



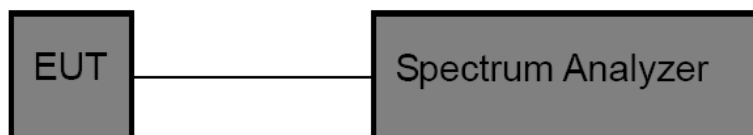


### 3.4. Band edge and Spurious Emissions (Conducted)

#### 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
3. 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.

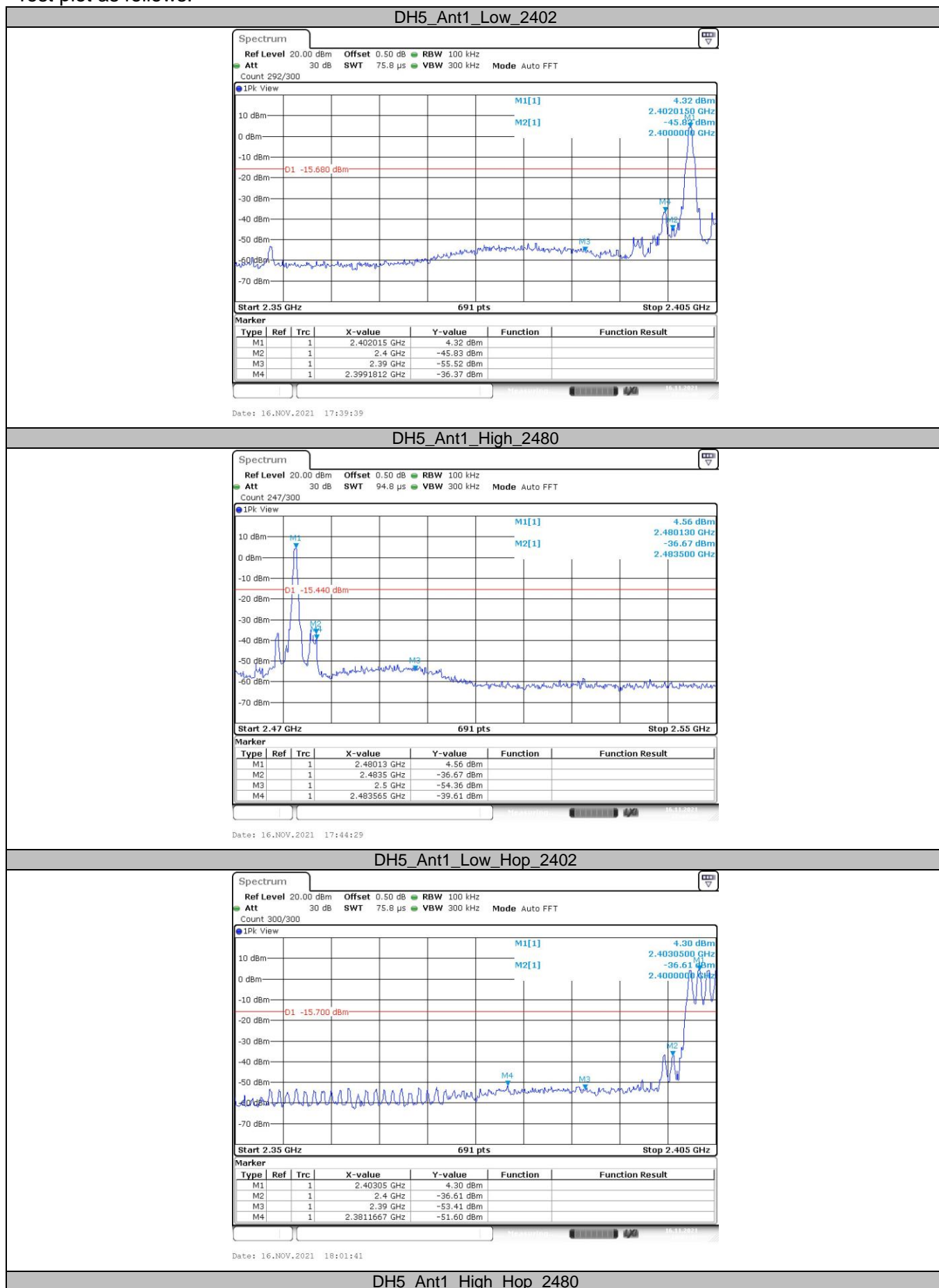
#### Test Results

##### (1) Band edge Conducted Test

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



Test plot as follows:



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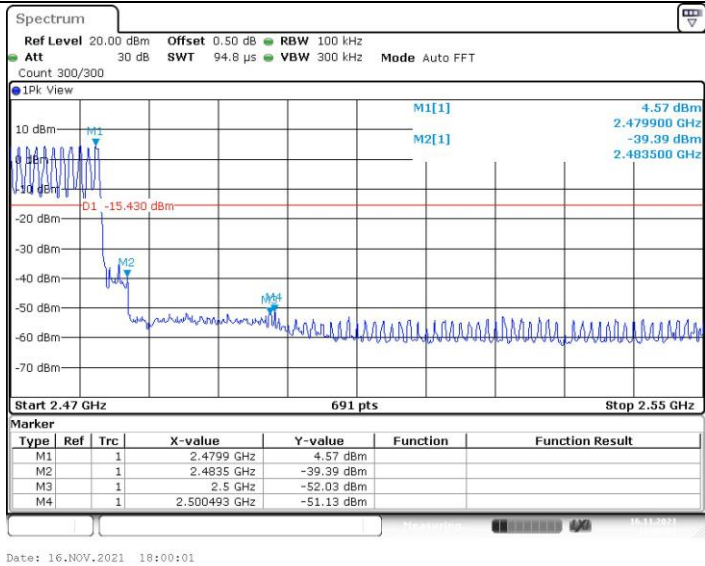
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Tel.: (86)755-27521059

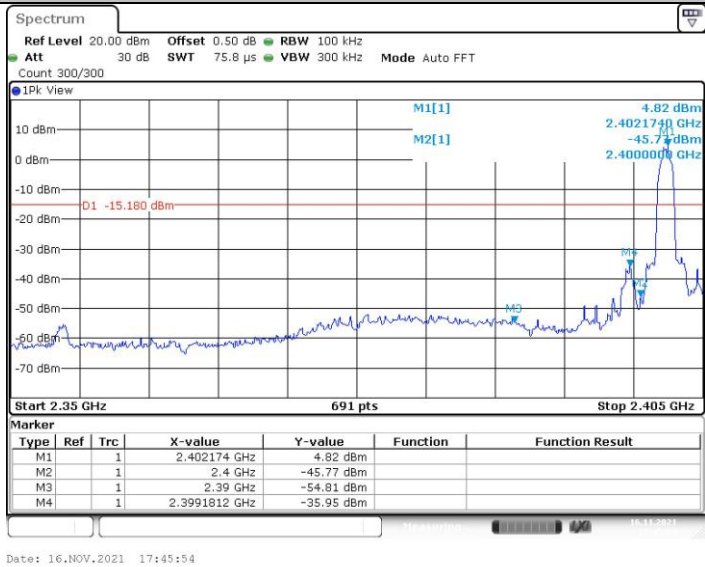
Fax: (86)755-27521011

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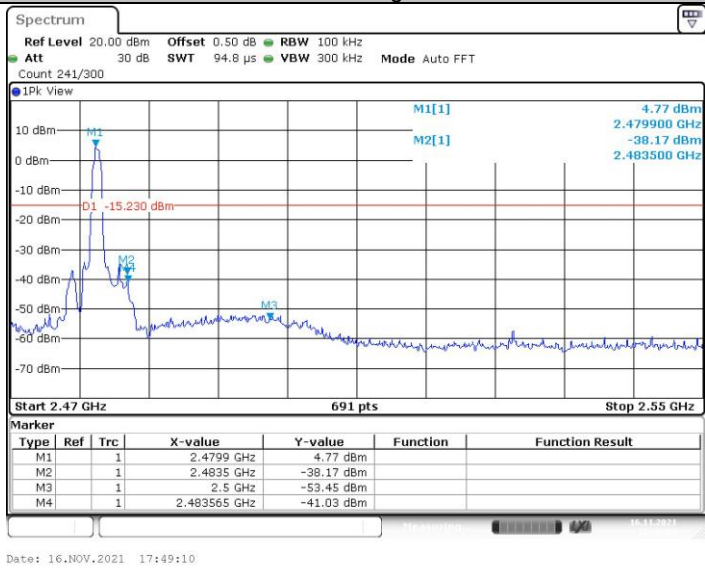
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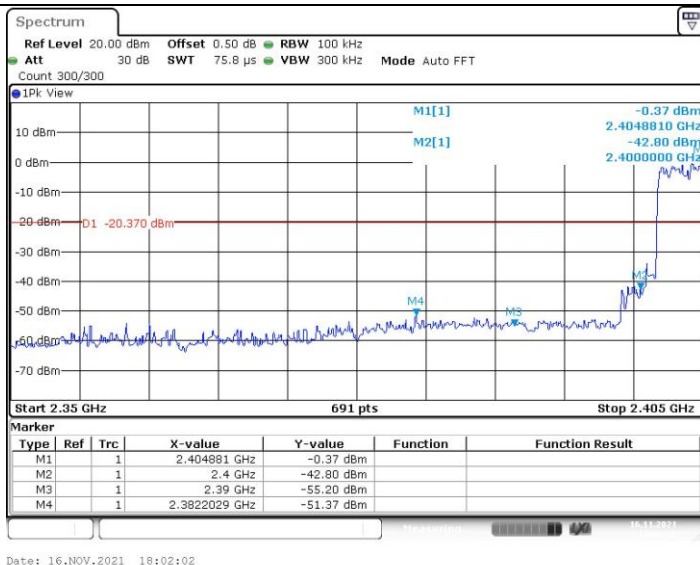
2DH5\_Ant1\_Low\_2402



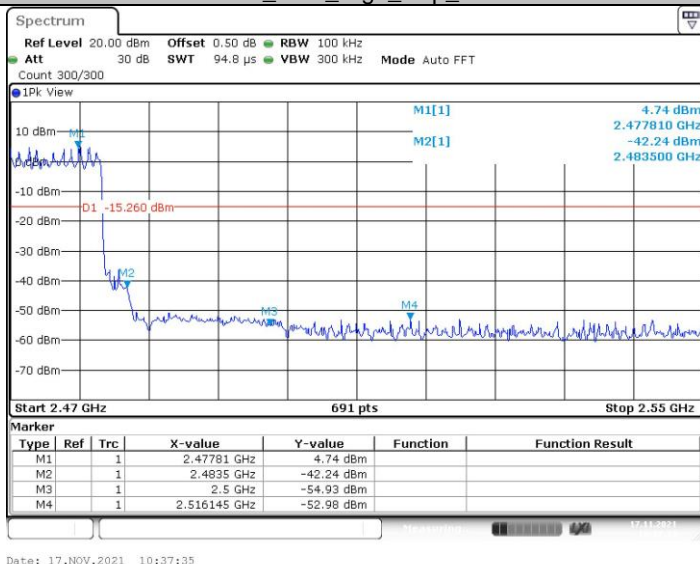
2DH5\_Ant1\_High\_2480



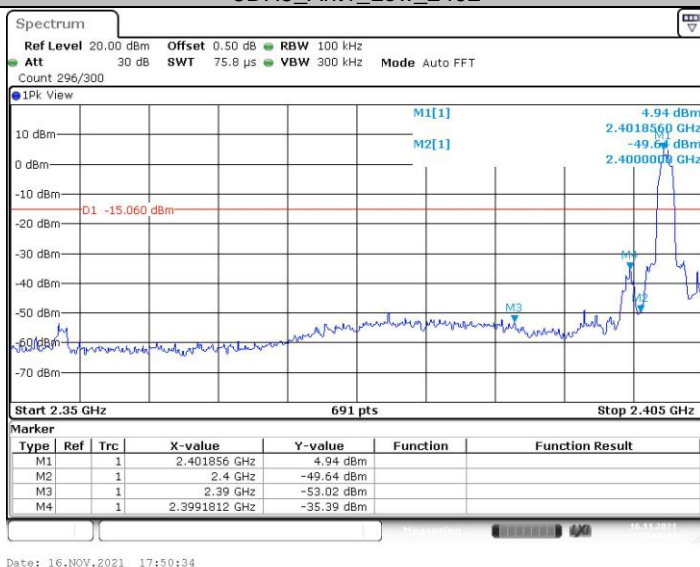
2DH5\_Ant1\_Low\_Hop\_2402



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



## 3DH5\_Ant1\_Low\_2402



## 3DH5\_Ant1\_High\_2480

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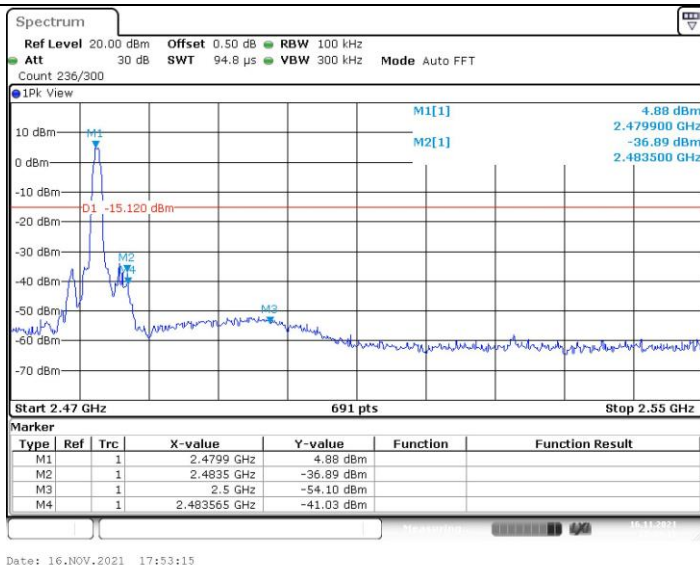
1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Tel.: (86)755-27521059

