

## Test Graphs Of Occupied Channel Bandwidth

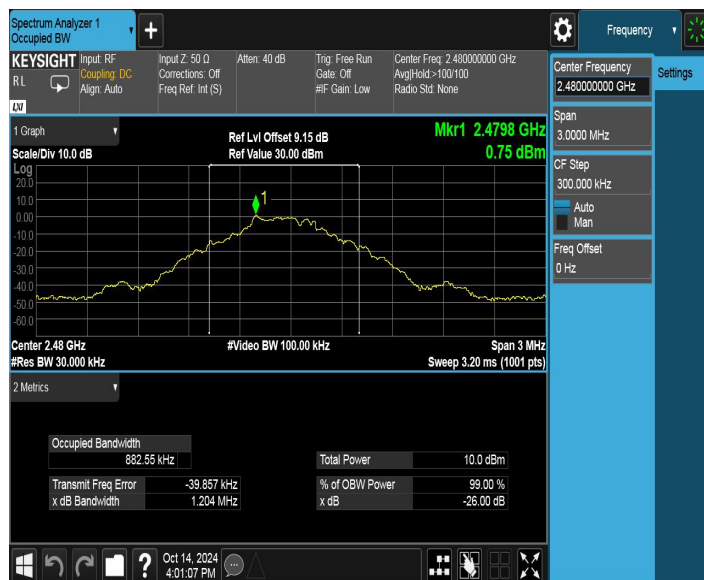
DH5\_Ant1\_2402



DH5\_Ant1\_2441



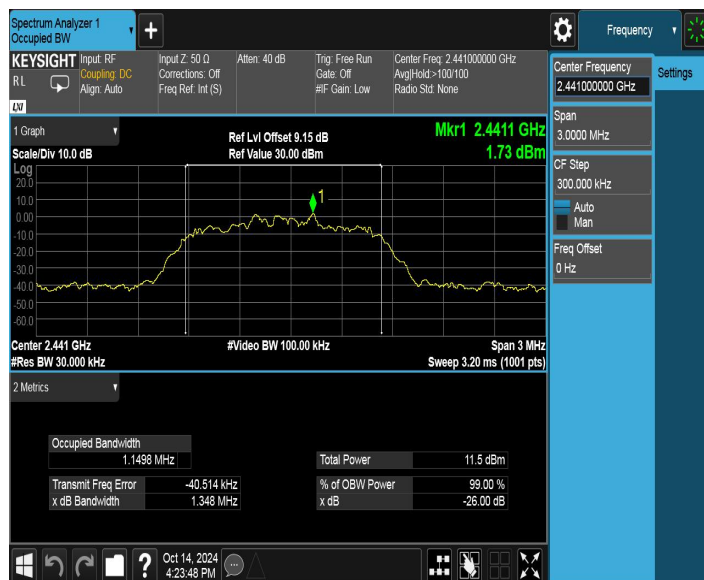
DH5\_Ant1\_2480



2DH5\_Ant1\_2402



2DH5\_Ant1\_2441



2DH5\_Ant1\_2480



3DH5\_Ant1\_2402



3DH5\_Ant1\_2441



3DH5\_Ant1\_2480



### **7.3. Output Power Measurement**

#### **7.3.1. Test Limit**

The maximum out power permissible output power is 1 Watt for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts. And for antenna gain greater than 6dBi the limit shall reduce by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

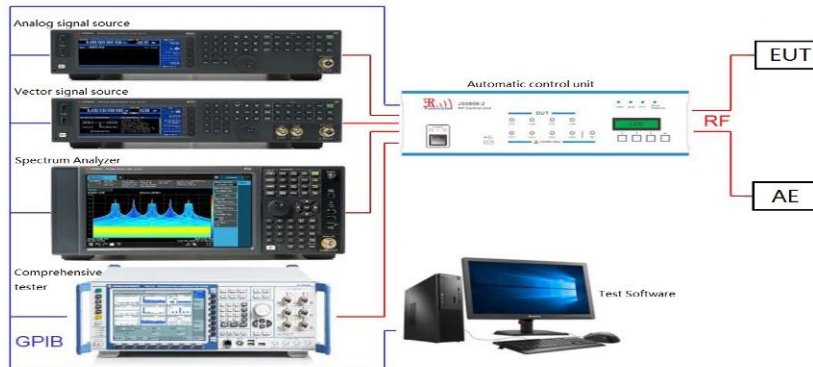
#### **7.3.2. Test Procedure Used**

ANSI C63.10-2013 - Section 7.8.5

#### **7.3.3. Test Setting**

1. Set RBW  $\geq$  the 20 dB bandwidth of the emission being measured.
2. VBW  $\geq$  RBW
3. Span = approximately five times the 20dB bandwidth, centered on a hopping channel
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace to stabilize, Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power (don't forget added the external attenuation and cable loss)

