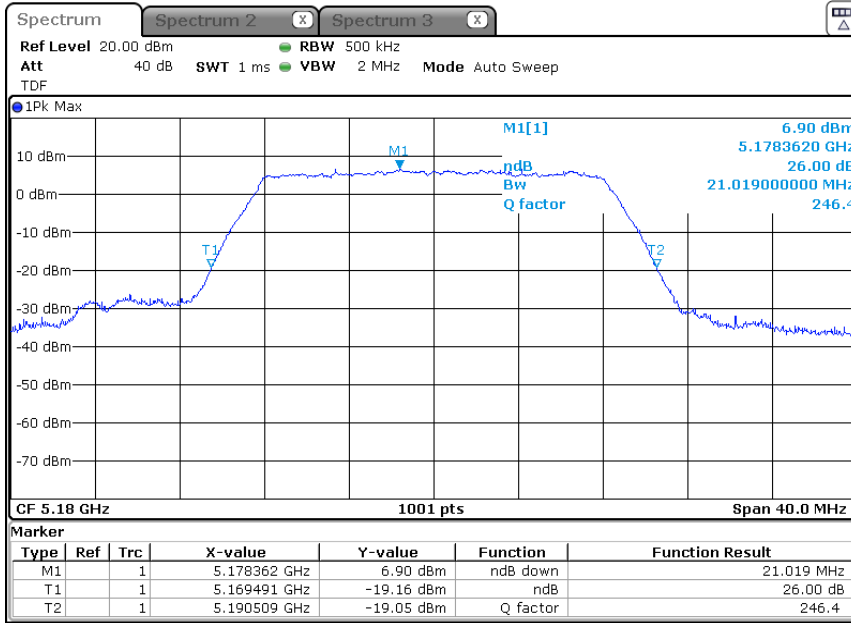
5.3.4 Test Plot

Figure 1. Bandwidth Measurement

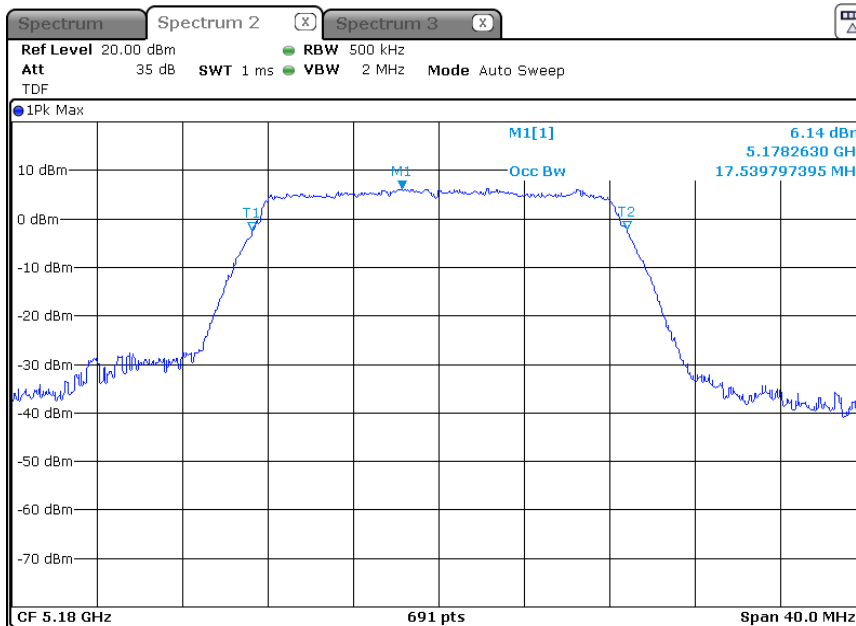
802.11a_ANT 1

-5 180 MHz

26 dB Bandwidth

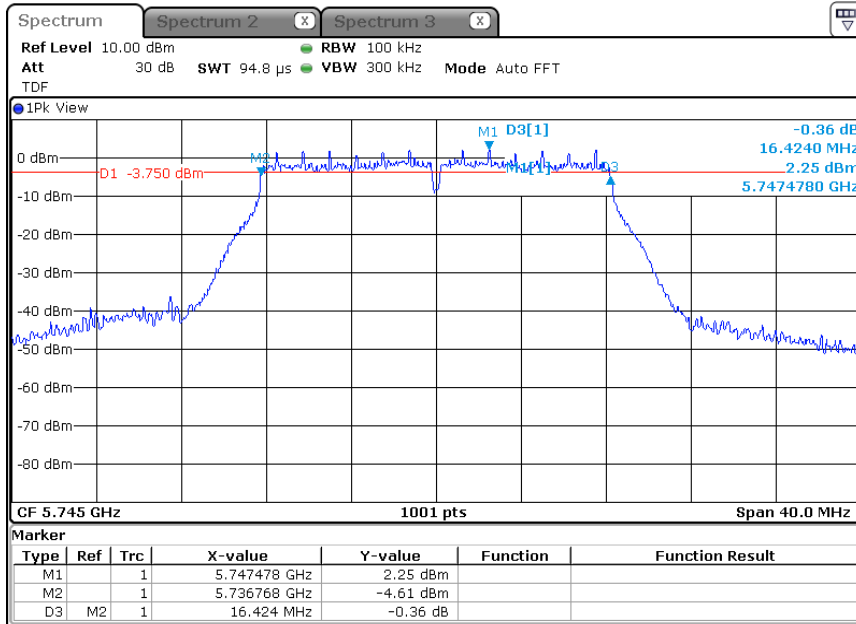


OBW

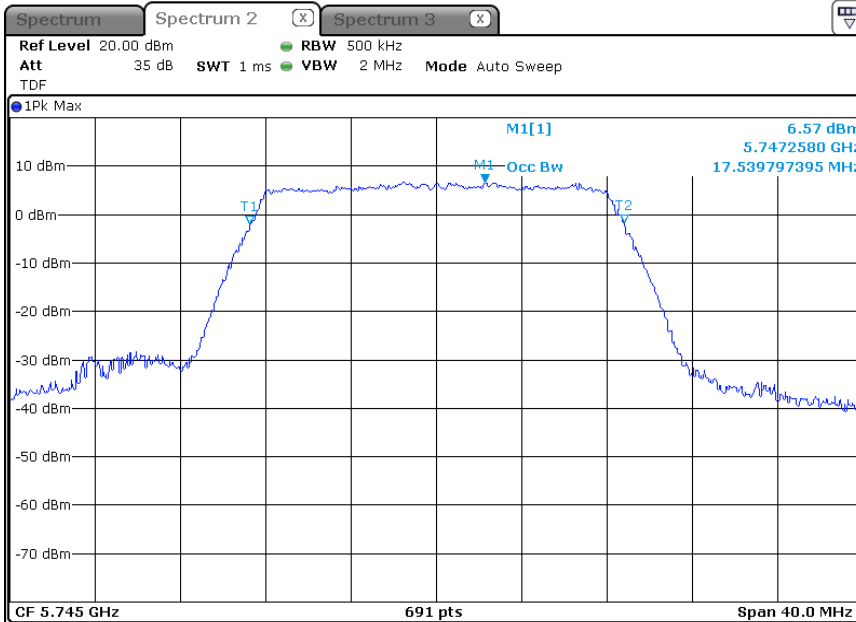


-5 745 MHz

6 dB Bandwidth



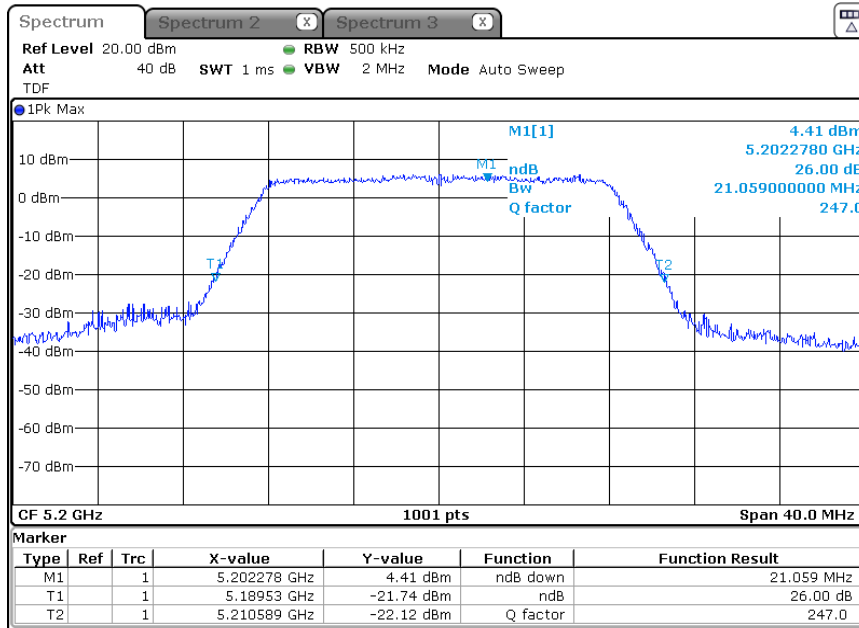
OBW



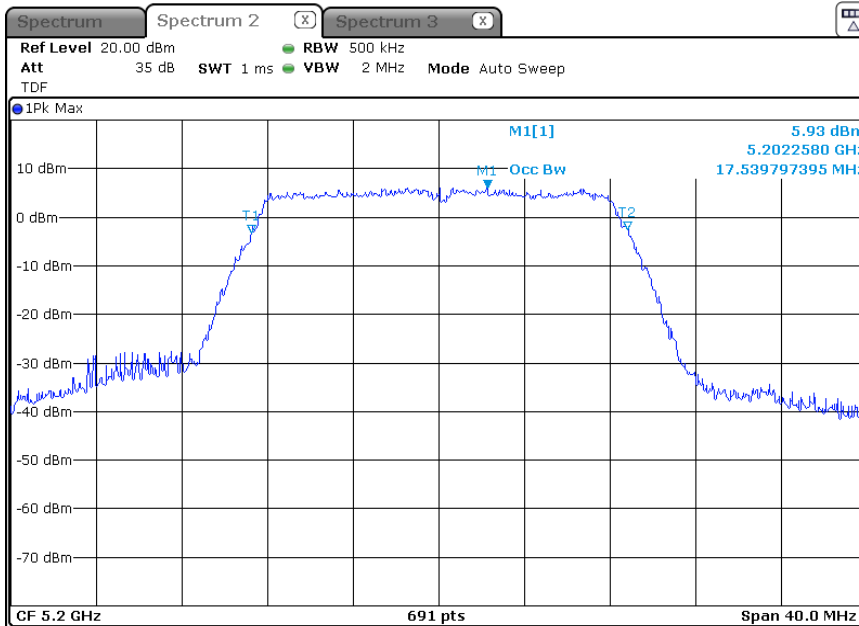
802.11a_ANT 1

-5 200 MHz

26 dB Bandwidth

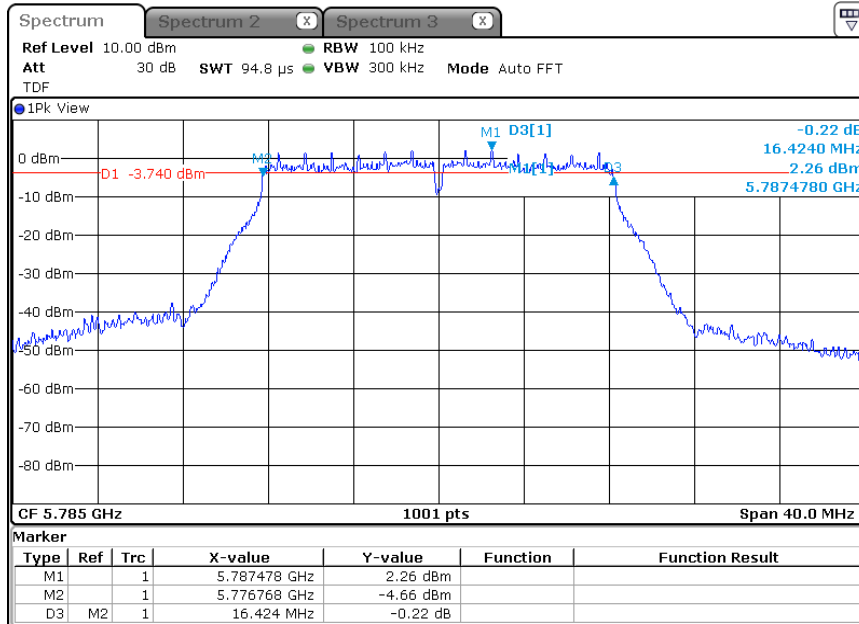


OBW

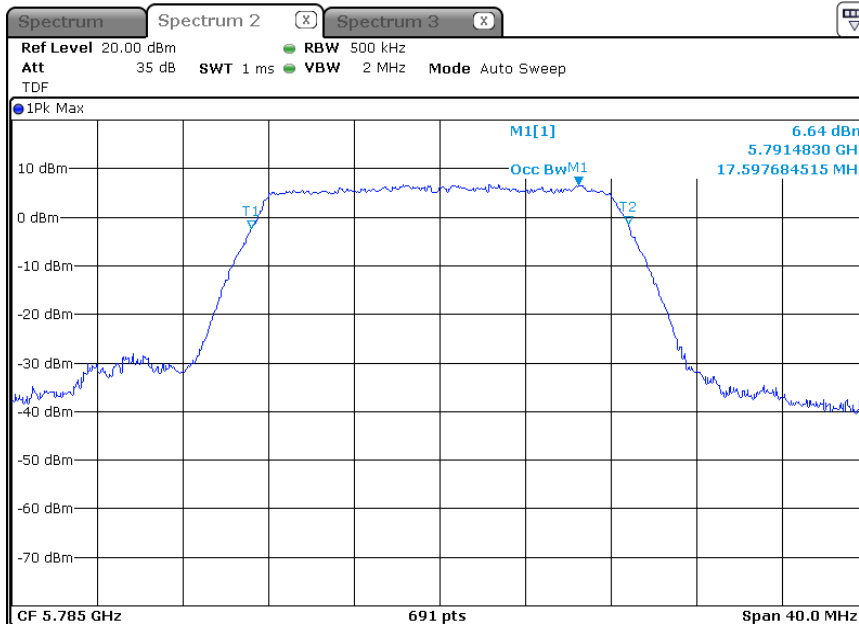


-5 785 MHz

6 dB Bandwidth



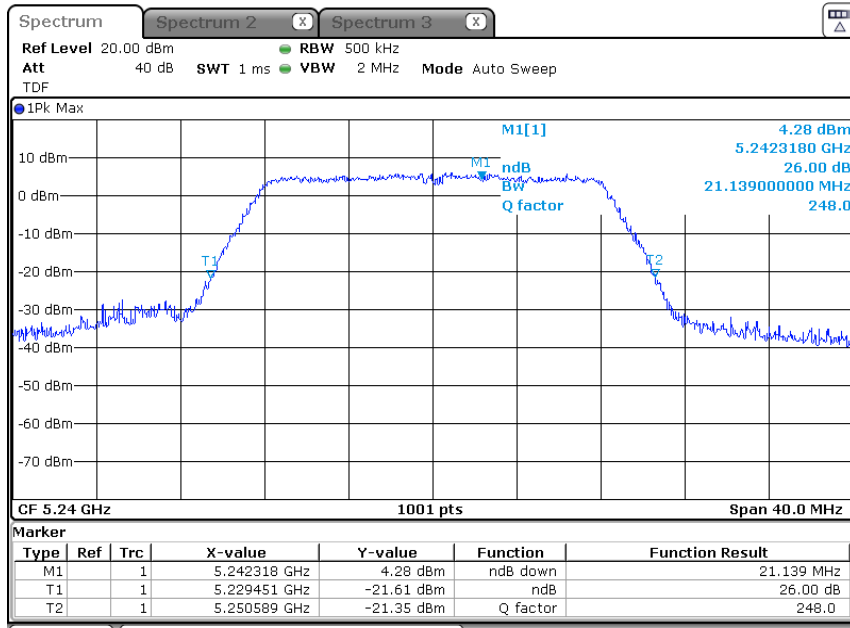
OBW



