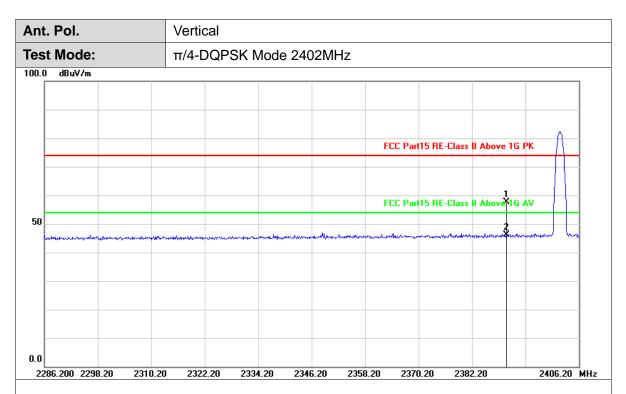


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	l	Margin (dB)	Detector
1	2390.000	30.84	27.67	58.51	74.00	-15.49	peak
2	2390.000	30.84	15.04	45.88	54.00	-8.12	AVG

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value



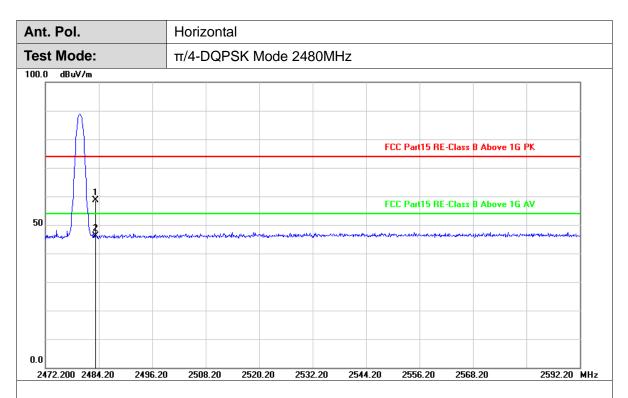


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	ı	Margin (dB)	Detector
1	2390.000	30.84	26.67	57.51	74.00	-16.49	peak
2	2390.000	30.84	15.25	46.09	54.00	-7.91	AVG

- 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- 2.Margin value = Level -Limit value







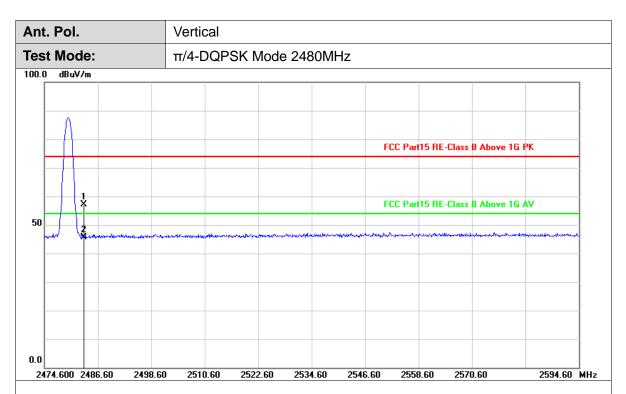
No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	ı	Margin (dB)	Detector
1	2483.500	31.24	27.34	58.58	74.00	-15.42	peak
2	2483.500	31.24	14.98	46.22	54.00	-7.78	AVG

### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

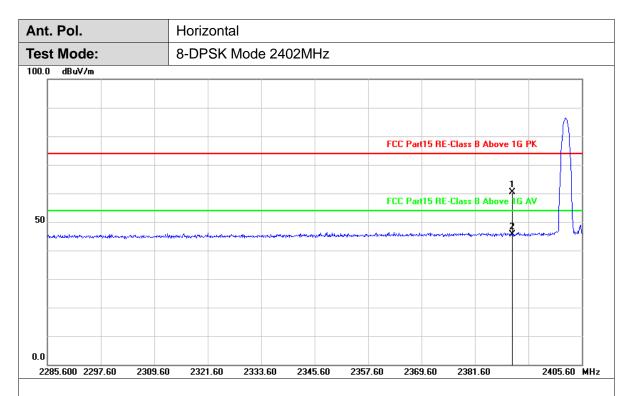




No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	l	Margin (dB)	Detector
1	2483.500	31.24	25.93	57.17	74.00	-16.83	peak
2	2483.500	31.24	14.31	45.55	54.00	-8.45	AVG

- 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- 2.Margin value = Level -Limit value



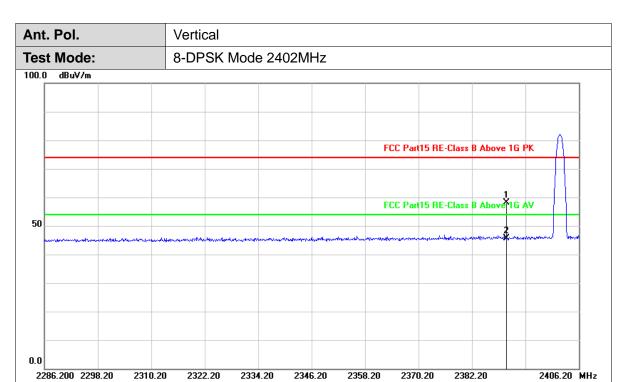


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)		Limit (dBuV/m)	Margin (dB)	Detector
1	2390.000	30.84	29.45	60.29	74.00	-13.71	peak
2	2390.000	30.84	14.87	45.71	54.00	-8.29	AVG

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

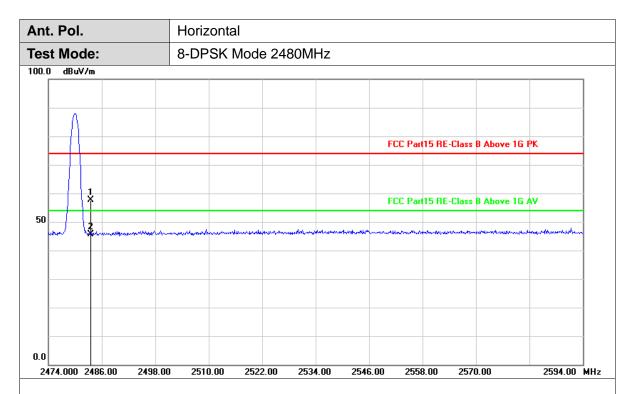




No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	l	Margin (dB)	Detector
1	2390.000	30.84	27.18	58.02	74.00	-15.98	peak
2	2390.000	30.84	14.87	45.71	54.00	-8.29	AVG

- 1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- 2.Margin value = Level -Limit value





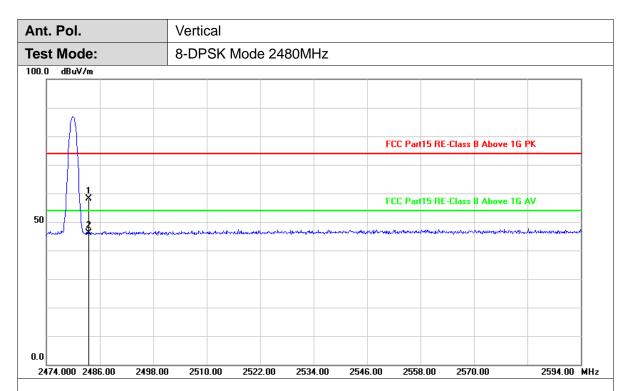
No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	ı	Margin (dB)	Detector
1	2483.500	31.24	26.34	57.58	74.00	-16.42	peak
2	2483.500	31.24	14.45	45.69	54.00	-8.31	AVG

### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value





No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)		Margin (dB)	Detector
1	2483.500	31.24	26.94	58.18	74.00	-15.82	peak
2	2483.500	31.24	15.01	46.25	54.00	-7.75	AVG

### Remarks:

1.Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

2.Margin value = Level -Limit value

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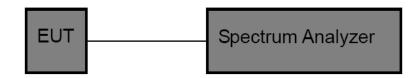


### 3.4. Band edge and Spurious Emissions (Conducted)

### **Limit**

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):In any 100 kHz bandwidth outside the frequency band 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.

### **Test Configuration**



### **Test Procedure**

- 1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously
- Use the following spectrum analyzer settings: RBW = 100 kHz, VBW ≥ RBW, scan up through 10<sup>th</sup> harmonic. Sweep = auto, Detector function = peak, Trace = max hold
- 4. Measure and record the results in the test report.