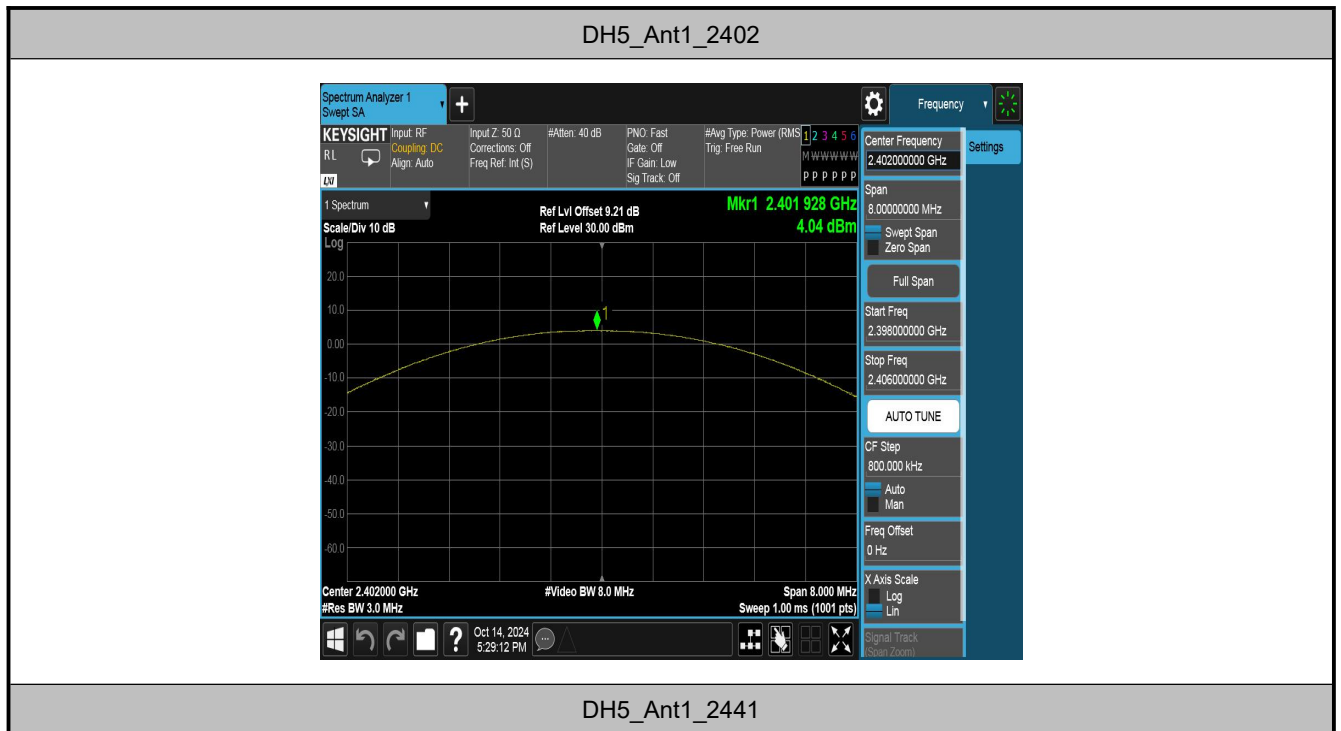
### 7.3.4. Test Setup



### 7.3.5. Test Result

Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	2402	4.04	≤20.97	PASS
		2441	4.23	≤20.97	PASS
		2480	4.75	≤20.97	PASS
2DH5	Ant1	2402	5.88	≤20.97	PASS
		2441	6.15	≤20.97	PASS
		2480	6.19	≤20.97	PASS
3DH5	Ant1	2402	6.22	≤20.97	PASS
		2441	6.58	≤20.97	PASS
		2480	6.99	≤20.97	PASS