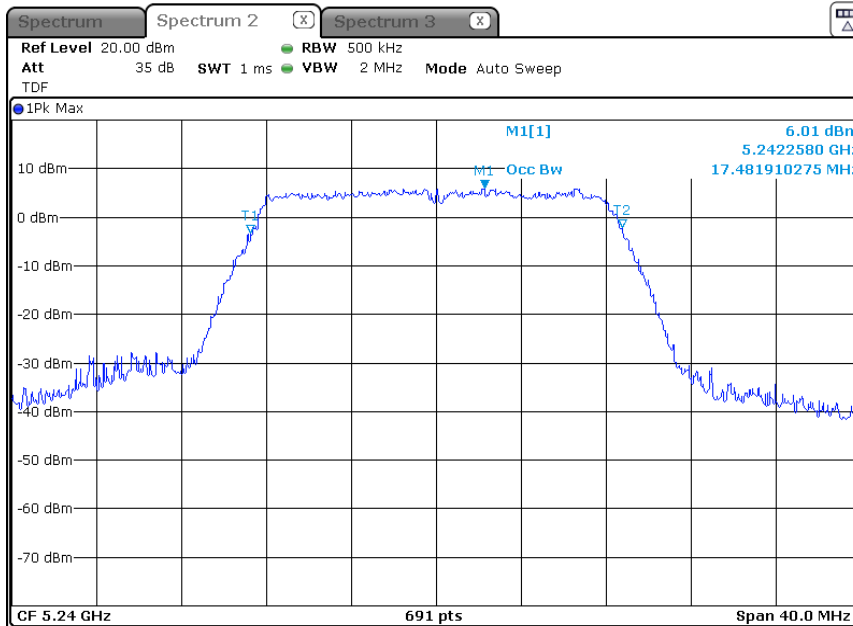
802.11a_ANT 1

-5 240 MHz

26 dB Bandwidth

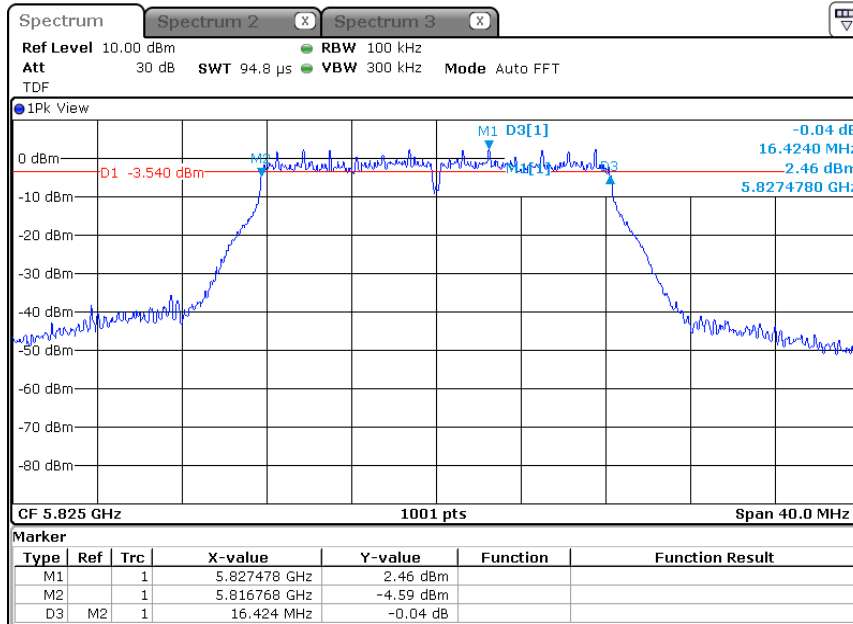


OBW

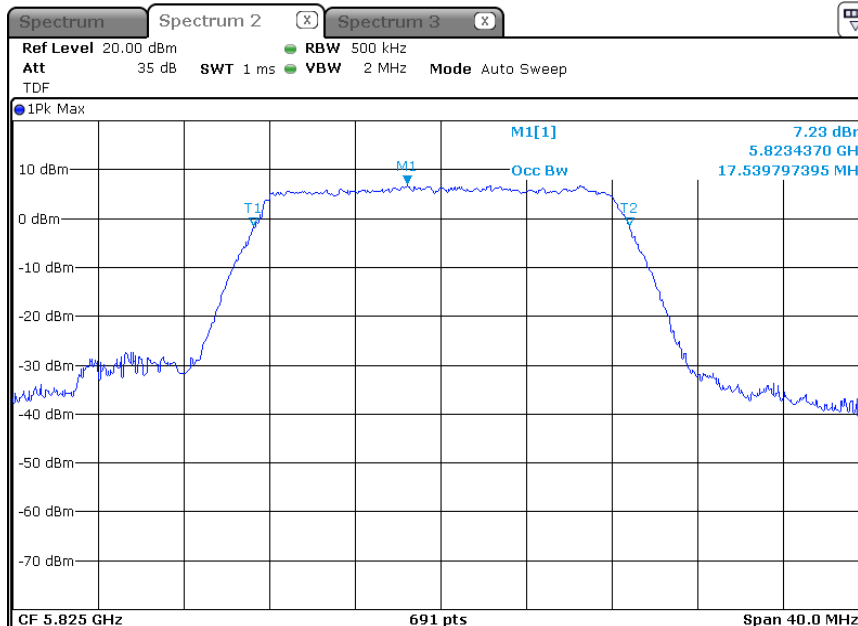


-5 825 MHz

6 dB Bandwidth



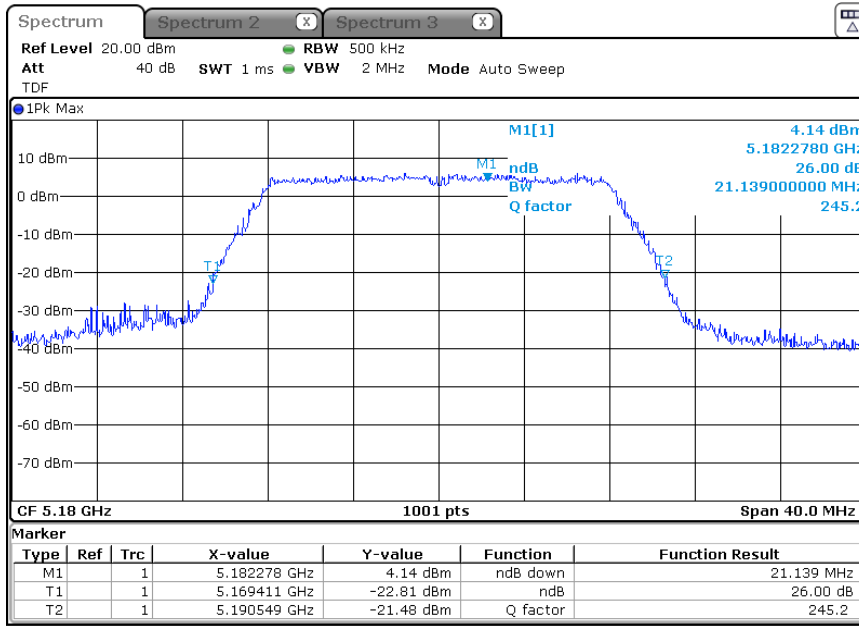
OBW



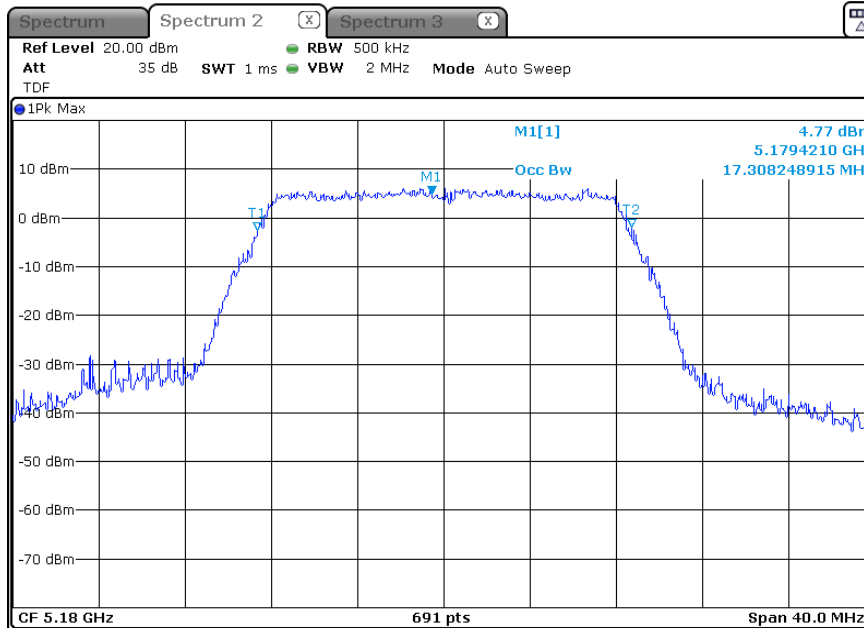
802.11a_ANT 2

-5 180 MHz

26 dB Bandwidth

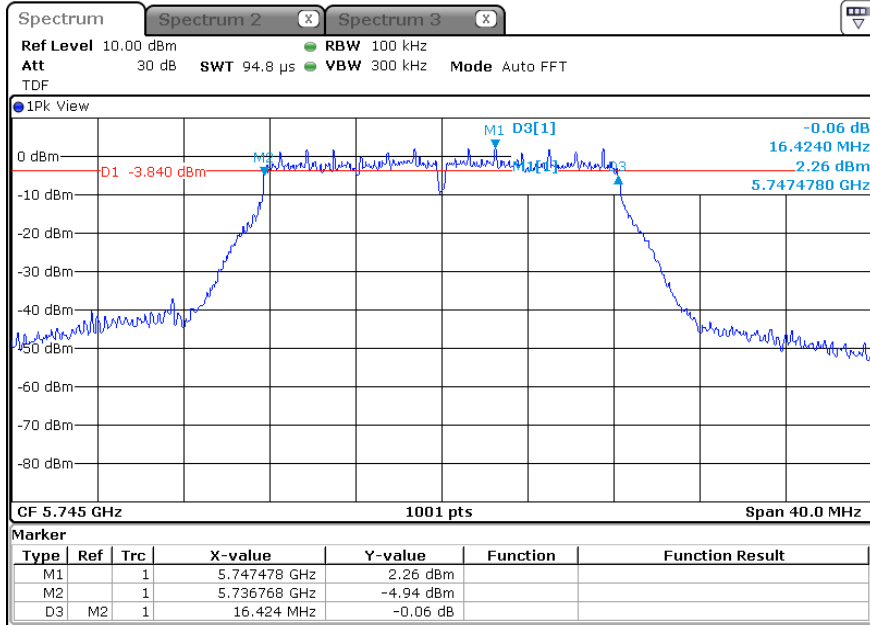


OBW

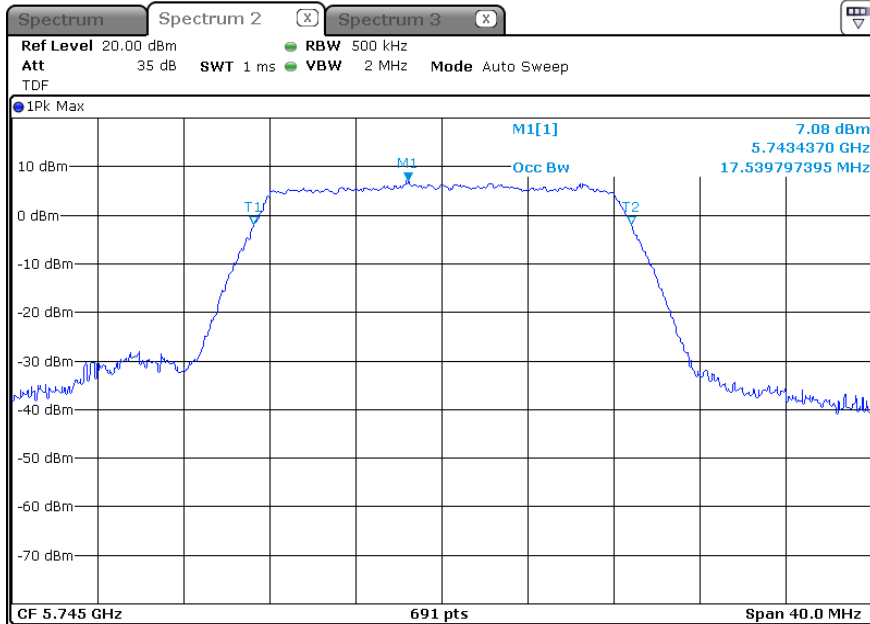


-5 745 MHz

6 dB Bandwidth



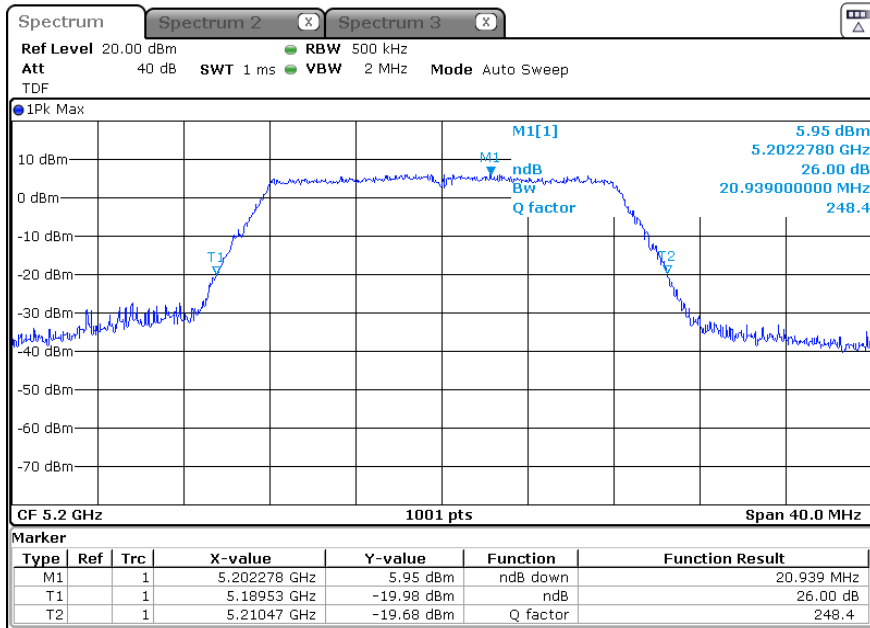
OBW



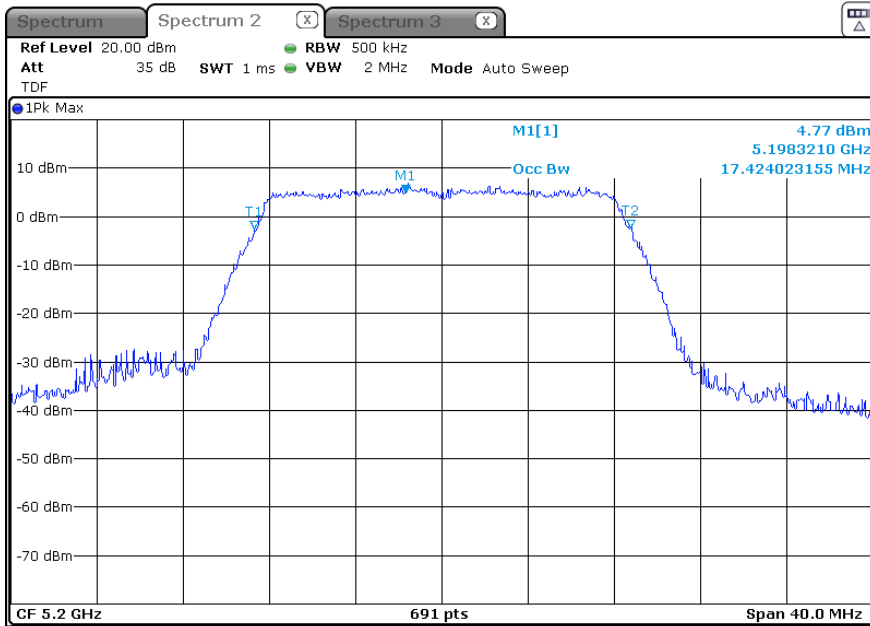
802.11a_ANT 2

-5 200 MHz

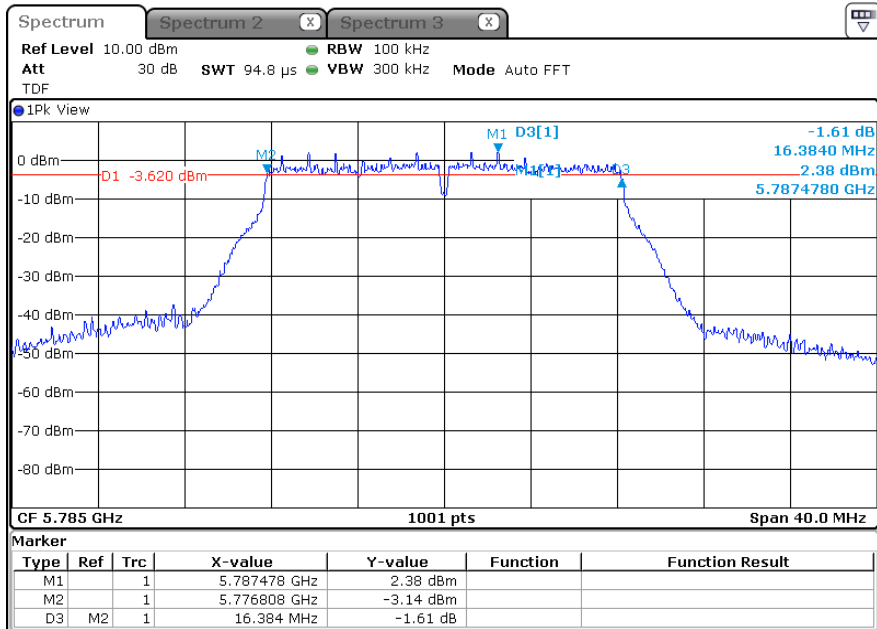
