

## 7.5. Number of Hopping Channels Measurement

### 7.5.1. Test Limit

This frequency hopping system must employ a minimum of 15 hopping channels.

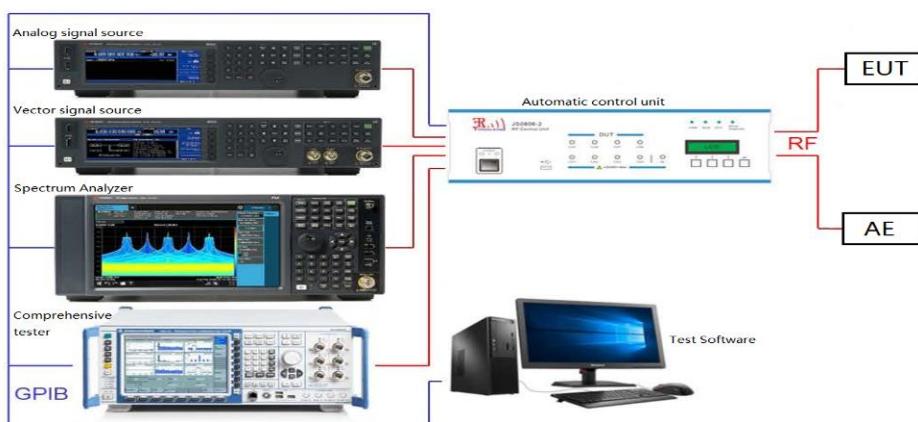
### 7.5.2. Test Procedure Used

ANSI C63.10-2013 - Section 7.8.3

### 7.5.3. Test Setting

1. Span = the frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
2. To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
3. VBW  $\geq$  RBW
4. Sweep time = Auto couple
5. Detector = Peak
6. Trace mode = Max hold
7. Allow the trace to stabilize

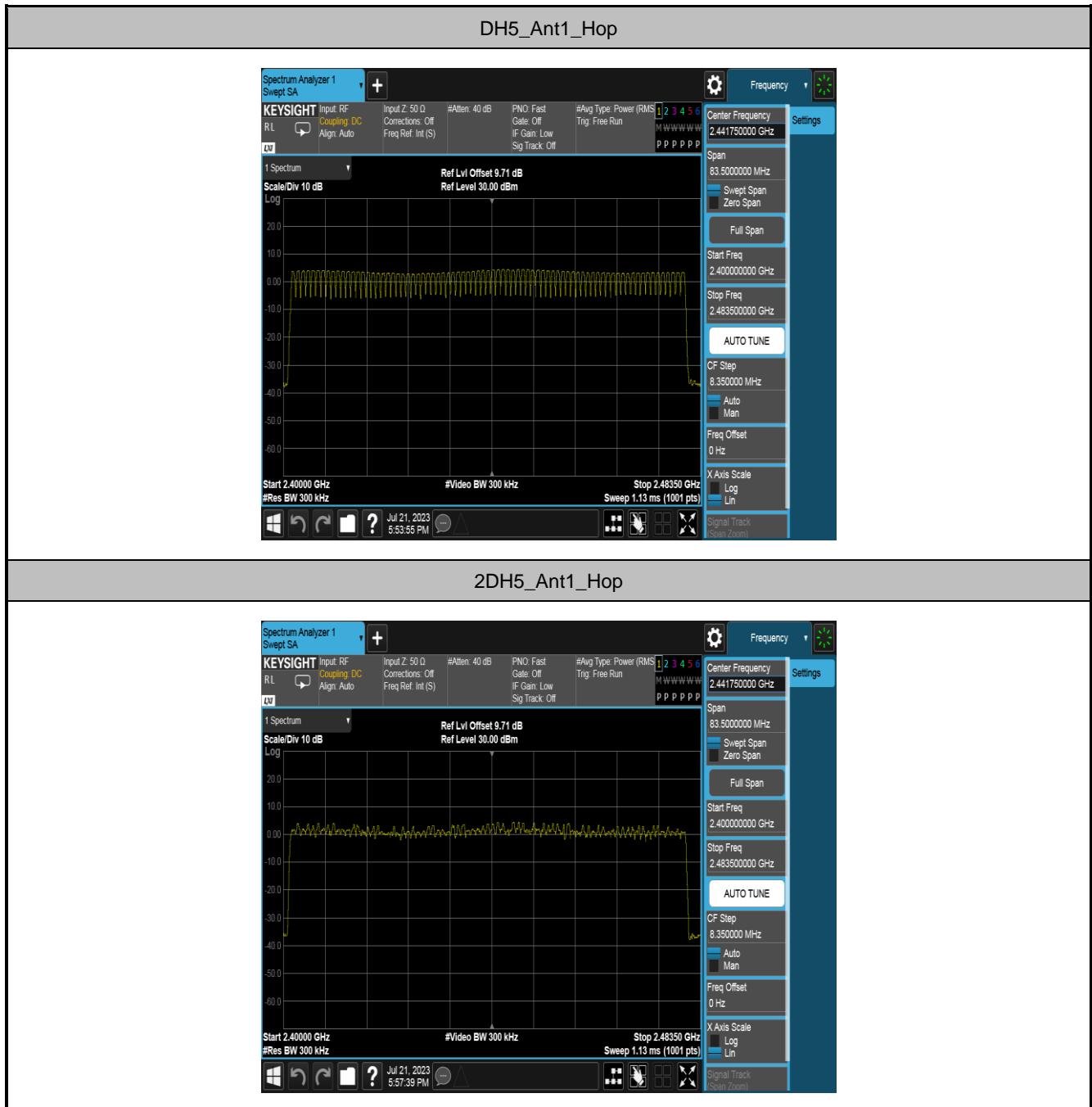
### 7.5.4. Test Setup

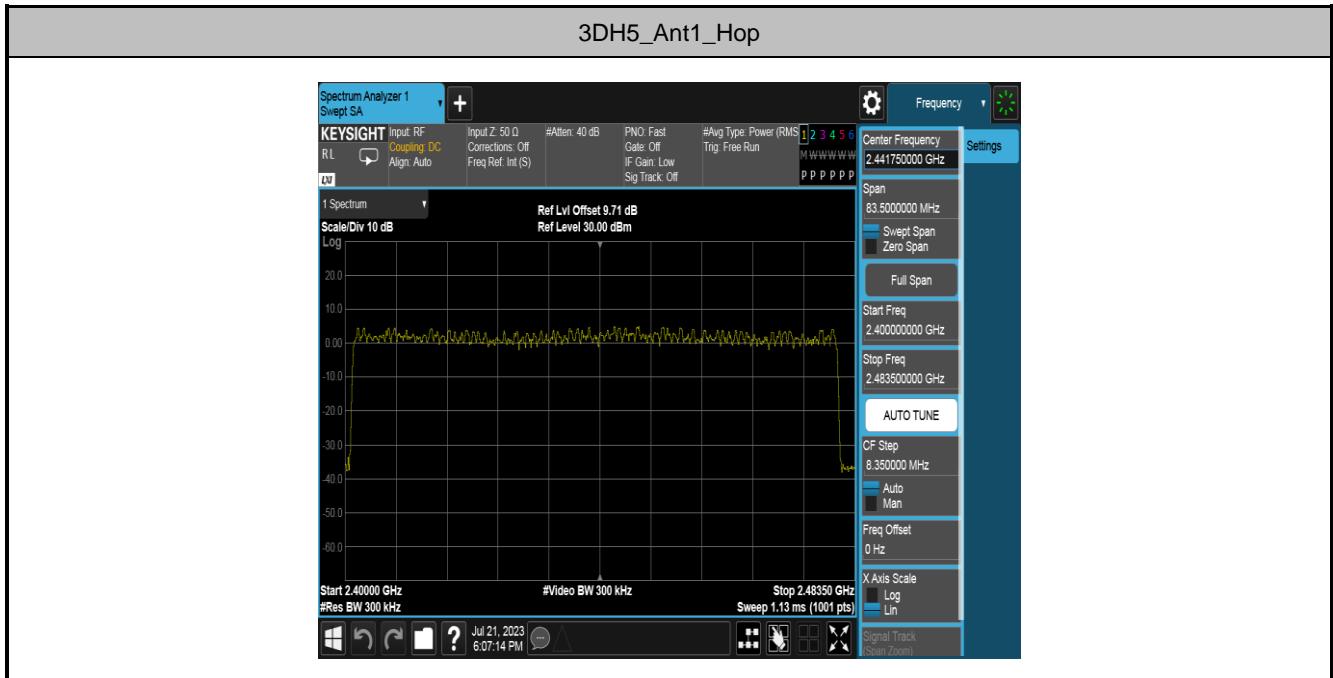


### 7.5.5. Test Result

Test Mode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH5	Ant1	Hop	79	≥15	PASS
2DH5	Ant1	Hop	79	≥15	PASS
3DH5	Ant1	Hop	79	≥15	PASS

### Test Graphs





## 7.6. Time of Occupancy Measurement

### 7.6.1. Test Limit

The maximum permissible time of occupancy is 400ms within a period of 400ms multiplied by the number of hopping channels employed.

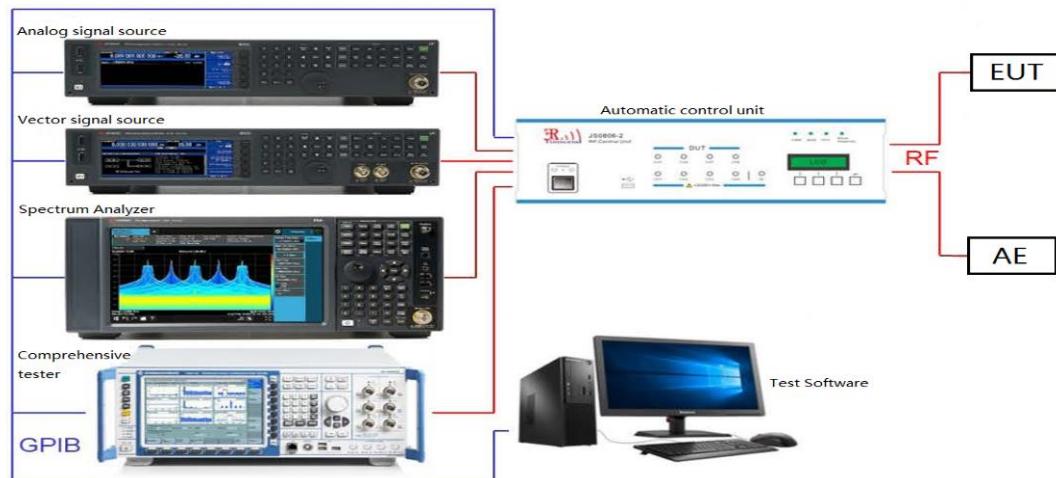
### 7.6.2. Test Procedure Used

ANSI C63.10-2013 - Section 7.8.4

### 7.6.3. Test Setting

1. Span = zero span, centered on a hopping channel.
2. RBW shall be  $\leq$  channel spacing and where possible RBW should be set  $>> 1 / T$ , where T is the expected dwell time per channel.
3. VBW  $\geq$  RBW
4. Sweep time = as necessary to capture the entire dwell time per hopping channel
5. Detector = Peak
6. Trace mode = max hold
7. Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time. An oscilloscope may be used instead of a spectrum analyzer. The EUT shall show compliance with the appropriate regulatory limit for the number of hopping channels. A plot of the data shall be included in the test report.