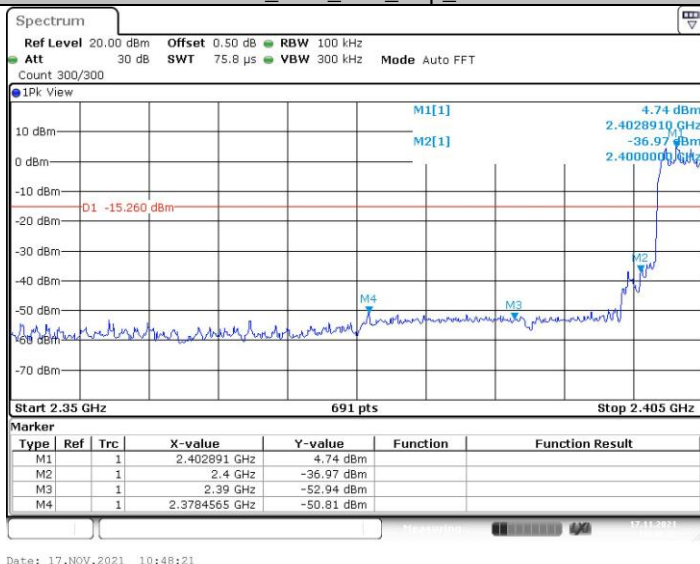
Fax: (86)755-27521011

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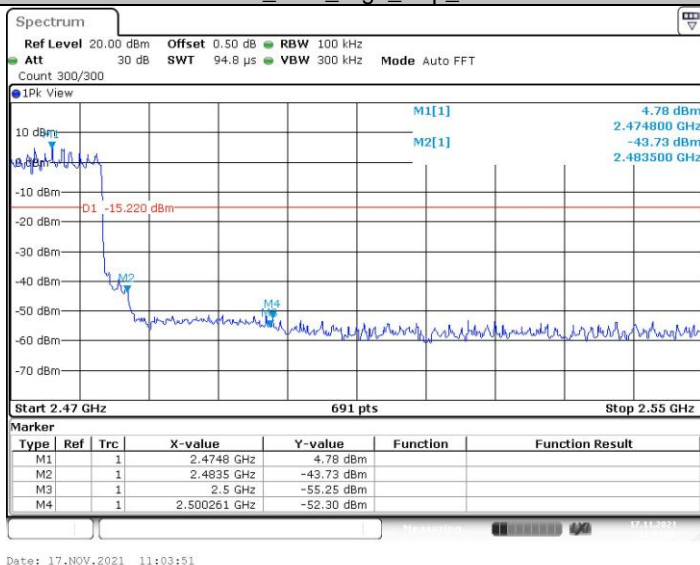
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## 3DH5\_Ant1\_Low\_Hop\_2402



## 3DH5\_Ant1\_High\_Hop\_2480



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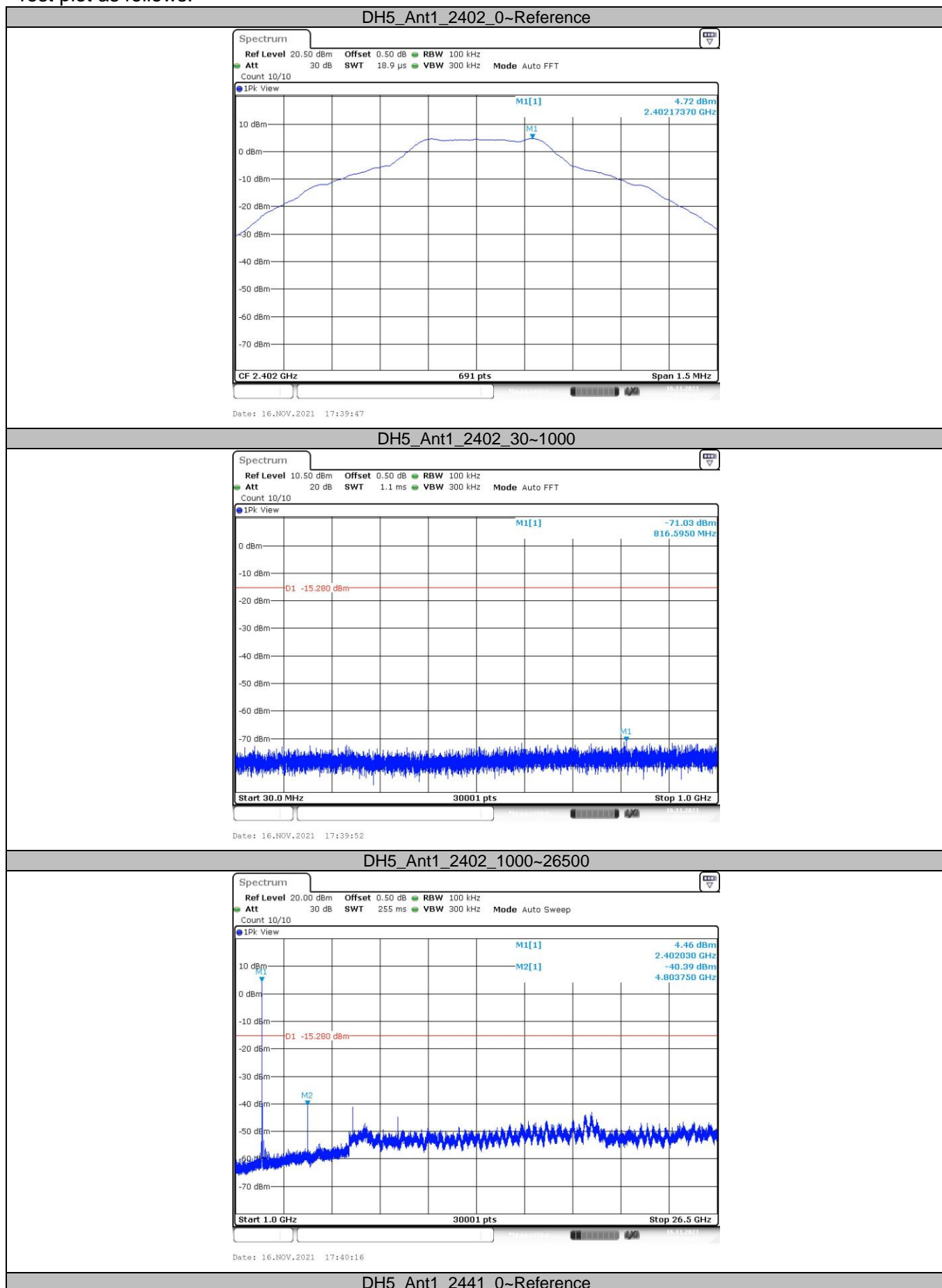
**(2) Conducted Spurious Emissions Test**

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





Test plot as follows:



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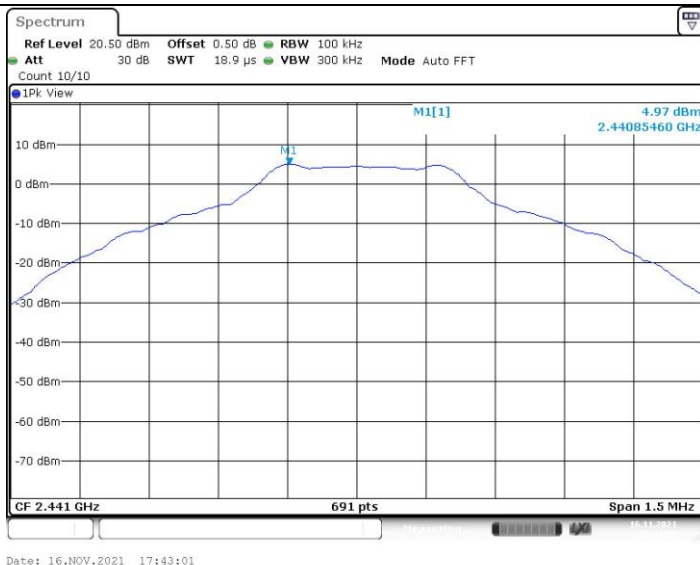
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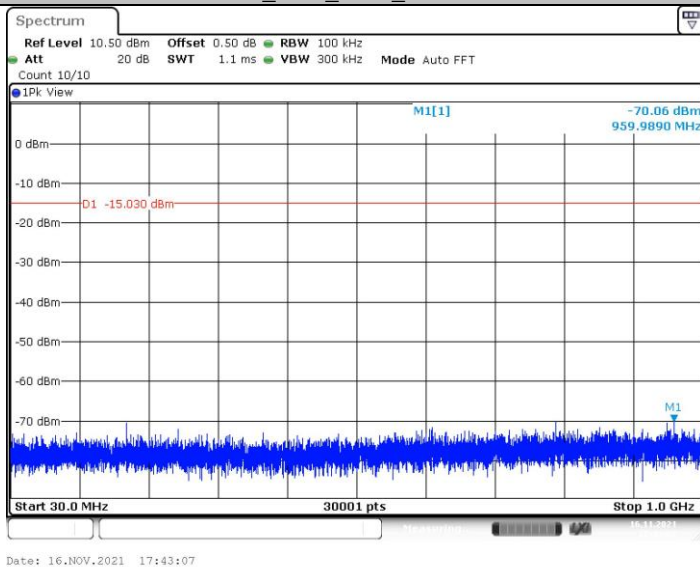
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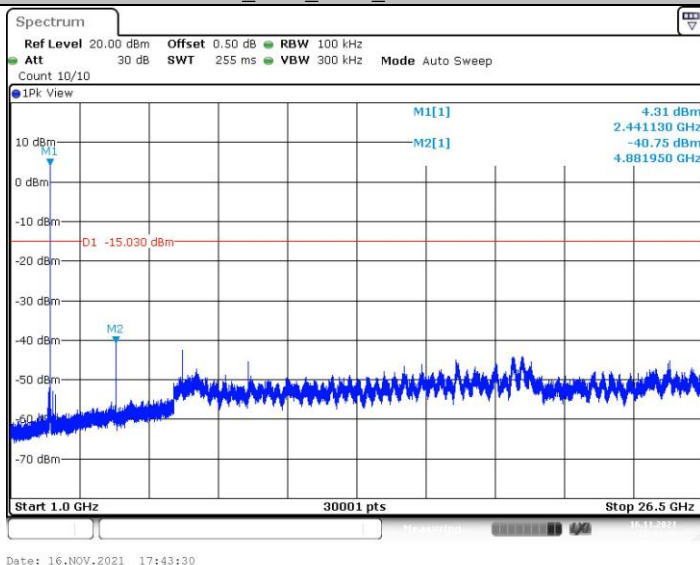
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## DH5\_Ant1\_2441\_30~1000