26 dB Bandwidth



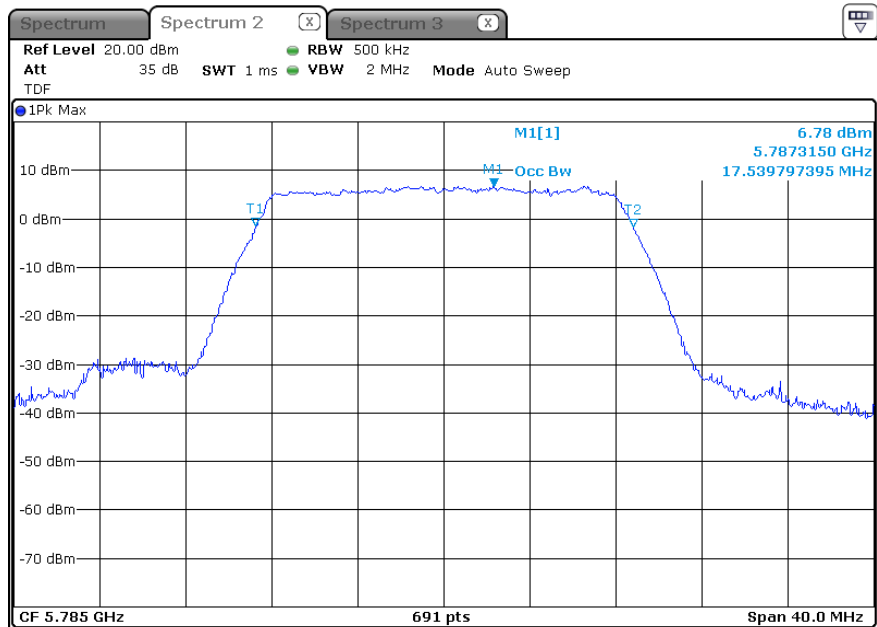
OBW



-5.785 MHz
 6 dB Bandwidth



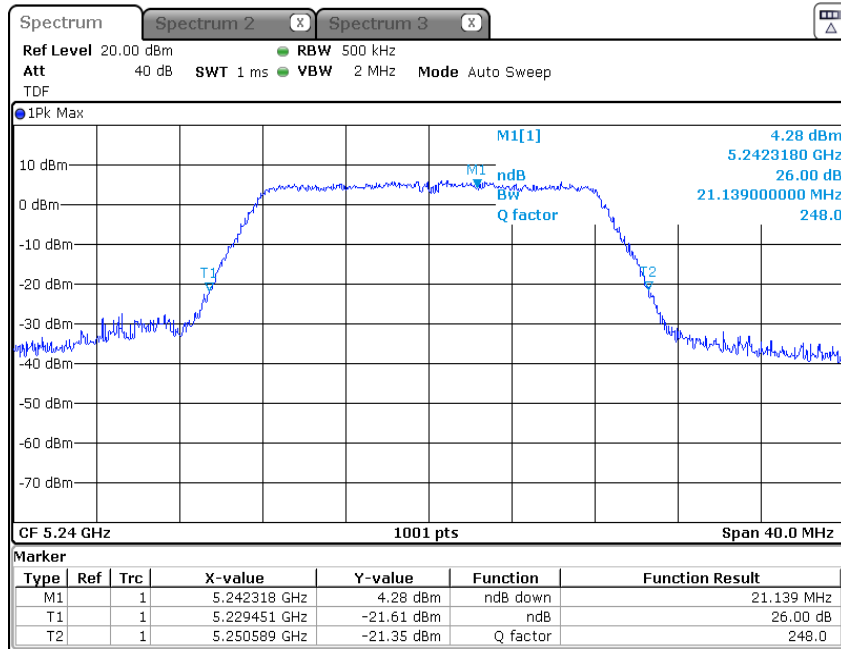
OBW



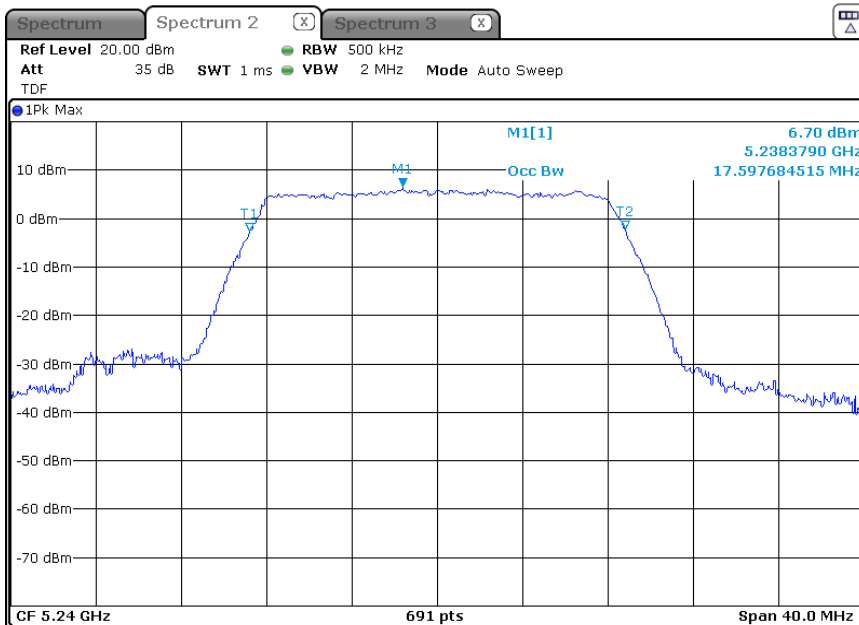
802.11a_ANT 2

-5 240 MHz

26 dB Bandwidth

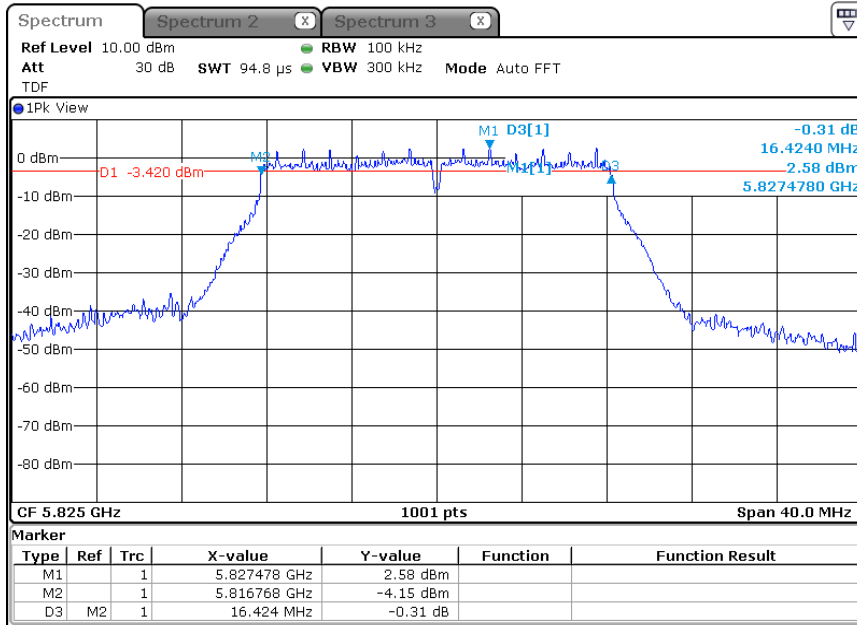


OBW

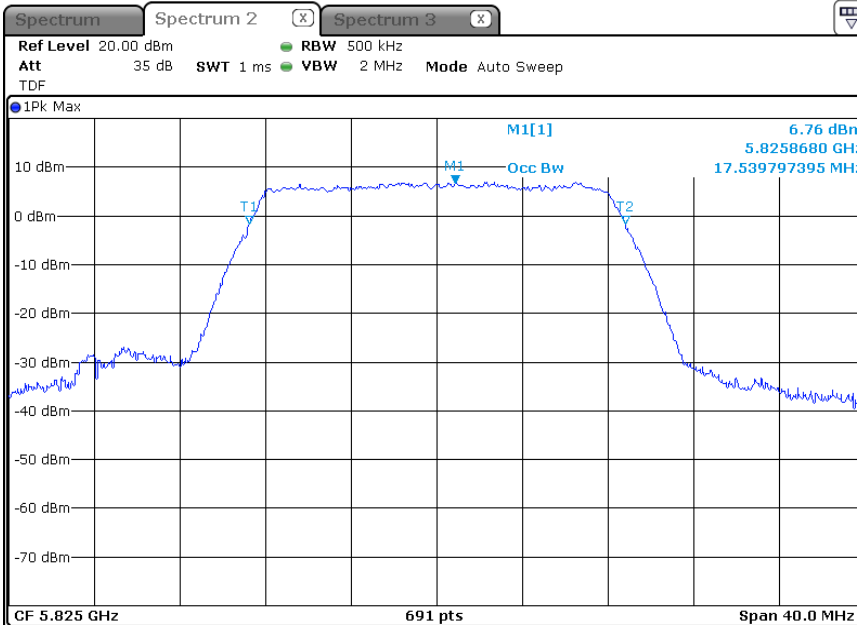


-5 825 MHz

6 dB Bandwidth



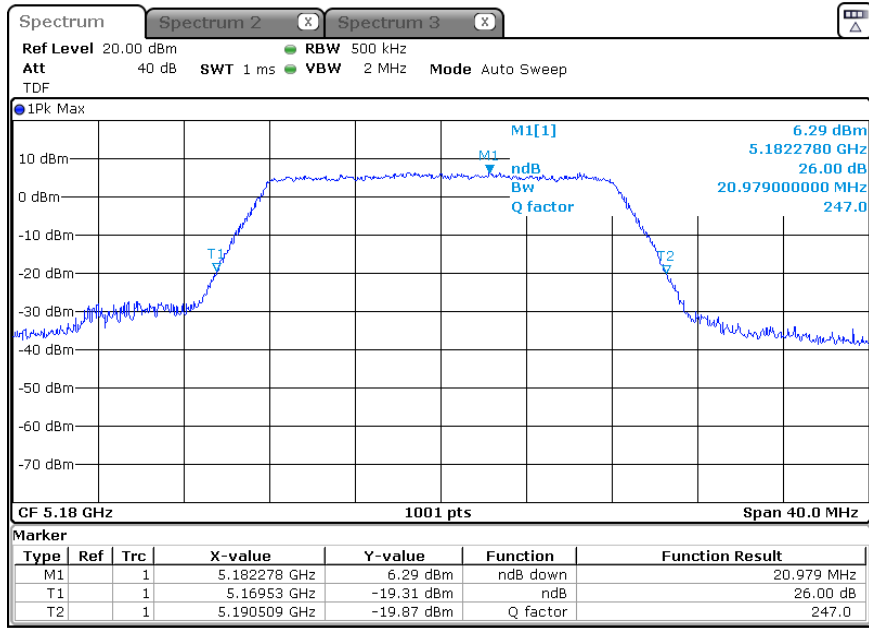
OBW



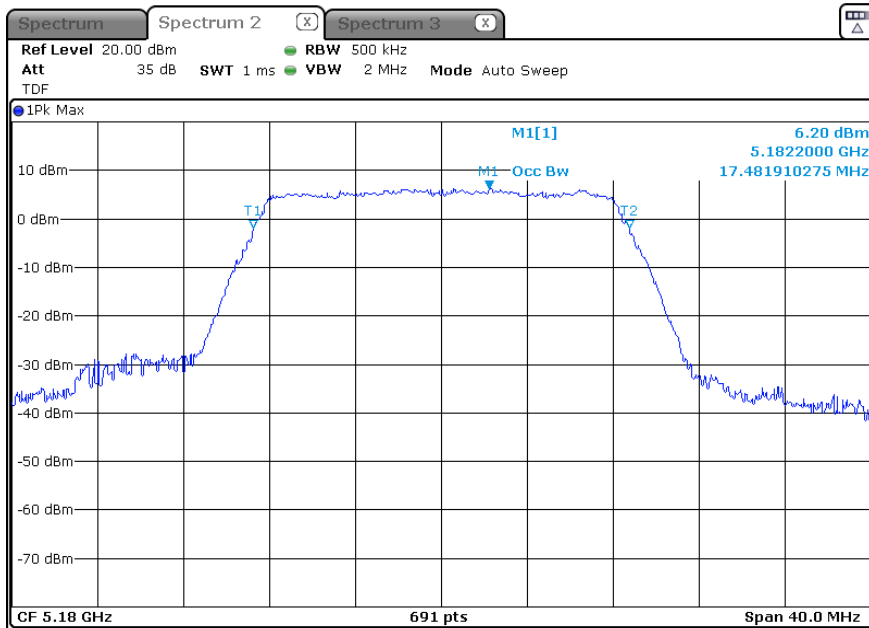
802.11a_ANT 3

-5 180 MHz

26 dB Bandwidth

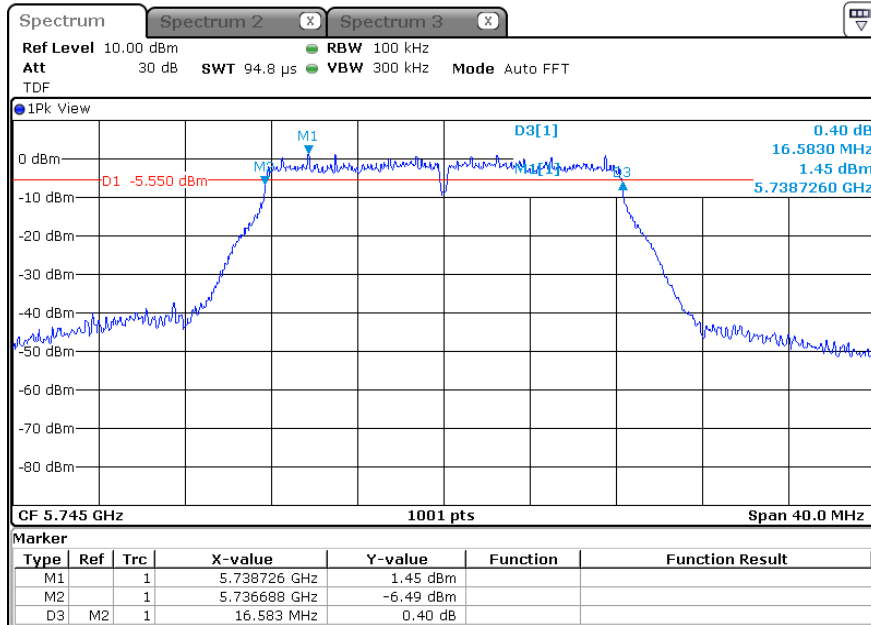


OBW

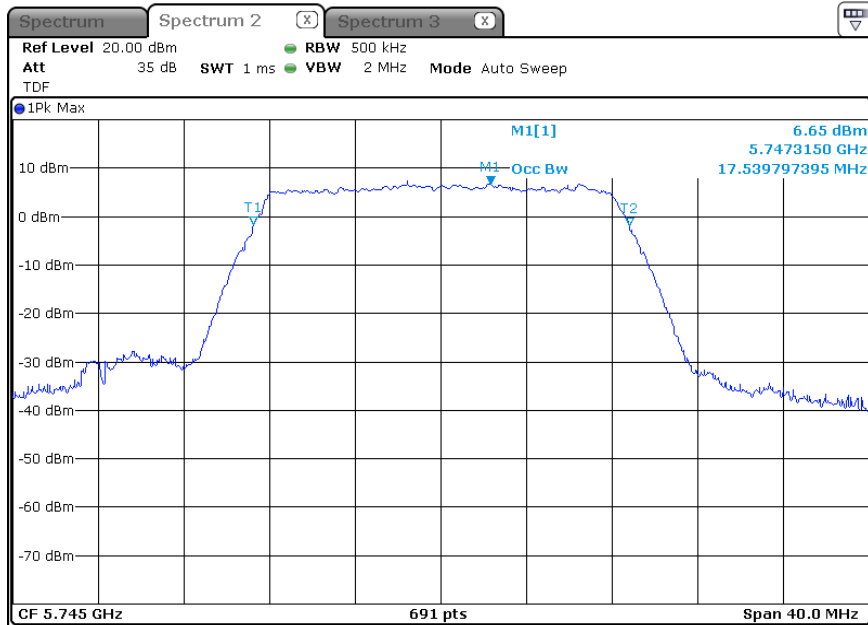


-5.745 MHz

6 dB Bandwidth