#### 7.6.4. Test Setup

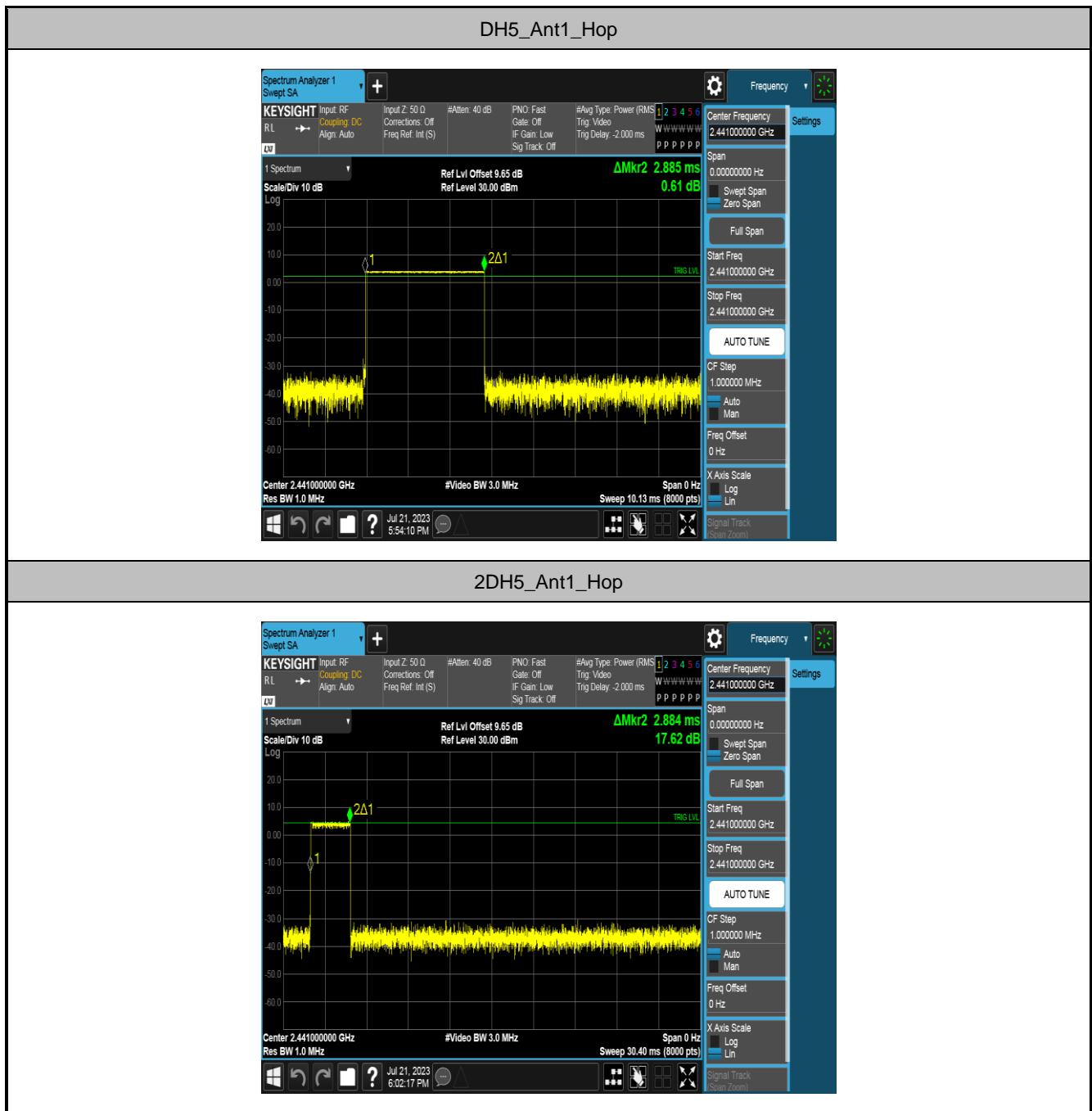


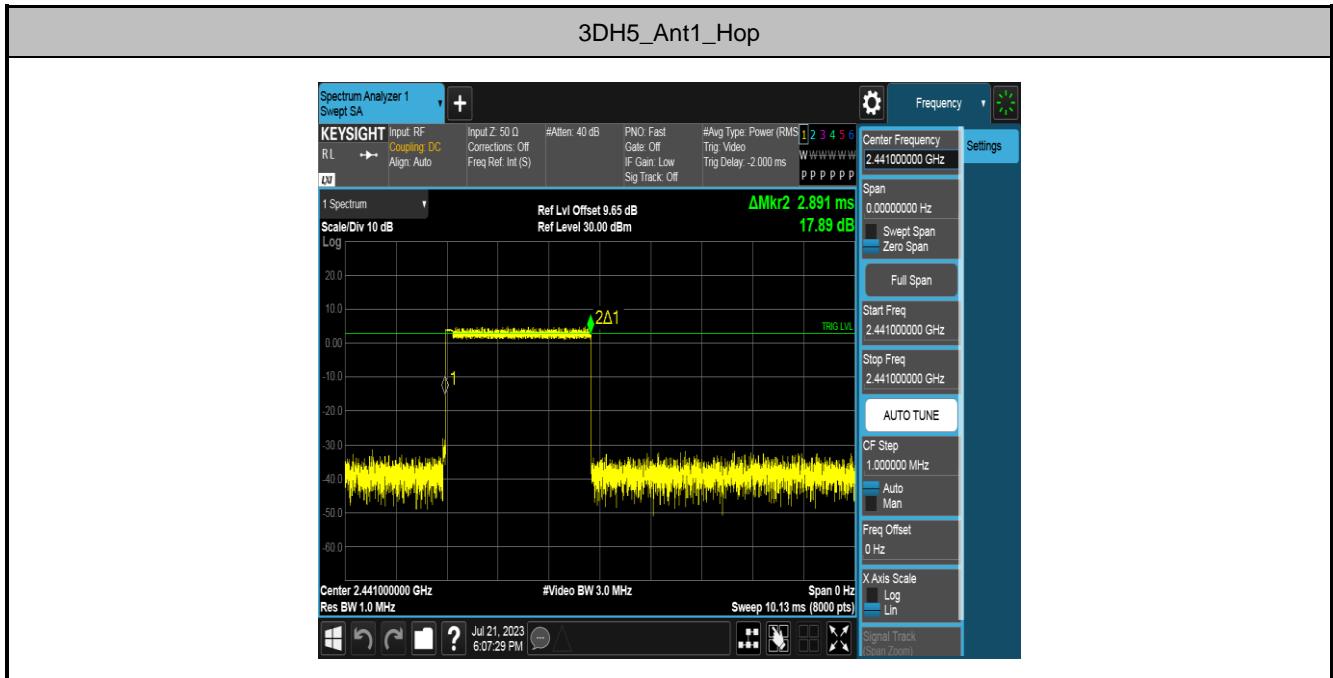
### 7.6.5. Test Result

Test Mode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH5	Ant1	Hop	2.885	106.67	0.308	≤0.4	PASS
2DH5	Ant1	Hop	2.884	106.67	0.308	≤0.4	PASS
3DH5	Ant1	Hop	2.891	106.67	0.308	≤0.4	PASS

Note: TotalHops is the number of bursts measured in a scan time of 31.6 seconds.

### Test Graphs





## 7.7. Band-edge Compliance Measurement

### 7.7.1. Test Limit

The maximum permissible emission level is 20dBc. Any emissions were lying outside of the emission bandwidth and in authorized band edges to a field strength limit specified in Section 15.209 of the Title 47 CFR.

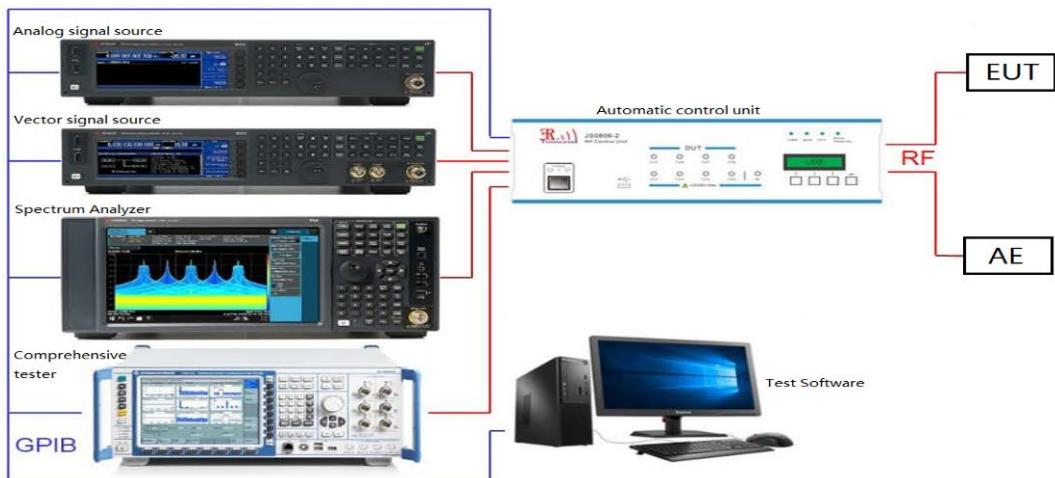
### 7.7.2. Test Procedure Used

ANSI C63.10-2013 - Section 6.10.4

### 7.7.3. Test Setting

1. Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation.
2. RBW = 100kHz
3. VBW = 300kHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize
8. Allow the trace to stabilize. Set the marker on the emission at the band edge, or on the highest modulation product outside of the band, if this level is greater than that at the band edge. Enable the marker-delta function, than use the marker-to-peak function to move the marker to the peak of the in-band emission.