## DH5\_Ant1\_2441\_1000~26500



## DH5\_Ant1\_2480\_0~Reference

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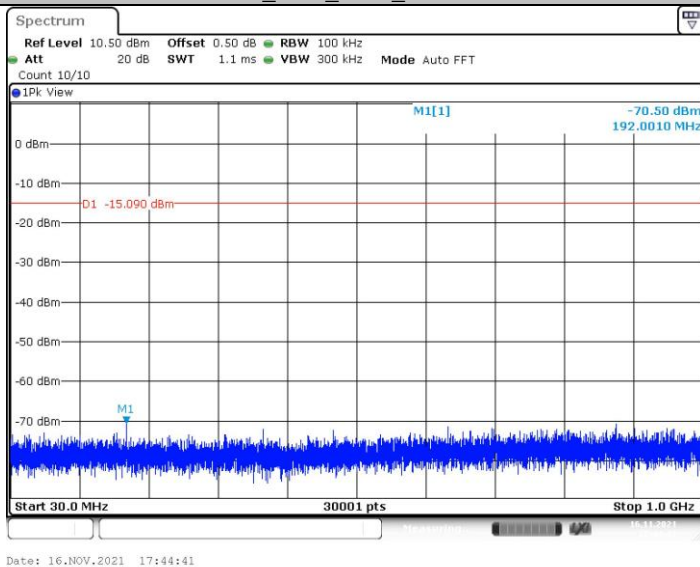
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Certification and Accreditation Administration of the People's Republic of ChinaFor anti-fake verification, please visit the official website of Certification and Accreditation Administration of the People's Republic of China : [yz.cnca.cn](http://yz.cnca.cn)

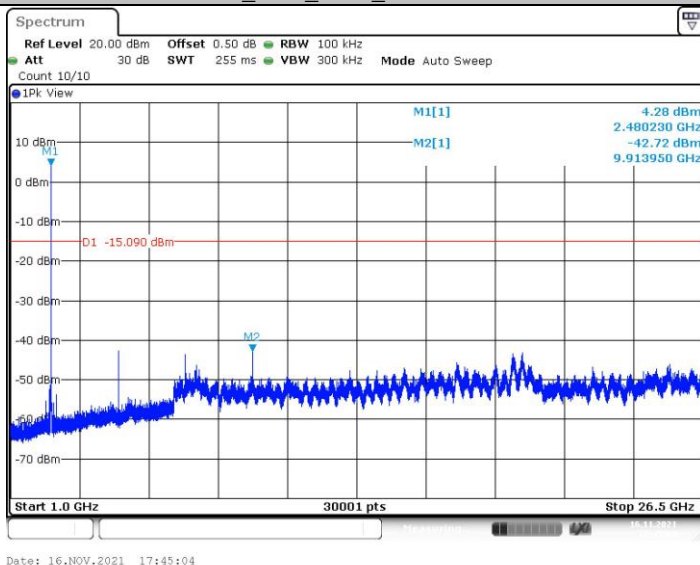




## DH5\_Ant1\_2480\_30~1000



## DH5\_Ant1\_2480\_1000~26500



## 2DH5\_Ant1\_2402\_0~Reference

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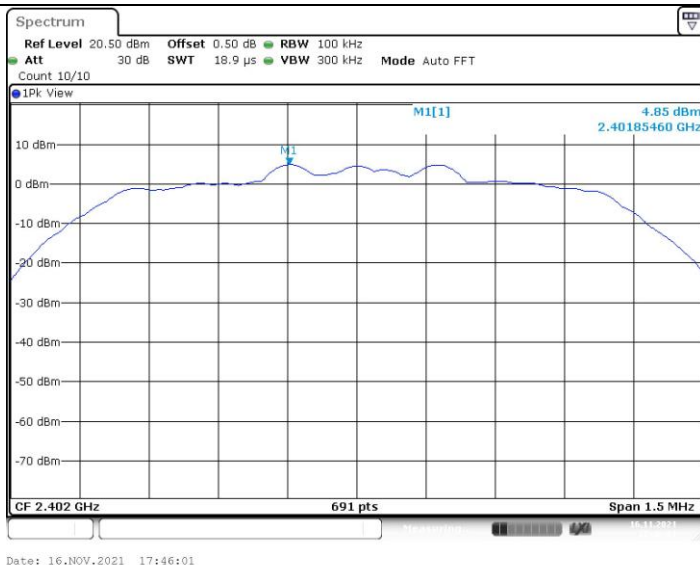
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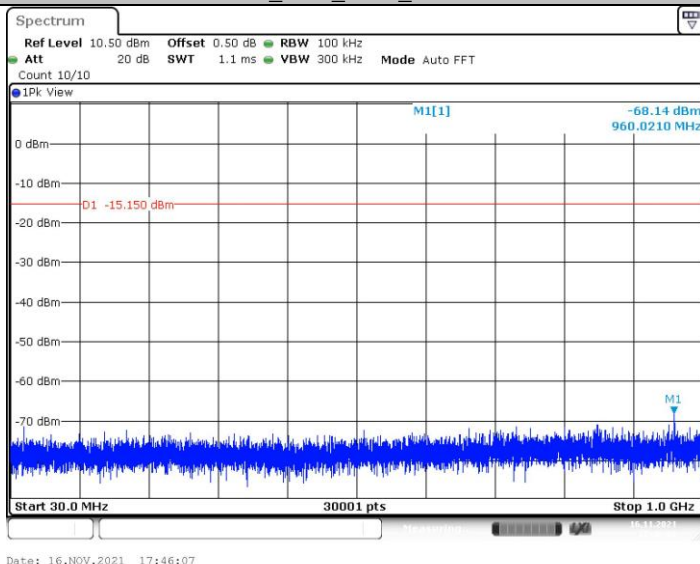
Fax: (86)755-27521011

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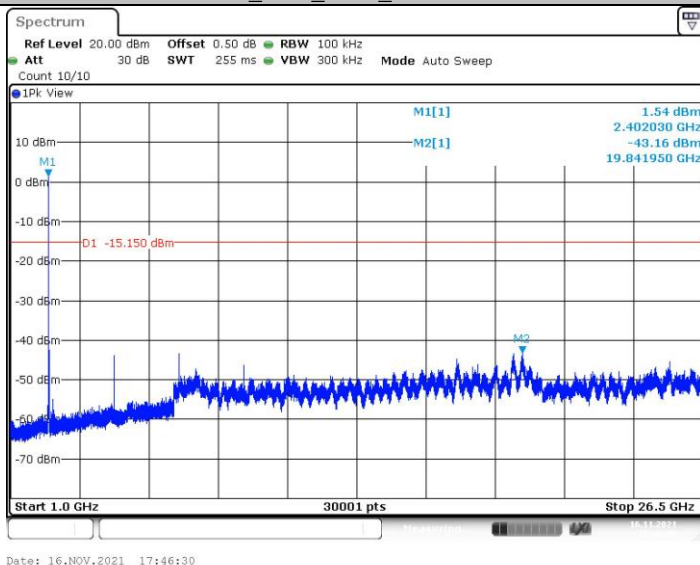
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## 2DH5\_Ant1\_2402\_30~1000



## 2DH5\_Ant1\_2402\_1000~26500



## 2DH5\_Ant1\_2441\_0~Reference

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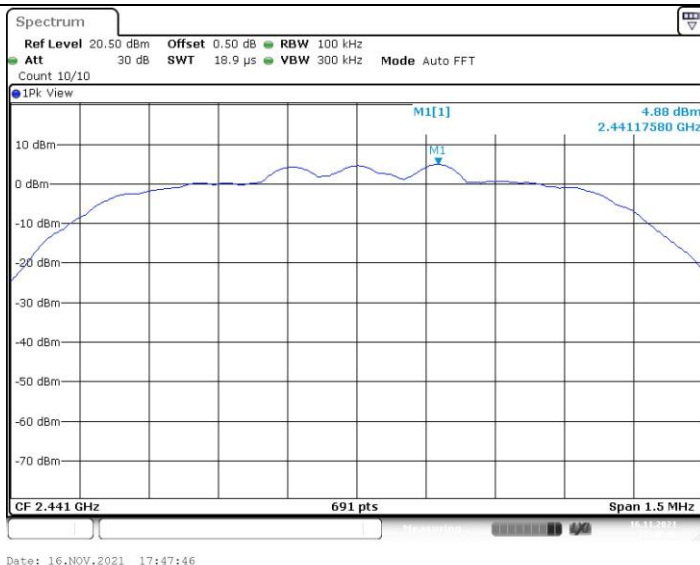
1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Tel.: (86)755-27521059

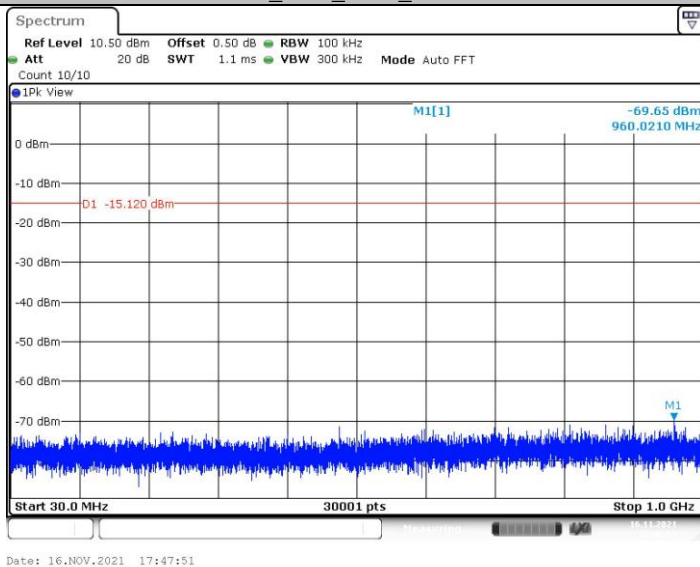
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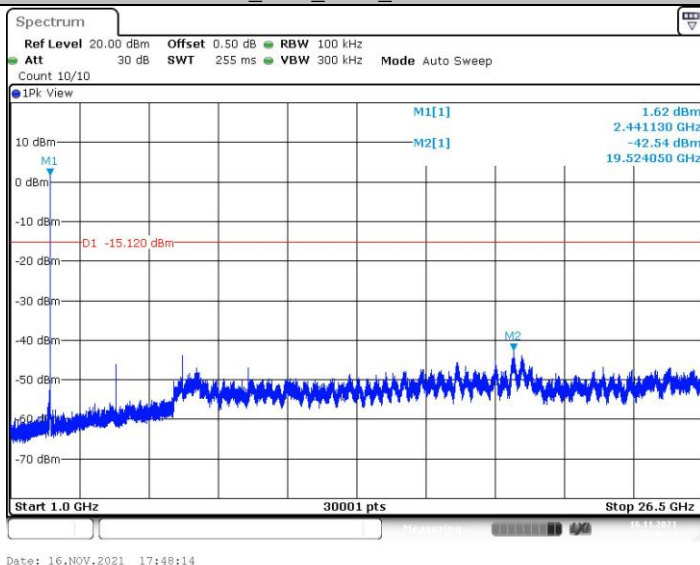
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## 2DH5\_Ant1\_2441\_30~1000



## 2DH5\_Ant1\_2441\_1000~26500



## 2DH5\_Ant1\_2480\_0~Reference

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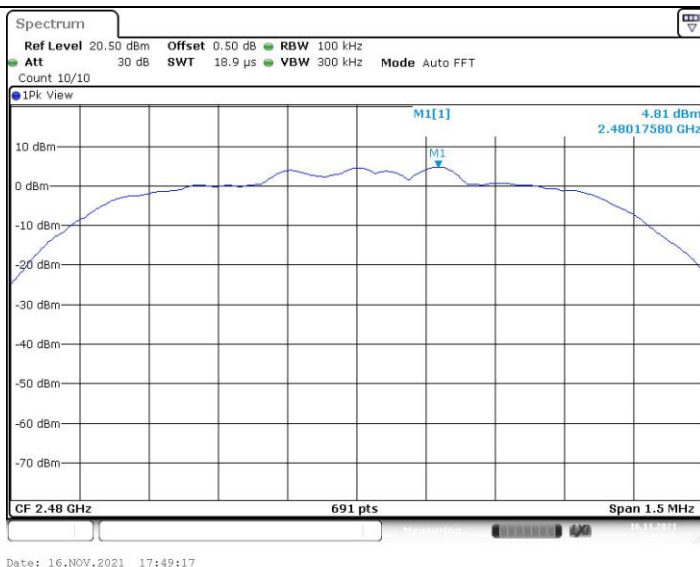
1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Tel.: (86)755-27521059