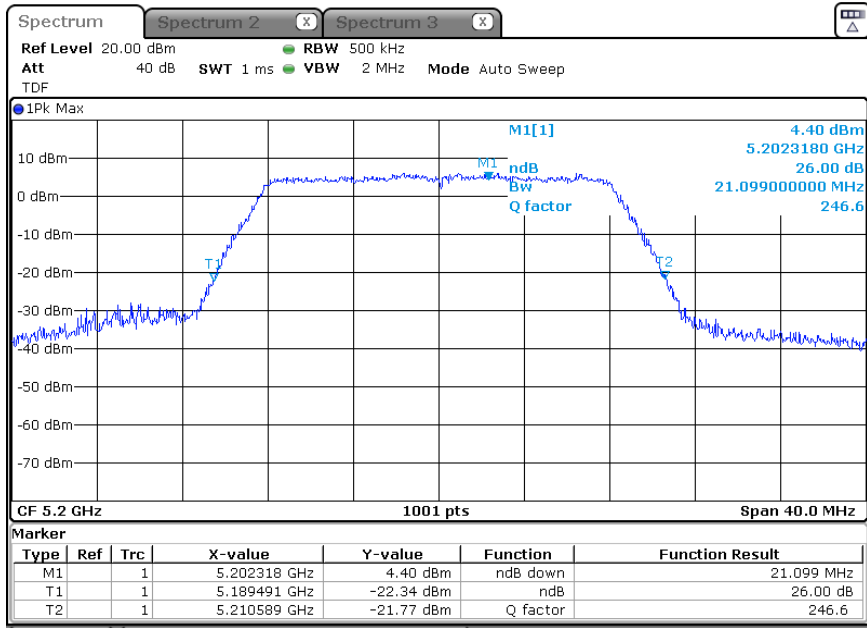
OBW



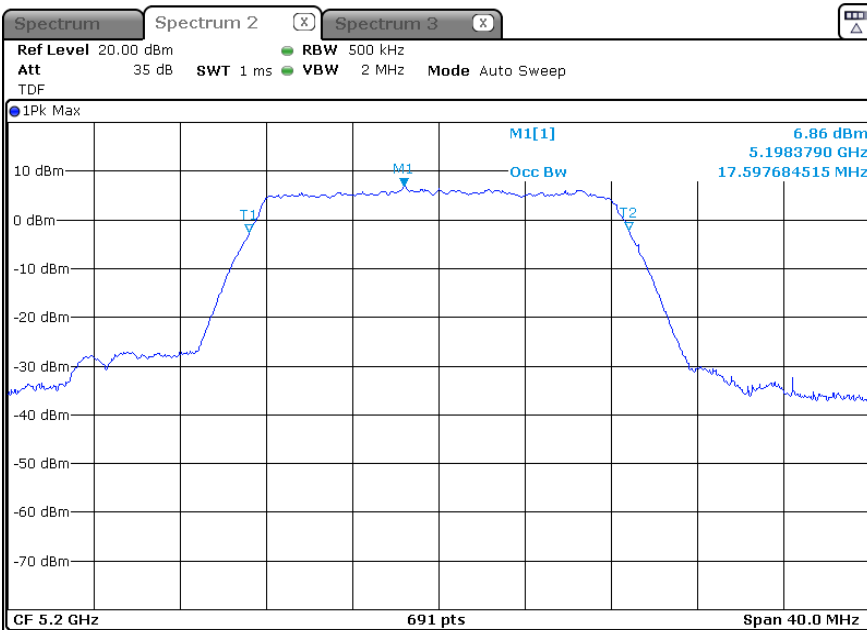
802.11a_ANT 3

-5 200 MHz

26 dB Bandwidth

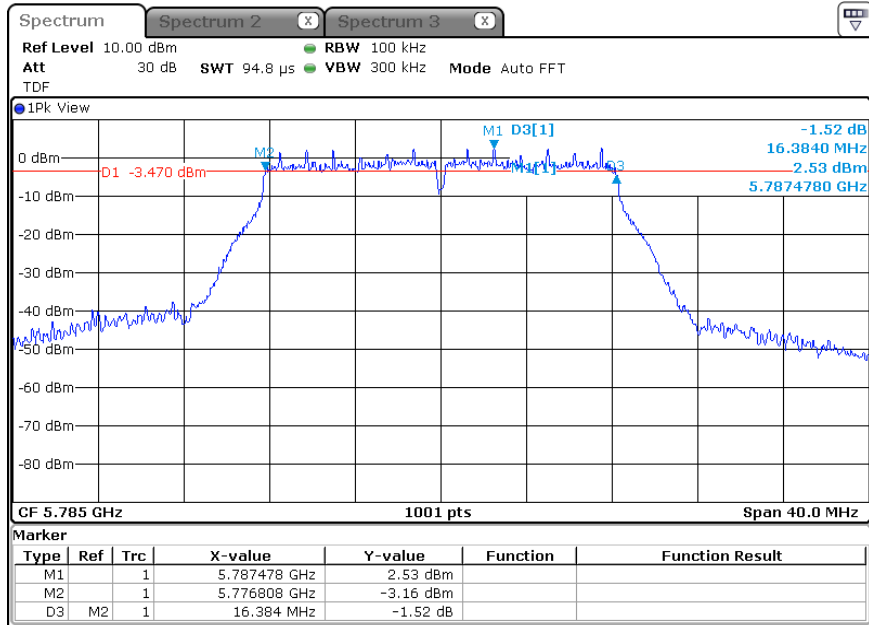


OBW

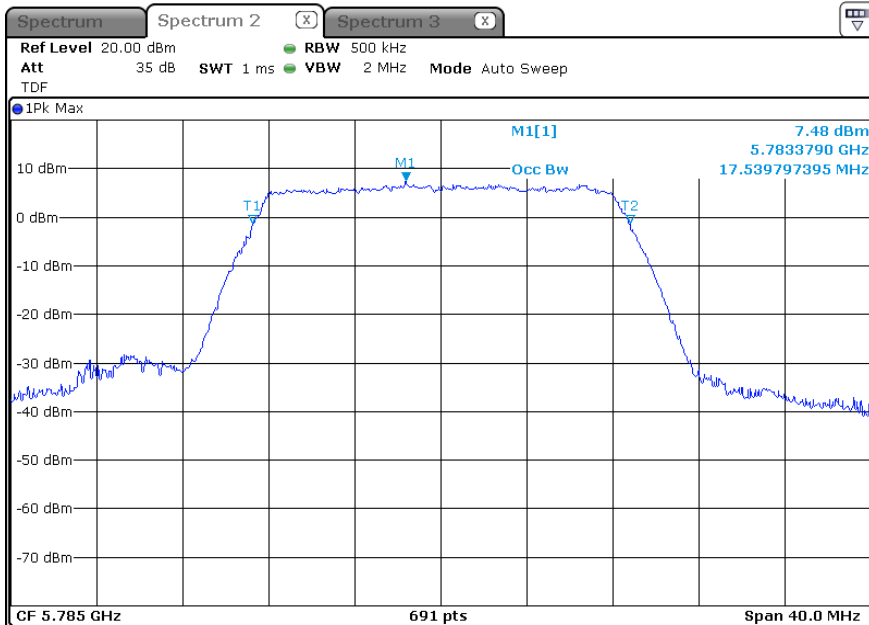


-5.785 MHz

6 dB Bandwidth



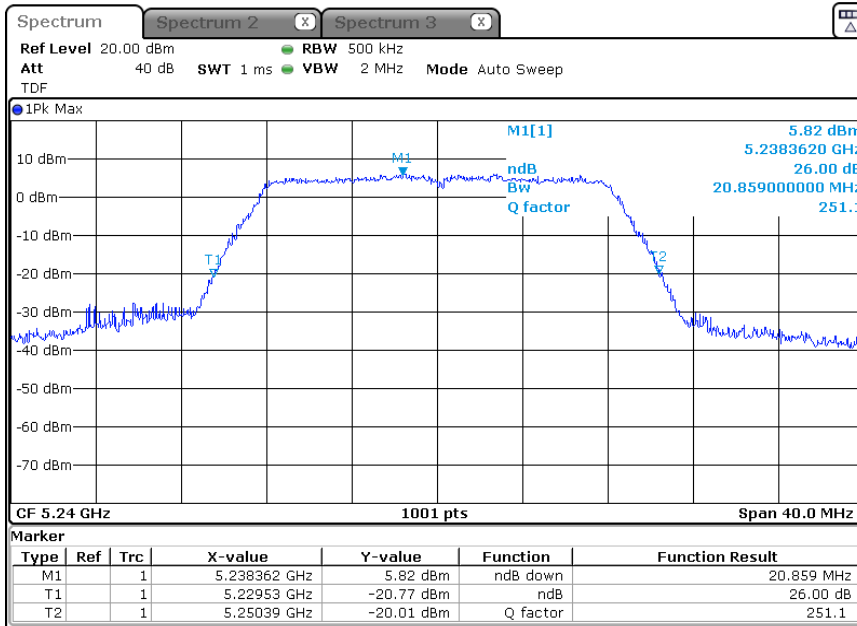
OBW



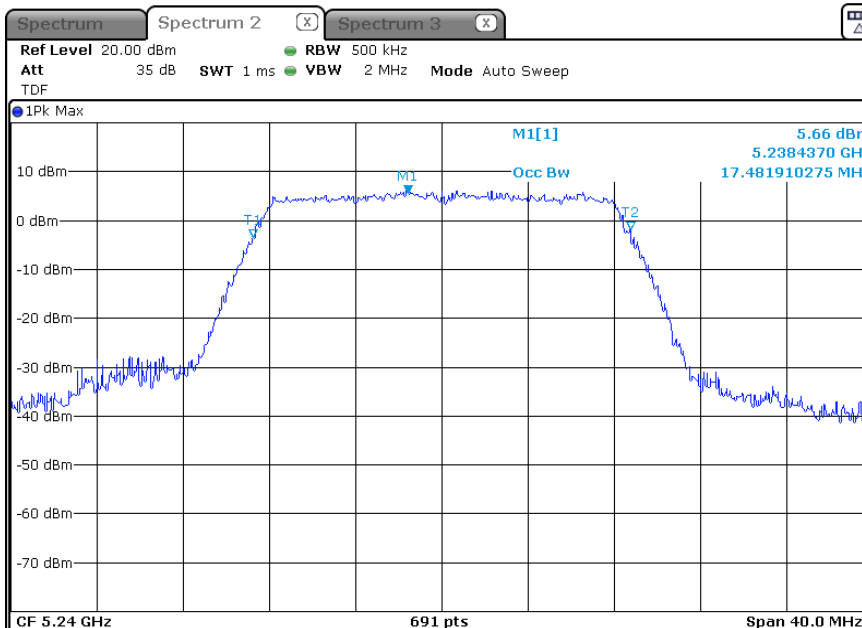
802.11a_ANT 3

-5 240 MHz

26 dB Bandwidth

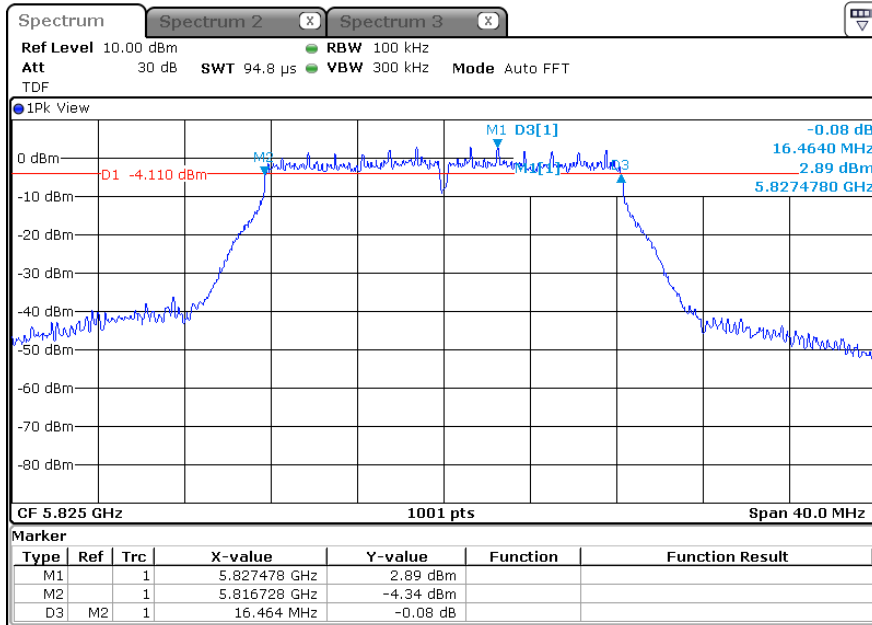


OBW

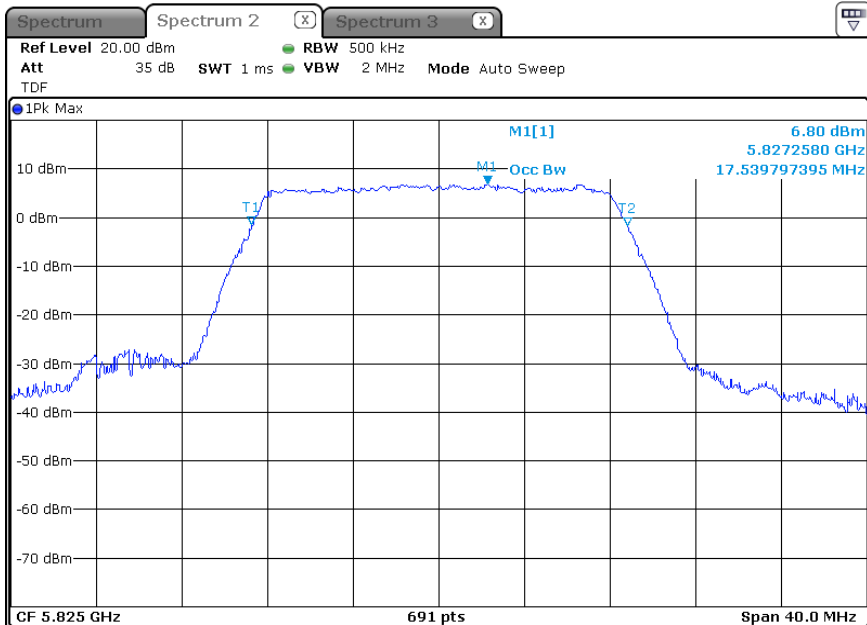


-5 825 MHz

6 dB Bandwidth



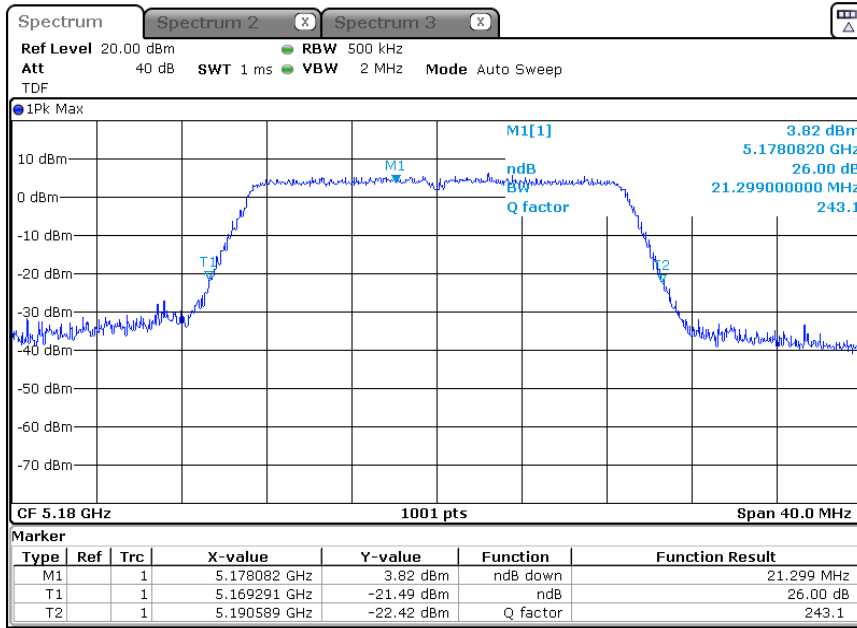
OBW



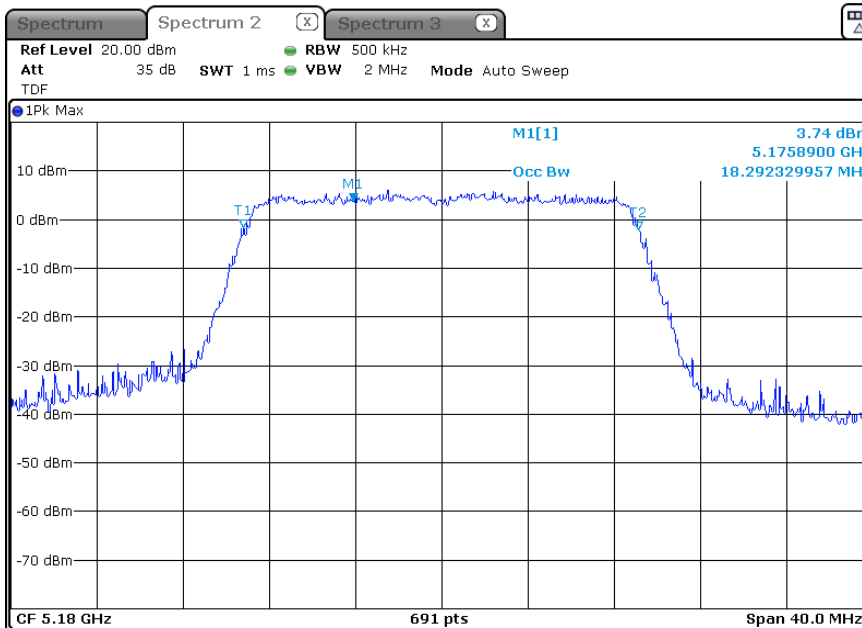
802.11an20_ANT1