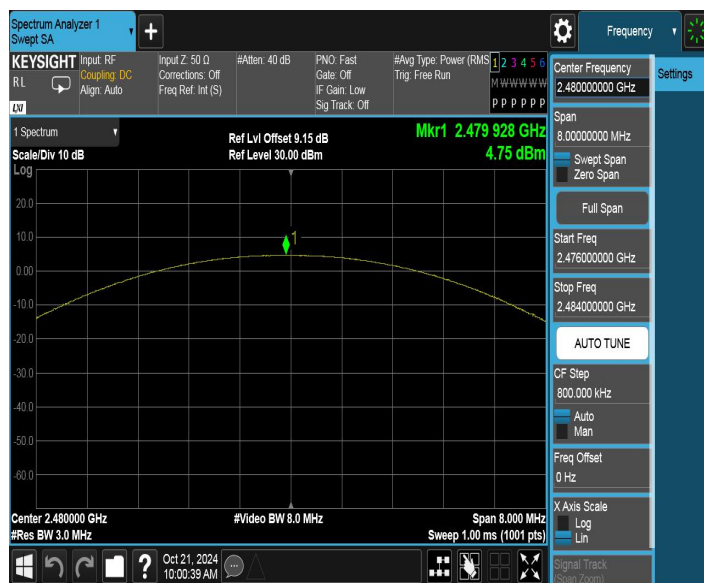
### Test Graphs



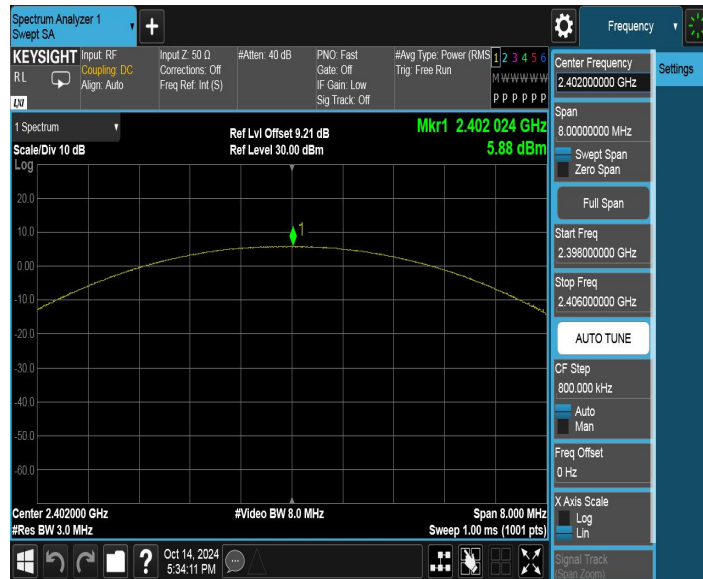




DH5\_Ant1\_2480



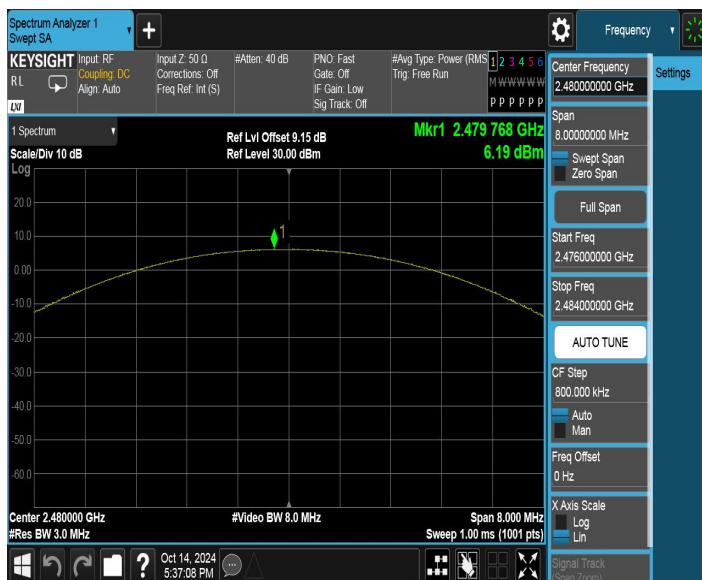
2DH5\_Ant1\_2402



2DH5\_Ant1\_2441



2DH5\_Ant1\_2480



3DH5\_Ant1\_2402



3DH5\_Ant1\_2441



3DH5\_Ant1\_2480



## **7.4. Carrier Frequency Separation Measurement**

### **7.4.1. Test Limit**

For BDR Mode, the minimum permissible channel separation for this system is the value of the 20dB BW. For EDR Mode, the minimum permissible channel separation for this system is 2/3 the value of the 20dB BW.

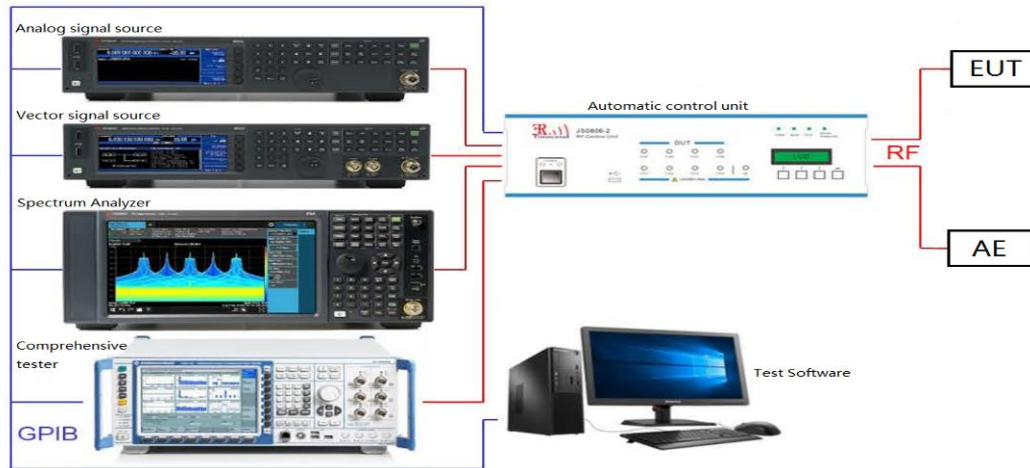
### **7.4.2. Test Procedure Used**

ANSI C63.10-2013 - Section 7.8.2

### **7.4.3. Test Setting**

1. Span = wide enough to capture the peaks of two adjacent channels.
2. Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
3.  $VBW \geq RBW$
4. Sweep time = Auto couple
5. Detector = Peak
6. Trace mode = Max hold
7. Allowed the trace to stabilize
8. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