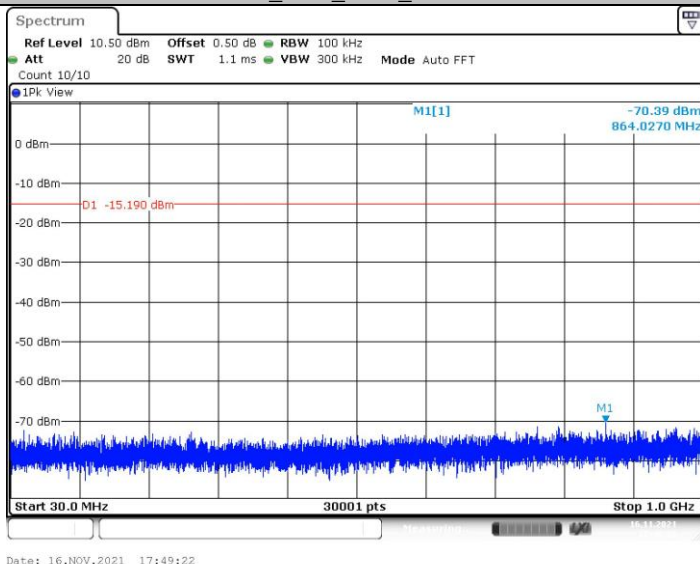
Fax: (86)755-27521011

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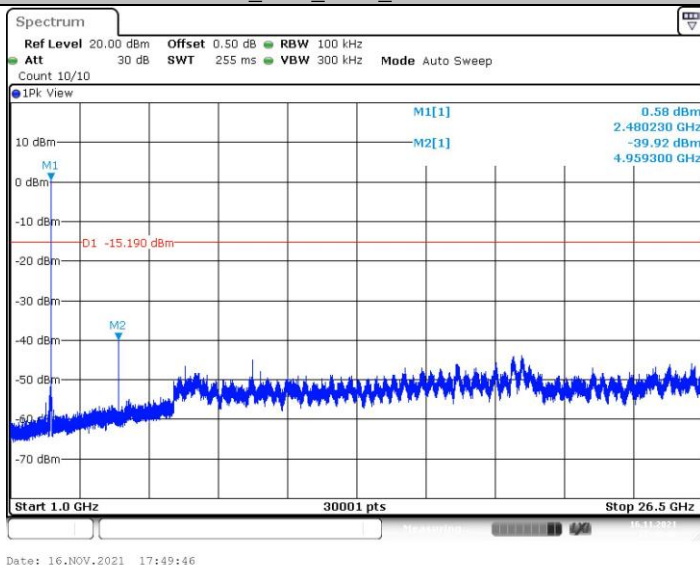
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## 2DH5\_Ant1\_2480\_30~1000



## 2DH5\_Ant1\_2480\_1000~26500



## 3DH5\_Ant1\_2402\_0~Reference

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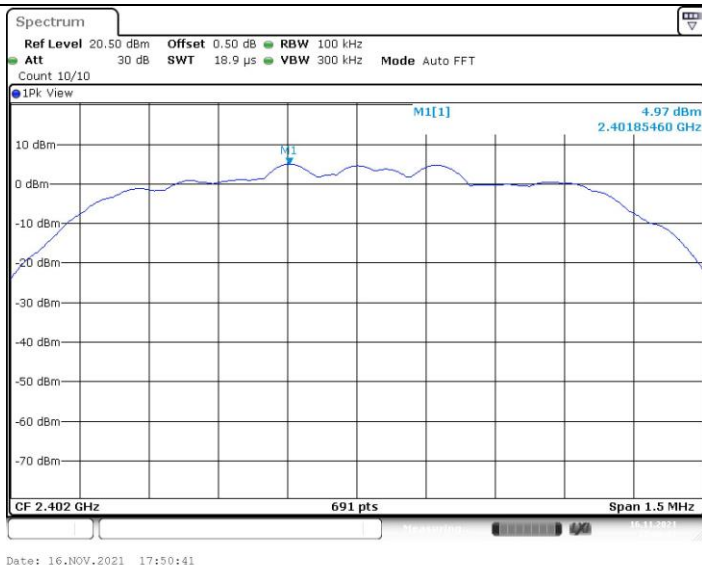
1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Tel.: (86)755-27521059

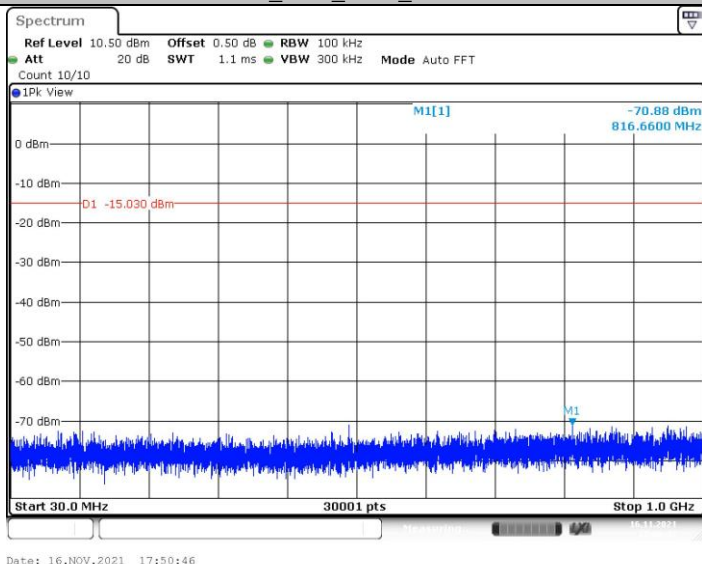
Fax: (86)755-27521011

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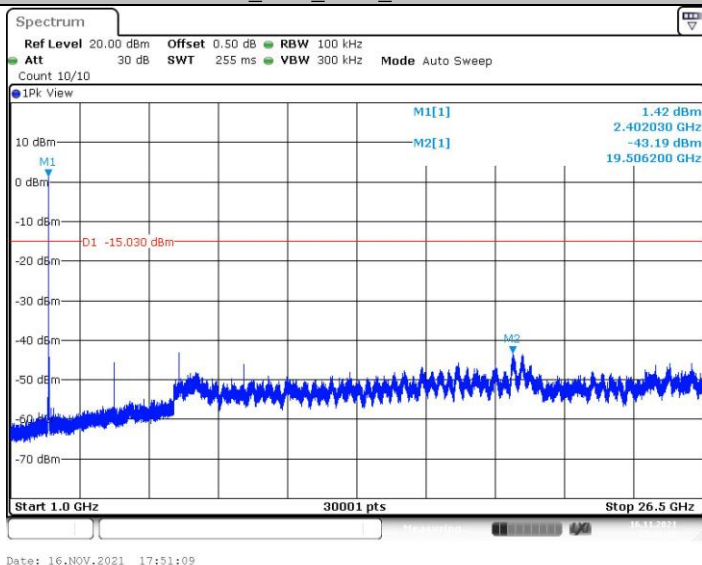
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## 3DH5\_Ant1\_2402\_30~1000



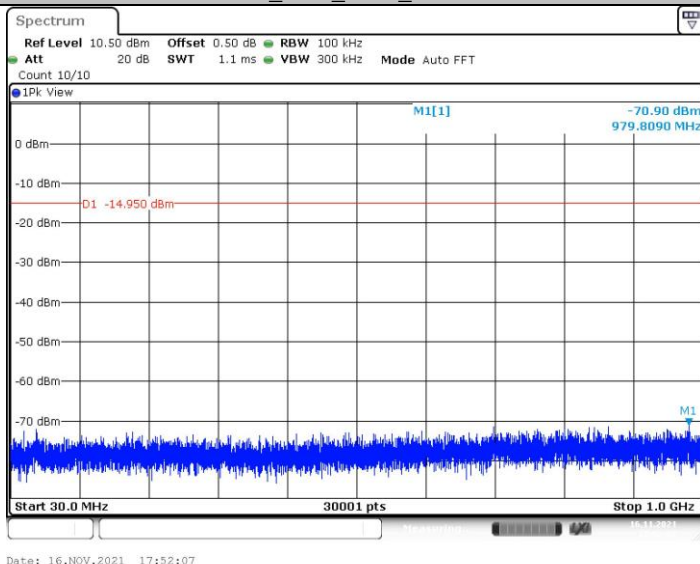
## 3DH5\_Ant1\_2402\_1000~26500



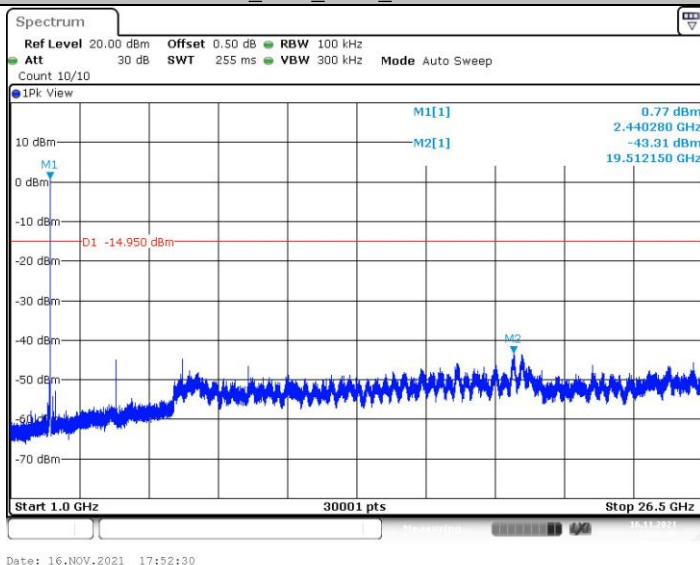
## 3DH5\_Ant1\_2441\_0~Reference



## 3DH5\_Ant1\_2441\_30~1000



## 3DH5\_Ant1\_2441\_1000~26500



## 3DH5\_Ant1\_2480\_0~Reference

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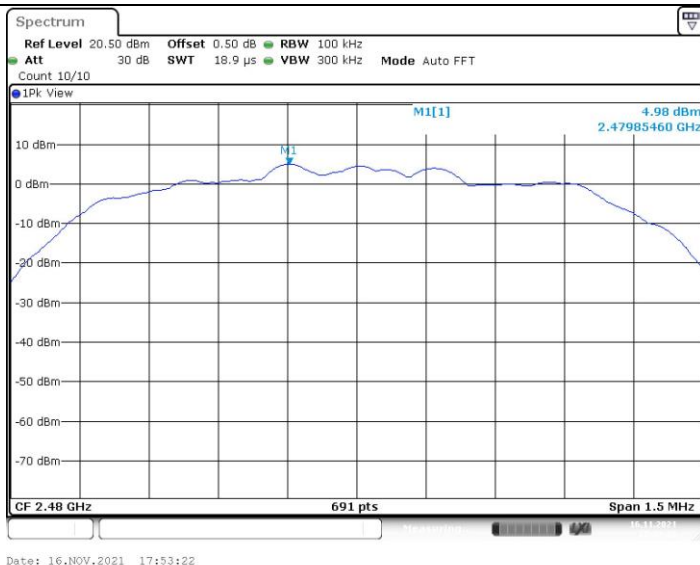
Tel.: (86)755-27521059