-5 180 MHz

26 dB Bandwidth

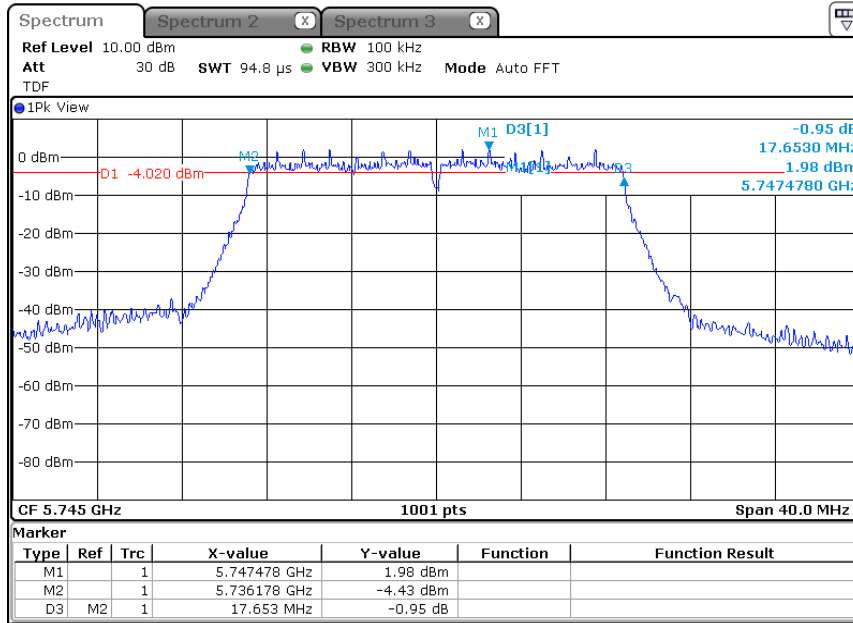


OBW

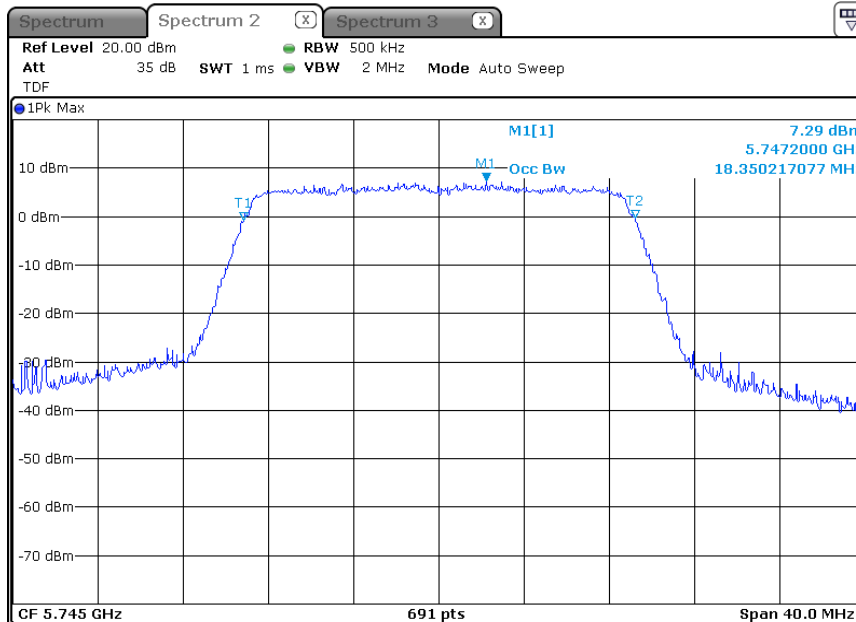


-5 745 MHz

6 dB Bandwidth



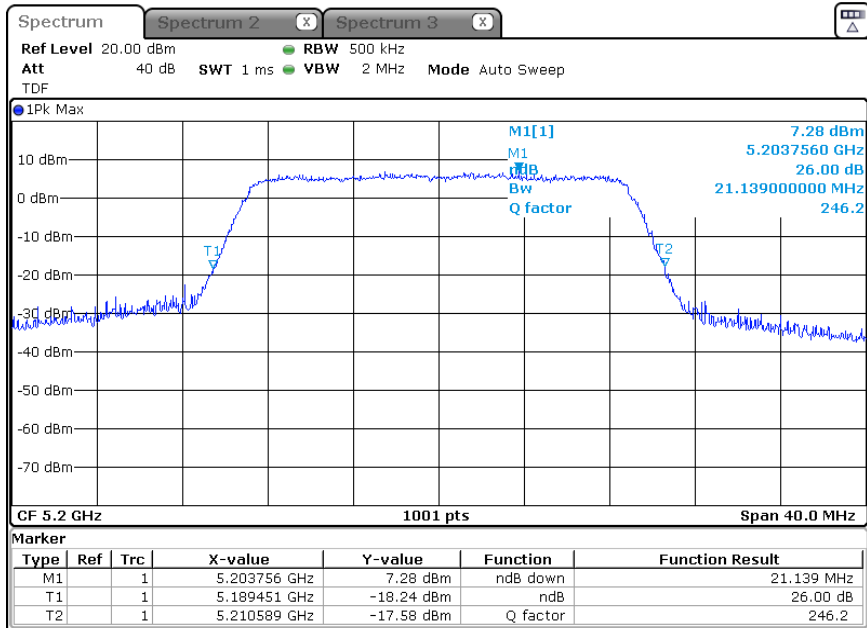
OBW



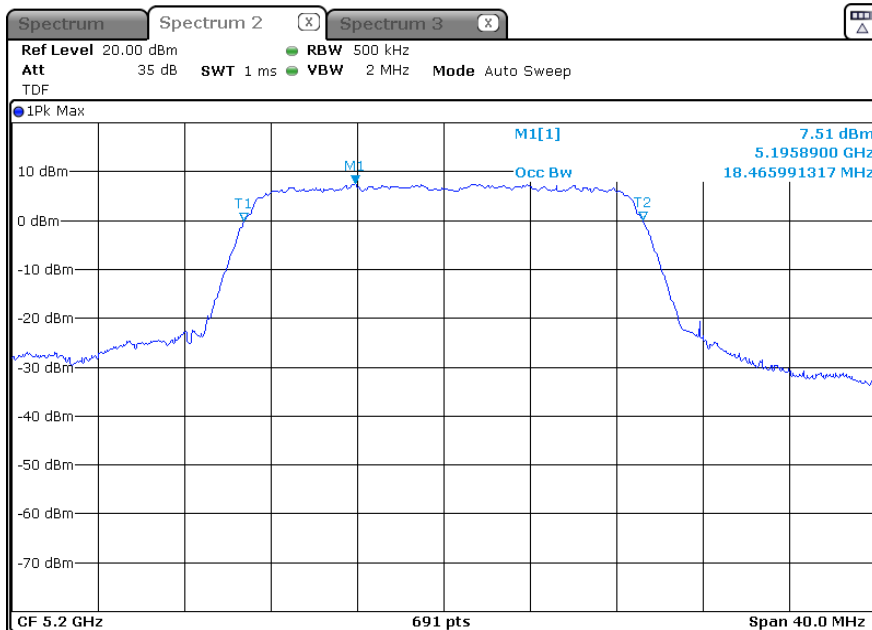
802.11an20_ANT1

-5 200 MHz

26 dB Bandwidth

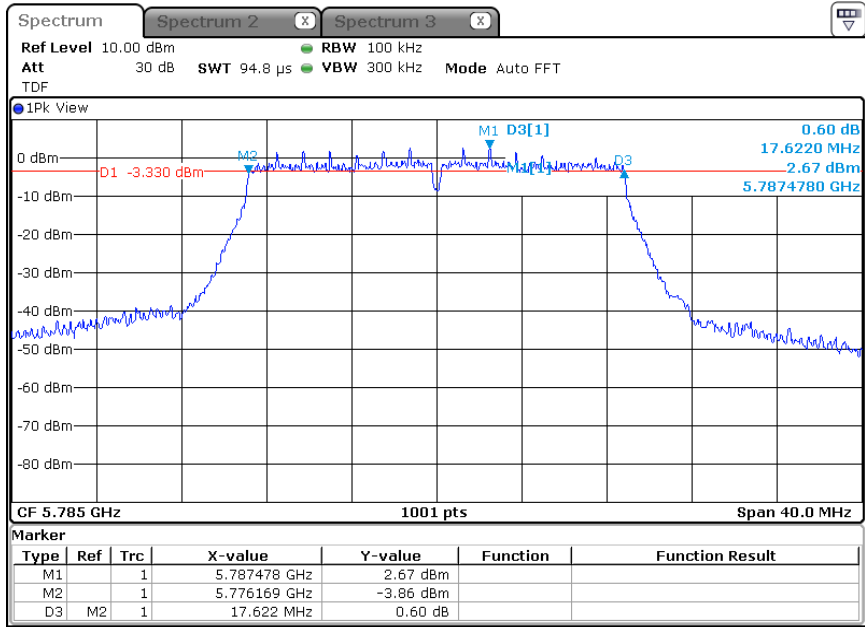


OBW

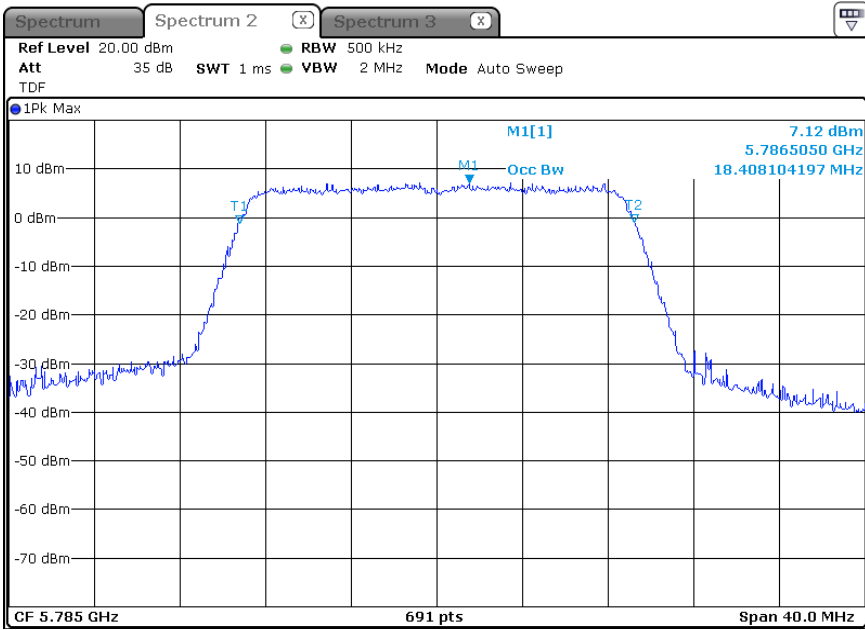


-5.785 MHz

6 dB Bandwidth



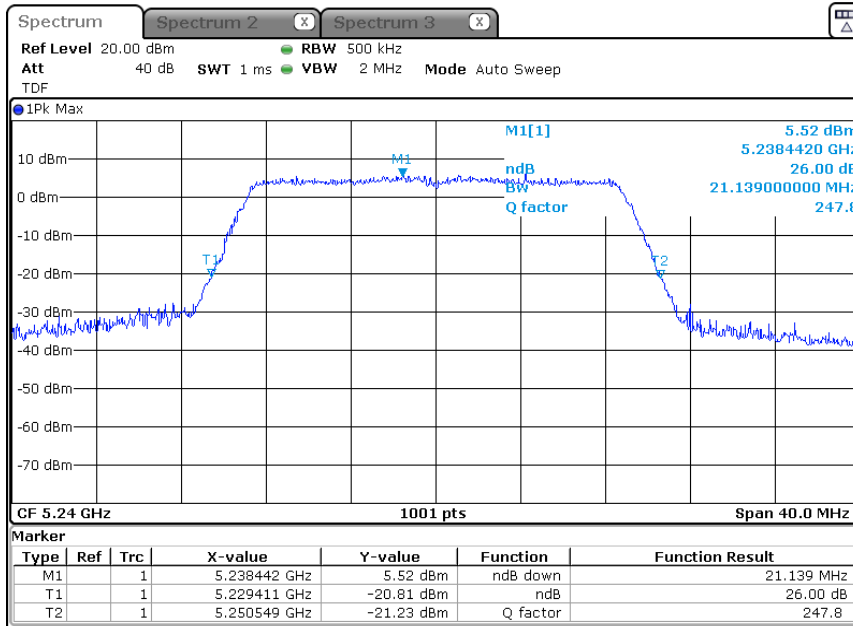
OBW



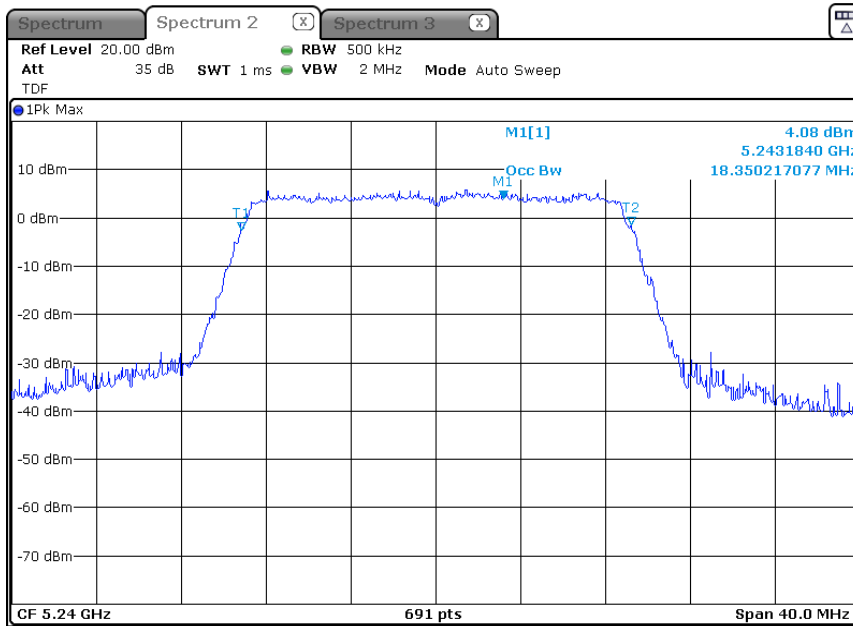
802.11an20_ANT1

-5 240 MHz

26 dB Bandwidth

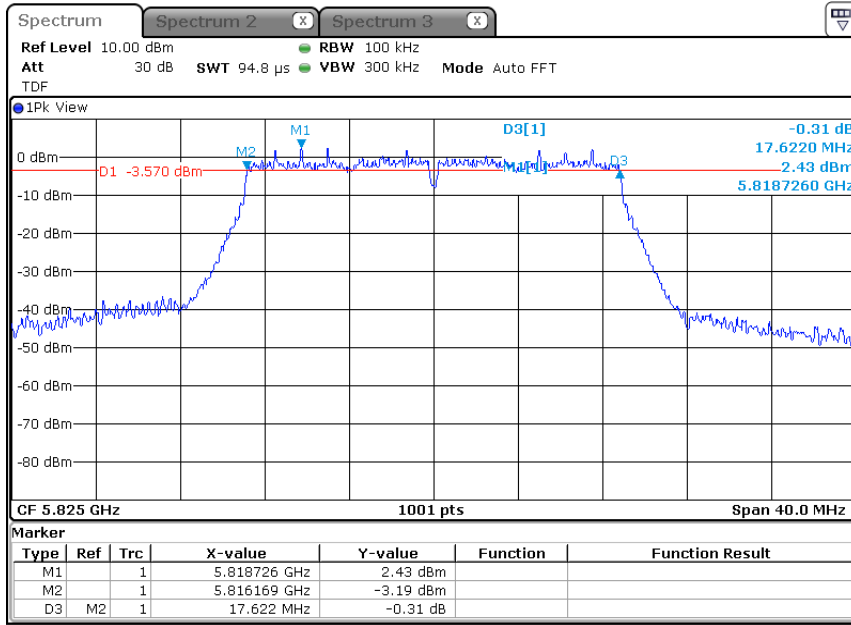


OBW