#### **Test Mode**

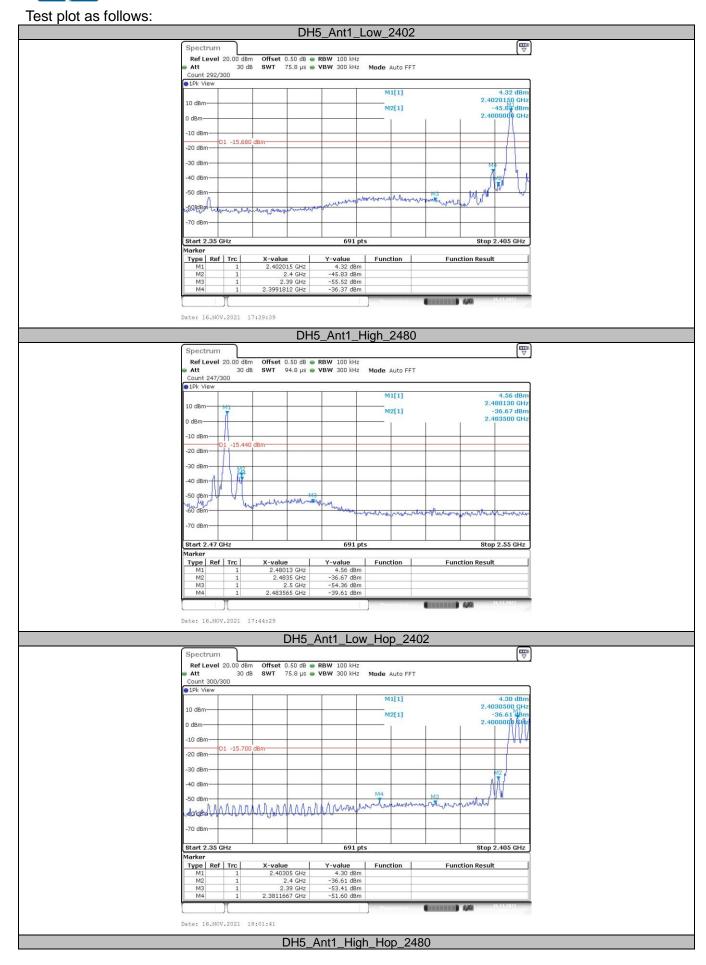
Please refer to the clause 2.4.

#### **Test Results**

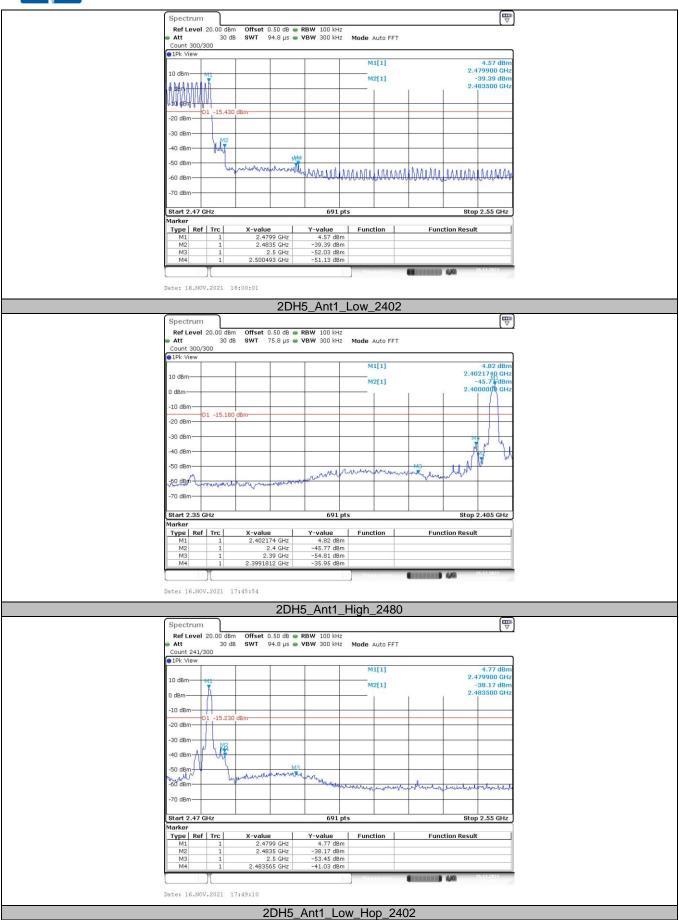
### (1) Band edge Conducted Test

Test Mode	Antenna	ChName	Frequency (MHz)	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
	Low	2402	4.32	-36.37	≤-15.68	PASS	
DH5	Ant1	High	2480	4.56	-39.61	≤-15.44	PASS
Dis	Anti	Low	Hop_2402	4.30	-51.60	≤-15.70	PASS
		High	Hop_2480	4.57	-51.13	≤-15.43	PASS
		Low	2402	4.82	-35.95	≤-15.18	PASS
2DH5	Ant1	High	2480	4.77	-41.03	≤-15.23	PASS
2003	Anti	Low	Hop_2402	-0.37	-51.37	≤-20.37	PASS
		High	Hop_2480	4.74	-52.98	≤-15.26	PASS
		Low	2402	4.94	-35.39	≤-15.06	PASS
3DH5 Ant1	High	2480	4.88	-41.03	≤-15.12	PASS	
	Anti	Low	Hop_2402	4.74	-50.81	≤-15.26	PASS
		High	Hop_2480	4.78	-52.30	≤-15.22	PASS

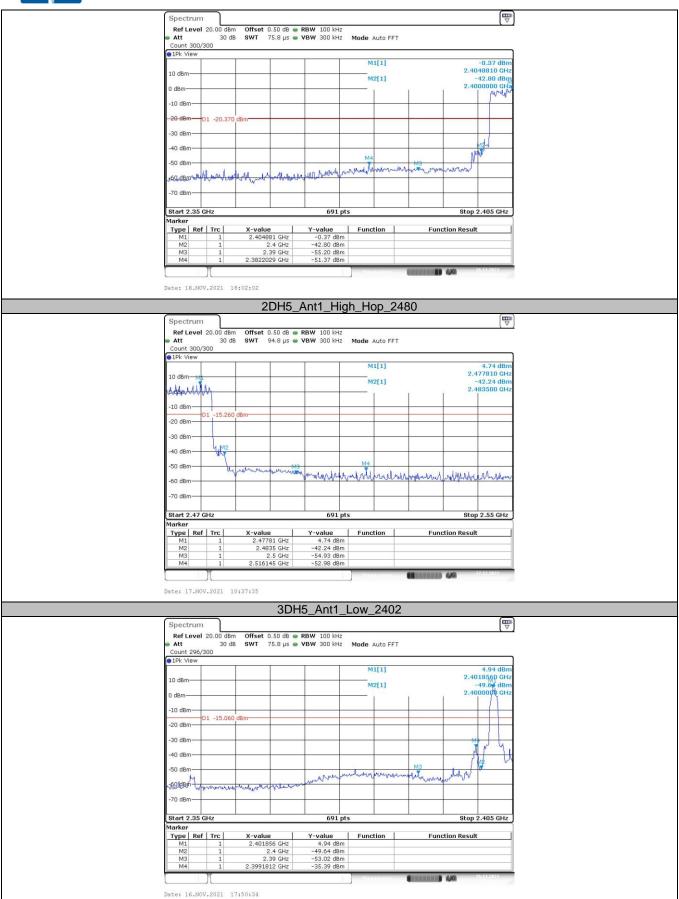
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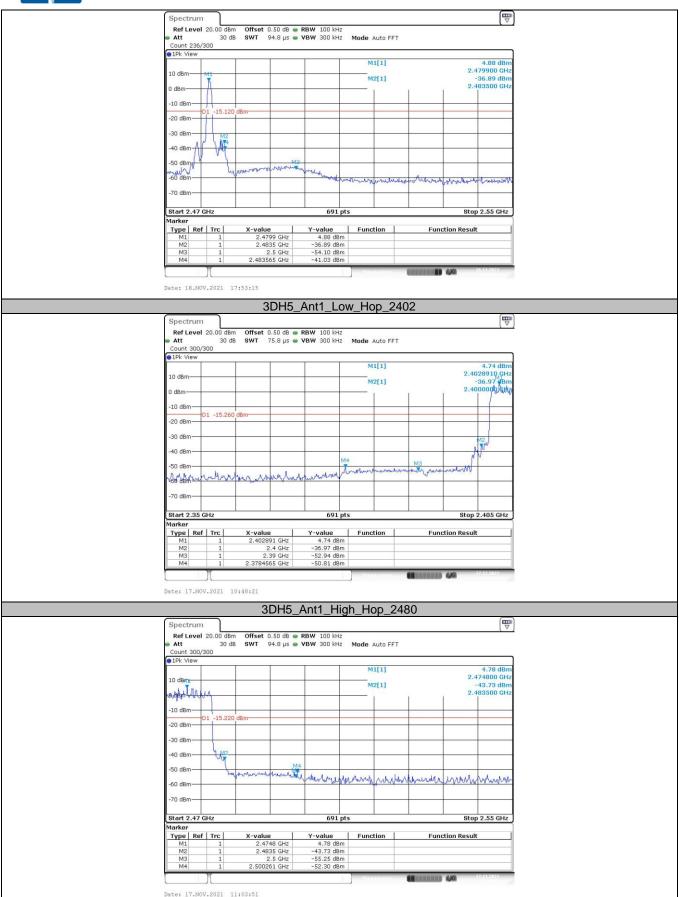