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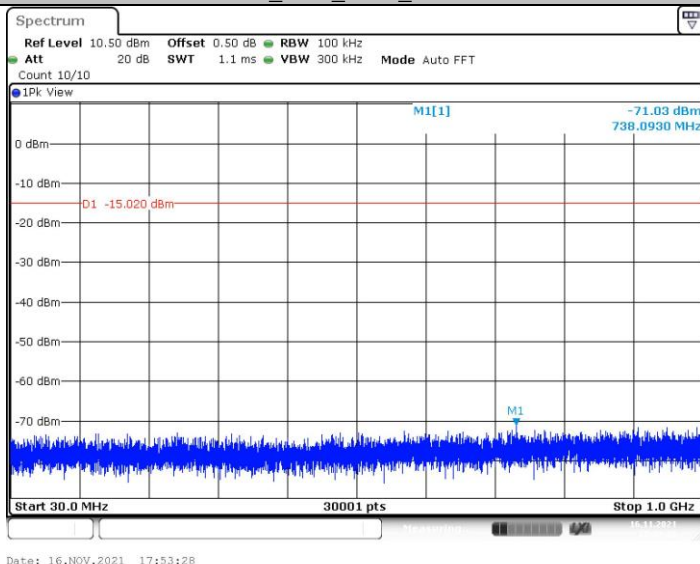
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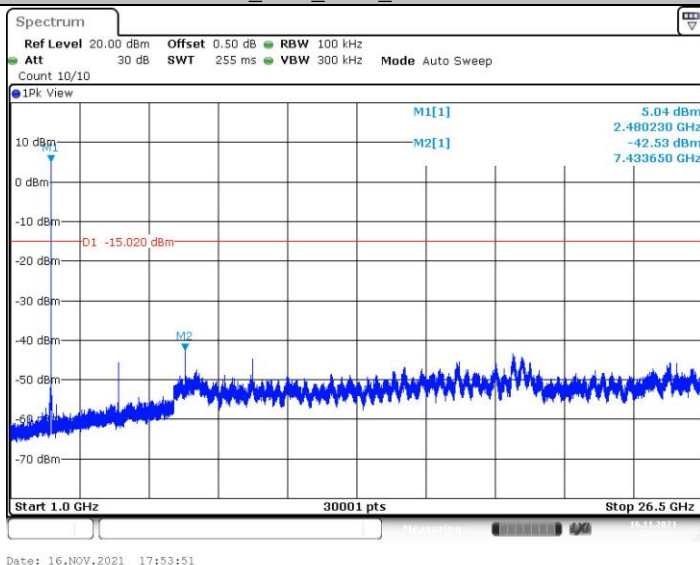




## 3DH5\_Ant1\_2480\_30~1000



## 3DH5\_Ant1\_2480\_1000~26500



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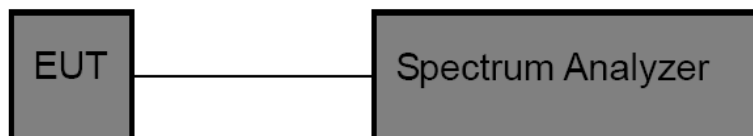
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### 3.5. Bandwidth

#### 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% ~ 5% occupied bandwidth.
  - (2) Set the video bandwidth (VBW)  $\geq 3$  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.

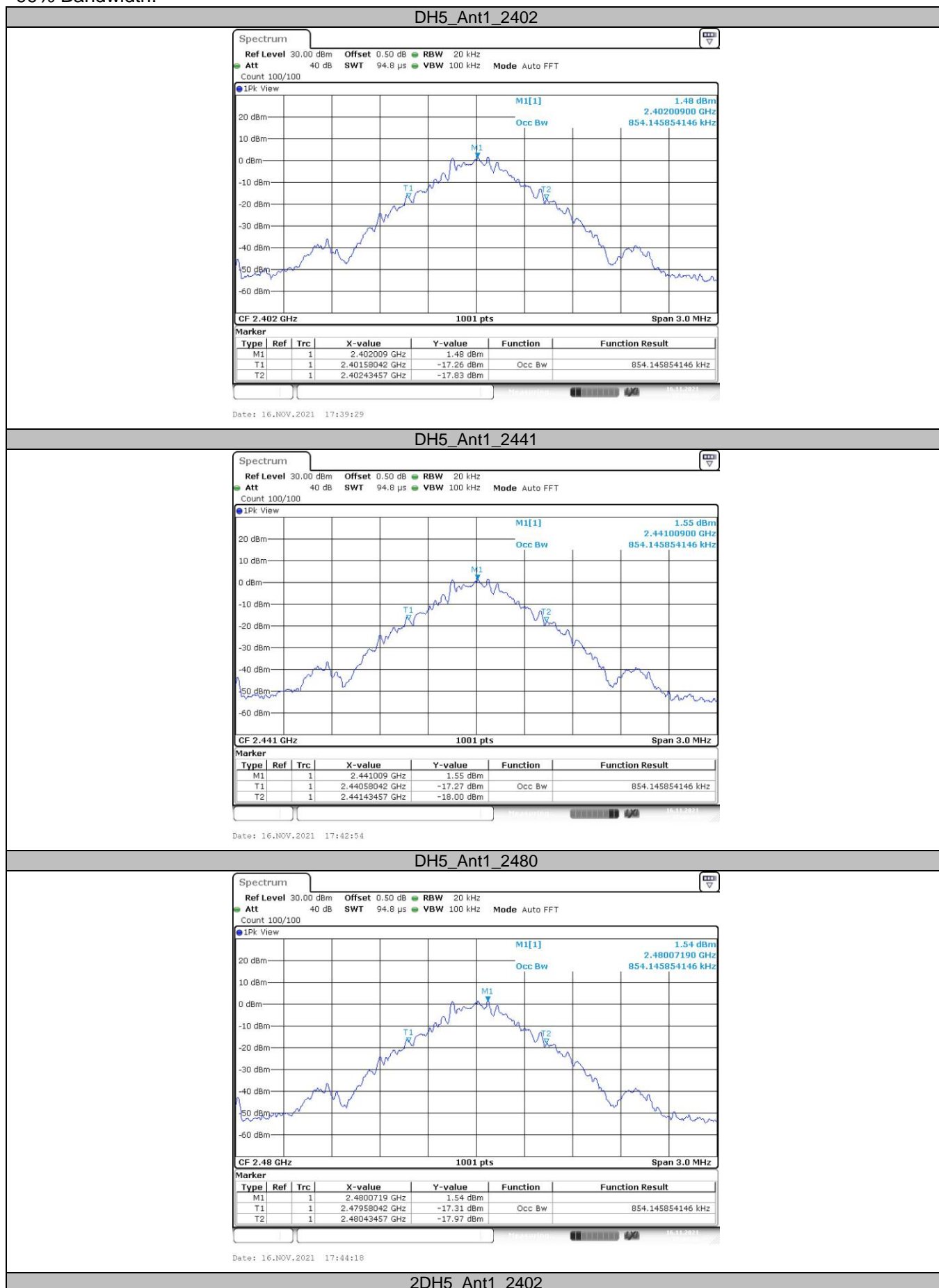
#### Test Results

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





99% Bandwidth:



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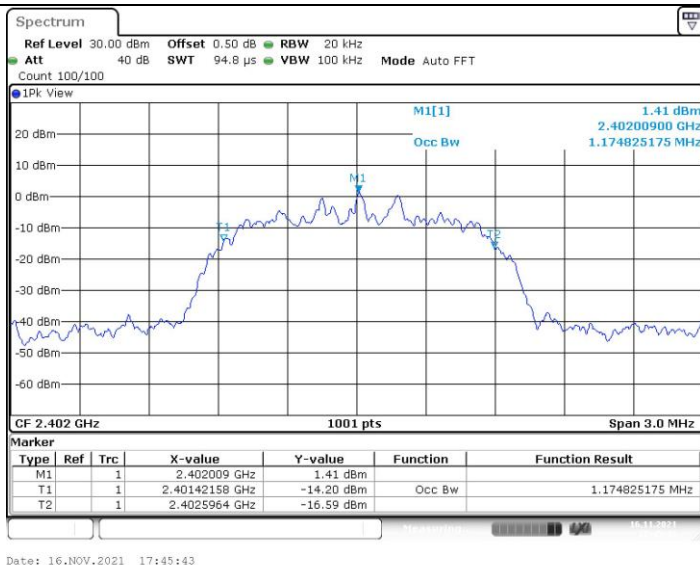
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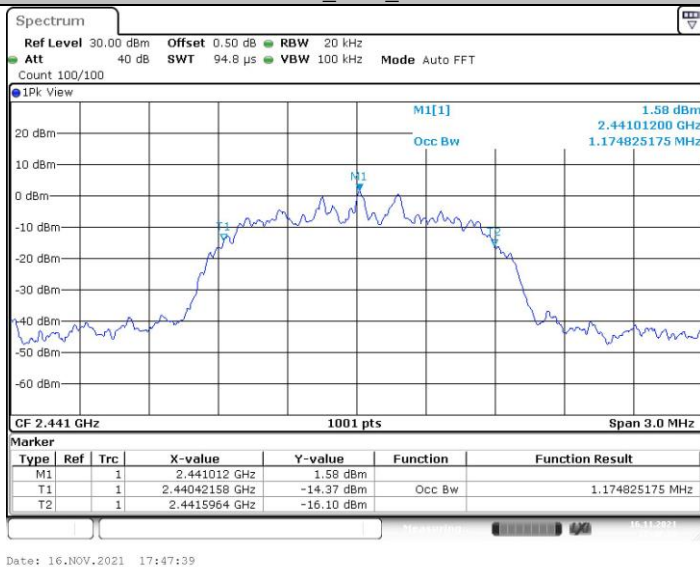
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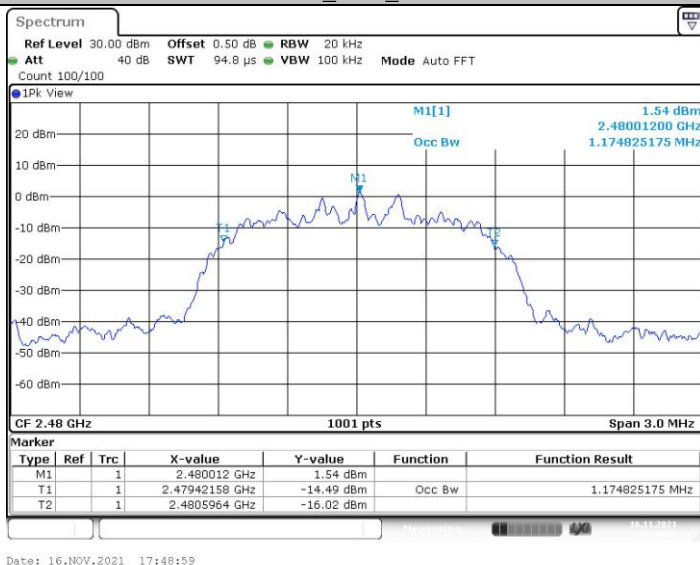
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## 2DH5\_Ant1\_2441



## 2DH5\_Ant1\_2480



## 3DH5\_Ant1\_2402

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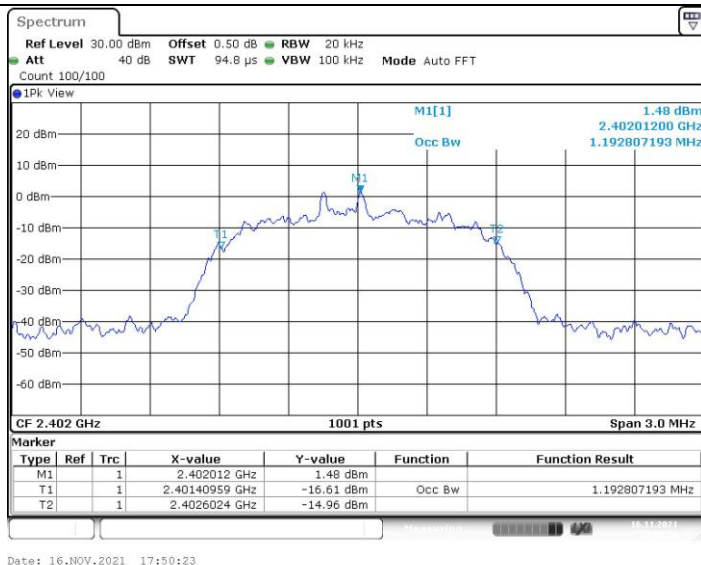
1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Tel.: (86)755-27521059