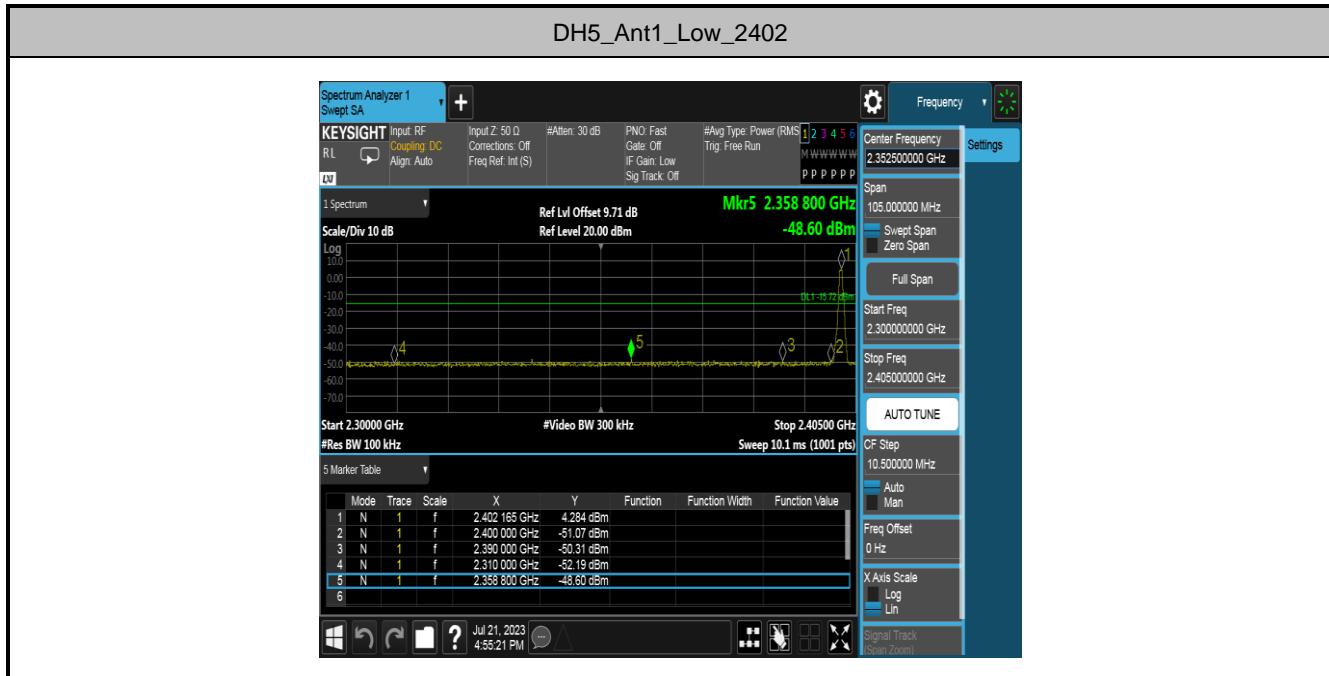
#### 7.7.4. Test Setup

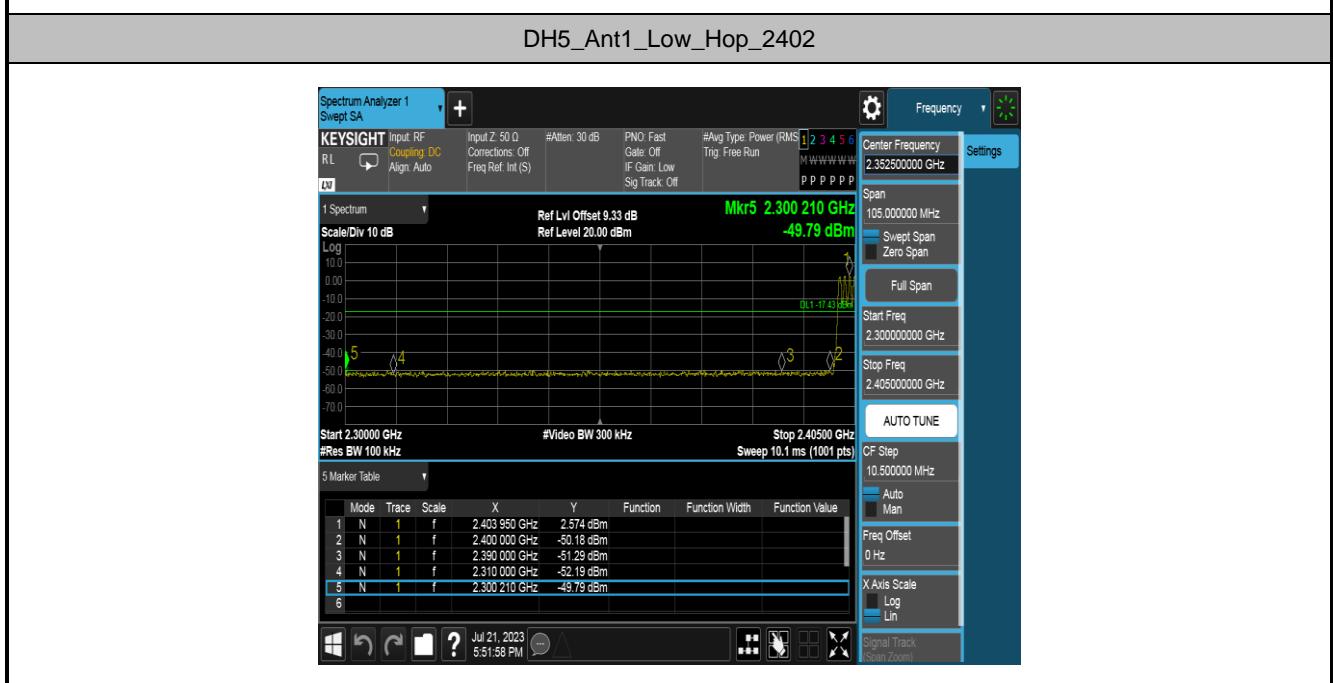
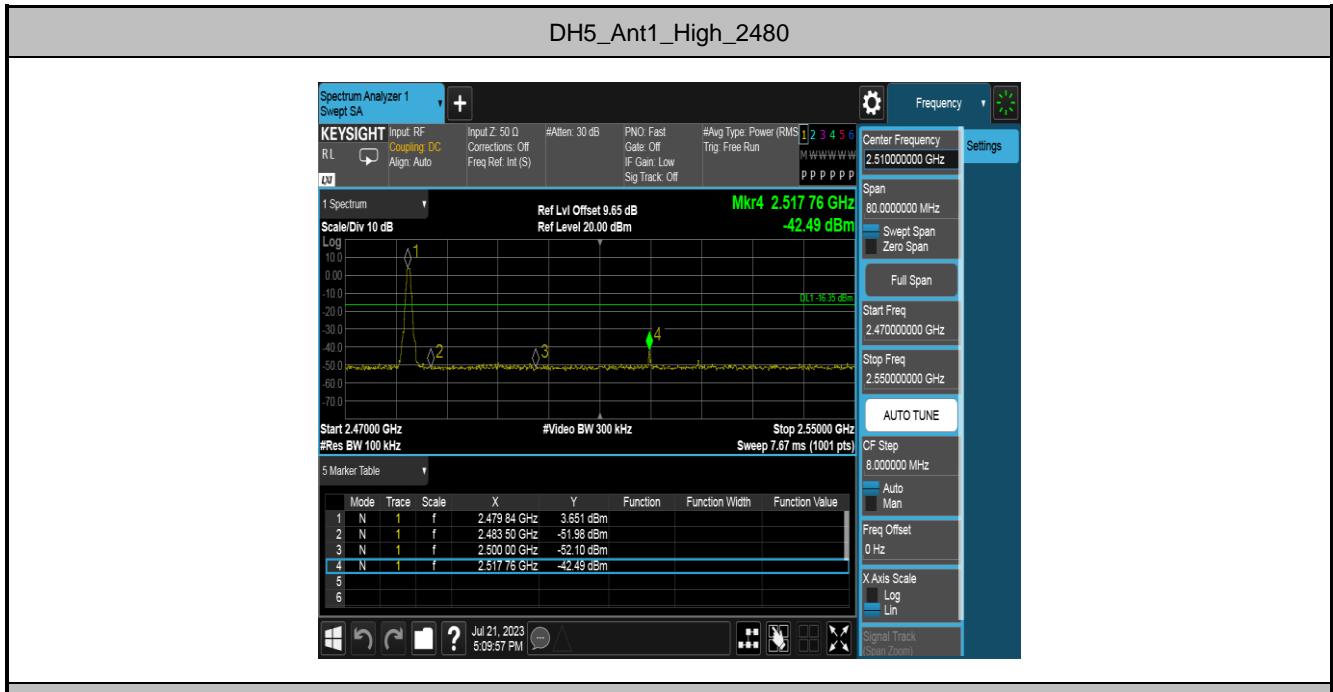


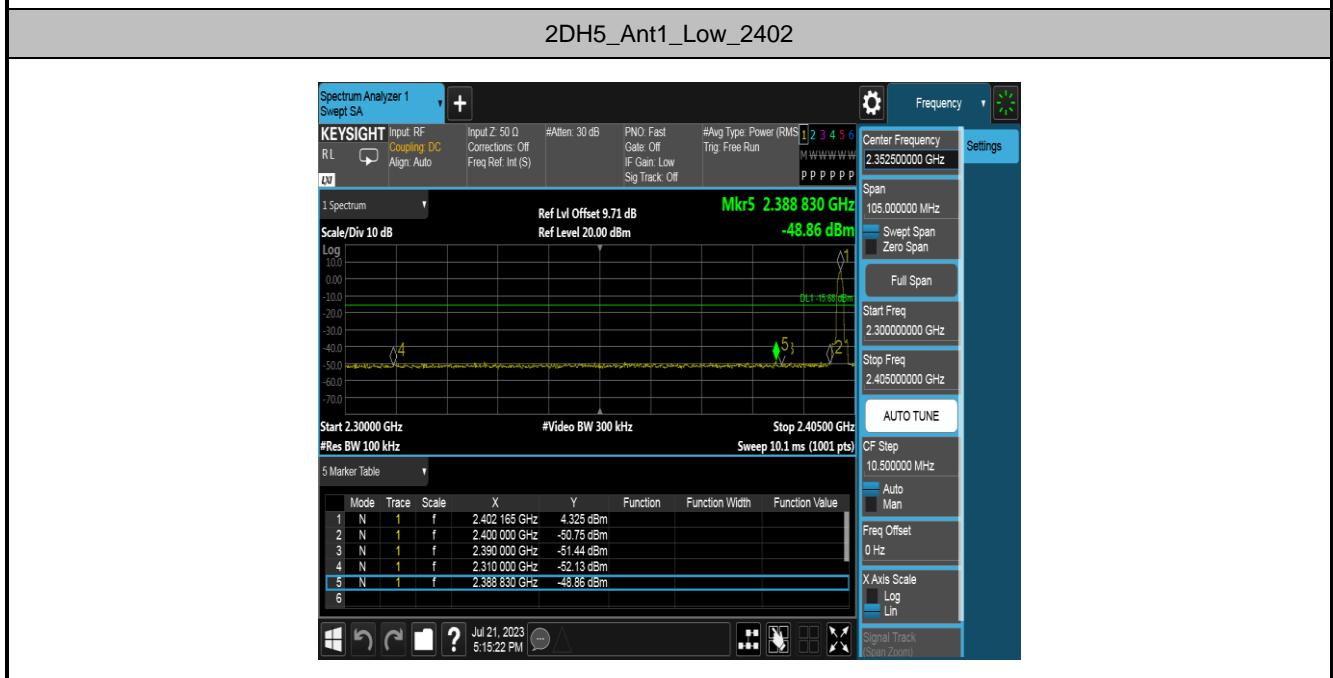
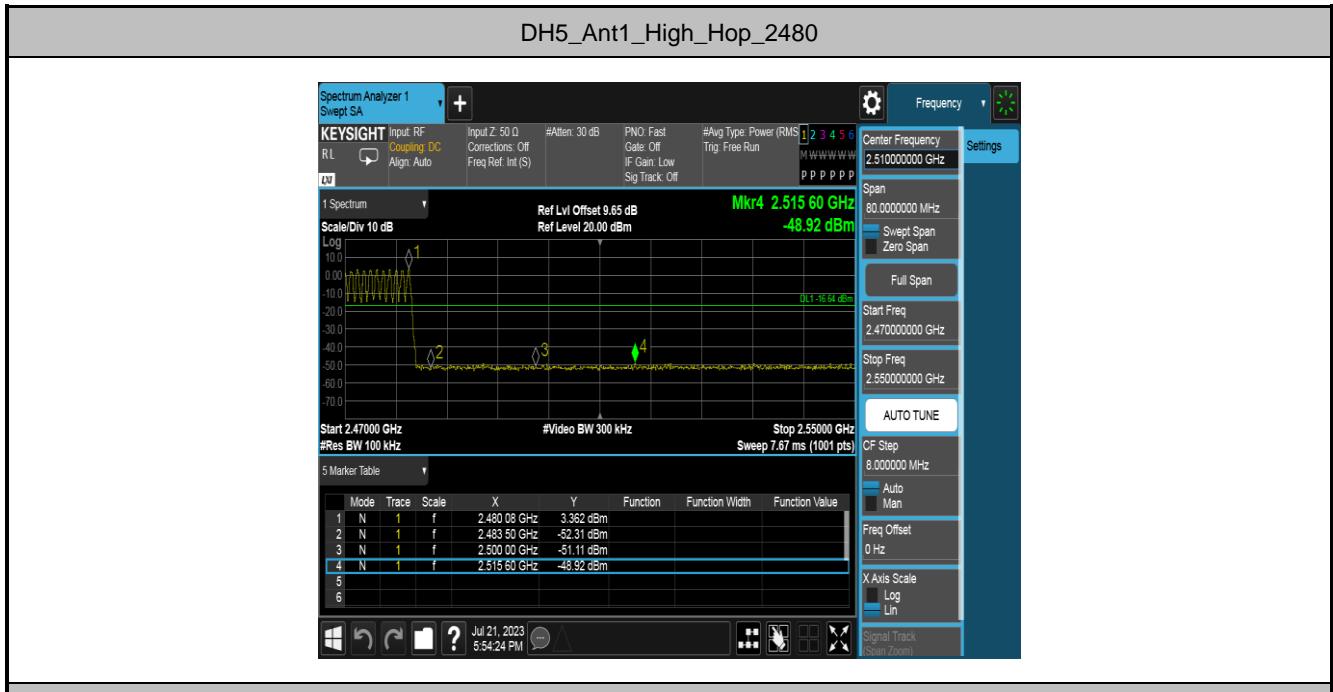
### 7.7.5. Test Result

Test Mode	Antenna	Ch Name	Channel	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	4.28	-48.60	≤-15.72	PASS
		High	2480	3.65	-42.49	≤-16.35	PASS
		Low	Hop_2402	2.57	-49.79	≤-17.43	PASS
		High	Hop_2480	3.36	-48.92	≤-16.64	PASS
2DH5	Ant1	Low	2402	4.33	-48.86	≤-15.68	PASS
		High	2480	3.26	-48.18	≤-16.74	PASS
		Low	Hop_2402	0.00	-49.51	≤-20.00	PASS
		High	Hop_2480	3.68	-48.91	≤-16.32	PASS
3DH5	Ant1	Low	2402	3.87	-48.96	≤-16.14	PASS
		High	2480	3.78	-49.30	≤-16.22	PASS
		Low	Hop_2402	-0.92	-49.70	≤-20.92	PASS
		High	Hop_2480	3.35	-49.00	≤-16.65	PASS

### Test Graphs







## 2DH5\_Ant1\_High\_2480



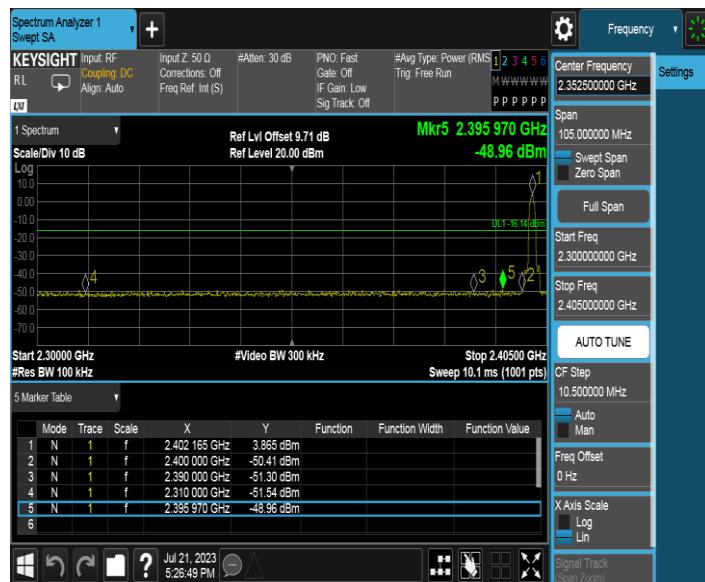
## 2DH5\_Ant1\_Low\_Hop\_2402



## 2DH5\_Ant1\_High\_Hop\_2480



## 3DH5\_Ant1\_Low\_2402

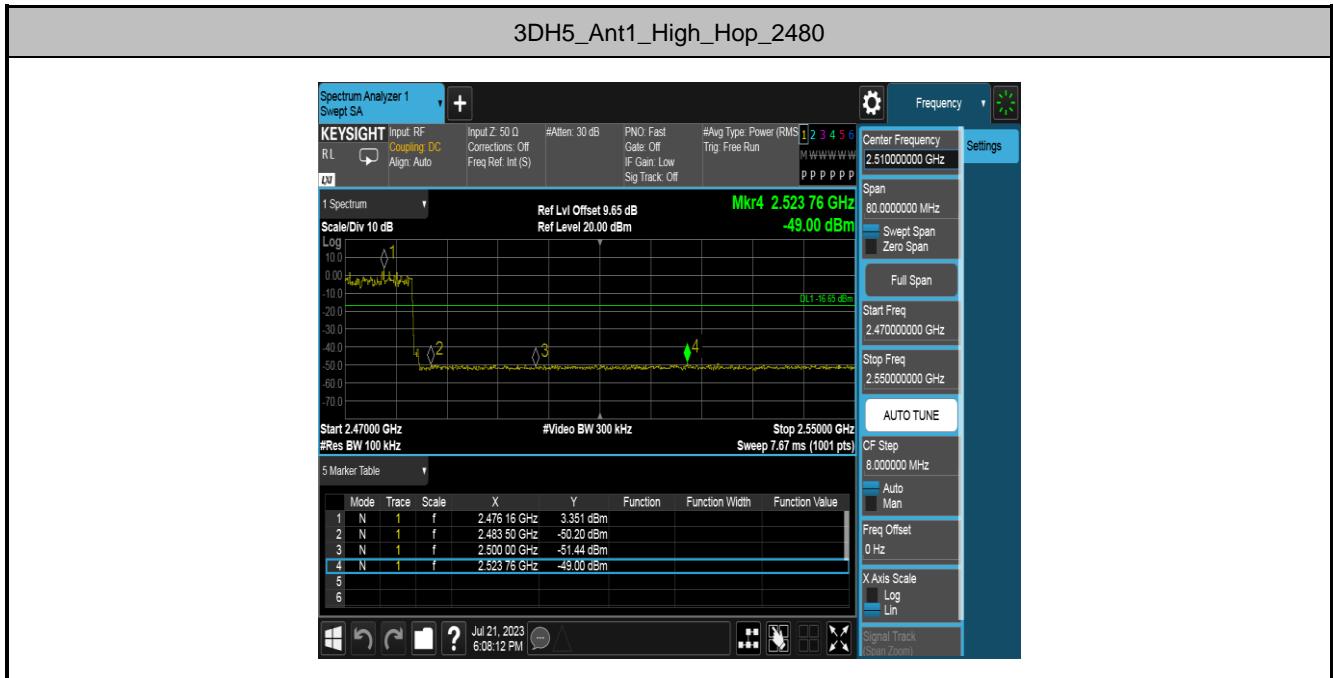


## 3DH5\_Ant1\_High\_2480



## 3DH5\_Ant1\_Low\_Hop\_2402





## 7.8. Conducted Spurious Emissions Measurement

### 7.8.1. Test Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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 or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