3DH5\_Ant1\_High\_2480



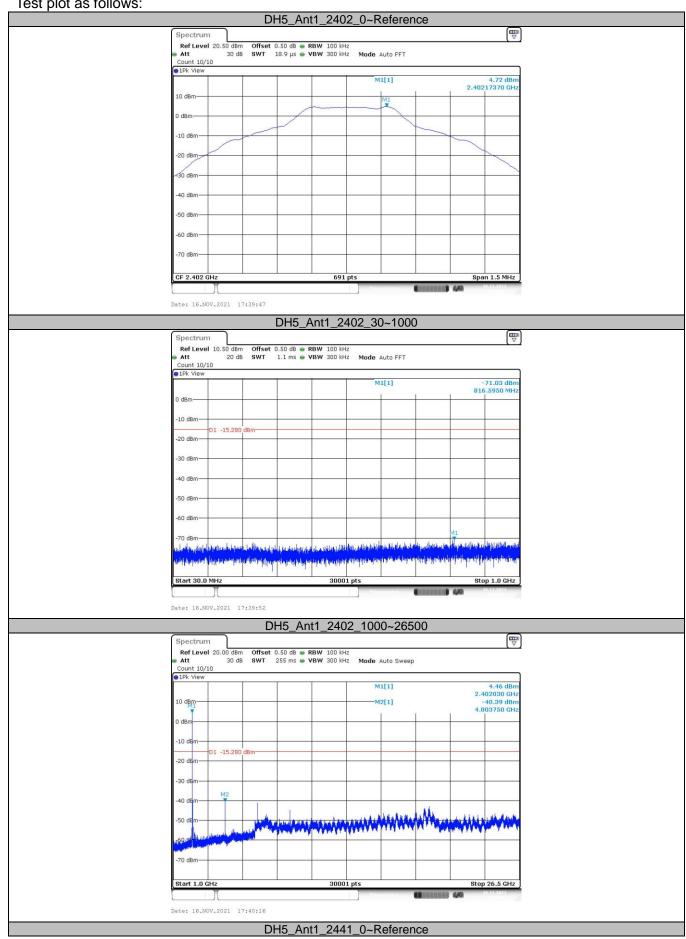




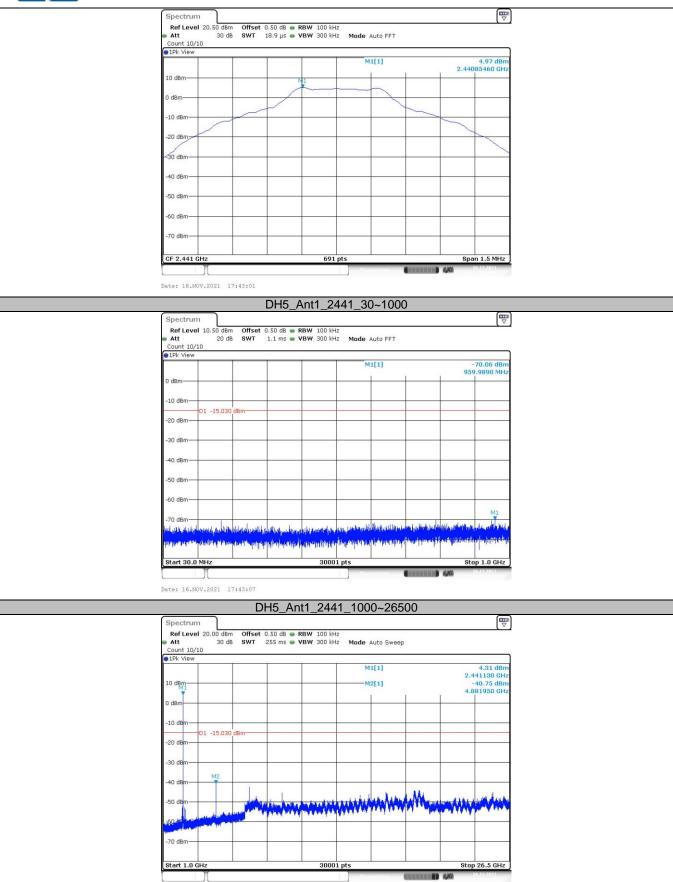
(2) Conducted Spurious Emissions Test

Test Mode	Antenna	Frequency (MHz)	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict	
		(**************************************	Reference	4.72	4.72		PASS	
		2402	30~1000	4.72	-71.03	≤-15.28	PASS	
			1000~26500	4.72	-40.39	≤-15.28	PASS	
	DH5 Ant1		Reference	4.97	4.97		PASS	
DH5		2441	30~1000	4.97	-70.06	≤-15.03	PASS	
			1000~26500	4.97	-40.75	≤-15.03	PASS	
			Reference	4.91	4.91		PASS	
		2480	30~1000	4.91	-70.50	≤-15.09	PASS	
			1000~26500	4.91	-42.72	≤-15.09	PASS	
		Reference	4.85	4.85		PASS		
	240		2402	30~1000	4.85	-68.14	≤-15.15	PASS
			1000~26500	4.85	-43.16	≤-15.15	PASS	
		Ant1 2441	Reference	4.88	4.88		PASS	
2DH5	Ant1		30~1000	4.88	-69.65	≤-15.12	PASS	
			1000~26500	4.88	-42.54	≤-15.12	PASS	
			Reference	4.81	4.81		PASS	
		2480	30~1000	4.81	-70.39	≤-15.19	PASS	
			1000~26500	4.81	-39.92	≤-15.19	PASS	
			Reference	4.97	4.97		PASS	
		2402	30~1000	4.97	-70.88	≤-15.03	PASS	
			1000~26500	4.97	-43.19	≤-15.03	PASS	
3DH5 Ant1			Reference	5.05	5.05		PASS	
	2441	30~1000	5.05	-70.90	≤-14.95	PASS		
			1000~26500	5.05	-43.31	≤-14.95	PASS	
		2480	Reference	4.98	4.98		PASS	
			30~1000	4.98	-71.03	≤-15.02	PASS	
			1000~26500	4.98	-42.53	≤-15.02	PASS	

Test plot as follows:



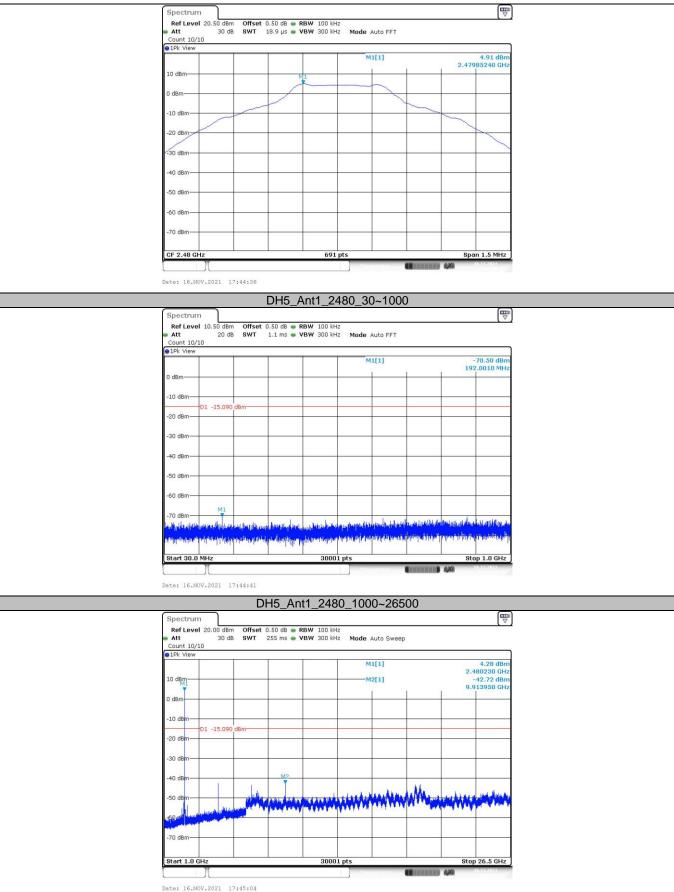




DH5\_Ant1\_2480\_0~Reference

Date: 16.NOV.2021 17:43:30

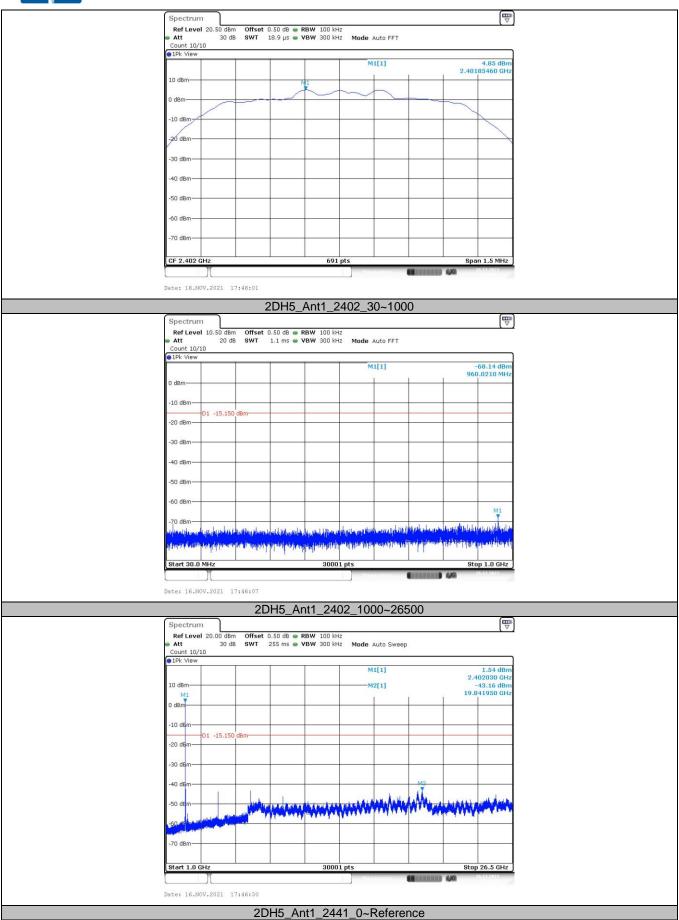




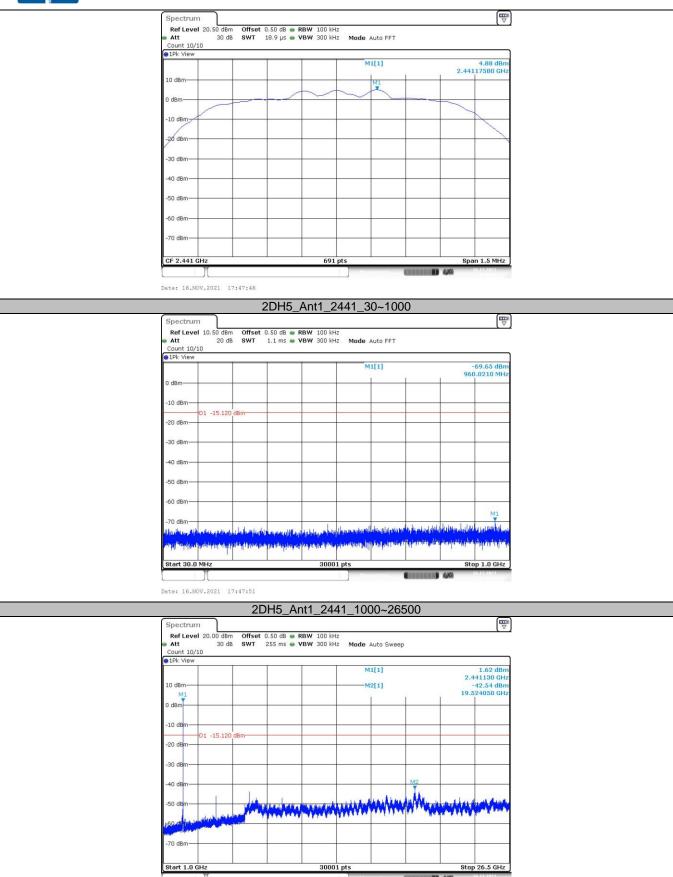
2DH5\_Ant1\_2402\_0~Reference









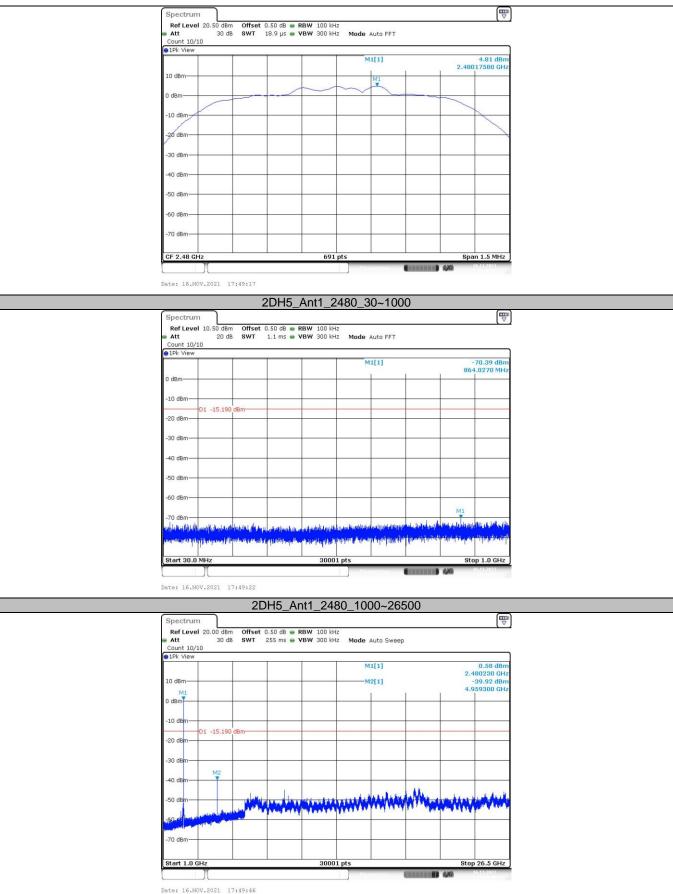


2DH5\_Ant1\_2480\_0~Reference



Date: 16.NOV.2021 17:48:14

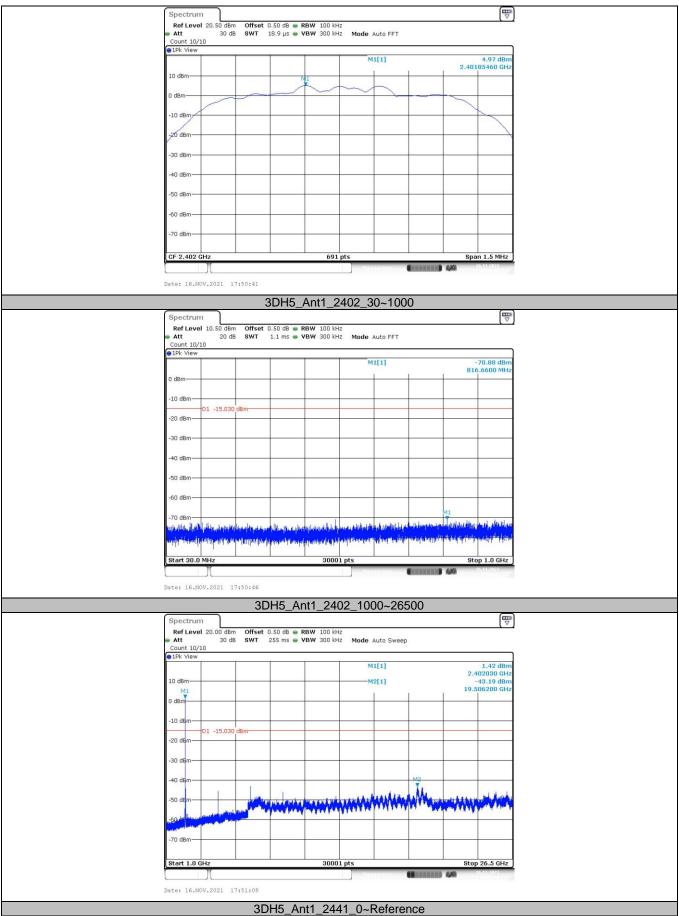




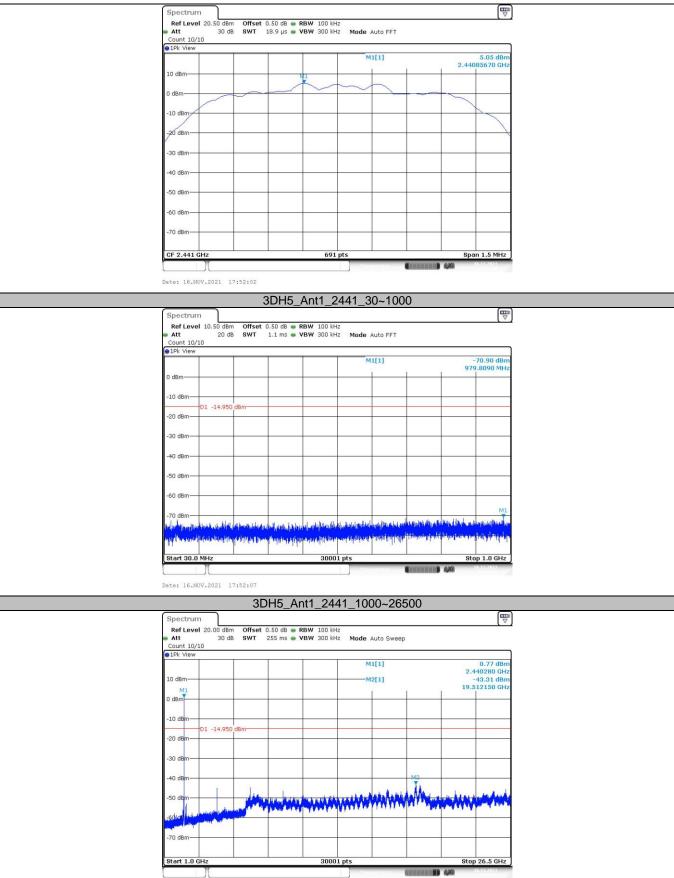
3DH5\_Ant1\_2402\_0~Reference







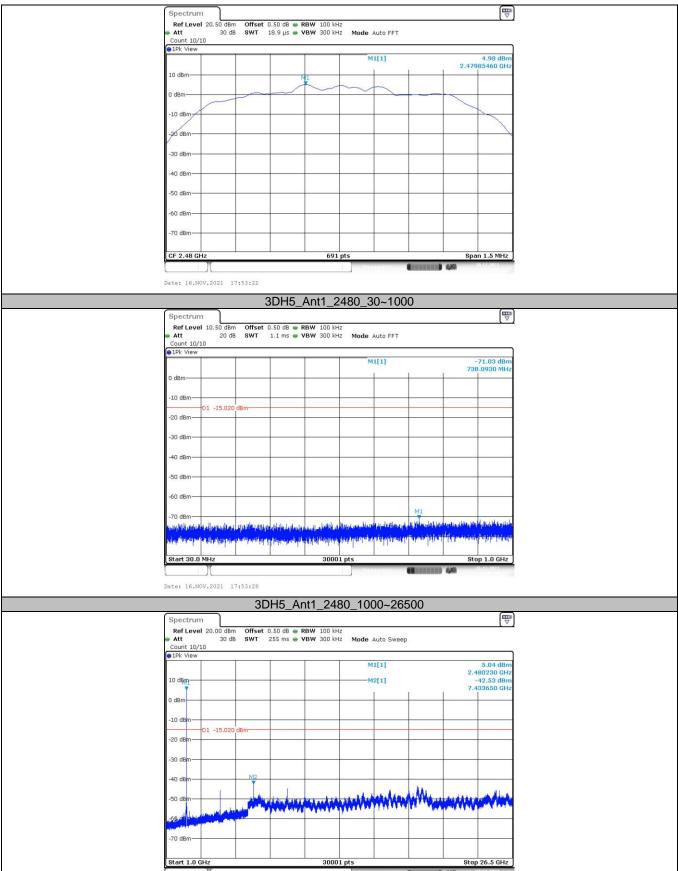




3DH5\_Ant1\_2480\_0~Reference

Date: 16.NOV.2021 17:52:30





Date: 16.NOV.2021 17:53:51

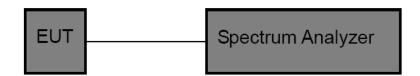


### 3.5. Bandwidth

### **Limit**

N/A

### **Test Configuration**



### **Test Procedure**

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. OCB and 20dB Spectrum Setting:
  - (1) Set RBW =  $1\% \sim 5\%$  occupied bandwidth.
  - (2) Set the video bandwidth (VBW) ≥ 3 RBW.
  - (3) Detector = Peak.
  - (4) Trace mode = Max hold.
  - (5) Sweep = Auto couple.

Note: The EUT was set to continuously transmitting in each mode and low, Middle and high channel for the test.

### **Test Mode**

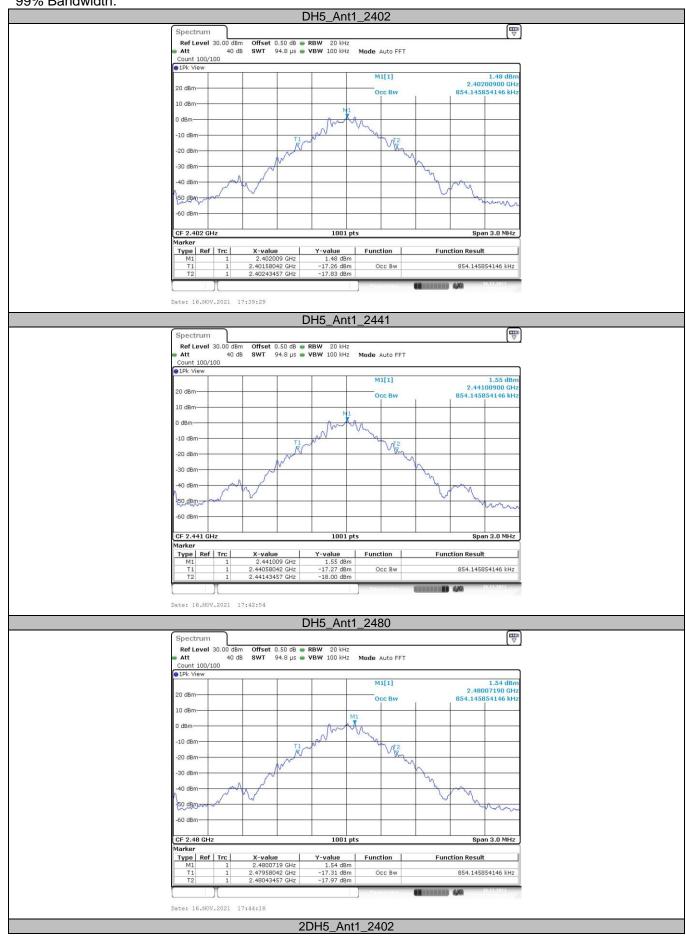
Please refer to the clause 2.4.

### **Test Results**

Modulation type	Channel	99% Bandwidth (MHz)	20dB Bandwidth (MHz)	20dB Bandwidth *2/3 (MHz)
	00	0.854	1.101	734.000
GFSK	39	0.854	1.101	734.000
	78	0.854	1.104	736.000
	00	1.175	1.371	914.000
π/4-DQPSK	39	1.175	1.368	912.000
	78	1.175	1.371	914.000
	00	1.193	1.374	916.000
8-DPSK	39	1.193	1.383	922.000
	78	1.190	1.377	918.000

CTC Laboratories, Inc.