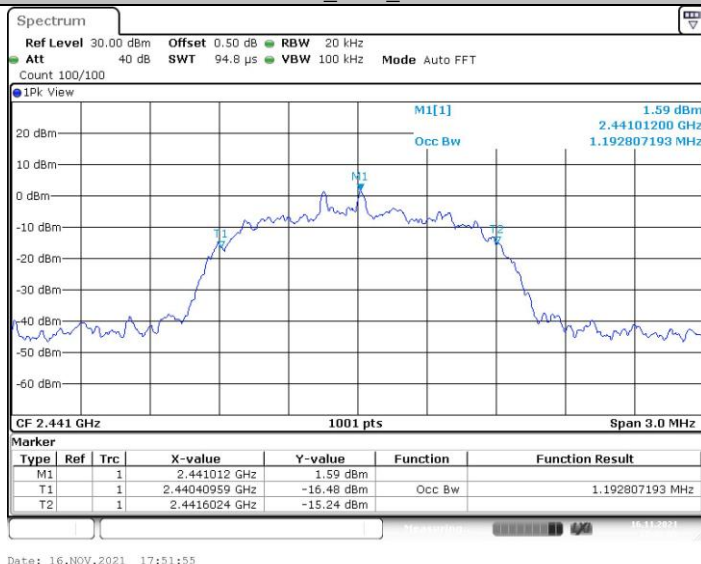
Fax: (86)755-27521011

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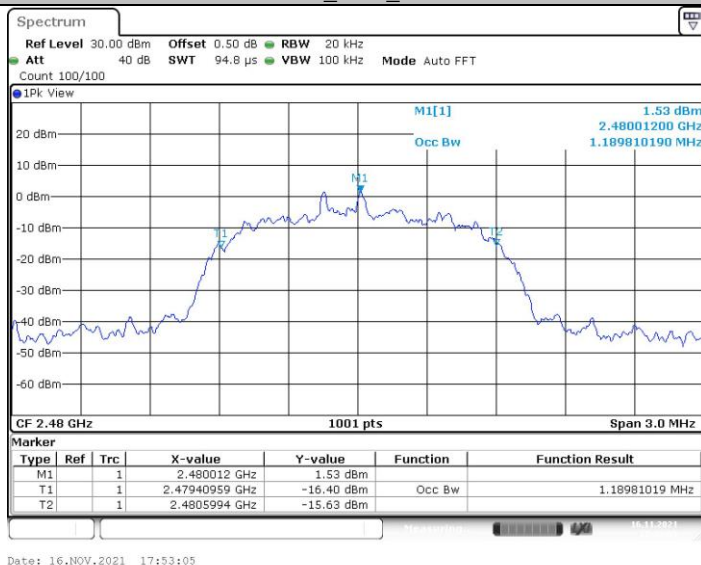
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## 3DH5\_Ant1\_2441



## 3DH5\_Ant1\_2480



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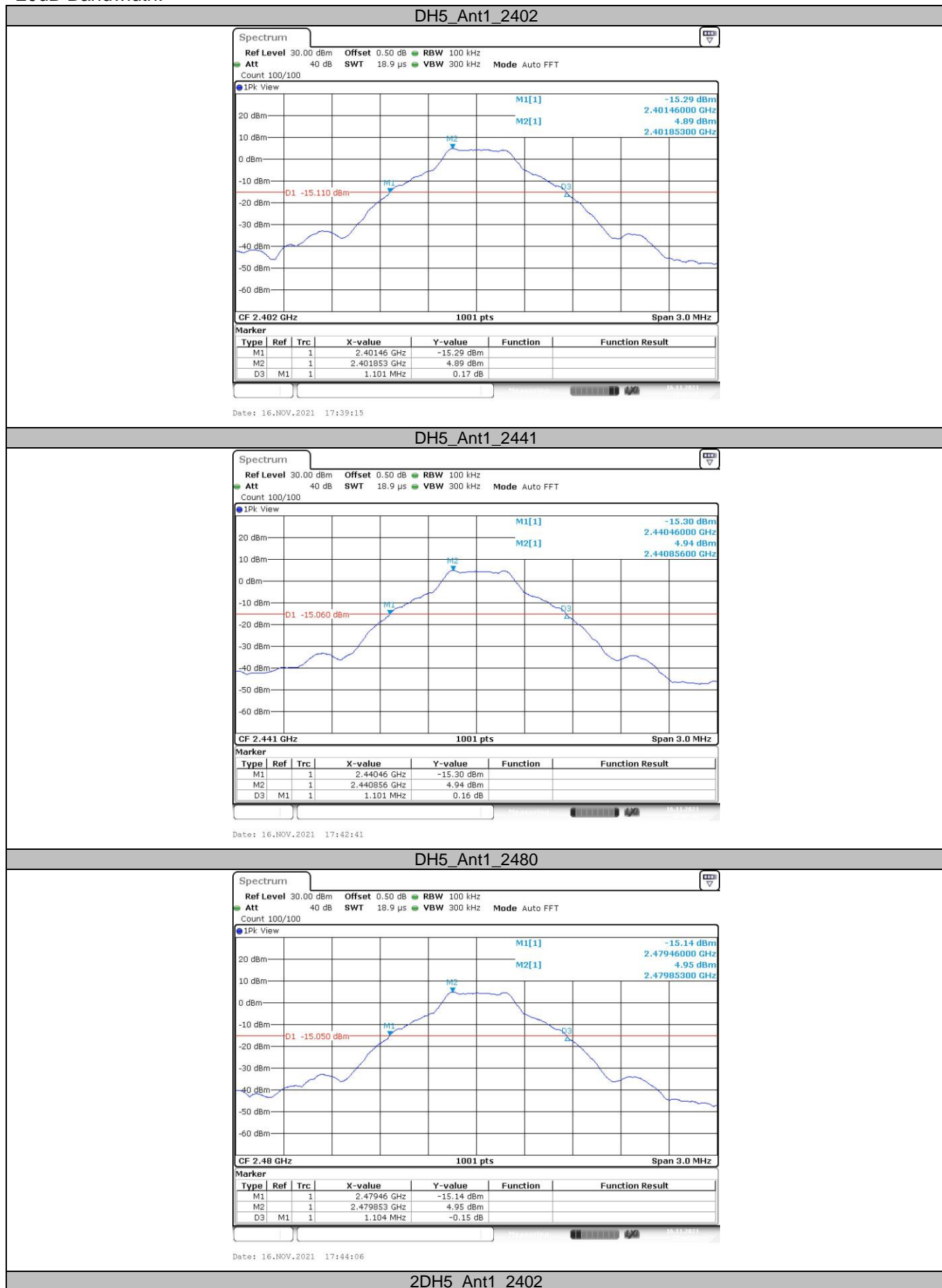
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20dB Bandwidth:



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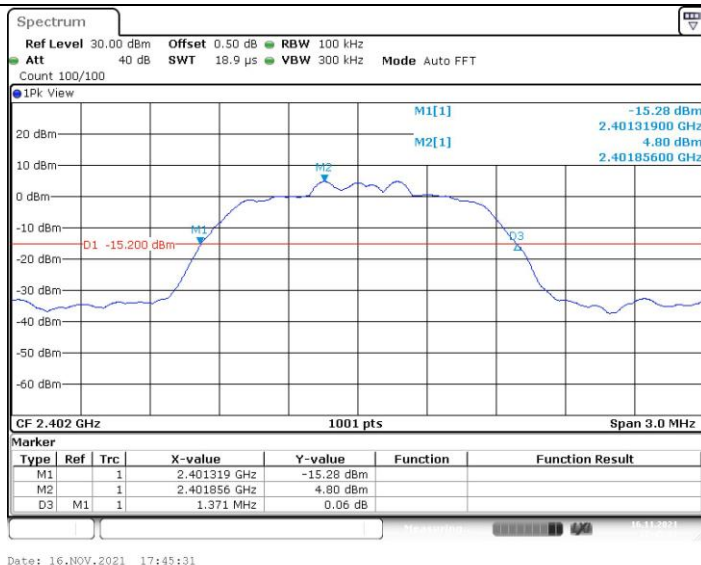
1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Shenzhen, Guangdong, China

Tel.: (86)755-27521059

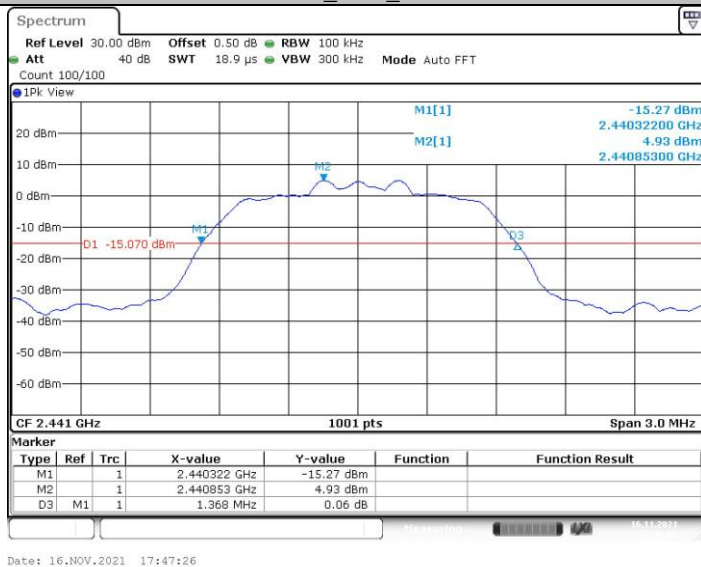
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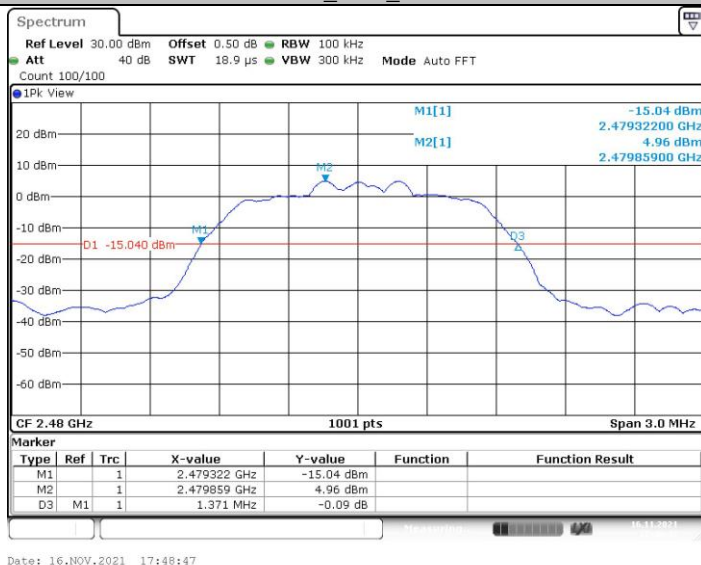
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## 2DH5\_Ant1\_2441



## 2DH5\_Ant1\_2480



## 3DH5\_Ant1\_2402

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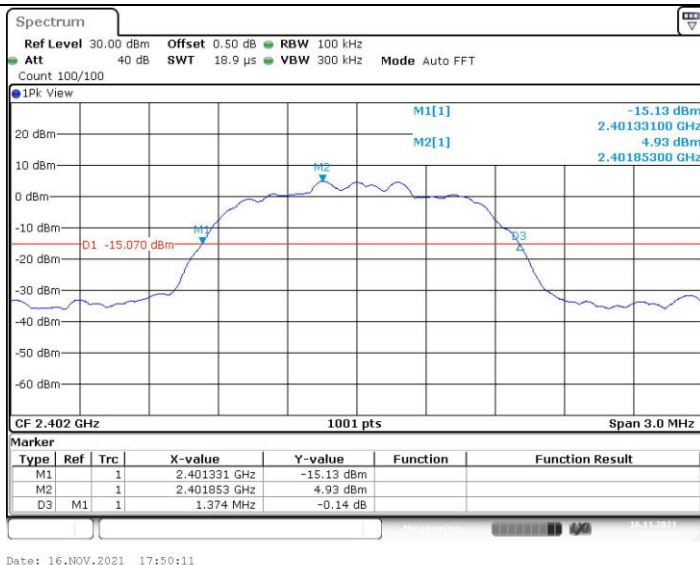
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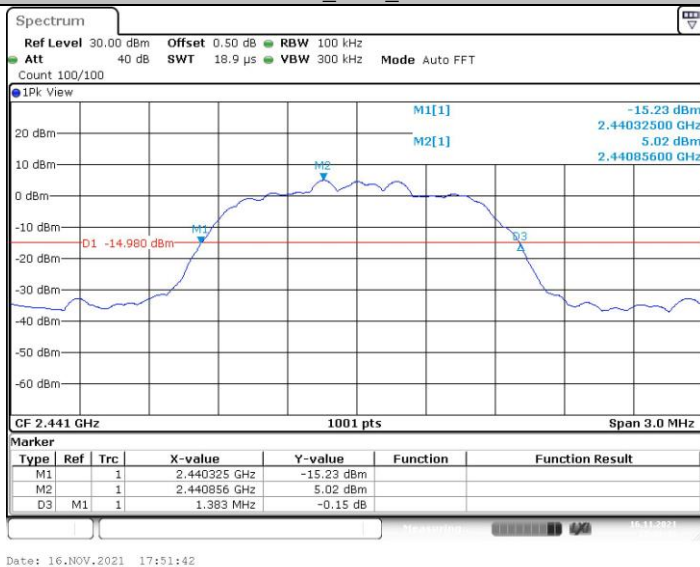
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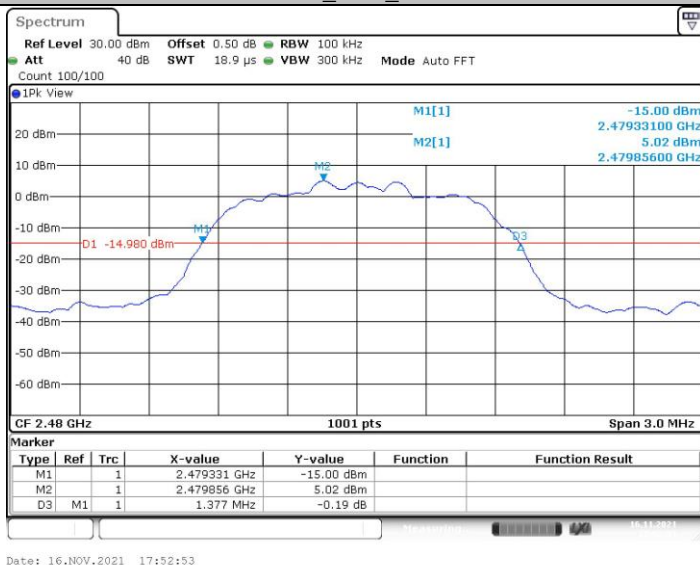