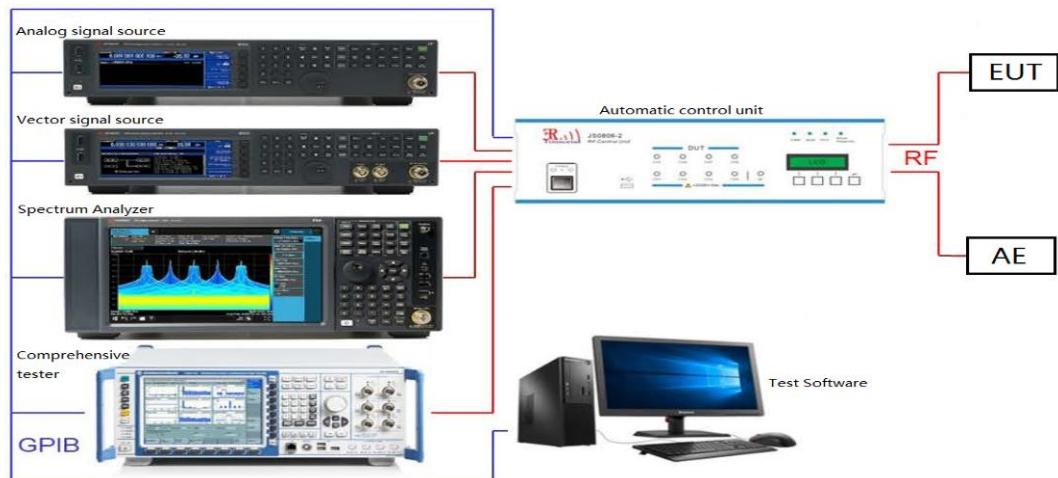
### 7.8.2. Test Procedure Used

ANSI C63.10-2013 - Section 7.8.8

### 7.8.3. Test Setting

1. Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
2. RBW = 100 KHz
3. VBW  $\geq$  RBW
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize
8. Set the marker on the peak of any spurious emission recorded. The level displayed must comply with the limit specified in this section.

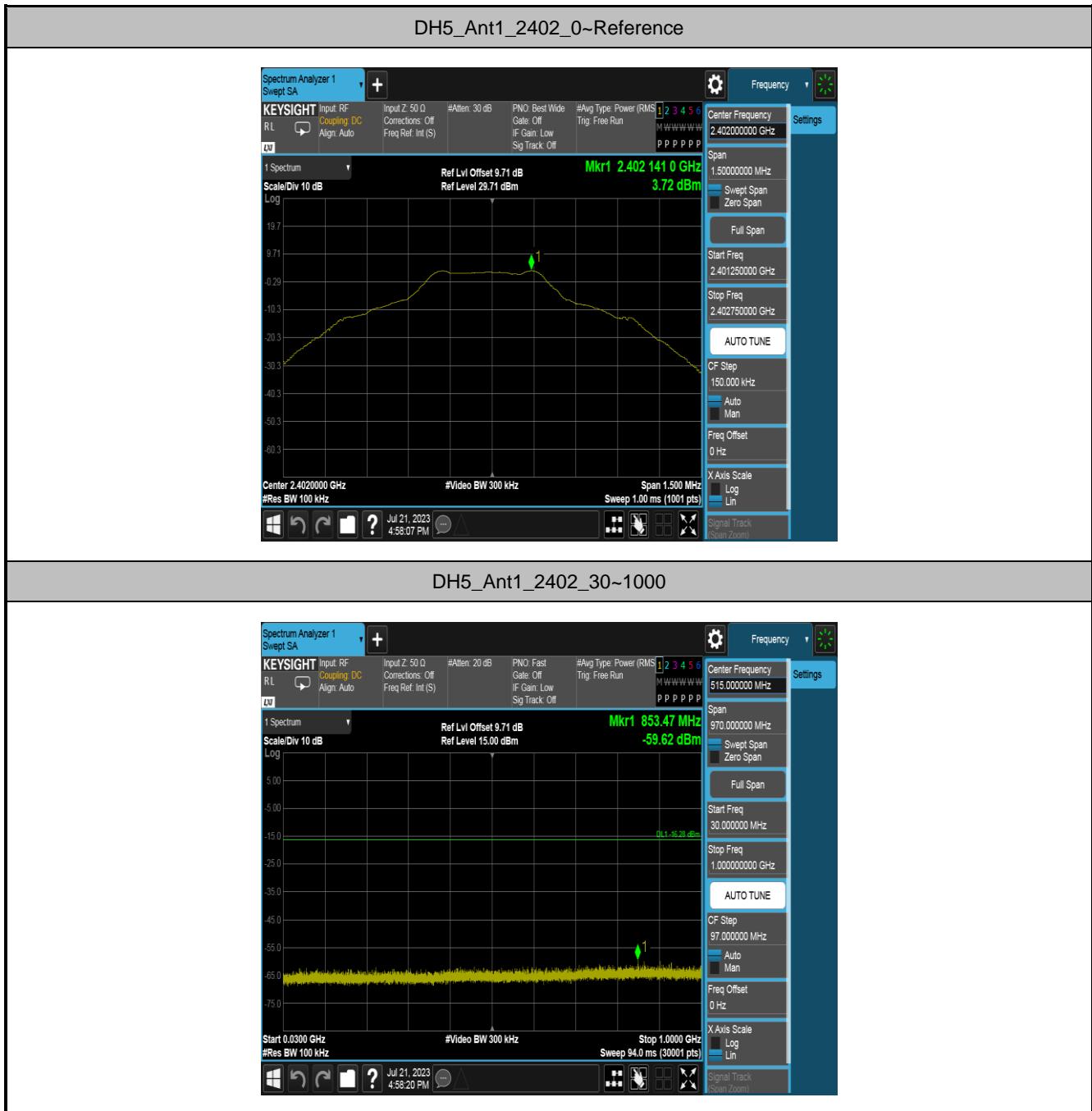
#### 7.8.4. Test Setup

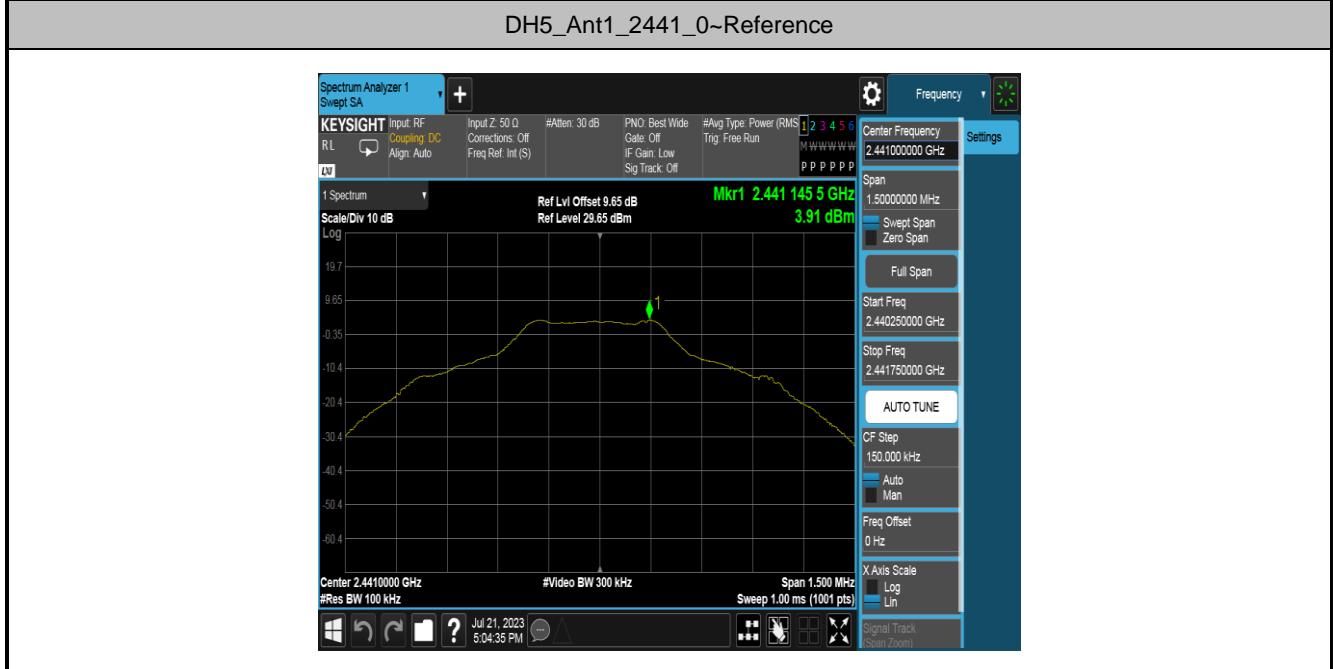
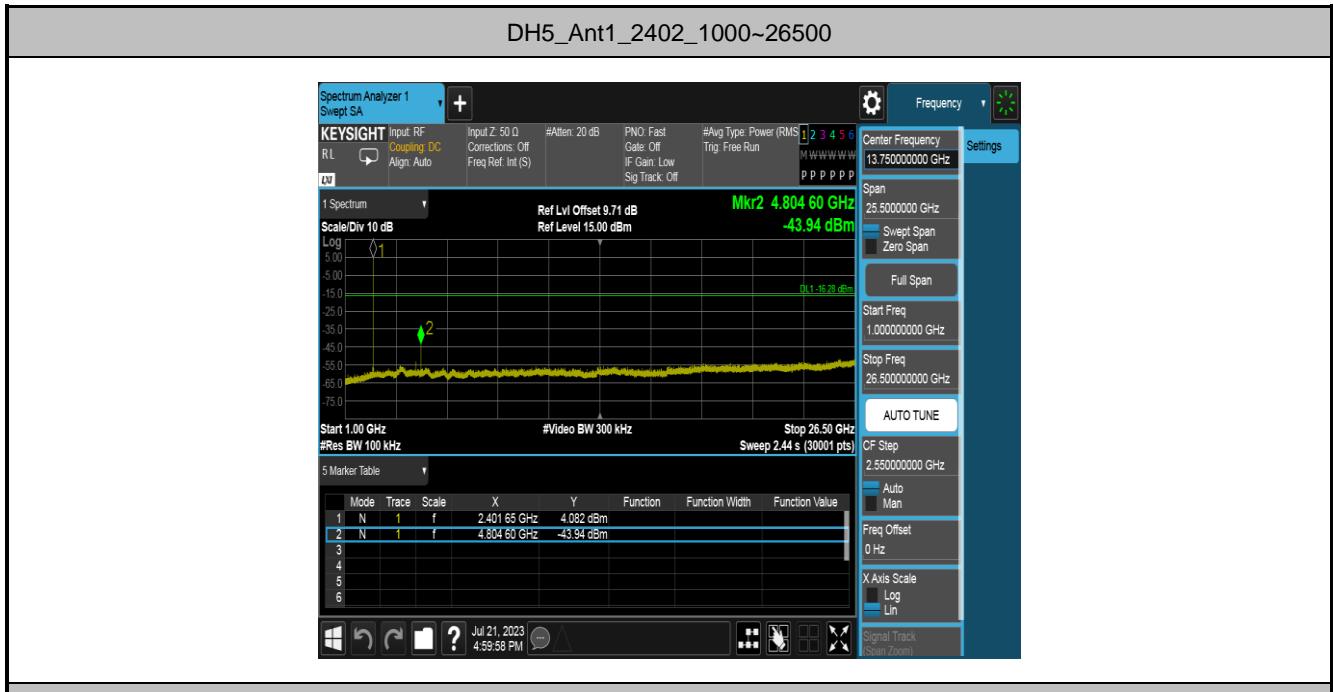