Offset 0.50 dB • RBW 20 kHz SWT 94.8 μs • VBW 100 kHz Mode Auto FFT

1001 pts

2DH5\_Ant1\_2441

1001 pts

Function

Occ Bw

Y-value 1.58 dBm -14.37 dBm -16.10 dBm

Offset 0.50 d8 • RBW 20 kHz SWT 94.8 µs • VBW 100 kHz

Function

Mode Auto FET

M1[1]

Y-value 1.41 dBm -14.20 dBm -16.59 dBm

M1[1]

Spectrum Ref Level 30.00 dBm

20 dBm 10 dBm 0 dBm -10 dBm -20 dBm -30 dBm

CF 2.402 GHz

Spectrum Ref Level 30.00 dBm

20 dBm

10 dBm

-20 dBn -30 dBm

CF 2.441 GHz

中国国家认证认可监督管理委员会

Type | Ref | Trc |

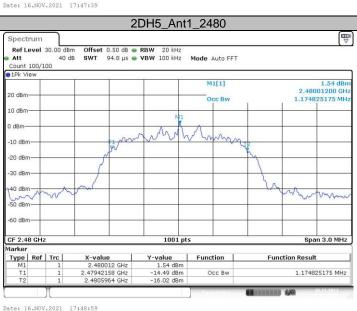
nt 100/100

Type Ref Trc

Date: 16.NOV.2021 17:45:43

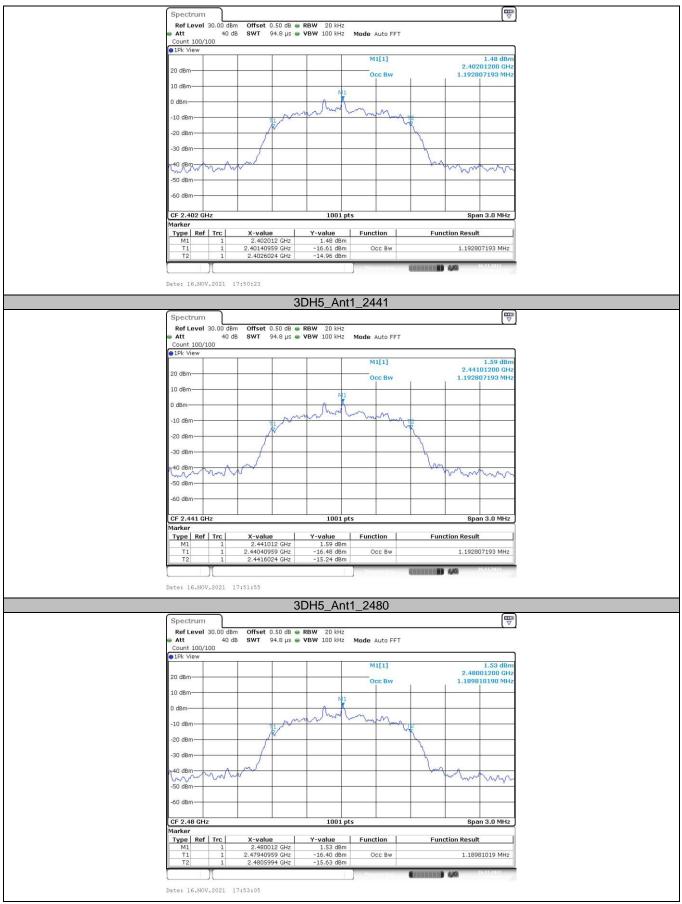
40 dB

# Report No.: CTC20211659E04 1.41 dB 2.40200900 GHz 1.174825175 MHz **Function Result** 2.44101200 GHz 1.174825175 MH 1 mm Span 3.0 MHz **Function Result** 1.174825175 MHz 1.54 dBm 2.48001200 GHz 1.174825175 MH