#### 7.4.4. Test Setup



### 7.4.5. Test Result

Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	Hop	1.182	$\geq 1.029$	PASS
2DH5	Ant1	Hop	1.124	$\geq 0.836$	PASS
3DH5	Ant1	Hop	1.116	$\geq 0.872$	PASS

### Test Graphs

DH5\_Ant1\_Hop



2DH5\_Ant1\_Hop



3DH5\_Ant1\_Hop





## 7.5. Number of Hopping Channels Measurement

### 7.5.1. Test Limit

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

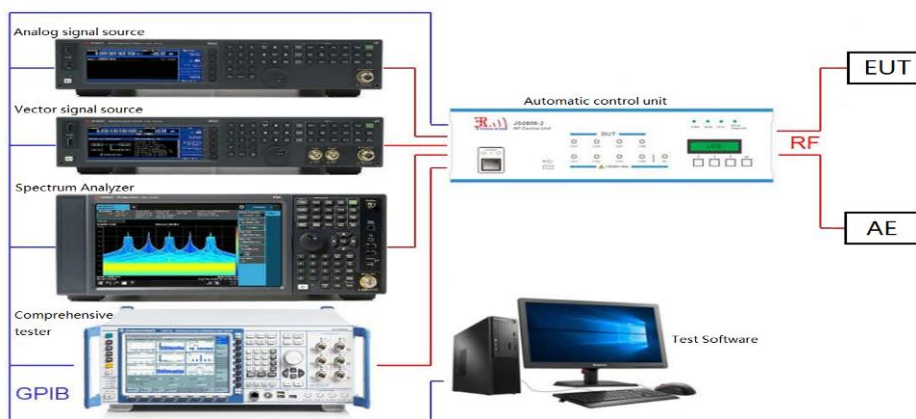
### 7.5.2. Test Procedure Used

ANSI C63.10-2013 - Section 7.8.3

### 7.5.3. Test Settintg

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

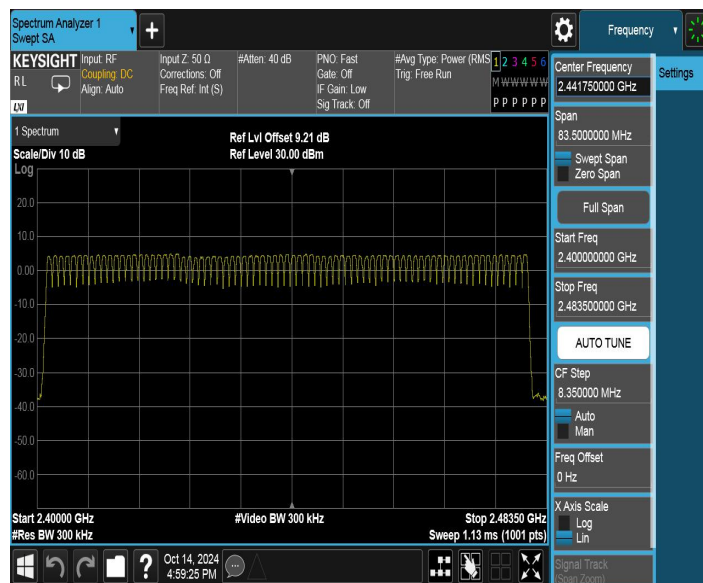


### 7.5.5. Test Result

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

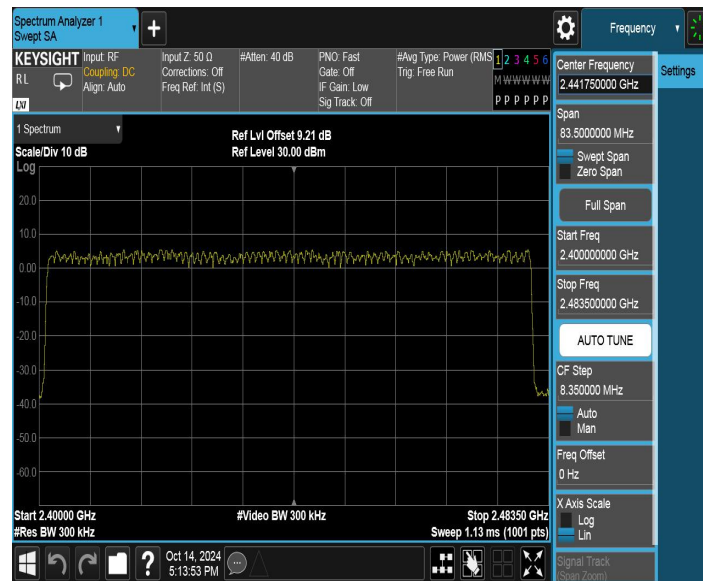
DH5\_Ant1\_Hop



2DH5\_Ant1\_Hop



3DH5\_Ant1\_Hop



## **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.

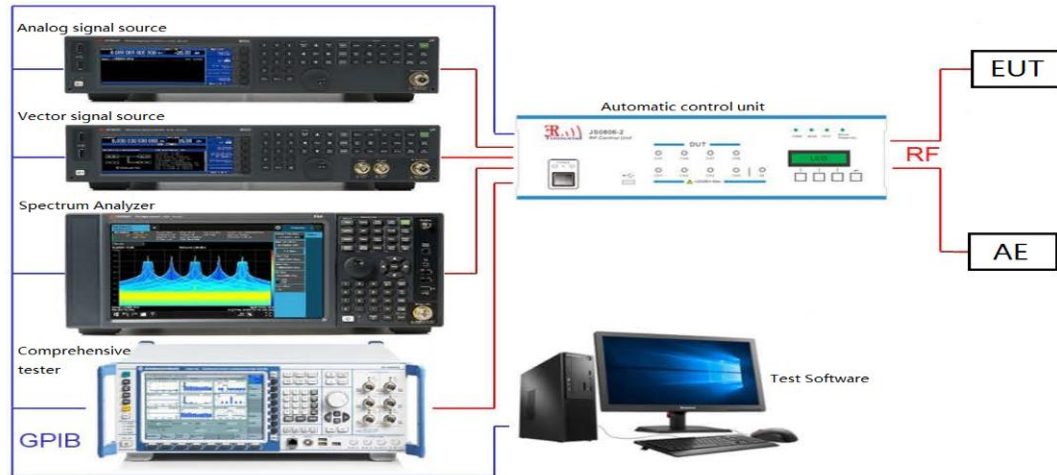
### **7.6.2. Test Procedure Used**

ANSI C63.10-2013 - Section 7.8.4

### **7.6.3. Test Settling**

1. Span = zero span, centered on a hopping channel.
2. RBW shall be  $\leq$  channel spacing and where possible RBW should be set  $\gg 1 / T$ , 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.