### 7.8.5. Test Result

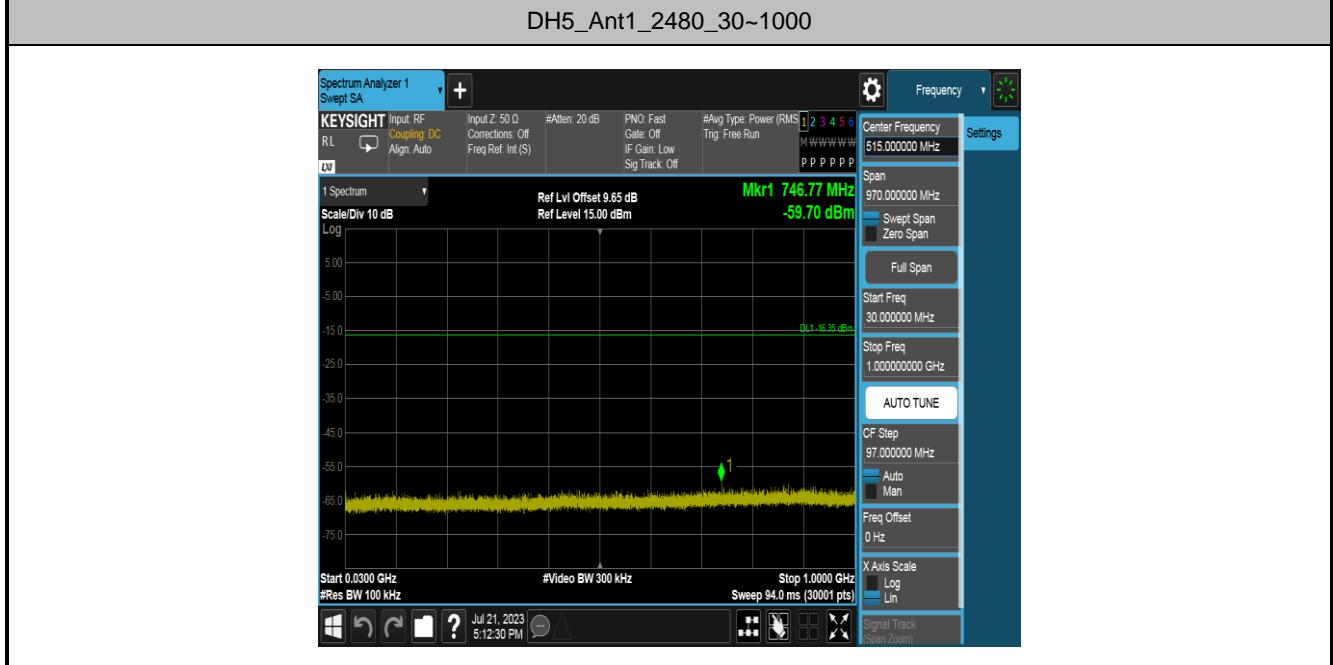
Test Mode	Antenna	Channel	Freq Range [MHz]	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	Reference	3.72	3.72	---	PASS
			30~1000	3.72	-59.62	≤-16.28	PASS
			1000~26500	3.72	-43.94	≤-16.28	PASS
		2441	Reference	3.91	3.91	---	PASS
			30~1000	3.91	-60.26	≤-16.09	PASS
			1000~26500	3.91	-42.04	≤-16.09	PASS
		2480	Reference	3.65	3.65	---	PASS
			30~1000	3.65	-59.7	≤-16.35	PASS
			1000~26500	3.65	-43.88	≤-16.35	PASS
2DH5	Ant1	2402	Reference	4.29	4.29	---	PASS
			30~1000	4.29	-60.45	≤-15.71	PASS
			1000~26500	4.29	-45.34	≤-15.71	PASS
		2441	Reference	3.94	3.94	---	PASS
			30~1000	3.94	-56.77	≤-16.06	PASS
			1000~26500	3.94	-47.8	≤-16.06	PASS
		2480	Reference	3.65	3.65	---	PASS
			30~1000	3.65	-60.31	≤-16.35	PASS
			1000~26500	3.65	-47.76	≤-16.35	PASS
3DH5	Ant1	2402	Reference	4.47	4.47	---	PASS
			30~1000	4.47	-60.11	≤-15.53	PASS
			1000~26500	4.47	-43.85	≤-15.53	PASS
		2441	Reference	4.13	4.13	---	PASS
			30~1000	4.13	-60.39	≤-15.87	PASS
			1000~26500	4.13	-41.66	≤-15.87	PASS
		2480	Reference	3.24	3.24	---	PASS
			30~1000	3.24	-60.82	≤-16.76	PASS
			1000~26500	3.24	-47.74	≤-16.76	PASS