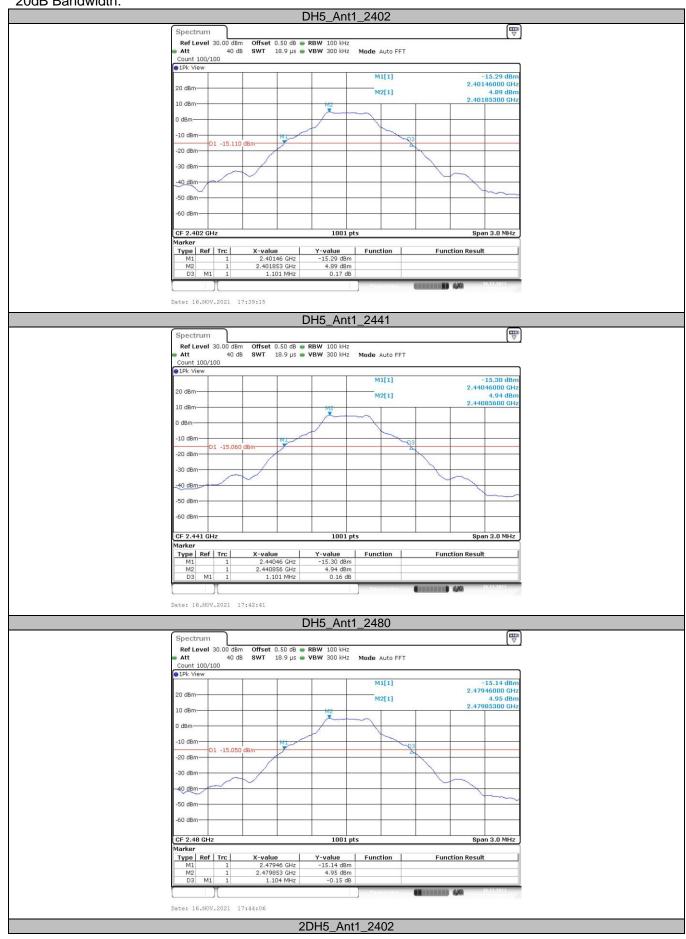


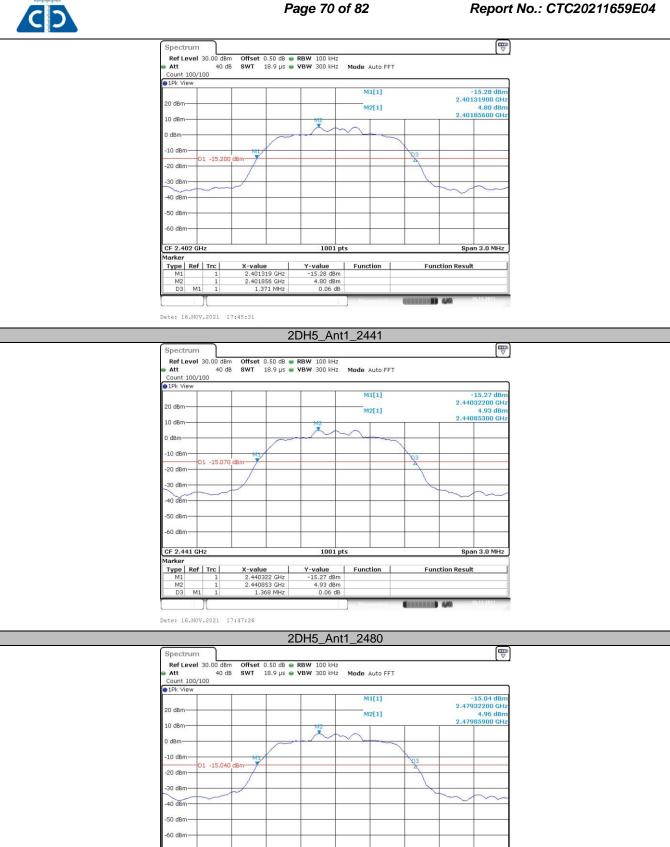
3DH5\_Ant1\_2402











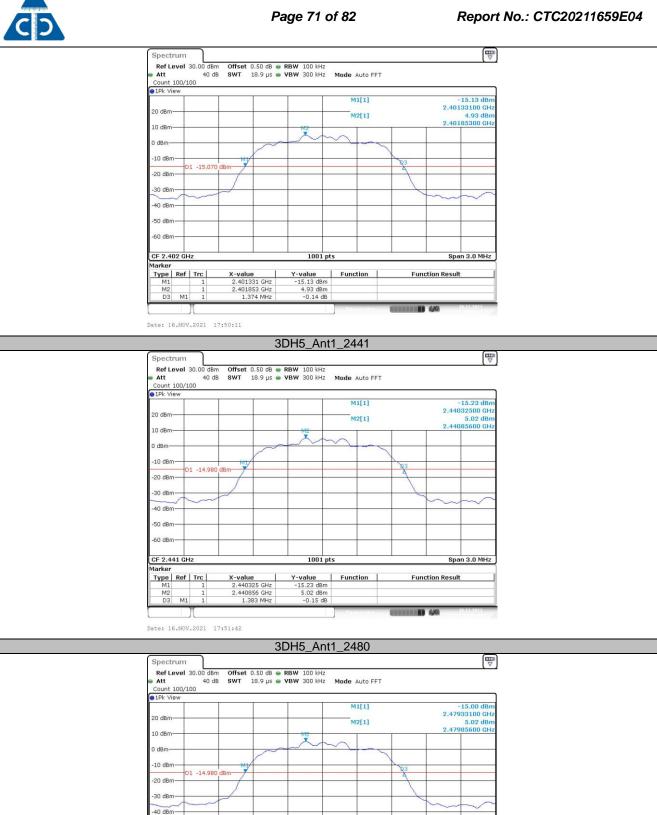
3DH5\_Ant1\_2402

Function

CF 2.48 GH Type Ref Trc

Date: 16.NOV.2021 17:48:47

**Function Result** 





1001 pts

Function

-50 dBm

CF 2.48 GH

Type Ref Trc

Date: 16.NOV.2021 17:52:53

**Function Result** 

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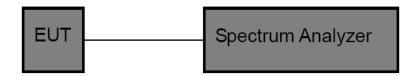
### 3.6. Channel Separation

### **Limit**

### FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1)/ RSS-247 5.1 b:

Test Item	Limit	Frequency Range(MHz)	
Channel Separation	>25KHz or >two-thirds of the 20 dB bandwidth Which is greater	2400~2483.5	

### **Test Configuration**



### **Test Procedure**

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. Spectrum Setting:
  - (1) Set RBW = 100 kHz.
  - (2) Set the video bandwidth (VBW) ≥ 3 RBW.
  - (3) Detector = Peak.
  - (4) Trace mode = Max hold.
  - (5) Sweep = Auto couple.

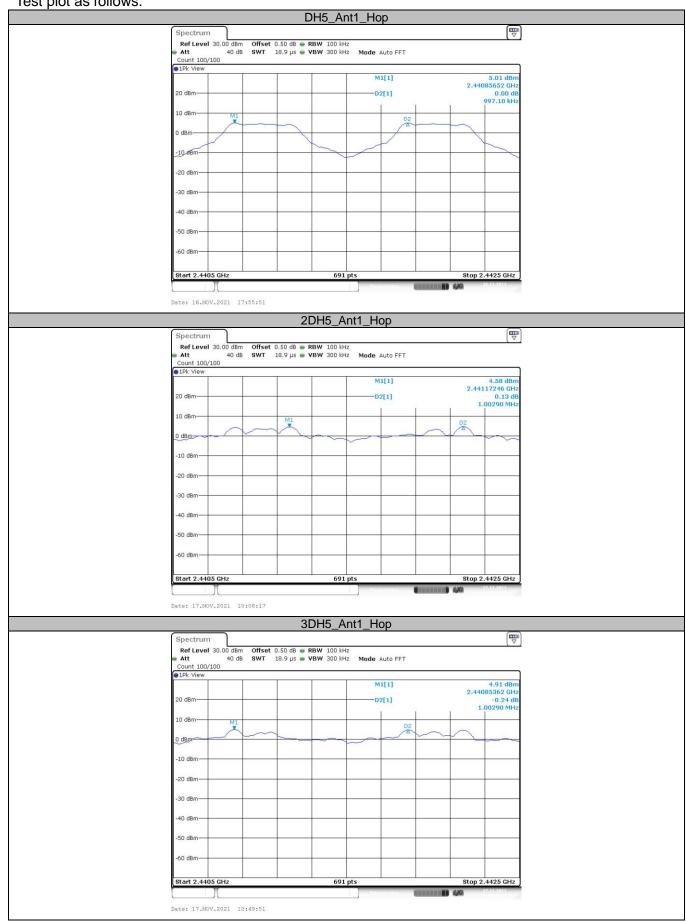
### **Test Mode**

Please refer to the clause 2.4.

### **Test Results**

Modulation type	Channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result
GFSK	39	0.997	734.000	Pass
π/4-DQPSK	39	1.003	912.000	Pass
8-DPSK	39	1.003	922.000	Pass

Test plot as follows:







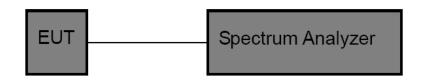
## 3.7. Number of Hopping Channel

### Limit

### FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(iii)/ RSS-247 5.1 d:

Section	Test Item	Limit	
15.247 (a)(iii)/ RSS-247 5.1 d:	Number of Hopping Channel	>15	

### **Test Configuration**



### **Test Procedure**

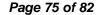
- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. Spectrum Setting:
  - (1) Peak Detector: RBW=100 kHz, VBW≥RBW, Sweep time= Auto.

### **Test Mode**

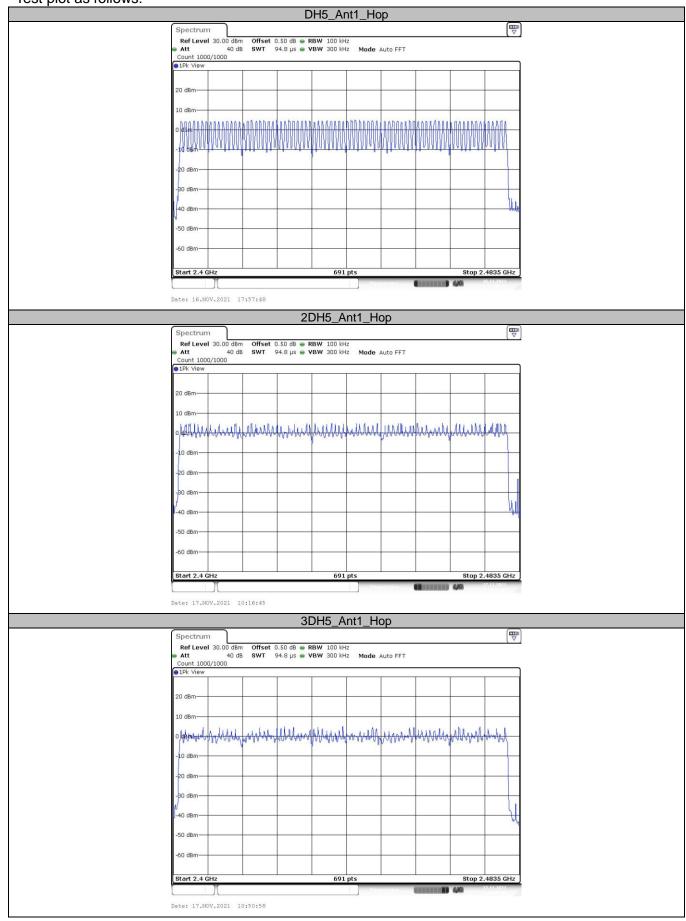
Please refer to the clause 2.4.

### **Test Result**

Modulation type	Channel number	Limit	Result
GFSK	79		
π/4-DQPSK	79 ≥15.00		Pass
8DPSK	79		



Test plot as follows:





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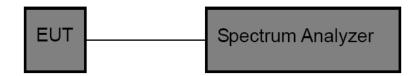


### 3.8. Dwell Time

#### Limit

Section	Test Item	Limit	
15.247(a)(iii)/ RSS-247 5.1 d	Average Time of Occupancy	0.4 sec	

### **Test Configuration**



### **Test Procedure**

- 1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- 2. Spectrum Setting:
  - (1) Spectrum Setting: RBW=1MHz, VBW≥RBW.
  - (2) Use video trigger with the trigger level set to enable triggering only on full pulses.
  - (3) Sweep Time is more than once pulse time.
- (4) Set the center frequency on any frequency would be measure and set the frequency span to zero.
  - (5) Measure the maximum time duration of one single pulse.
  - (6) Set the EUT for packet transmitting.

### **Test Mode**

Please refer to the clause 2.4.