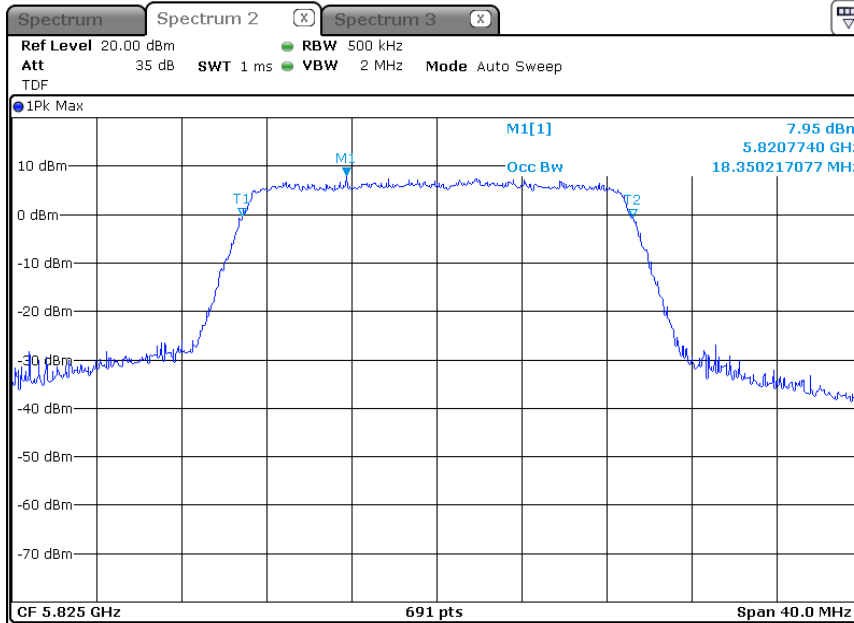


-5 825 MHz

6 dB Bandwidth



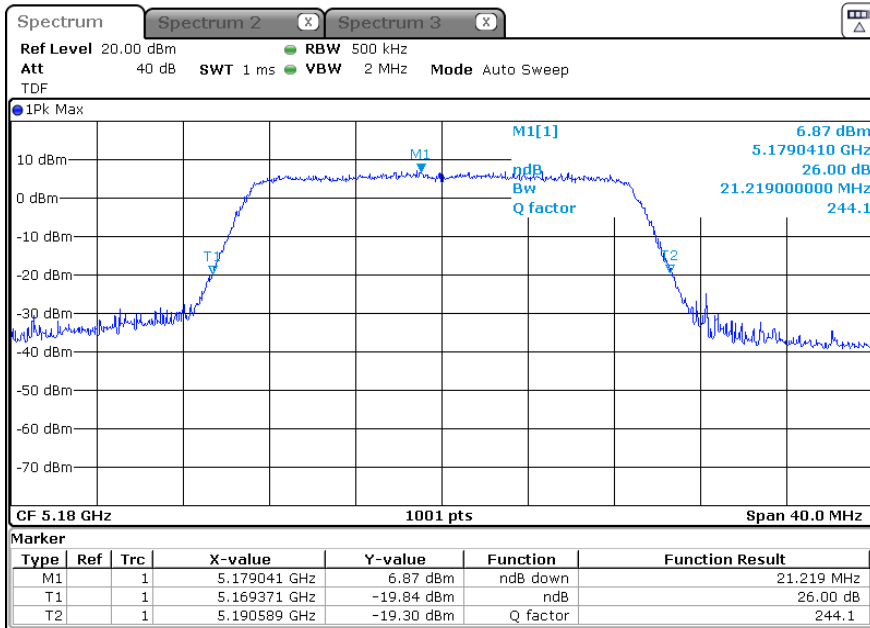
OBW



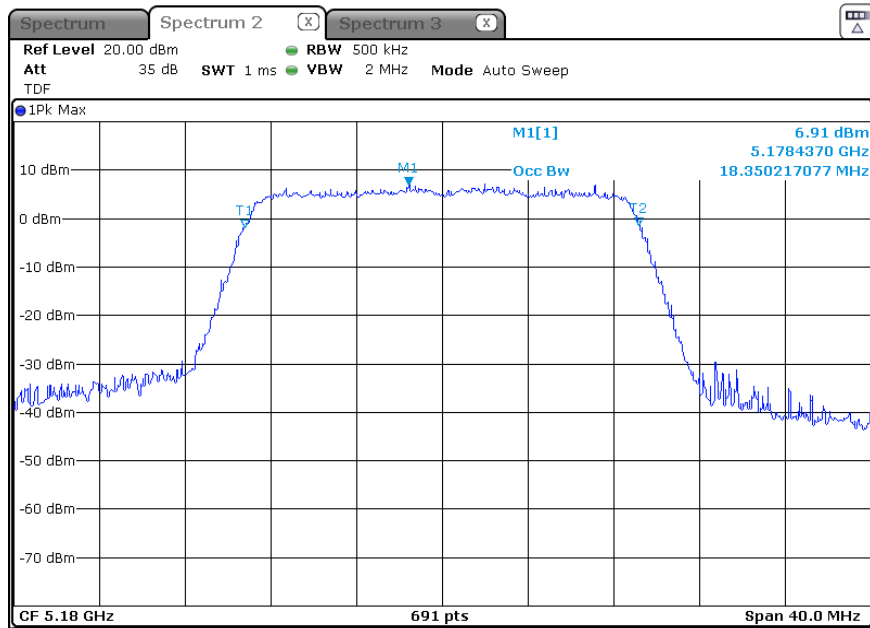
802.11an20_ANT2

-5 180 MHz

26 dB Bandwidth

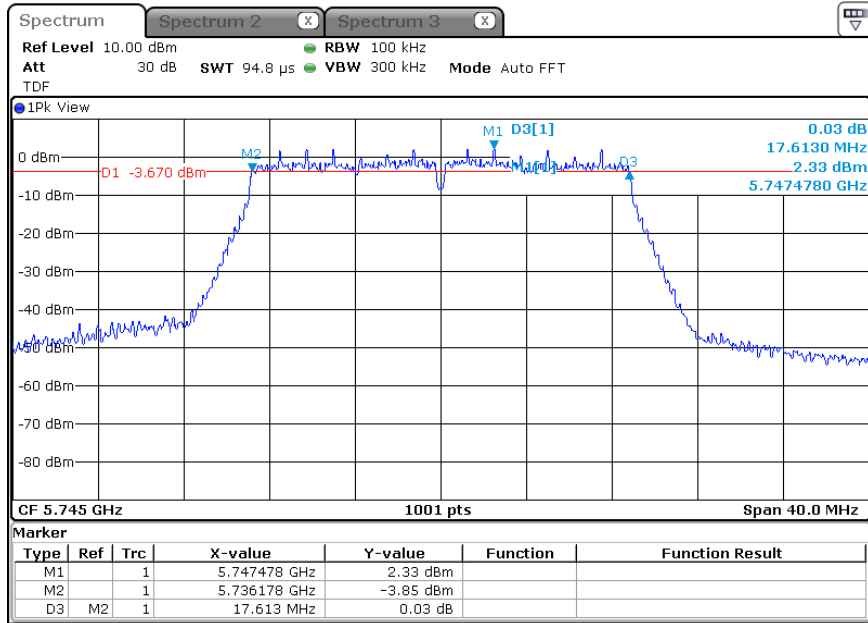


OBW

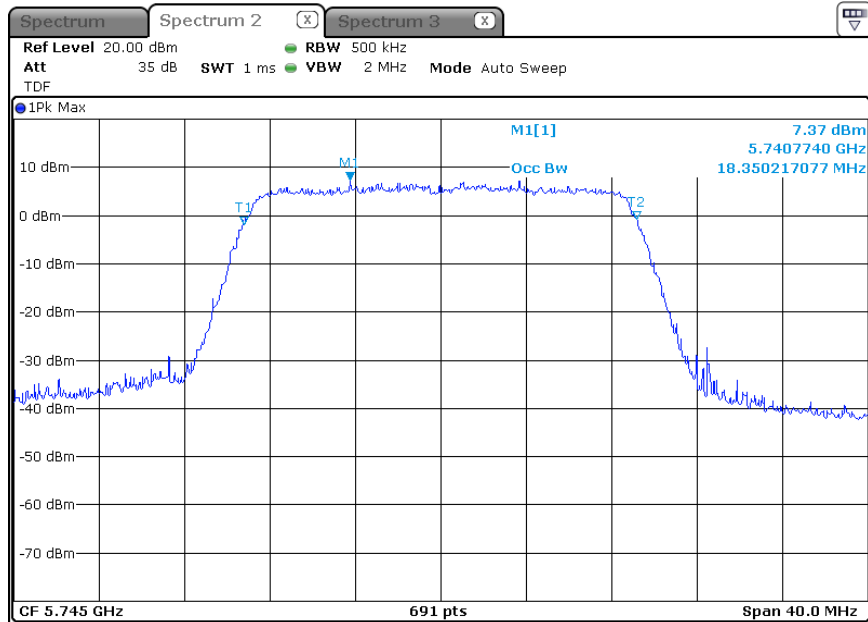


-5.745 MHz

6 dB Bandwidth



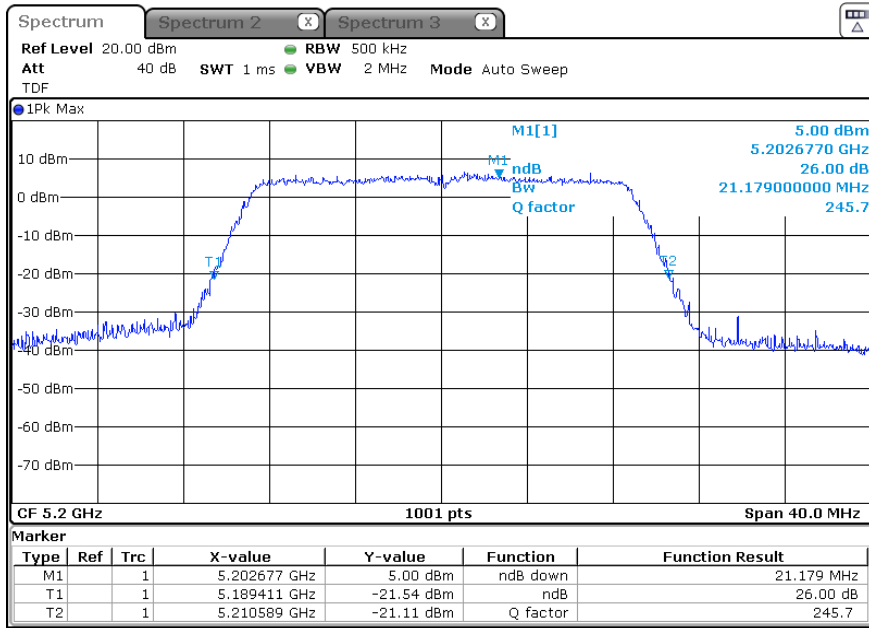
OBW



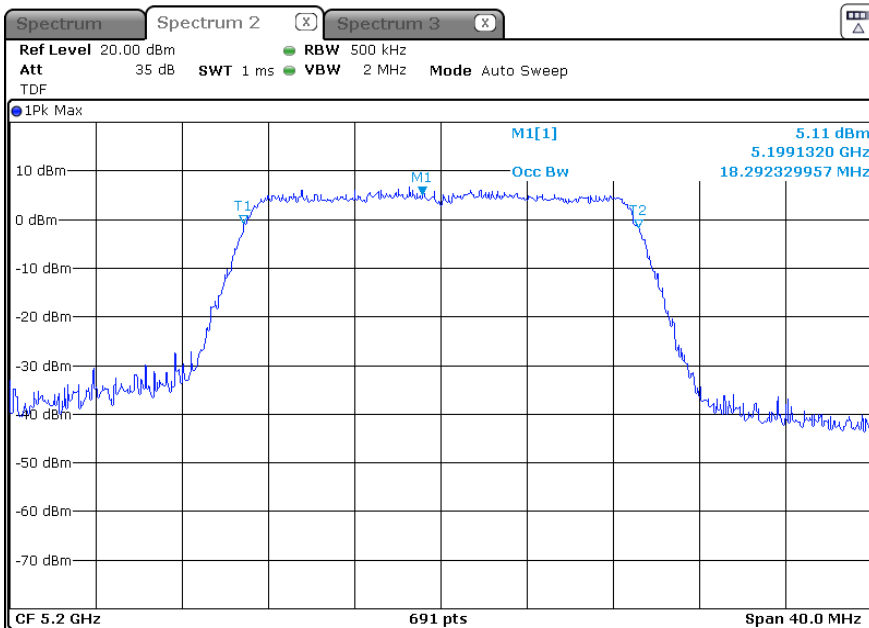
802.11an20_ANT2

-5 200 MHz

26 dB Bandwidth

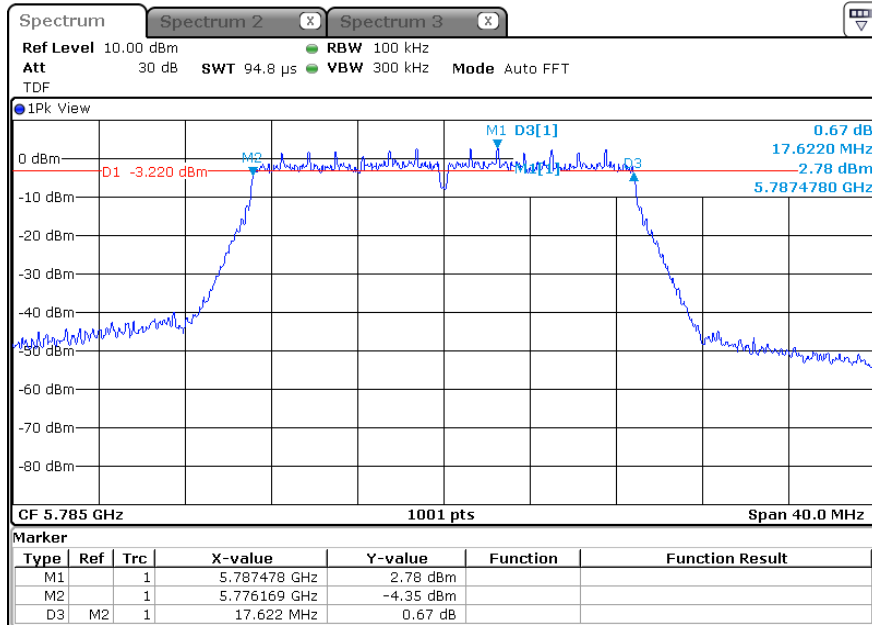


OBW

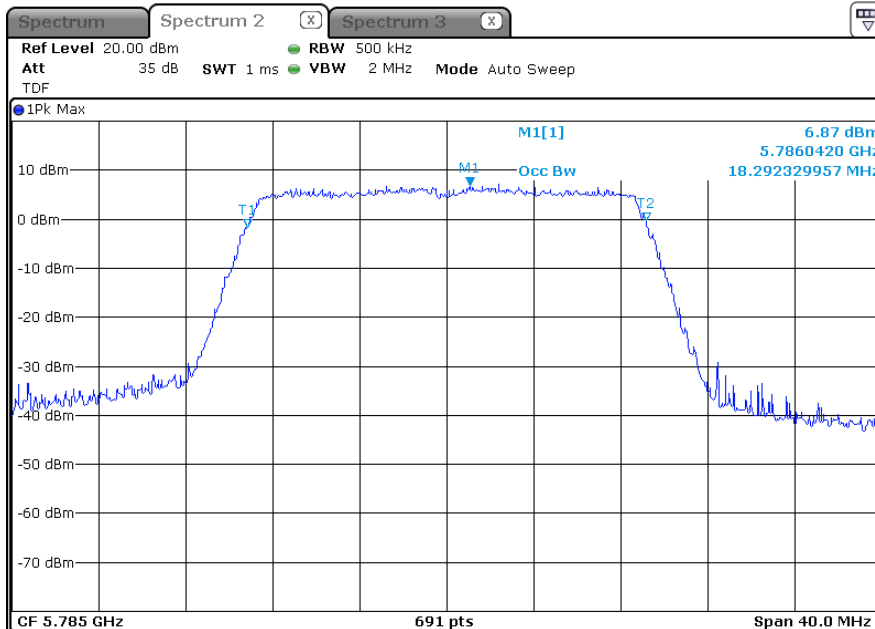


-5.785 MHz

6 dB Bandwidth



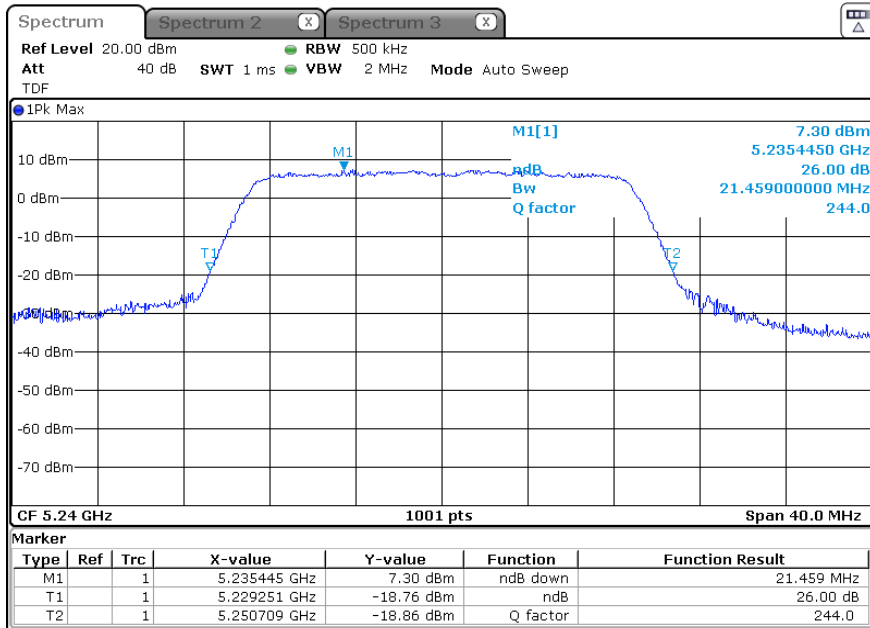