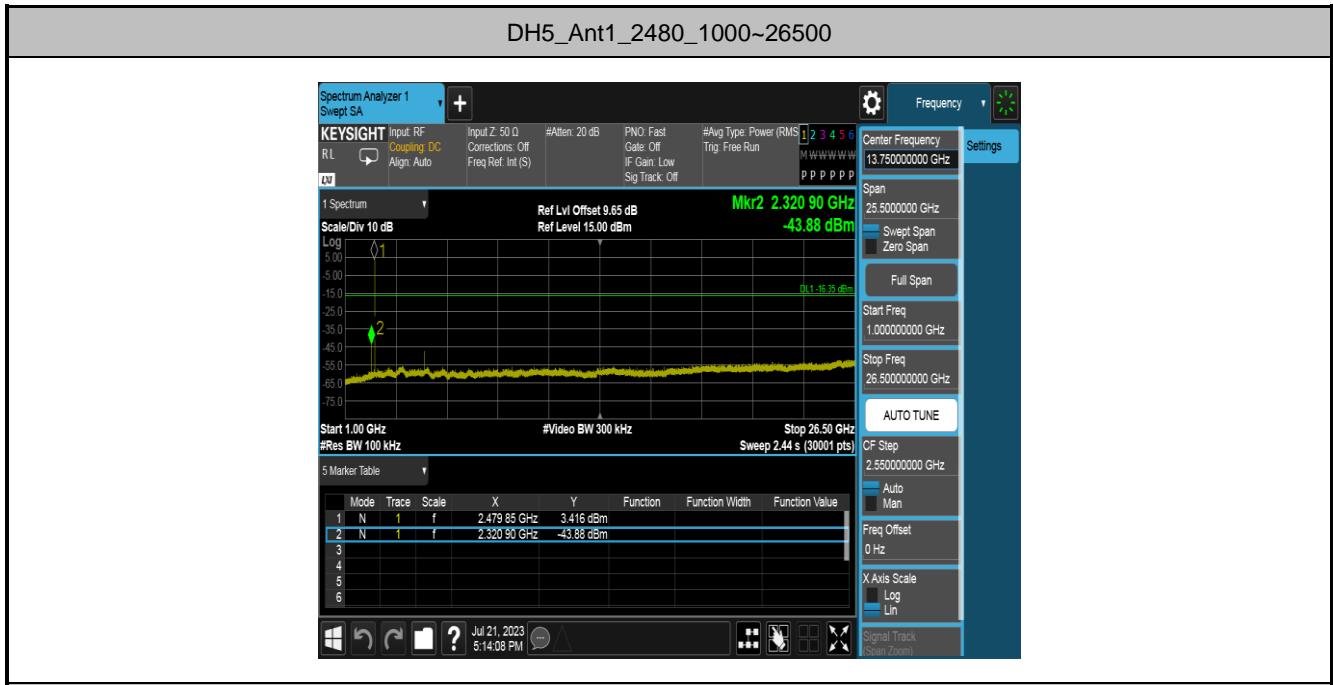
## Test Graphs

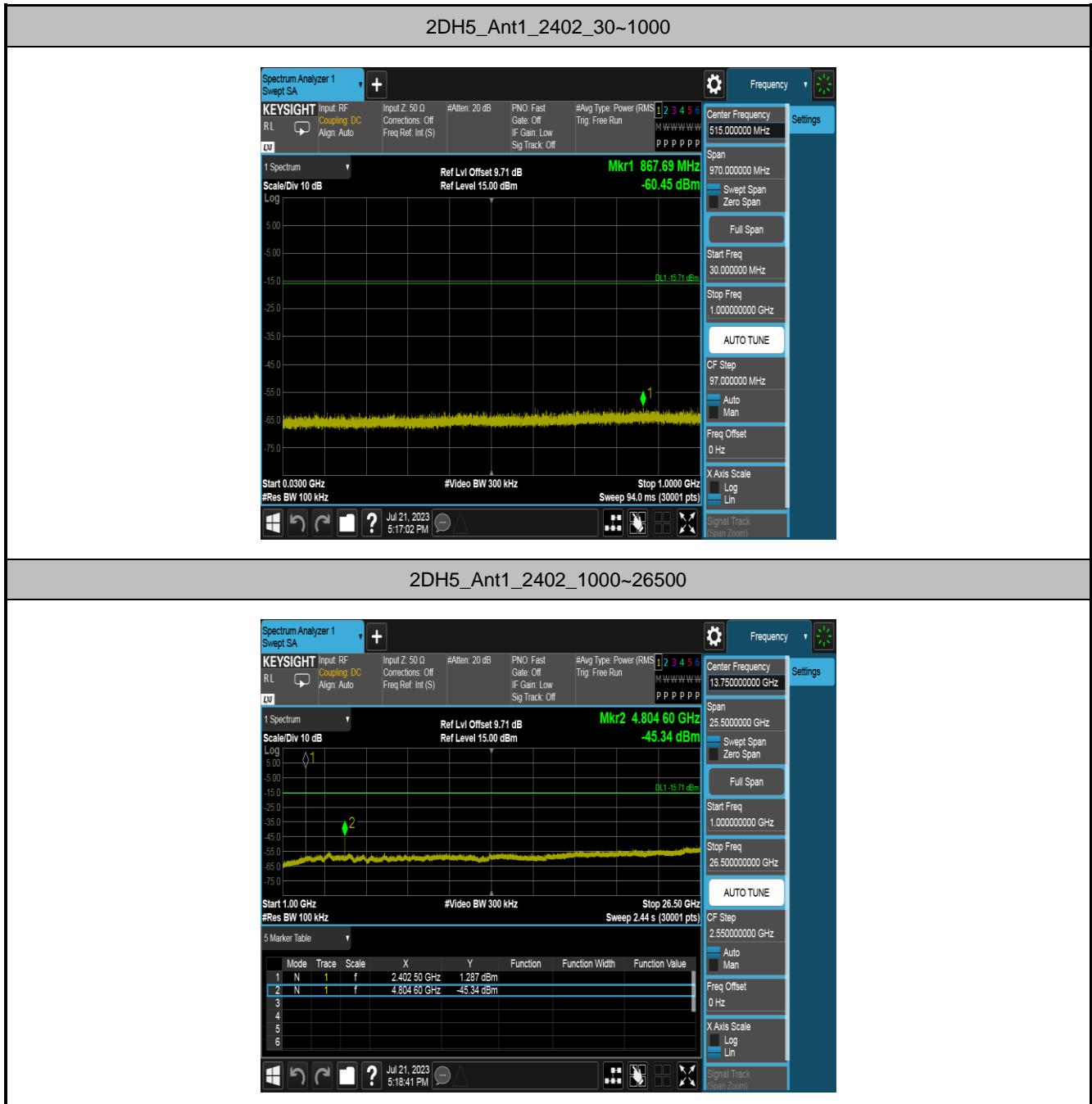


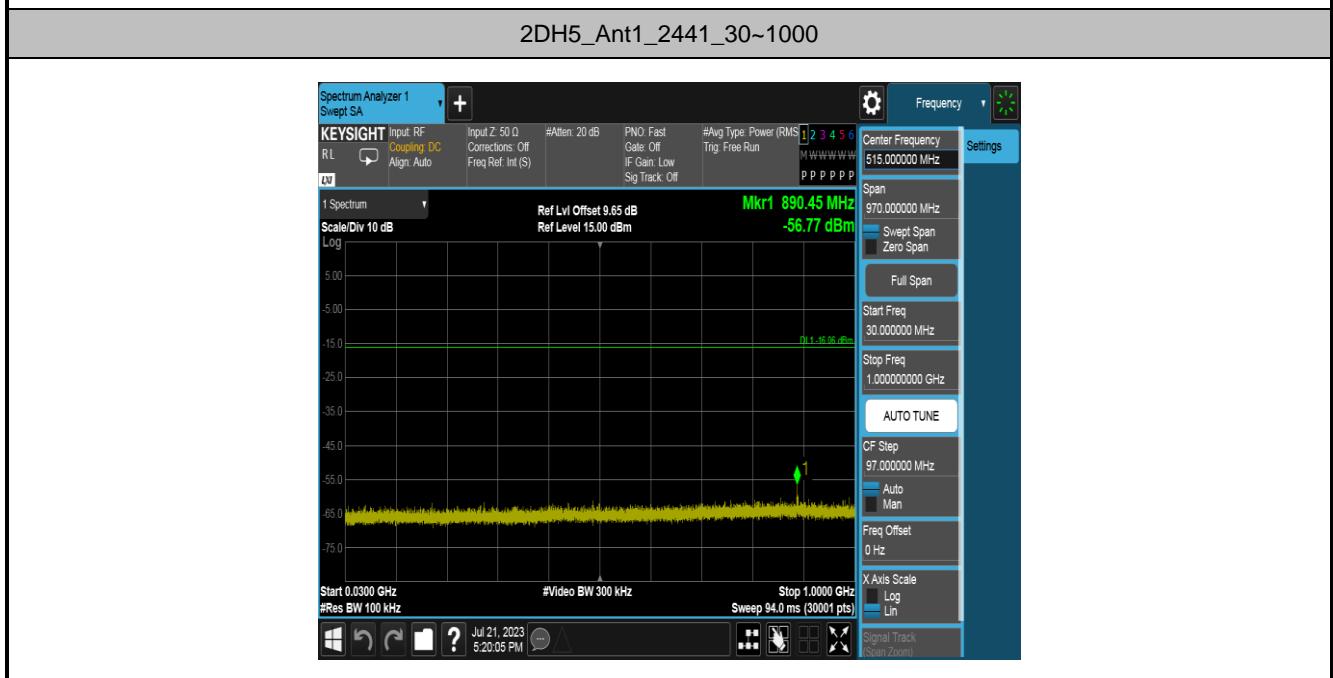
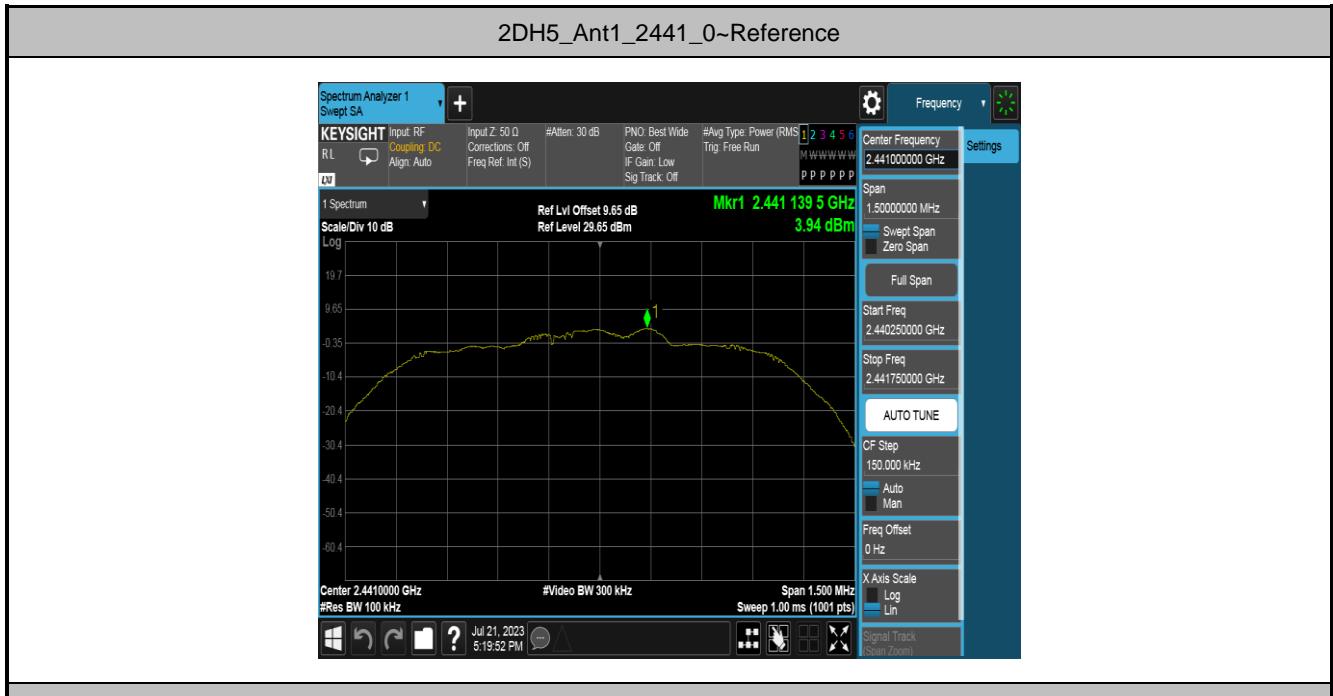


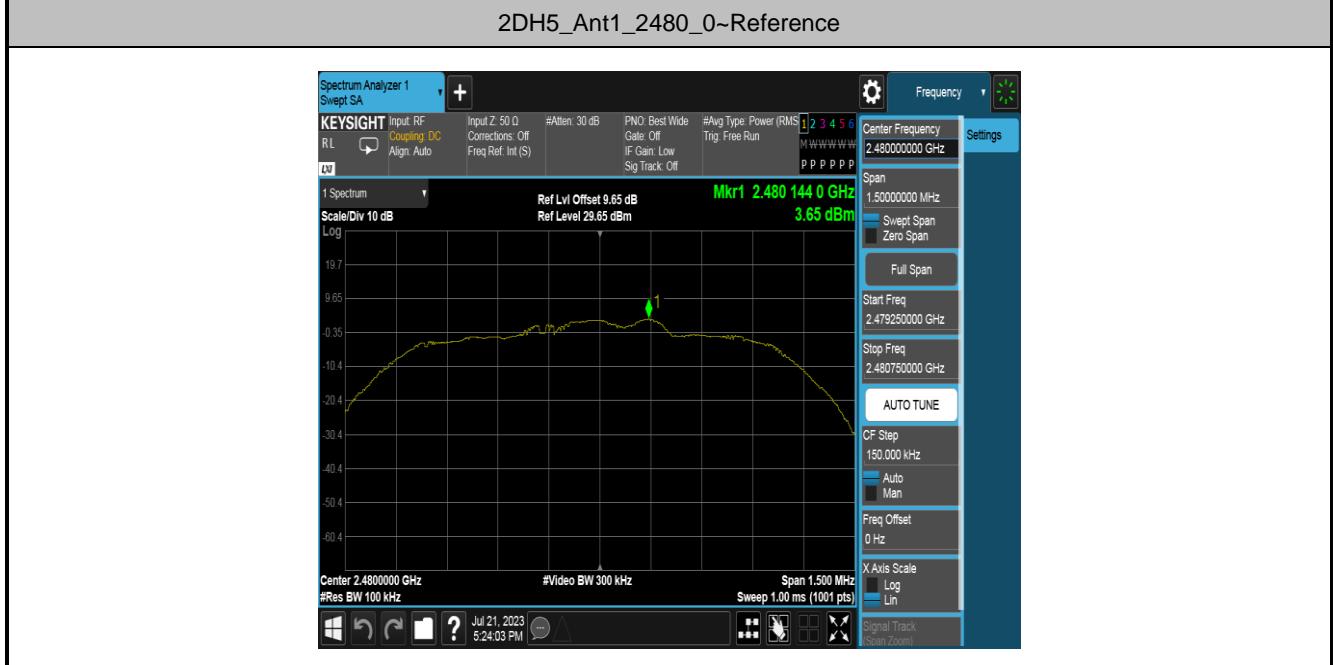
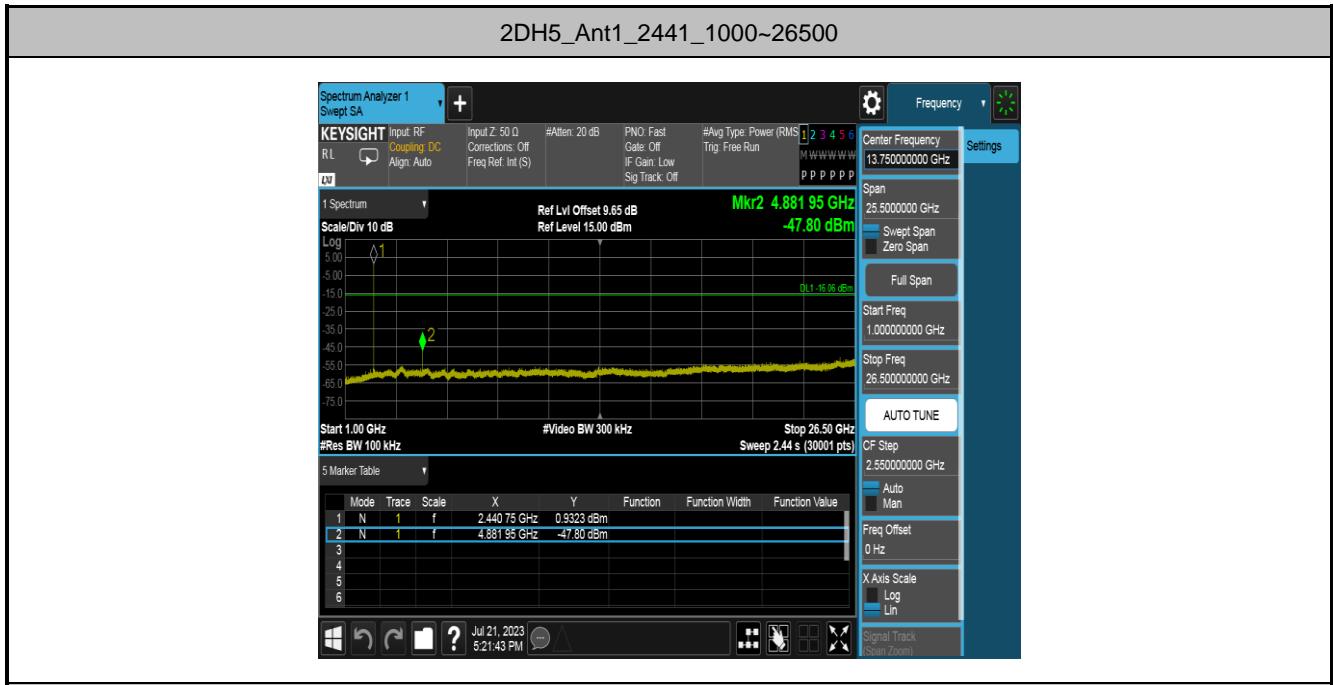


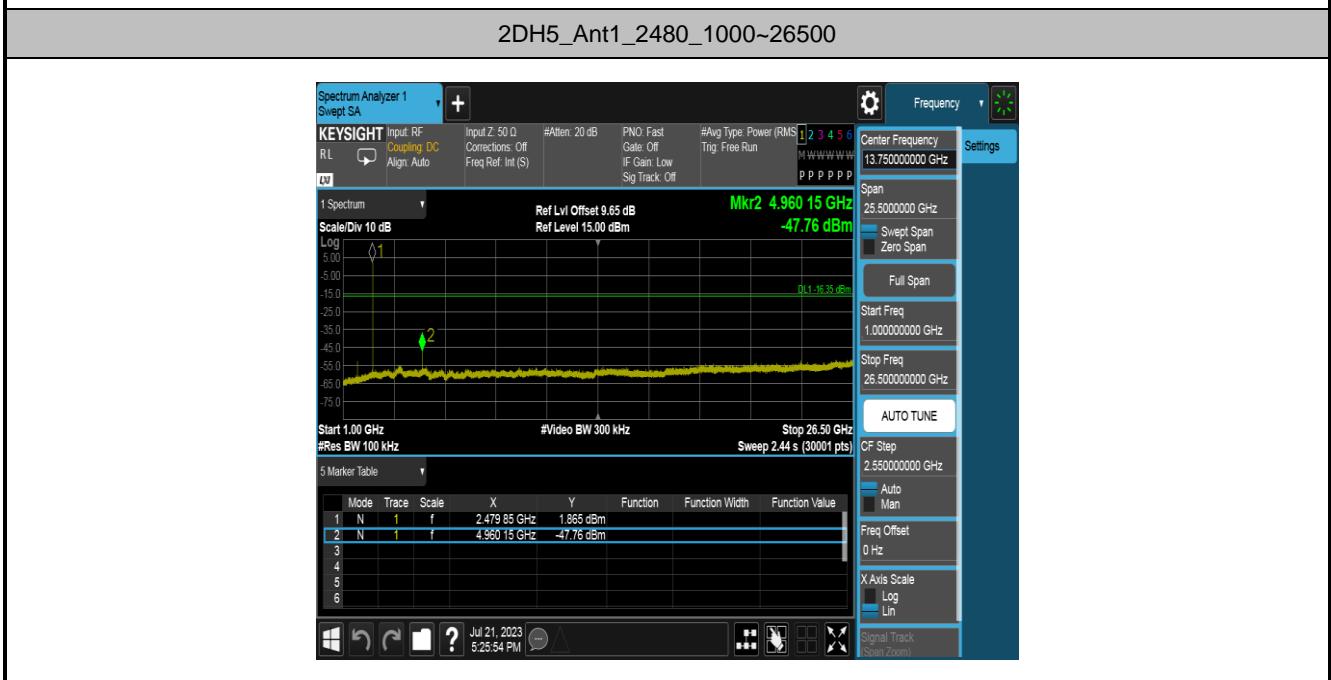
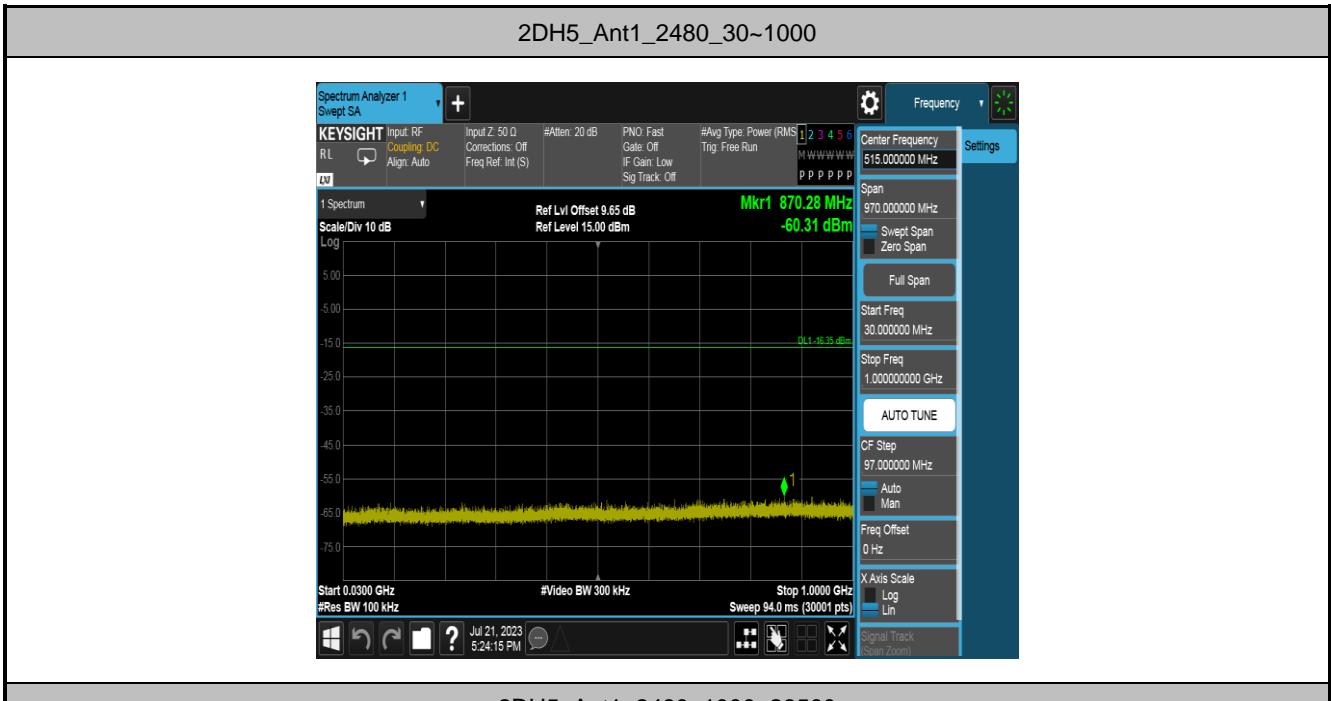