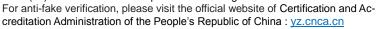




### **Test Result**

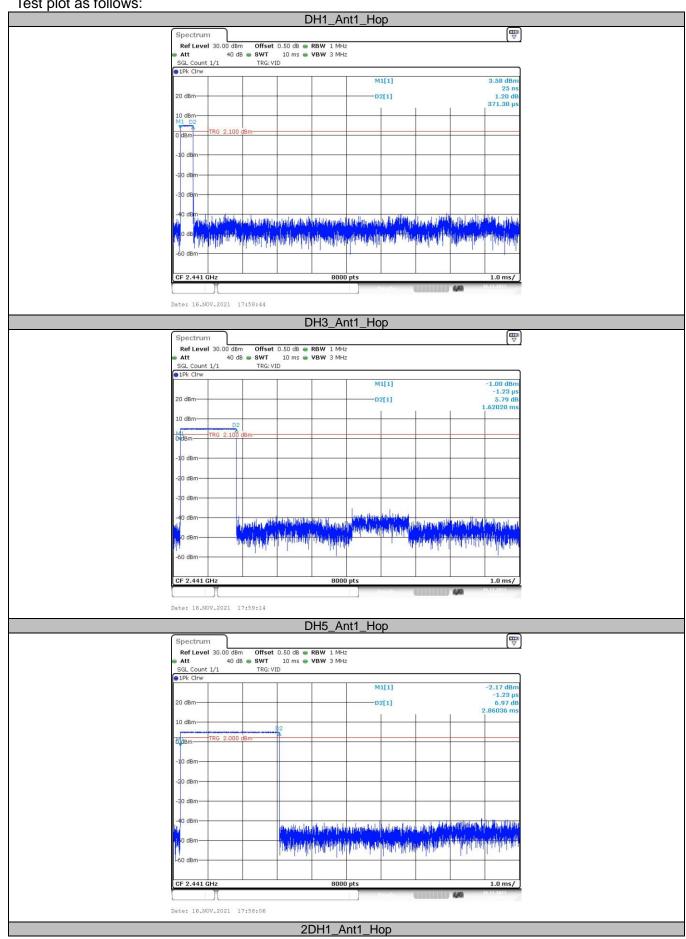
Modulation type	Channel	Channel (MHz)	Pulse Time (ms)	Total of Dwell (ms)	Period Time (ms)	Limit (Second)	Result
GFSK	DH1	2441	0.37	118.40	31.60		
	DH3	2441	1.62	259.20	31.60	≤ 0.40	Pass
	DH5	2441	2.86	305.07	31.60		
π/4-DQPSK	2DH1	2441	0.38	121.60	31.60		
	2DH3	2441	1.63	260.80	31.60	≤ 0.40	Pass
	2DH5	2441	2.87	306.13	31.60		
8-DPSK	3DH1	2441	0.38	121.60	31.60		
	3DH3	2441	1.63	260.80	31.60	≤ 0.40	Pass
	3DH5	2441	2.87	306.13	31.60		

Note: 1DH1/2DH1/3DH1Total of Dwell= Pulse Time\*(1600/2)\*31.6/79 1DH3/2DH3/3DH3 Total of Dwell= Pulse Time\*(1600/4)\*31.6/79 1DH5/2DH5/3DH5 Total of Dwell= Pulse Time\*(1600/6)\*31.6/79

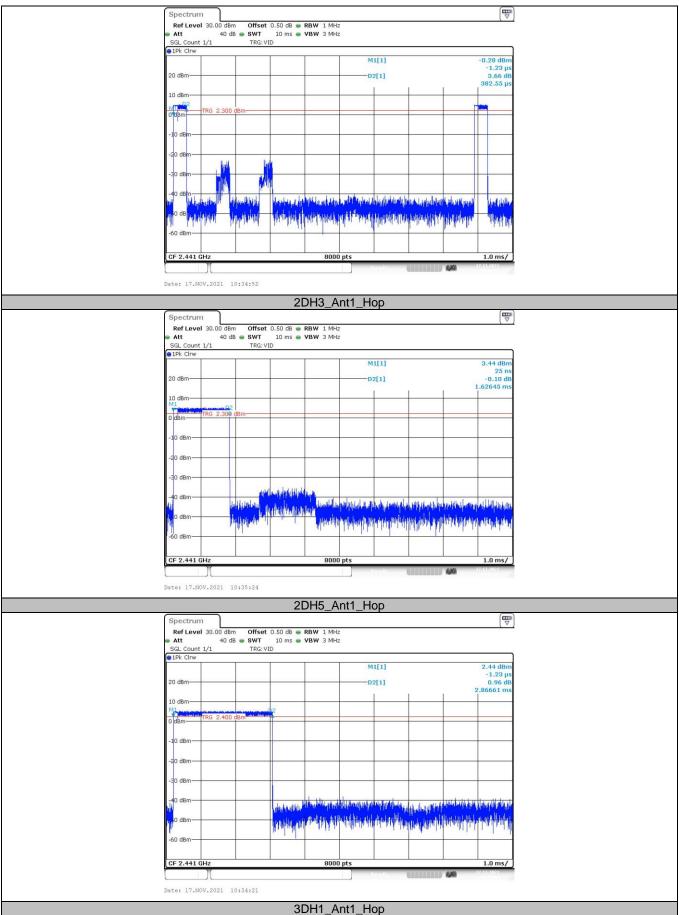




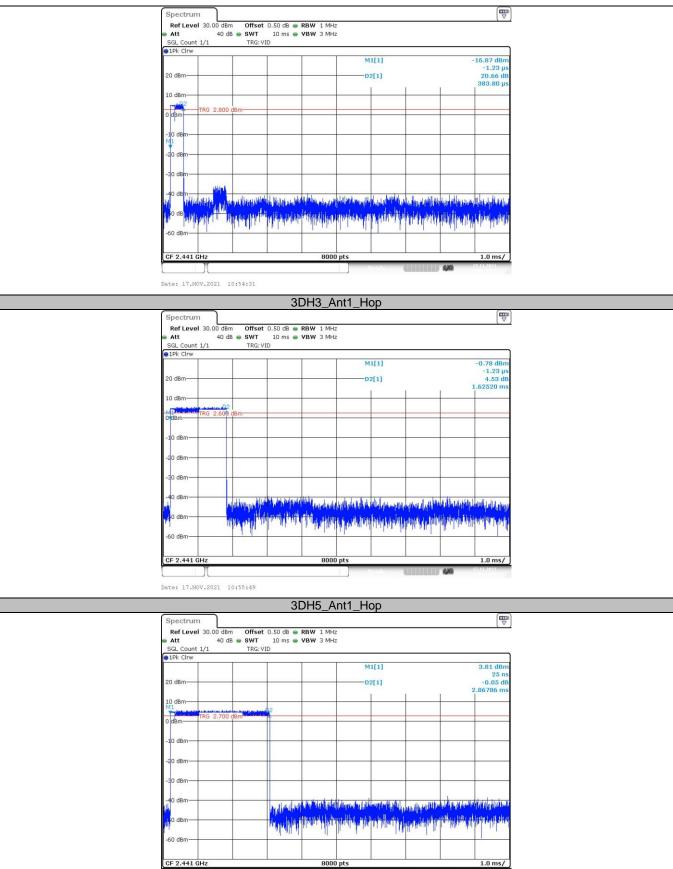
Test plot as follows:











Date: 17.NOV.2021 10:51:16

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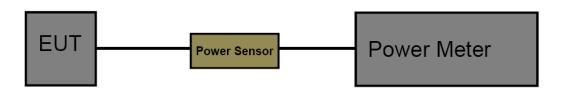
### 3.9. Peak Output Power

### Limit

### FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(1) / RSS-247 5.4 b:

Test Item	Limit	Frequency Range(MHz)	
Peak Output Power	Hopping Channels>75 Pow- er<1W(30dBm) Other <125mW(21dBm)	2400~2483.5	

### **Test Configuration**



### **Test Procedure**

- 1. The maximum conducted output power may be measured using a broadband Peak RF power meter.
- 2. Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor.
- 3. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.
- 4. Record the measurement data.

### **Test Mode**

Please refer to the clause 2.4.

### **Test Result**

Modulation type	Channel	Output power (dBm) Limit (dBm)		Result
GFSK	00	4.71		Pass
	39	4.82	< 21.00	
	78	4.81		
π/4-DQPSK	00	5.16		
	39	5.34	< 21.00	Pass
	78	5.34		
8-DPSK	00	5.37		
	39	5.65	< 21.00	Pass
	78	5.73		

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### 3.10. Antenna Requirement

### Requirement

### FCC CFR Title 47 Part 15 Subpart C Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

### FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

### **Test Result**

The directional gain of the antenna less than 6dBi, please refer to the EUT internal photographs antenna photo.





CTC Laboratories, Inc.