OBW



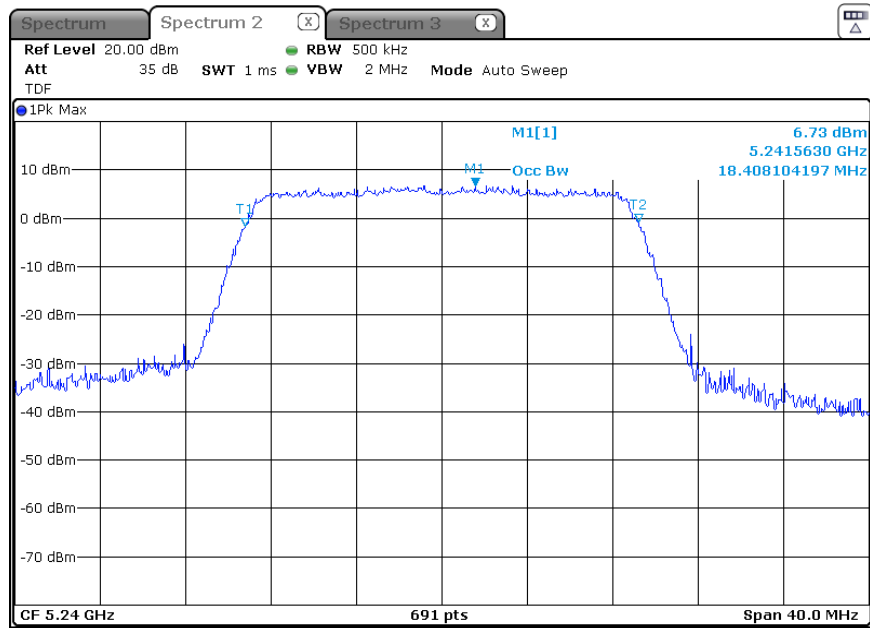
802.11an20_ANT2

-5 240 MHz

26 dB Bandwidth

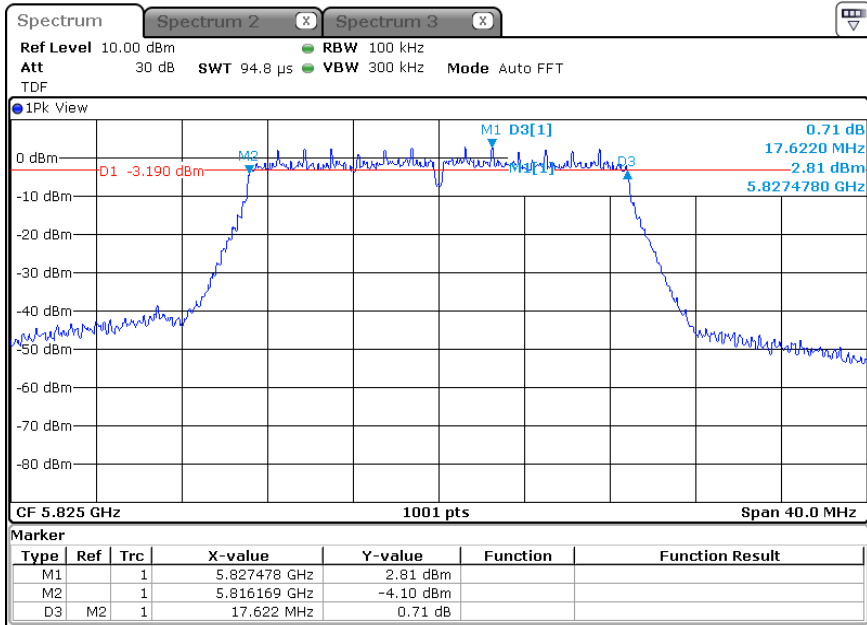


OBW

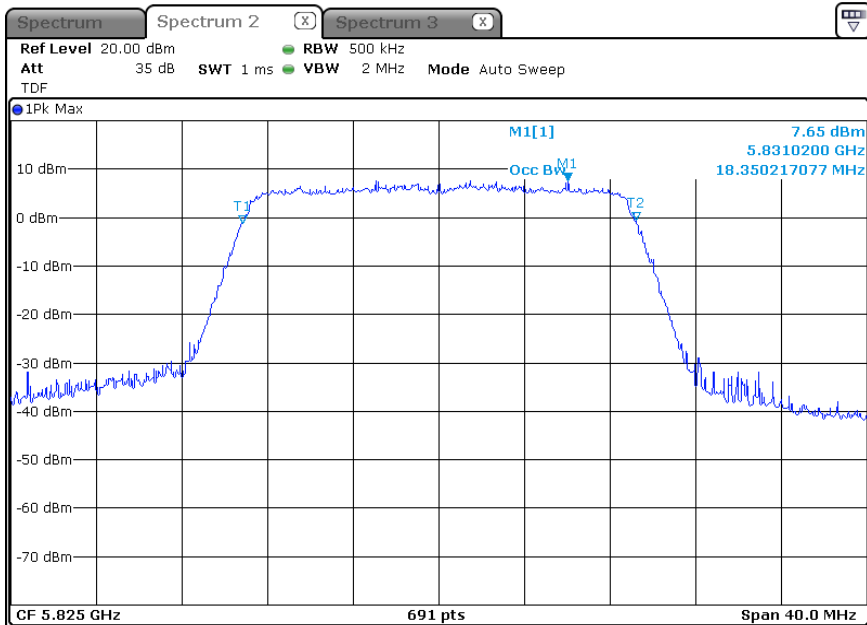


-5 825 MHz

6 dB Bandwidth



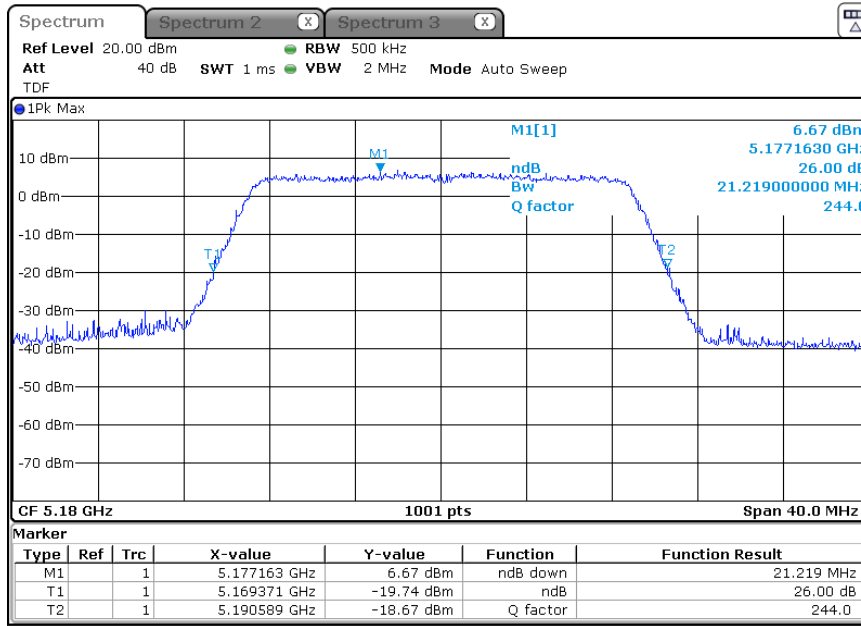
OBW



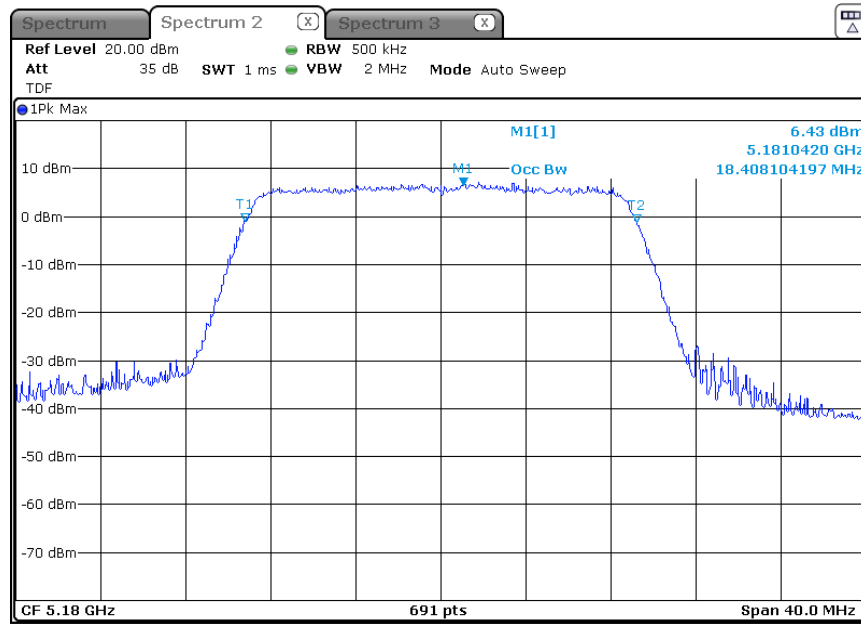
802.11an20_ANT3

-5 180 MHz

26 dB Bandwidth

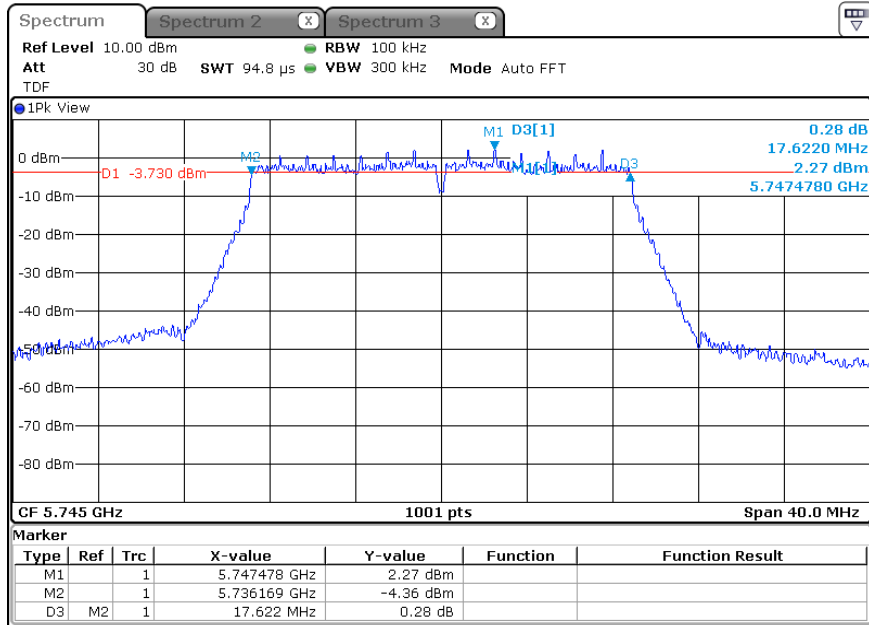


OBW

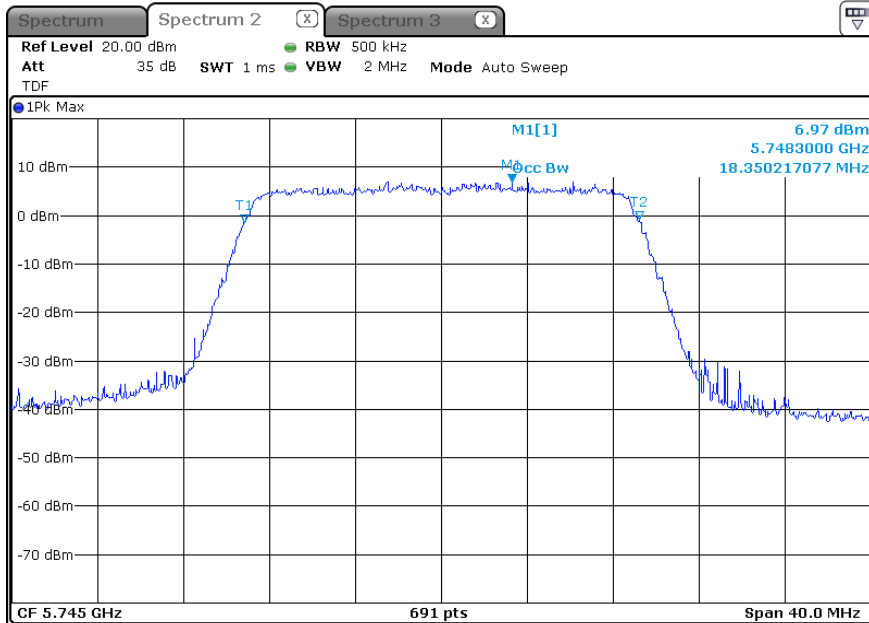


-5.745 MHz

6 dB Bandwidth



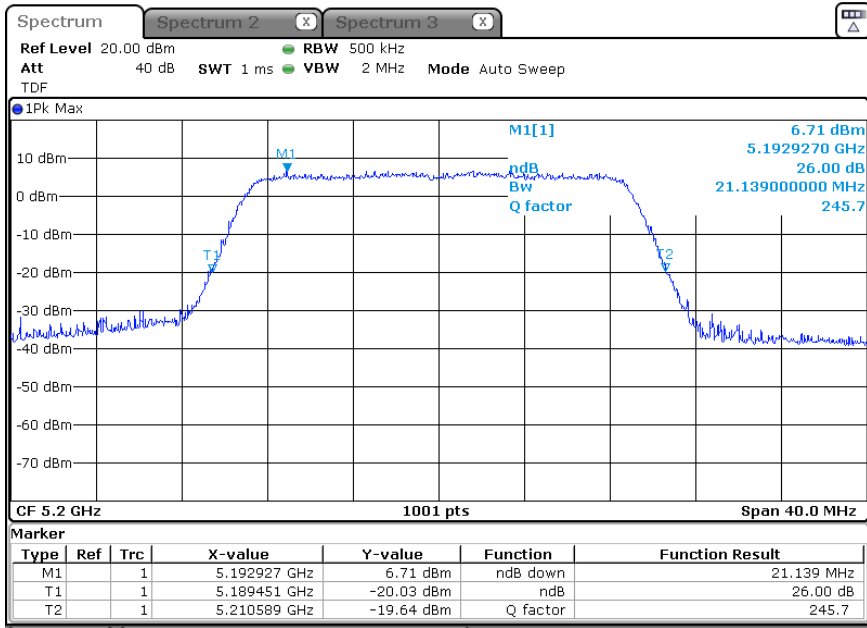
OBW



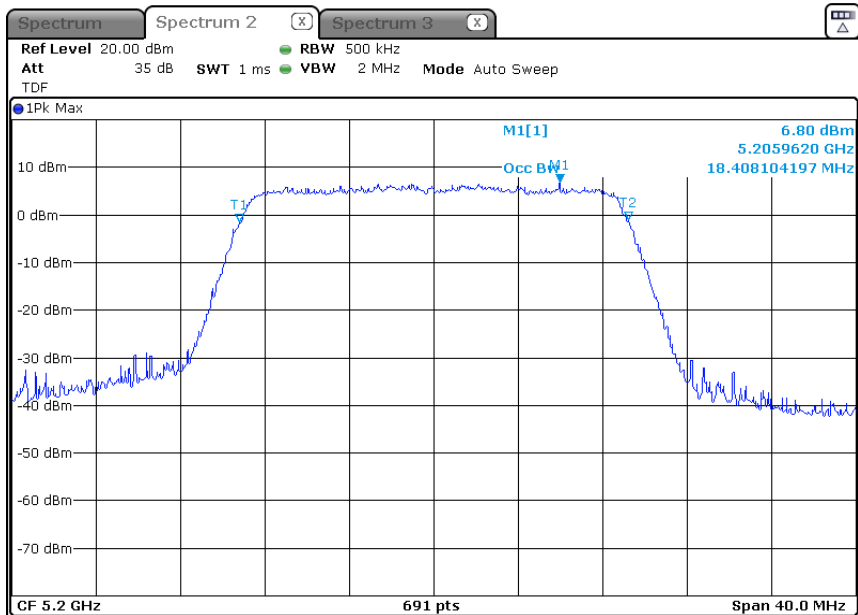
802.11an20_ANT3

-5 200 MHz

26 dB Bandwidth