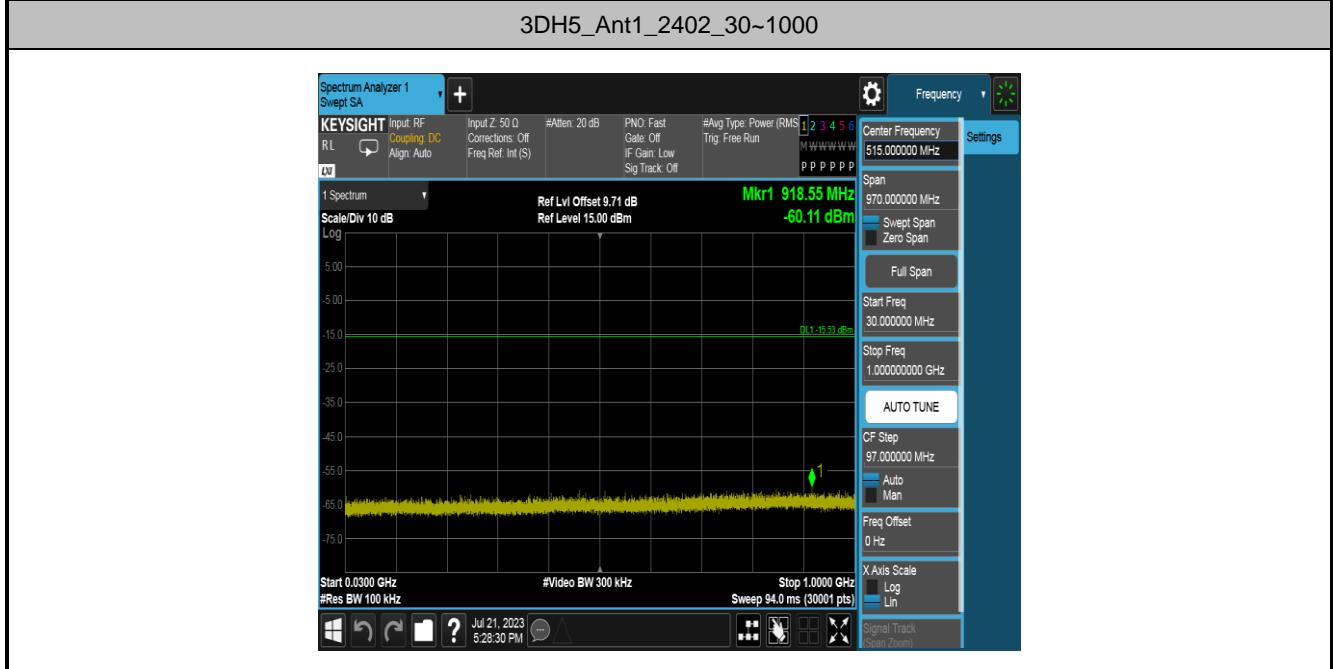
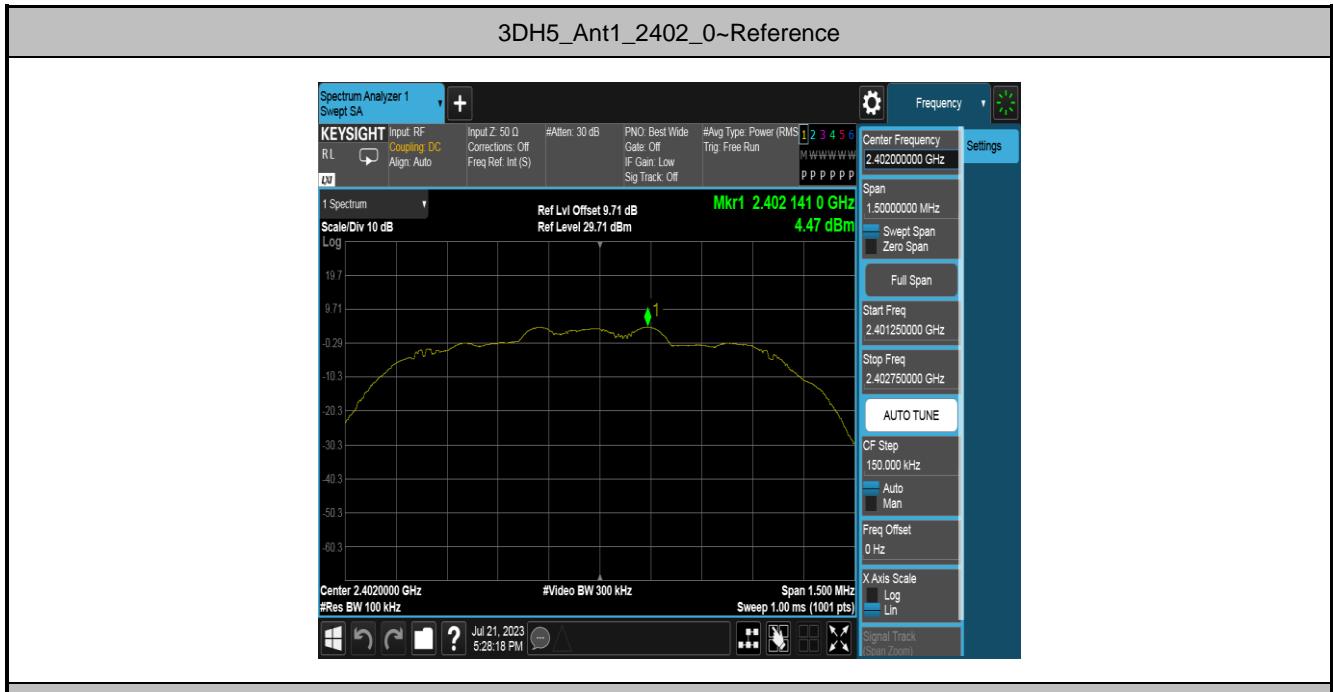


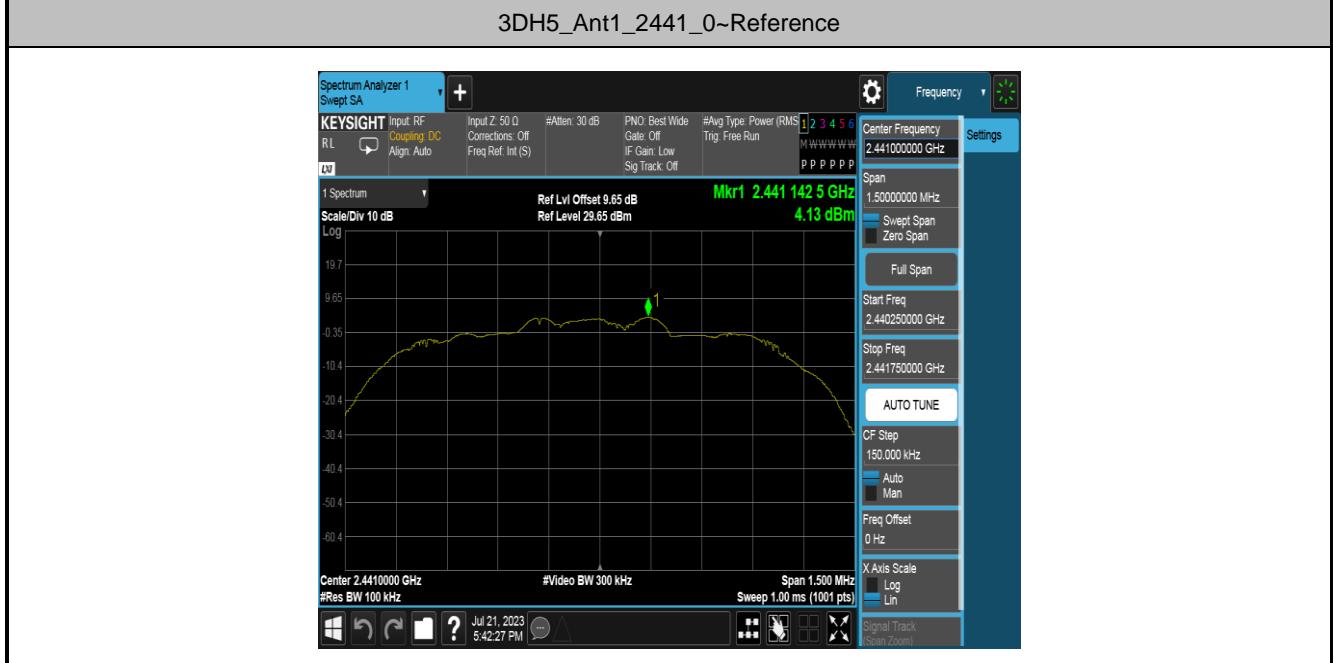
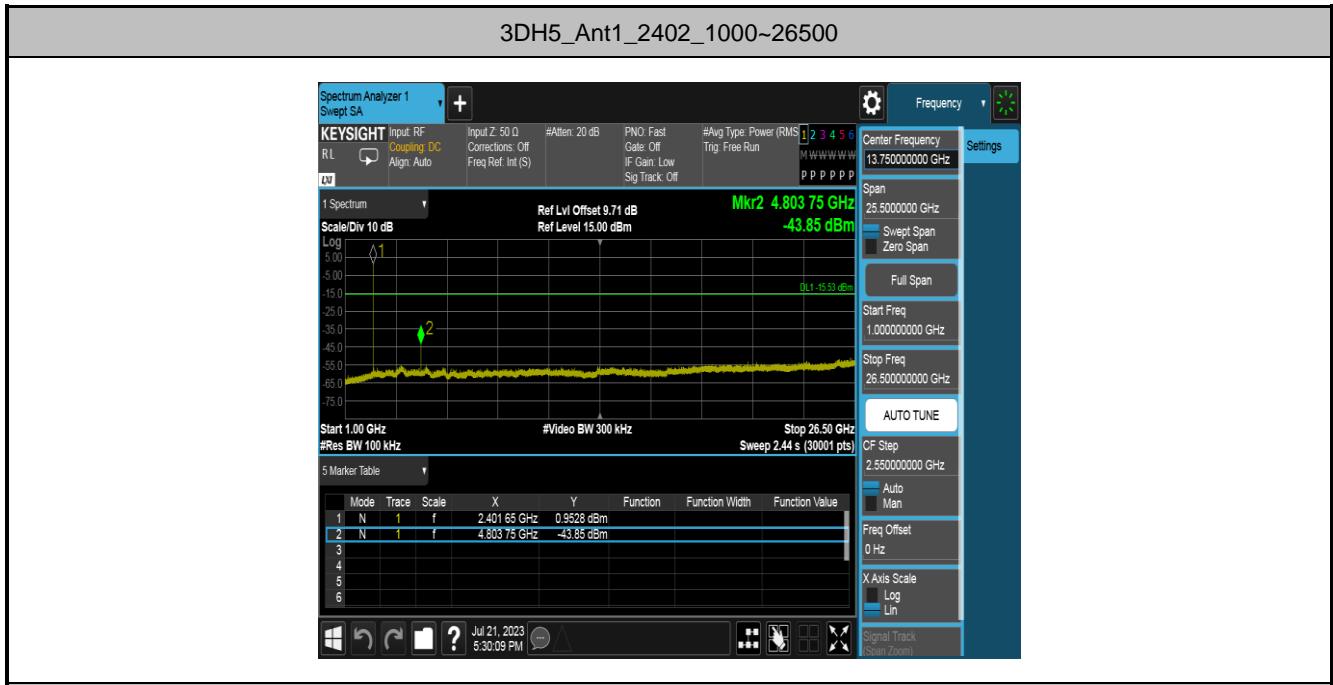