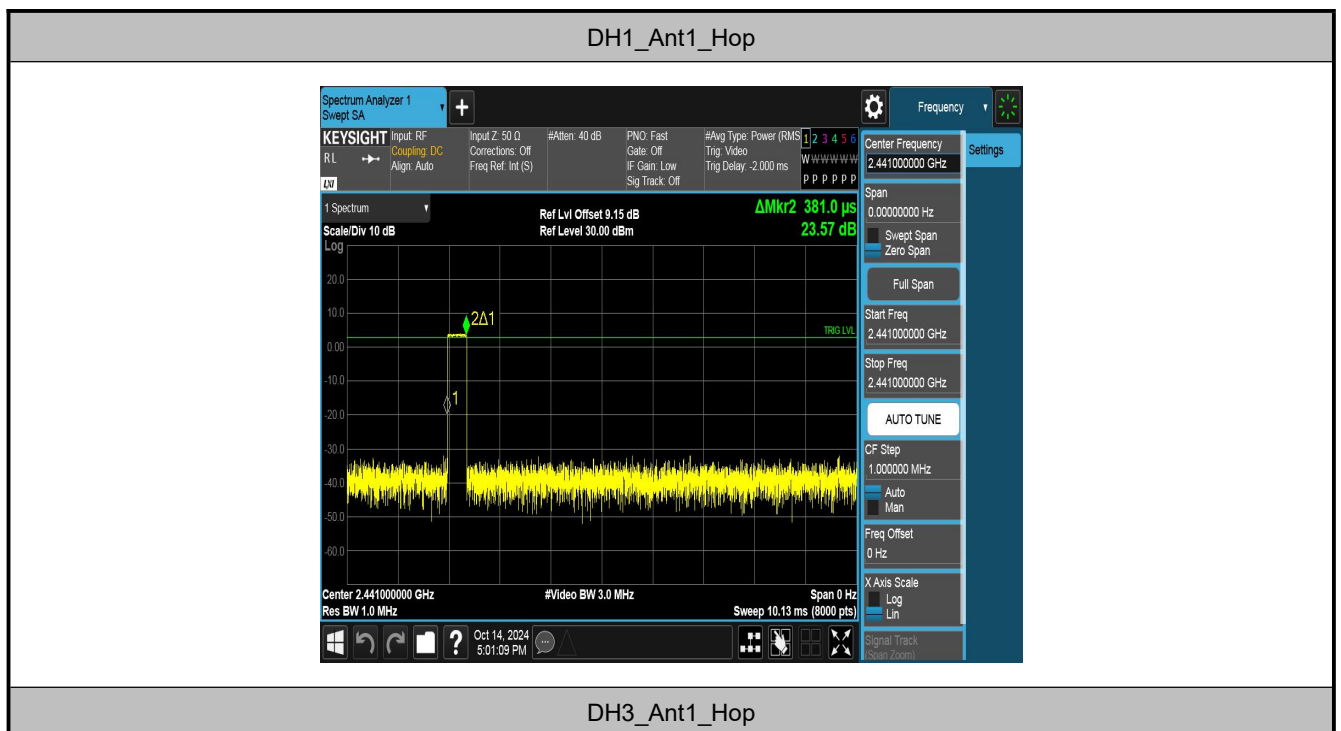
#### 7.6.4. Test Setup

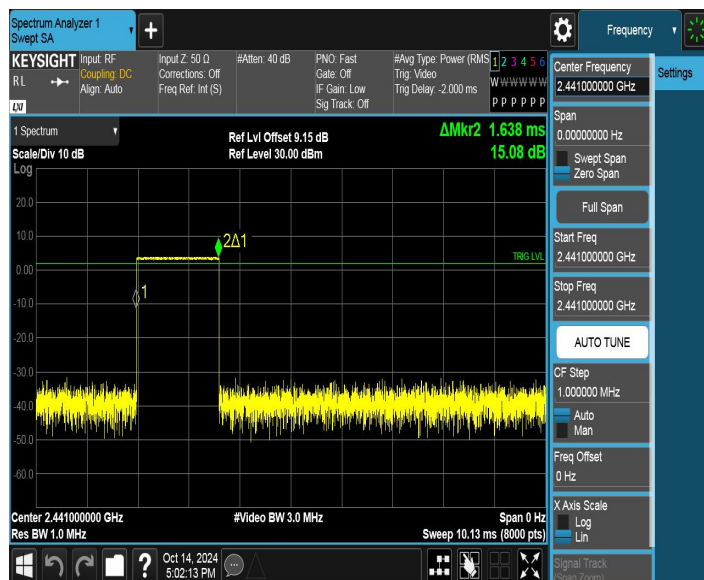


### 7.6.5. Test Result

Test Mode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.381	320	0.122	≤0.4	PASS
DH3	Ant1	Hop	1.638	160	0.262	≤0.4	PASS
DH5	Ant1	Hop	2.884	106.67	0.308	≤0.4	PASS
2DH1	Ant1	Hop	0.390	320	0.125	≤0.4	PASS
2DH3	Ant1	Hop	1.643	160	0.263	≤0.4	PASS
2DH5	Ant1	Hop	2.891	106.67	0.308	≤0.4	PASS
3DH1	Ant1	Hop	0.390	320	0.125	≤0.4	PASS
3DH3	Ant1	Hop	1.642	160	0.263	≤0.4	PASS
3DH5	Ant1	Hop	2.892	106.67	0.308	≤0.4	PASS