## 3DH5\_Ant1\_2441



## 3DH5\_Ant1\_2480



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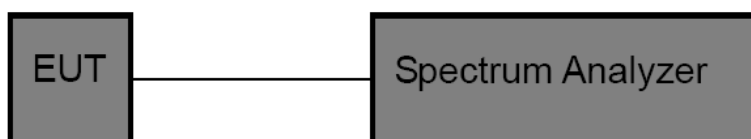
### 3.6. Channel Separation

#### 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)  $\geq 3$  RBW.
  - (3) Detector = Peak.
  - (4) Trace mode = Max hold.
  - (5) Sweep = Auto couple.

#### Test Mode

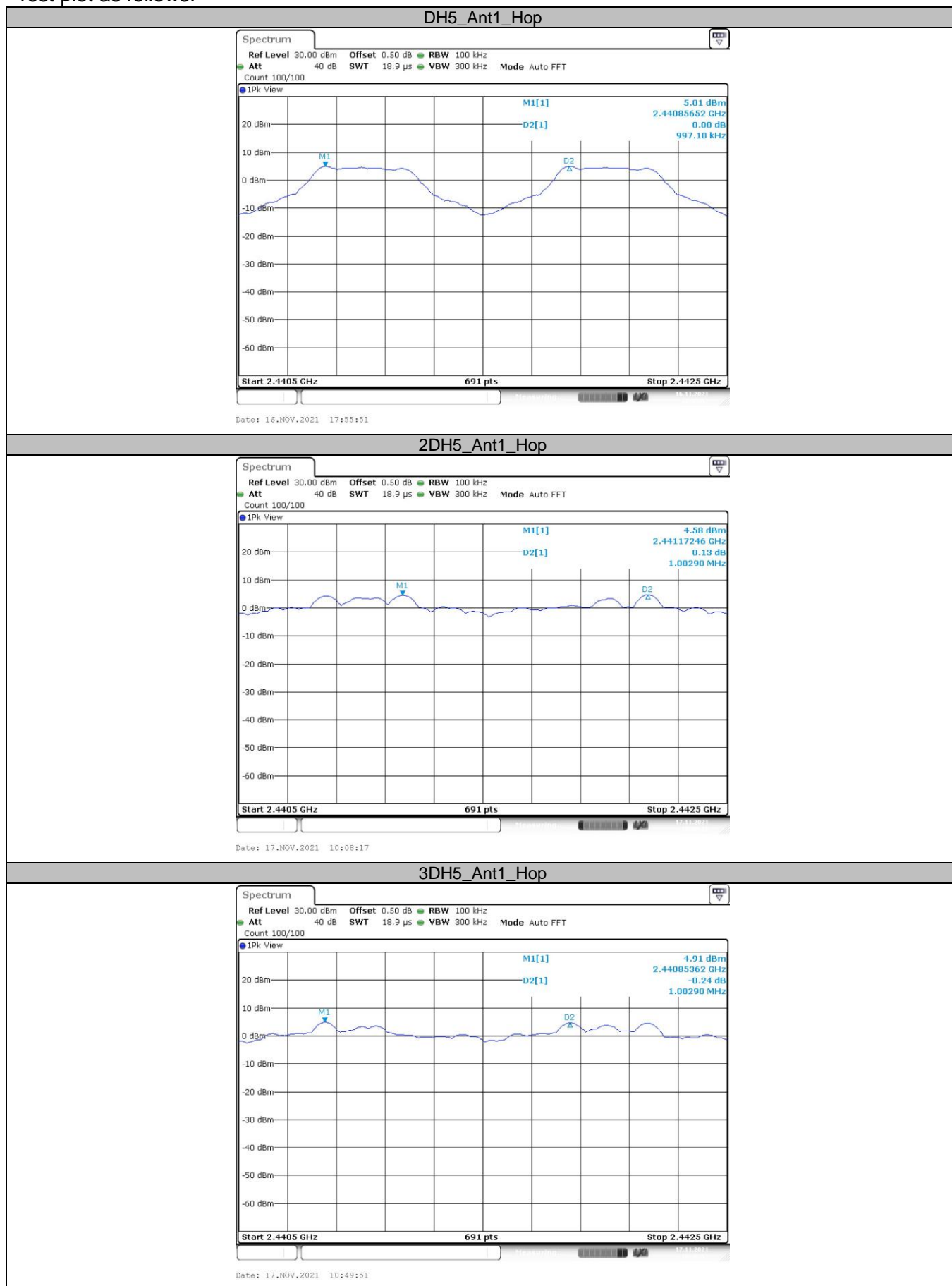
Please refer to the clause 2.4.

#### Test Results

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



Test plot as follows:



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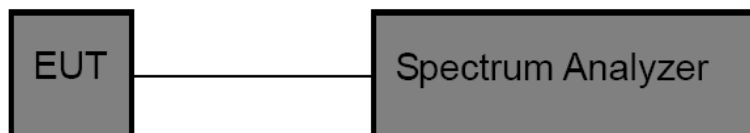
### 3.7. Number of Hopping Channel

#### 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

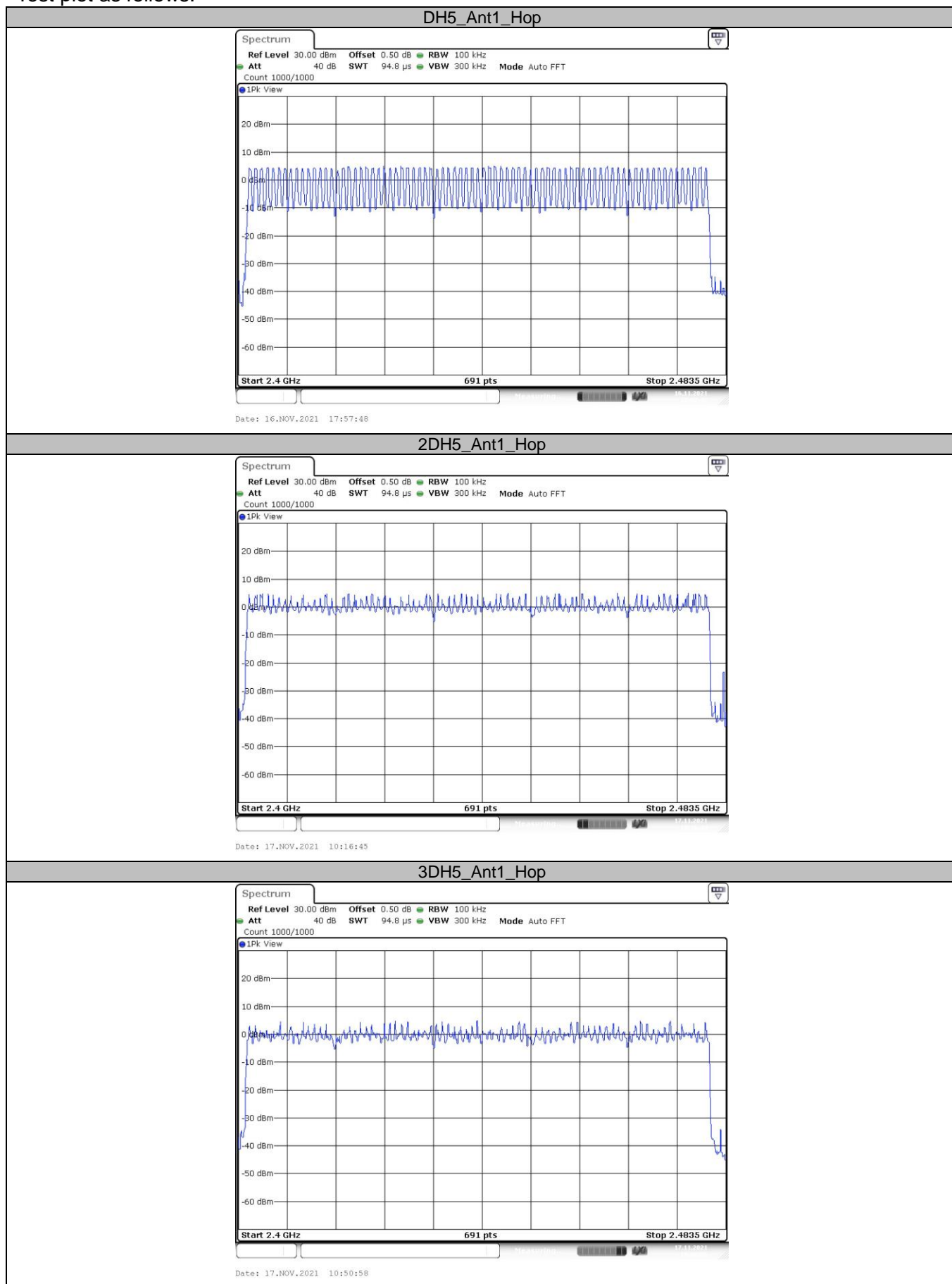
Please refer to the clause 2.4.

#### Test Result

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



Test plot as follows:



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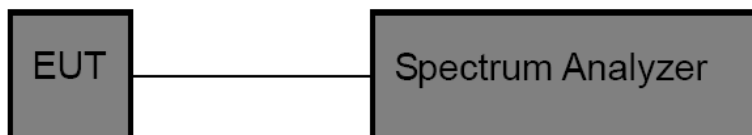
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### 3.8. Dwell Time

#### 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	$\leq 0.40$	Pass
	DH3	2441	1.62	259.20	31.60		
	DH5	2441	2.86	305.07	31.60		
$\pi/4$ -DQPSK	2DH1	2441	0.38	121.60	31.60	$\leq 0.40$	Pass
	2DH3	2441	1.63	260.80	31.60		
	2DH5	2441	2.87	306.13	31.60		
8-DPSK	3DH1	2441	0.38	121.60	31.60	$\leq 0.40$	Pass
	3DH3	2441	1.63	260.80	31.60		
	3DH5	2441	2.87	306.13	31.60		