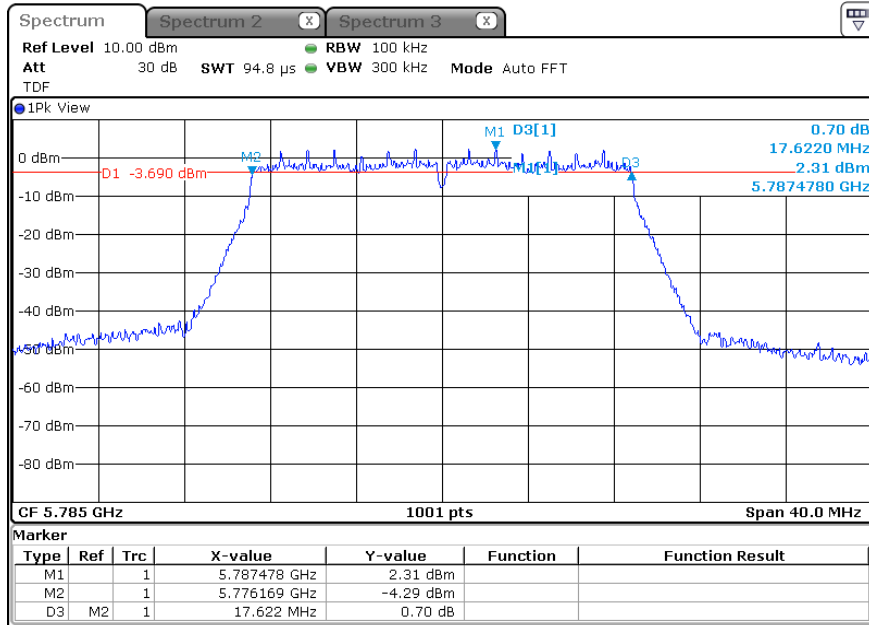


OBW

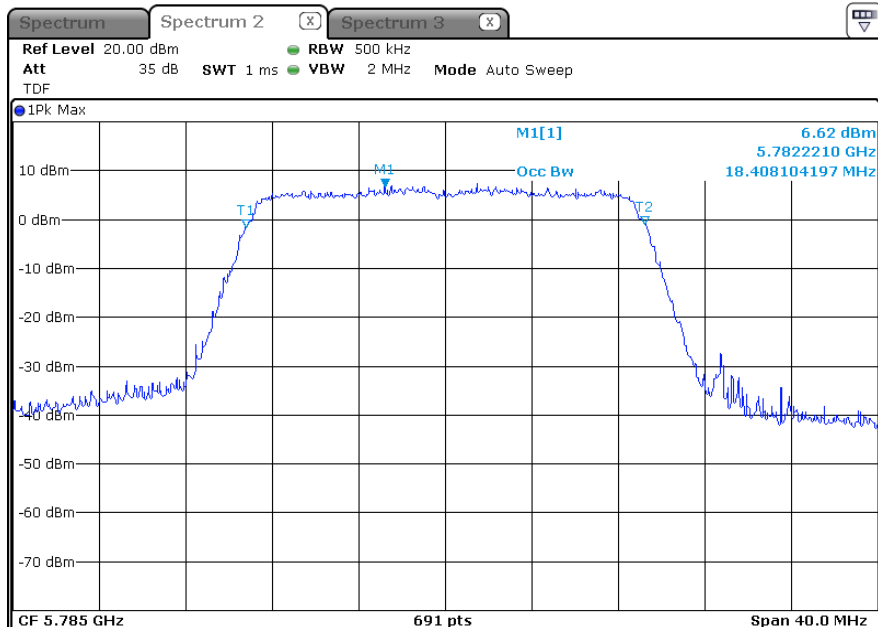


-5 785 MHz

6 dB Bandwidth



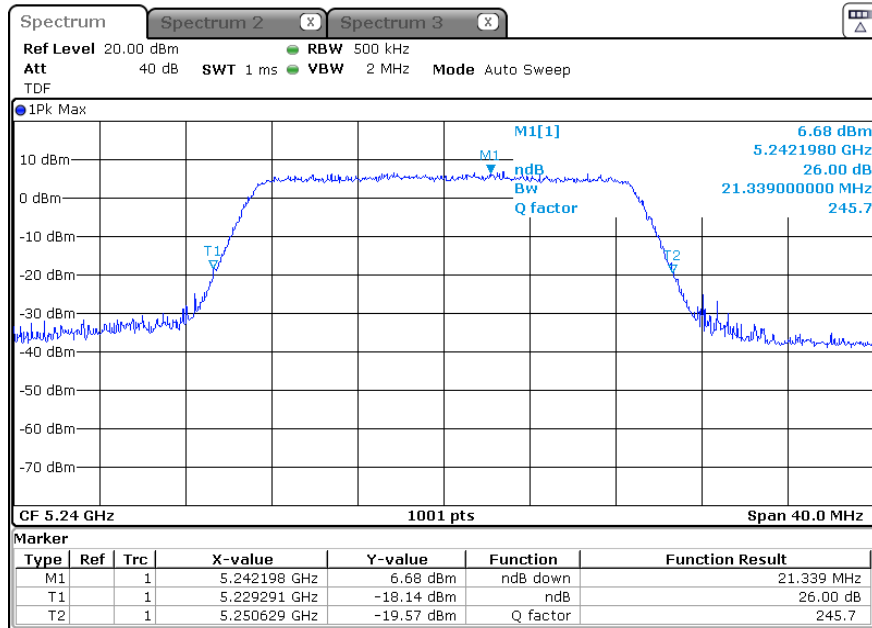
OBW



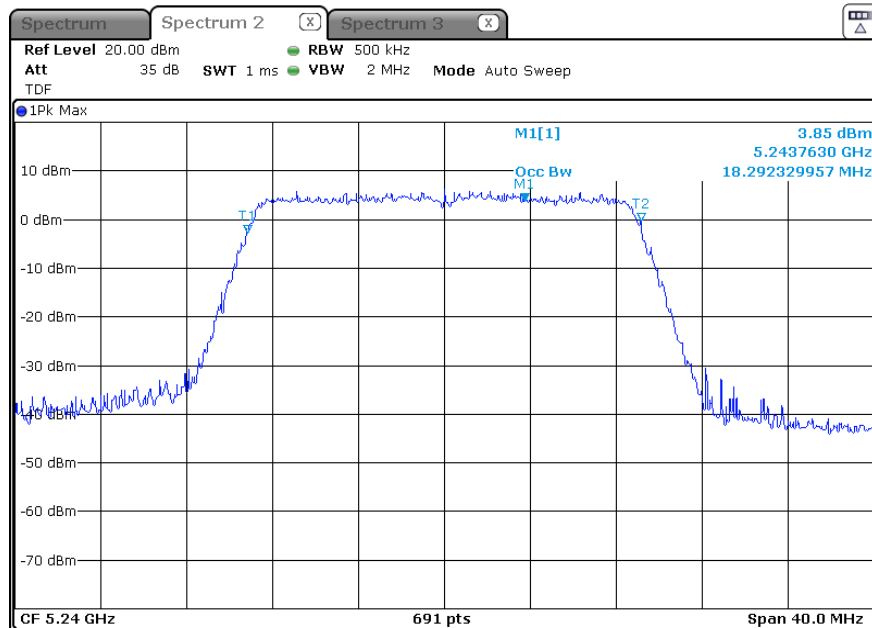
802.11an20_ANT3

-5 240 MHz

26 dB Bandwidth

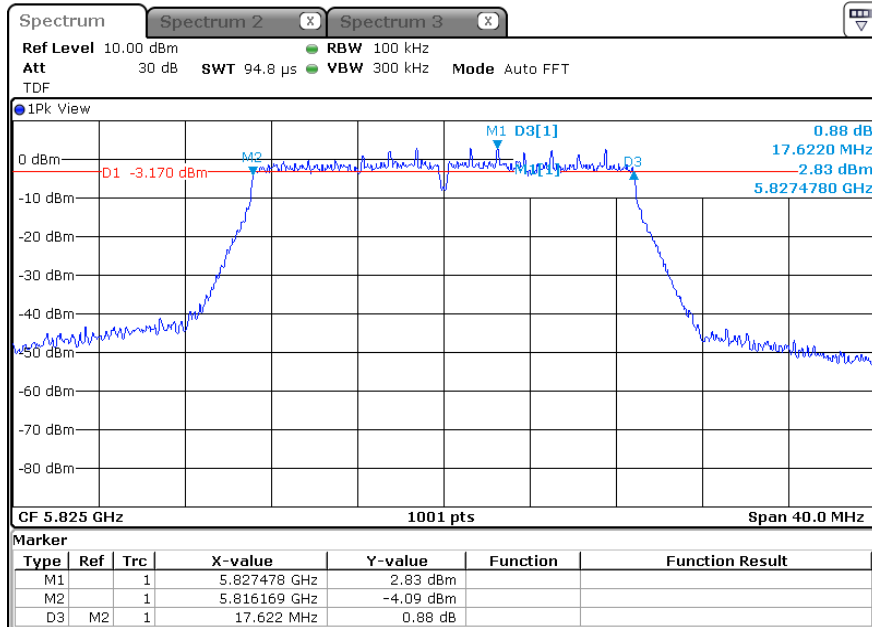


OBW

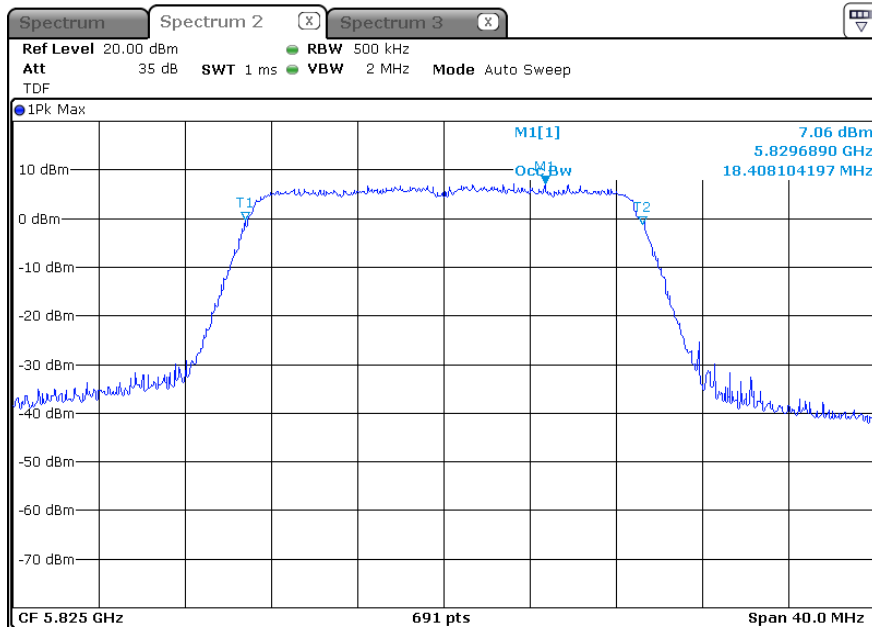


-5 825 MHz

6 dB Bandwidth



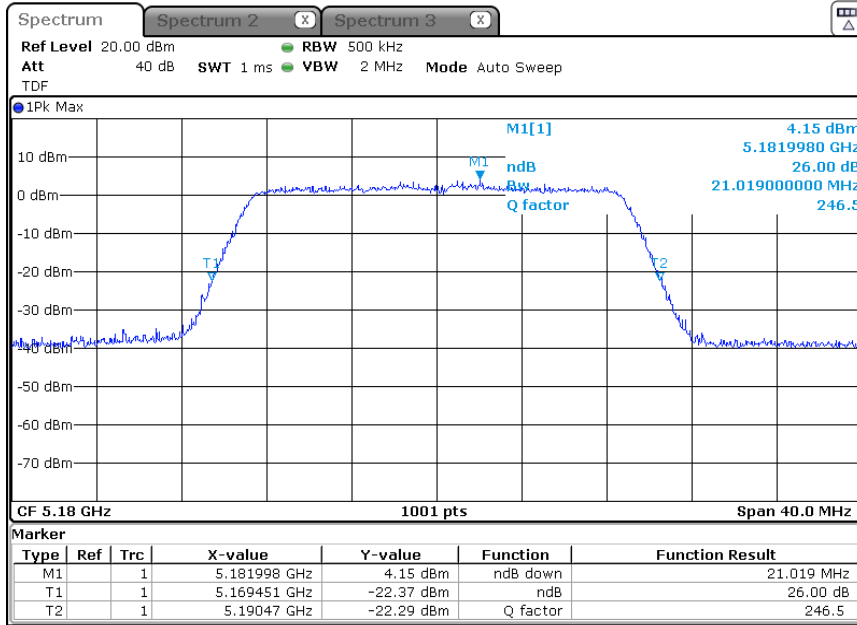
OBW



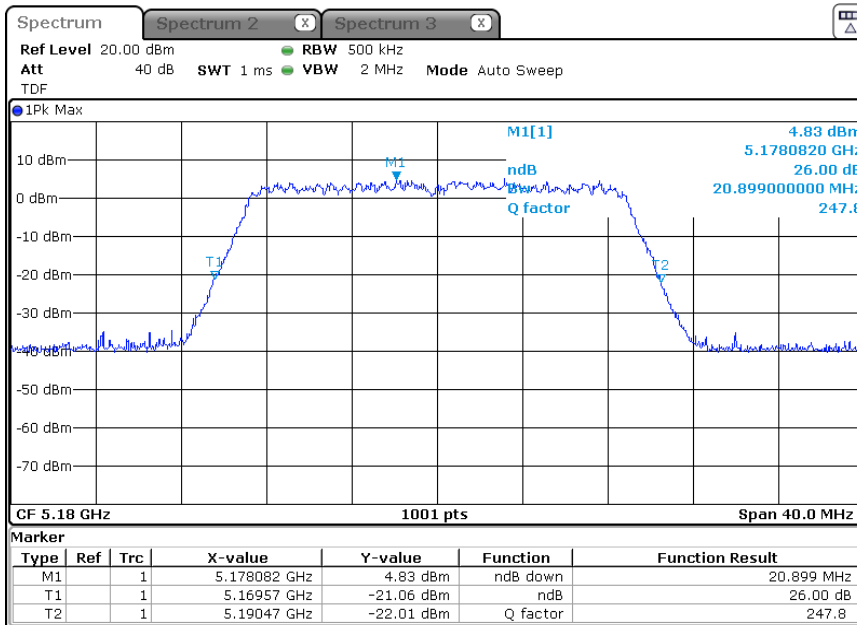
802.11an20_ANT 1+2_ANT 1

-5 180 MHz

26 dB Bandwidth

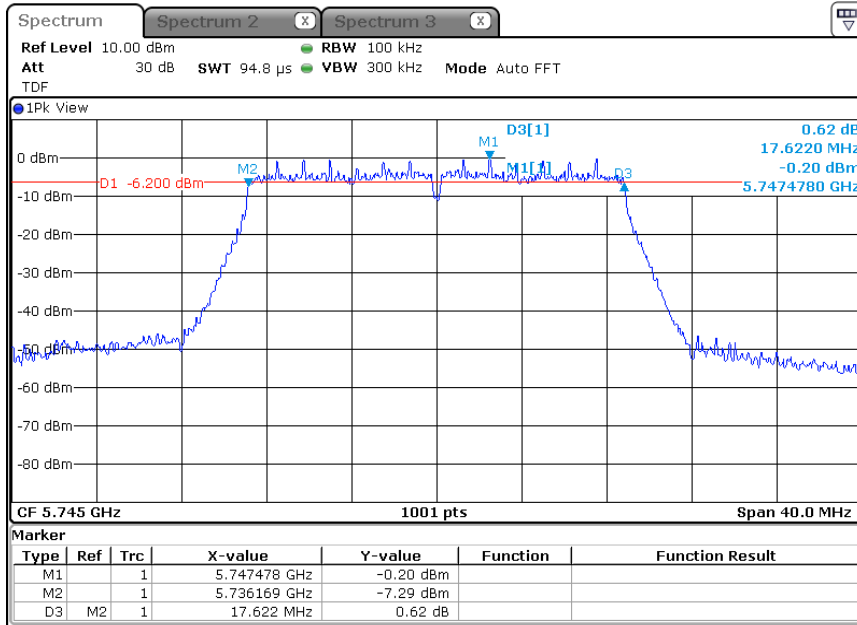


OBW



-5 745 MHz

6 dB Bandwidth



OBW