### Test Graphs





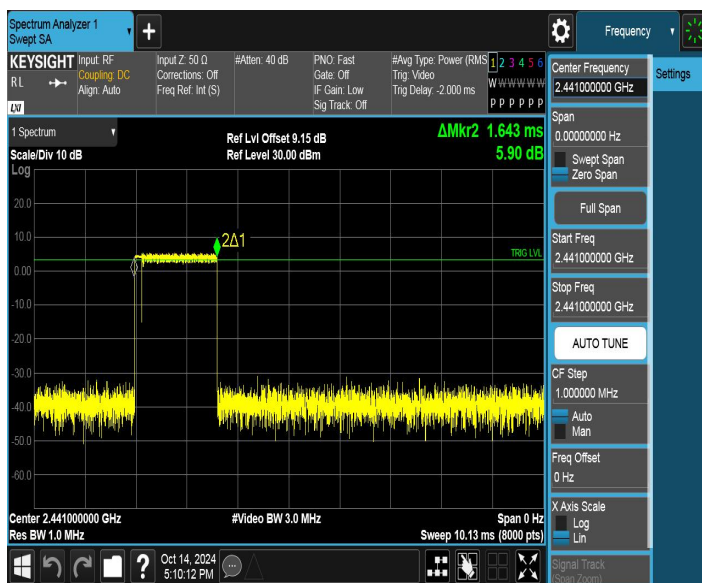
DH5\_Ant1\_Hop



2DH1\_Ant1\_Hop



2DH3\_Ant1\_Hop

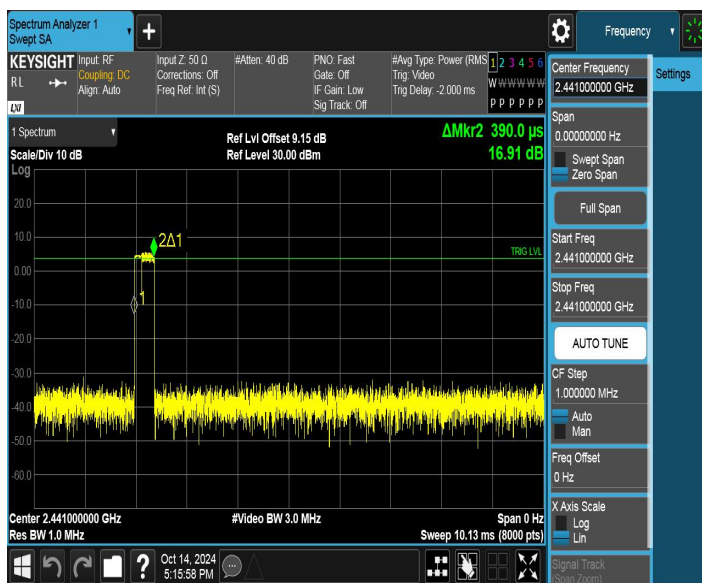


2DH5\_Ant1\_Hop

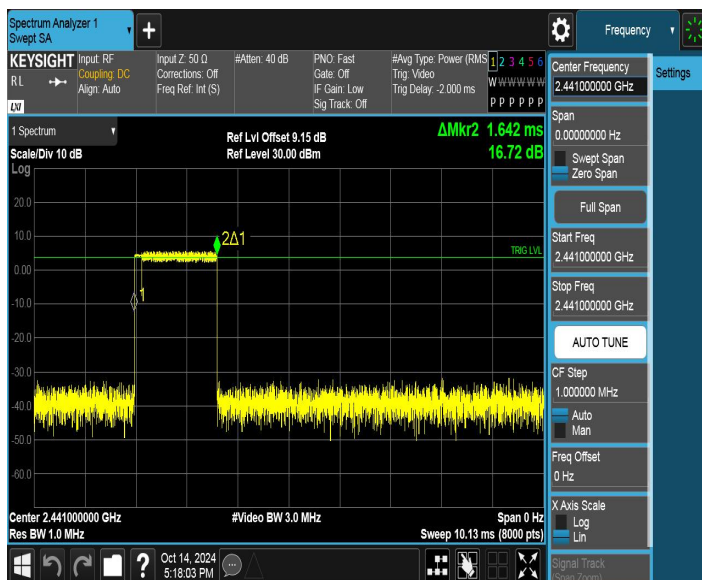




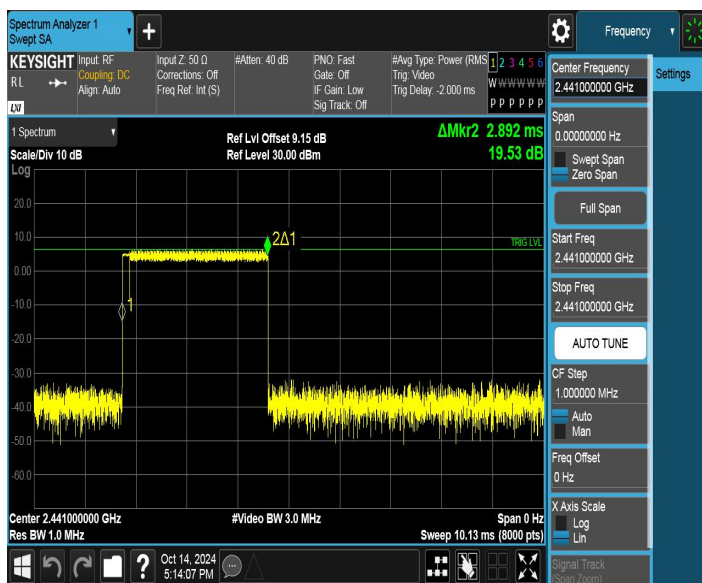
3DH1\_Ant1\_Hop



3DH3\_Ant1\_Hop