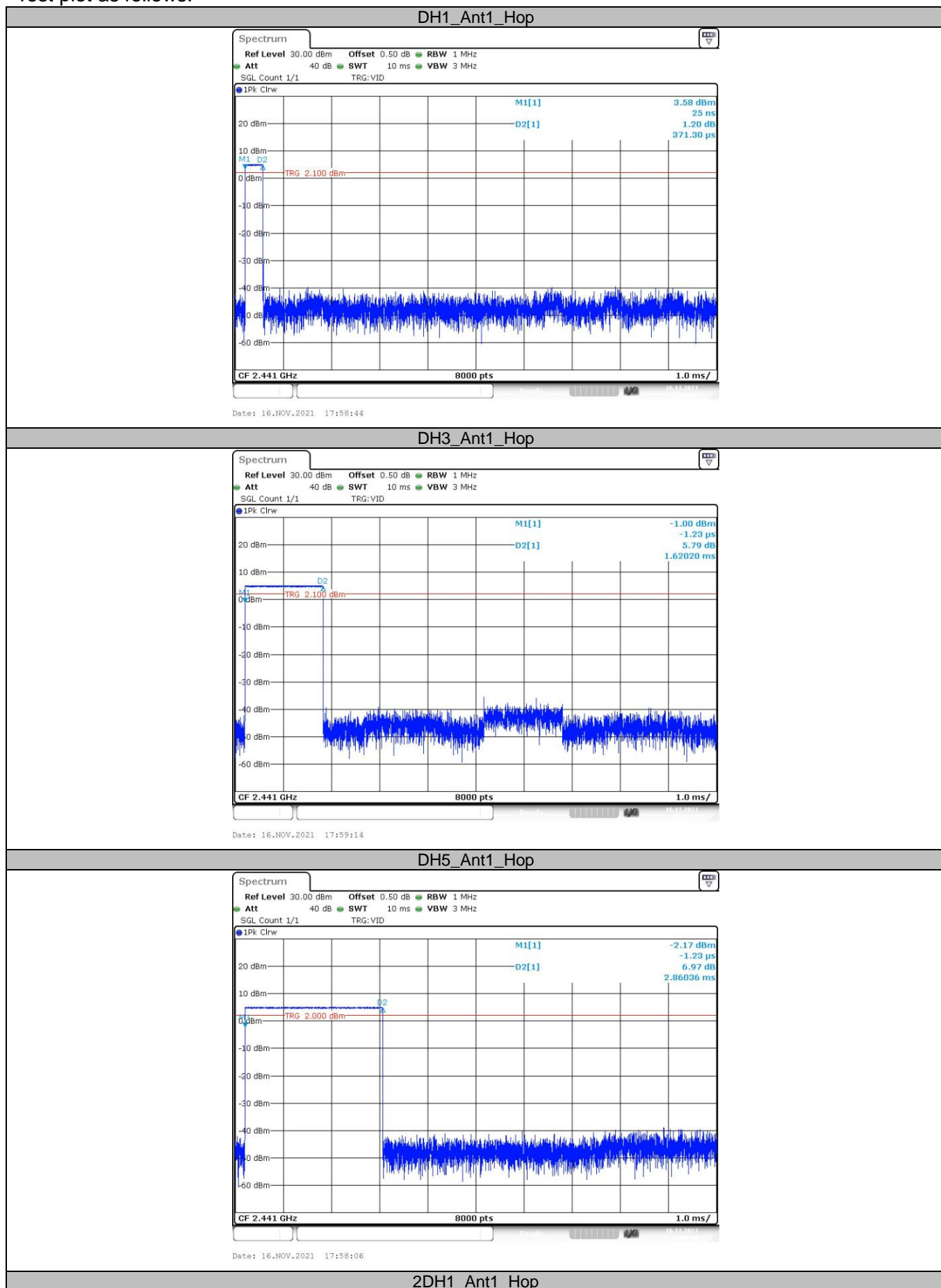
Note: 1DH1/2DH1/3DH1 Total of Dwell= Pulse Time\*(1600/2)\*31.6/79

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:



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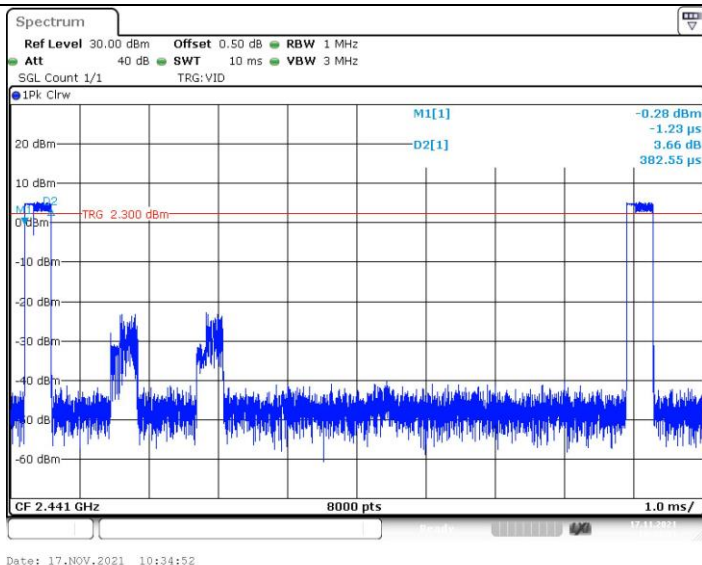
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Tel.: (86)755-27521059

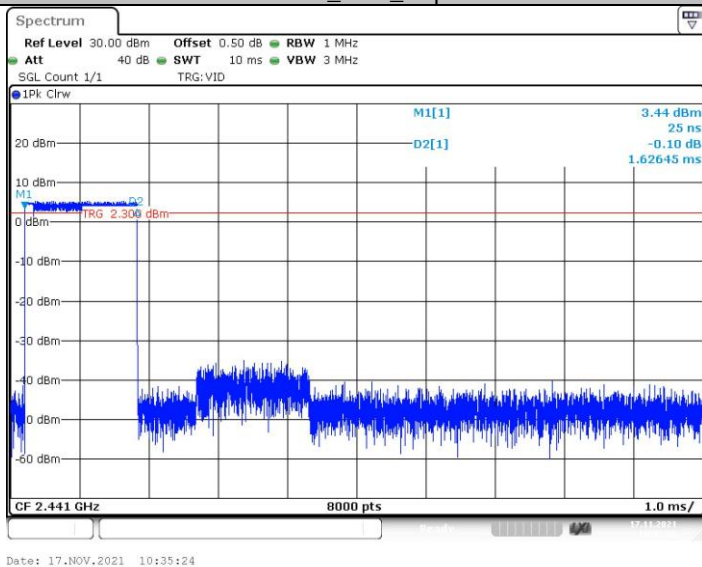
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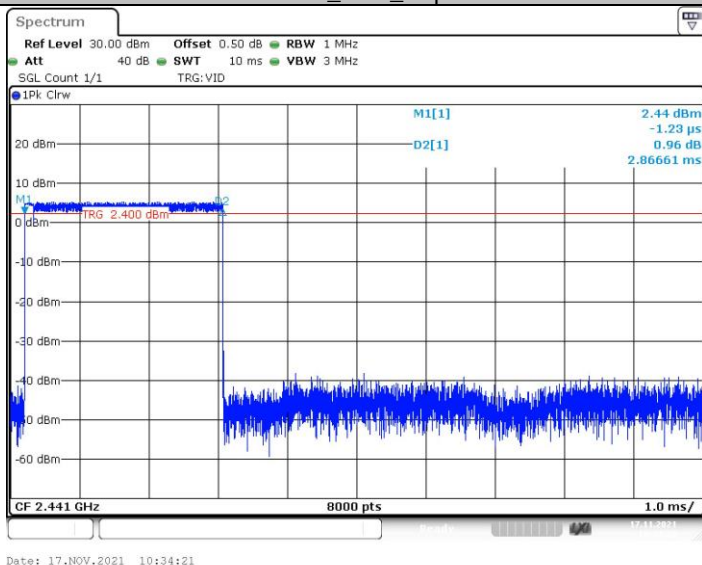
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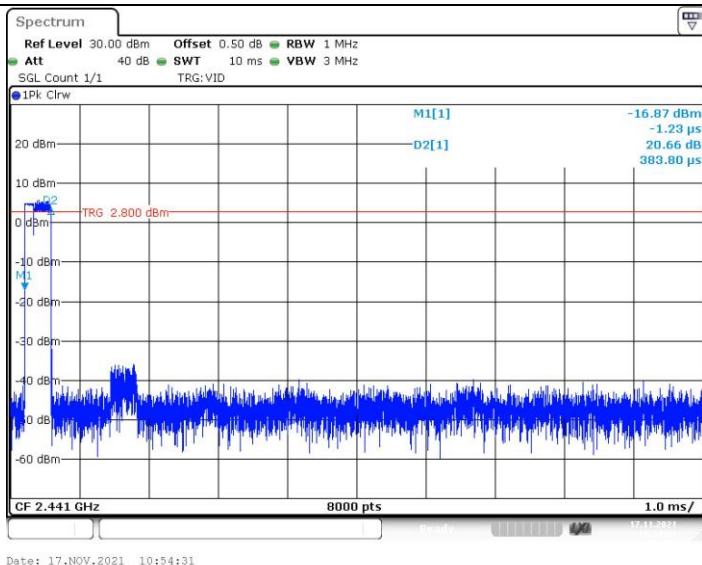
2DH3\_Ant1\_Hop



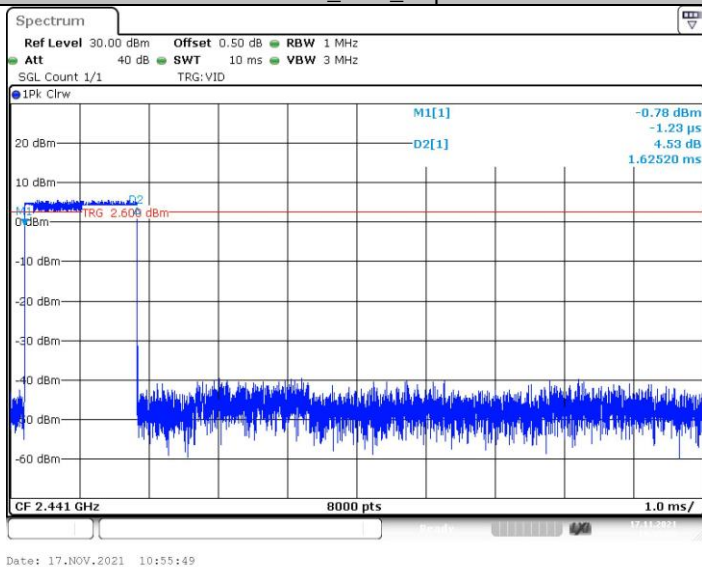
2DH5\_Ant1\_Hop



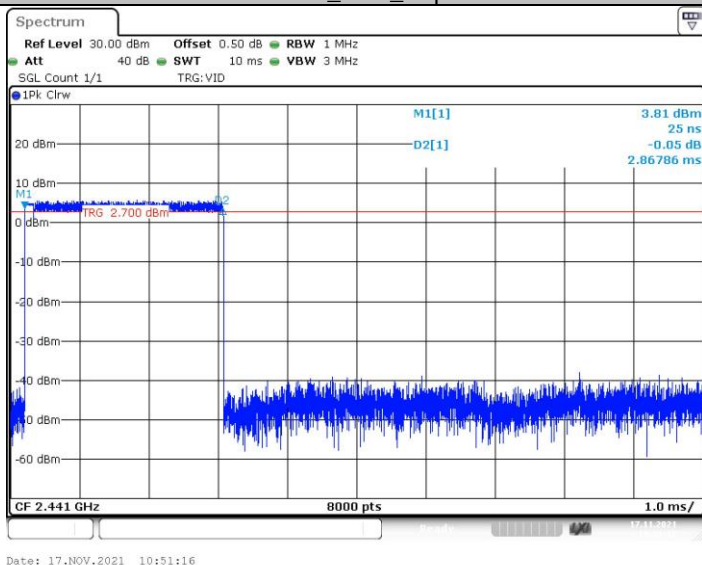
3DH1\_Ant1\_Hop



## 3DH3\_Ant1\_Hop



## 3DH5\_Ant1\_Hop



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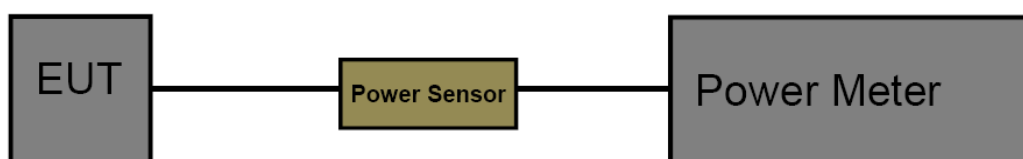
### 3.9. Peak Output Power

#### 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 Power<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	< 21.00	Pass
	39	4.82		
	78	4.81		
π/4-DQPSK	00	5.16	< 21.00	Pass
	39	5.34		
	78	5.34		
8-DPSK	00	5.37	< 21.00	Pass
	39	5.65		
	78	5.73		





### 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.

\*\*\*\*\*THE END\*\*\*\*\*