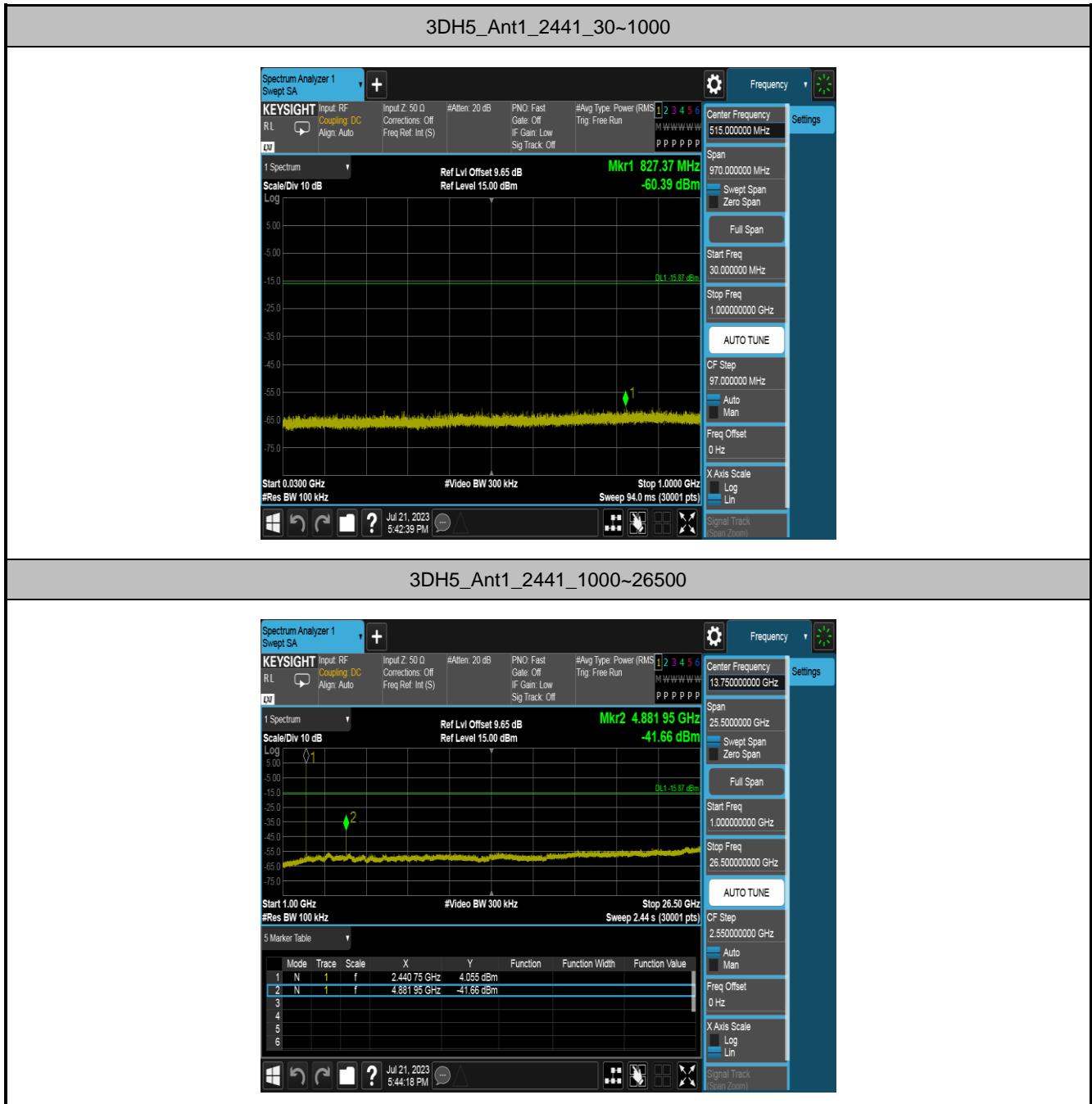


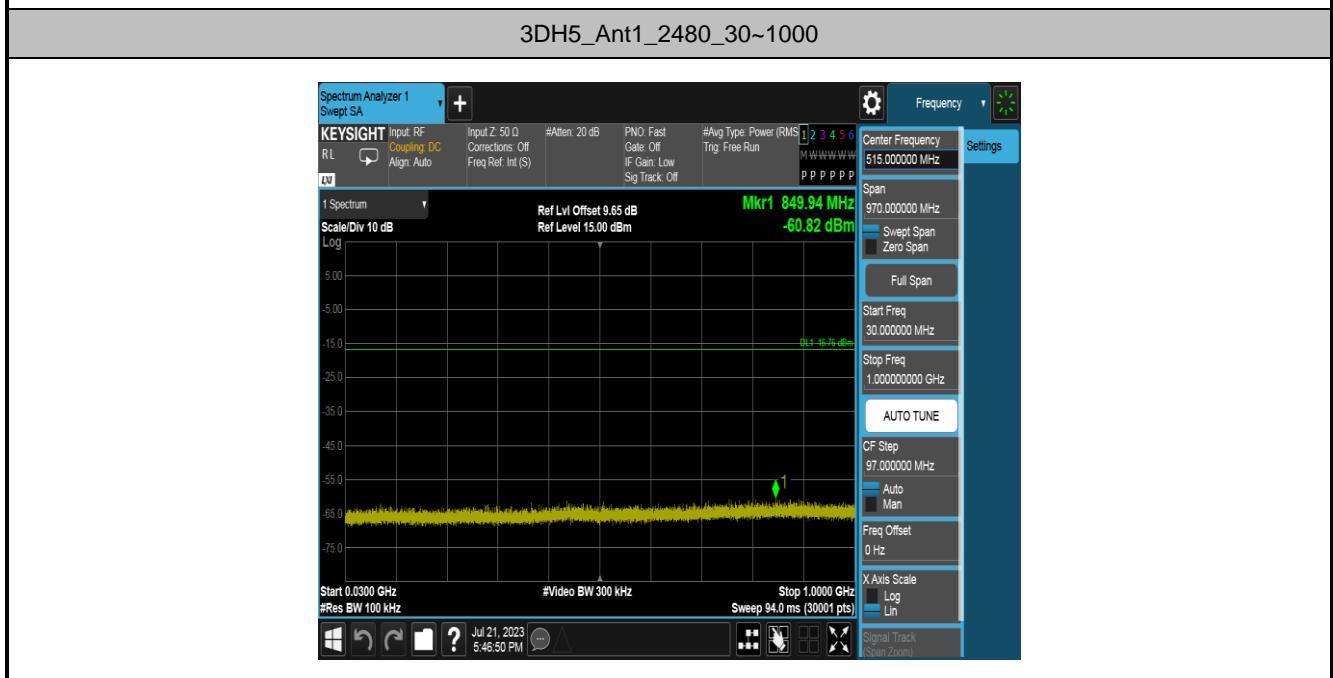
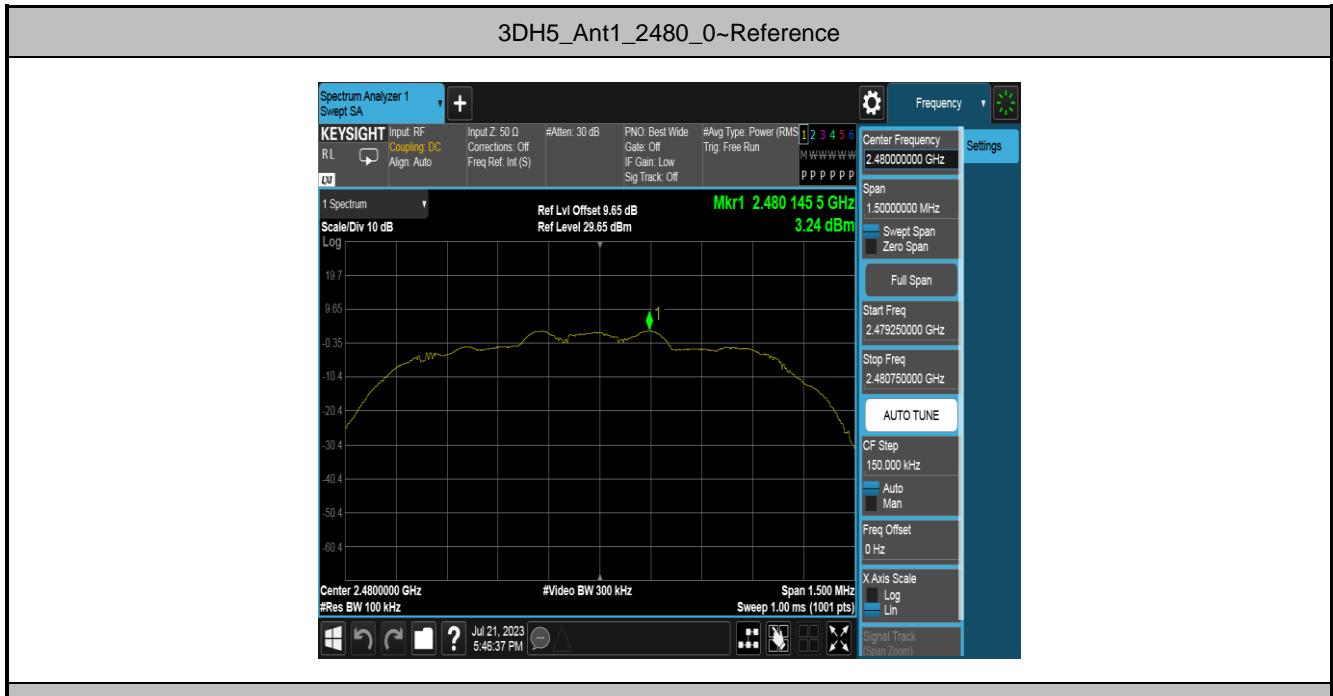


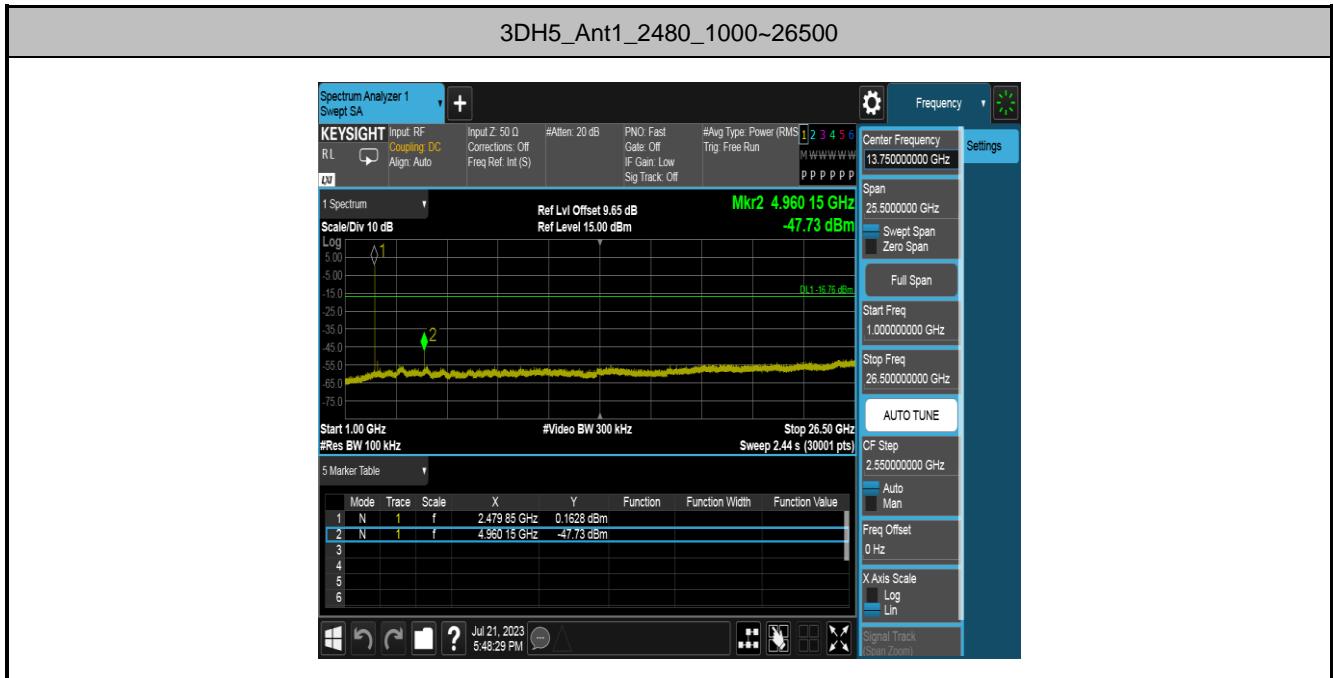












## 7.9. Radiated Spurious Emission Measurement

### 7.9.1. Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

### 7.9.2. Test Procedure Used

ANSI C63.10 Section 6.3 (General Requirements)

ANSI C63.10 Section 6.4 (Standard test method below 30MHz)

ANSI C63.10 Section 6.5 (Standard test method above 30MHz to 1GHz)

ANSI C63.10 Section 6.6 (Standard test method above 1GHz)