### 3DH5\_Ant1\_Hop



## **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.

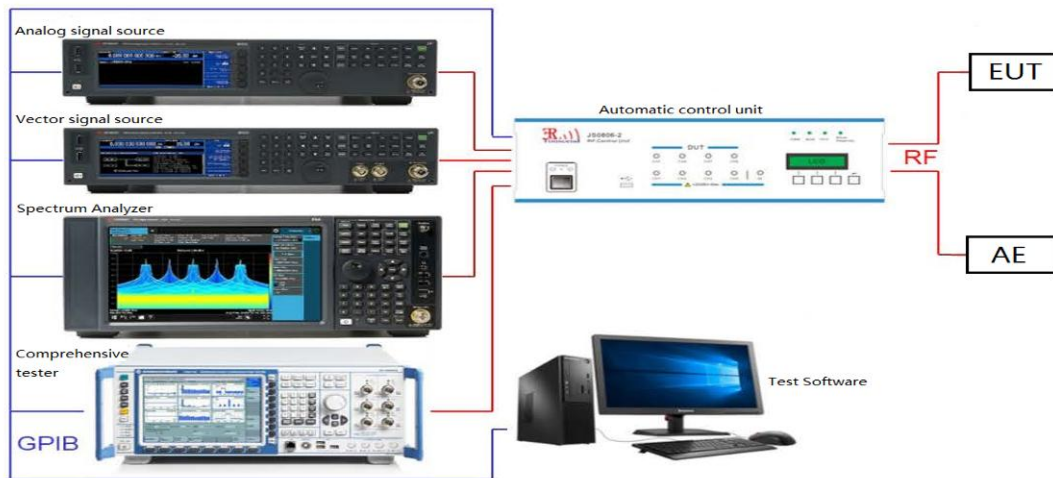
### **7.7.2. Test Procedure Used**

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, then use the marker-to-peak function to move the marker to the peak of the in-band emission.

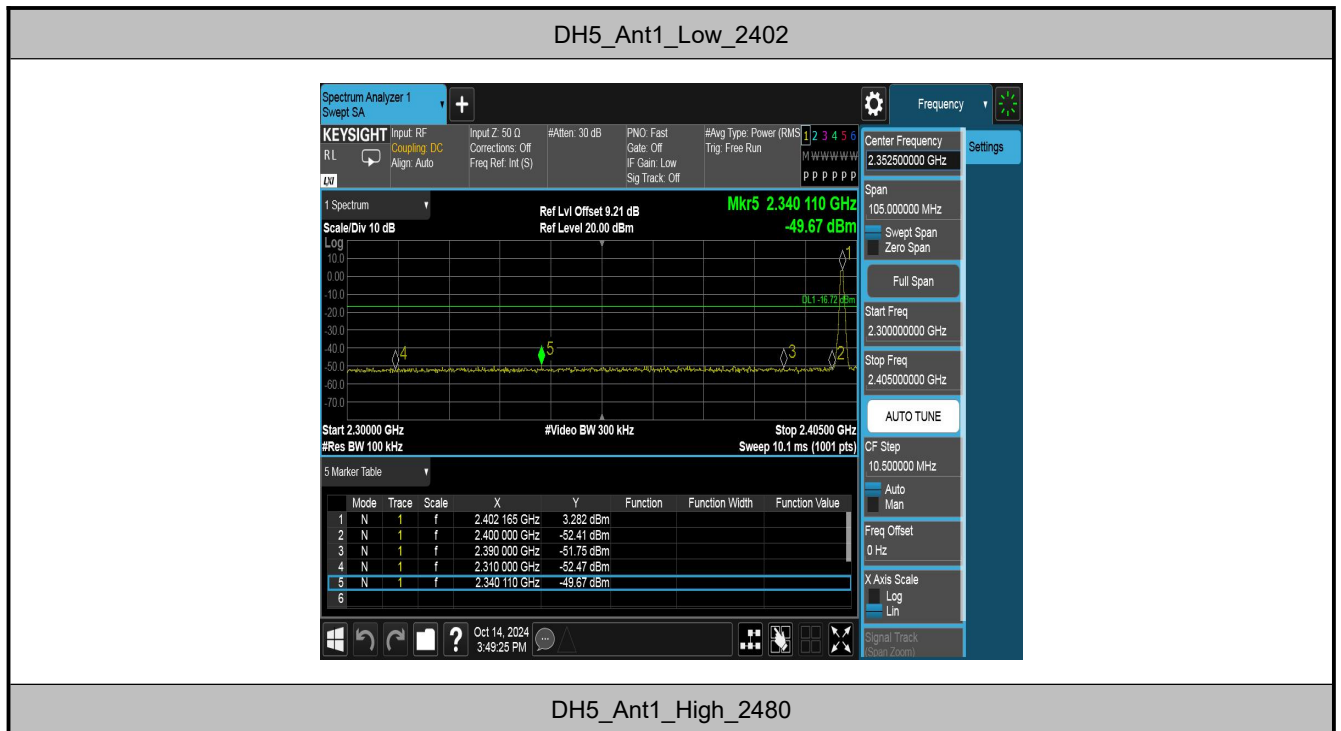
#### 7.7.4. Test Setup

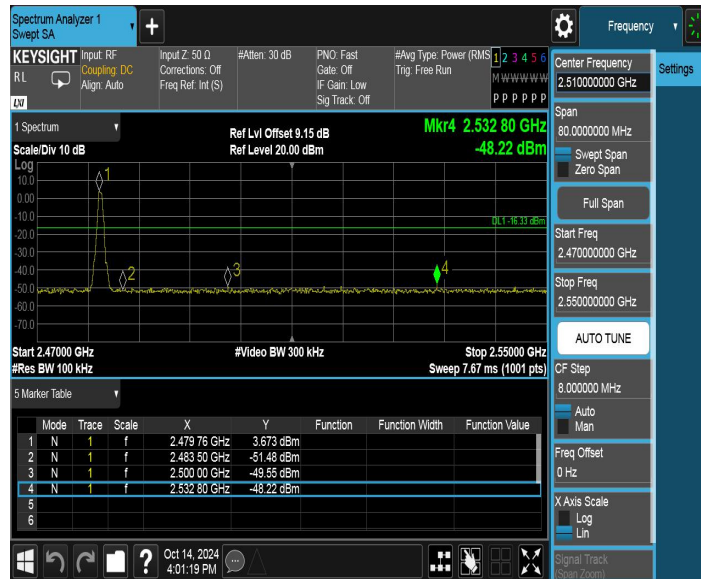


### 7.7.5. Test Result

Test Mode	Antenna	Ch Name	Channel	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	3.28	-49.67	≤-16.72	PASS
		High	2480	3.67	-48.22	≤-16.33	PASS
		Low	Hop_2402	3.01	-50.3	≤-16.99	PASS
		High	Hop_2480	3.27	-49.33	≤-16.73	PASS
2DH5	Ant1	Low	2402	4.33	-48.99	≤-15.67	PASS
		High	2480	4.99	-49.59	≤-15.01	PASS
		Low	Hop_2402	1.06	-50.36	≤-18.94	PASS
		High	Hop_2480	3.97	-49.01	≤-16.03	PASS
3DH5	Ant1	Low	2402	4.85	-49.63	≤-15.15	PASS
		High	2480	4.98	-48.42	≤-15.02	PASS
		Low	Hop_2402	1.07	-49.7	≤-18.94	PASS
		High	Hop_2480	3.96	-49.74	≤-16.04	PASS

### Test Graphs





DH5\_Ant1\_Low\_Hop\_2402



DH5\_Ant1\_High\_Hop\_2480