TEST REPORT

Report No. ……:	**2021-90022-1**
FCC ID……:	**2AVYW-TOPKEY**
Applicant……:	**Topdon Technology Co,.Ltd**
Address……:	Unit 2005 , No.3040 Xinghai, Qianhai Shimao, Qianhai Shenzhen-Hong kong Cooperation Zone, Shenzhen, PR.China
Manufacturer……:	Topdon Technology Co,.Ltd
Address……:	Unit 2005 , No.3040 Xinghai, Qianhai Shimao, Qianhai Shenzhen-Hong kong Cooperation Zone, Shenzhen, PR.China
Product Name……:	**Key Programmer**
Trade Mark……:	TOPDON
Model/Type reference……:	TOP KEY
Listed Model(s) ……:	N/A
Standard……:	**FCC 15.247**
Date of receipt of test sample…:	November 22, 2021
Date of testing……..:	November 22, 2021~December 30, 2021
Date of issue……....:	December 30, 2021
Test Result……..……:	**Pass**

Compiled by: (Printed name + Signature)	Chen Zhijun	chen zhijun
Supervised by: (Printed name + Signature)	Liu Canhui	LiuCanhui
Approved by: (Printed name + Signature)	Wang Weixiong	Wang Weixiong

Testing Laboratory Name……:	**KSIGN Testing Co., Ltd.**
Address……:	Building 5, No. 316, Jianghong South Road Binjiang District, Hangzhou 310052, China

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1. TEST SUMMARY

1.1. Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.247: Operation within the bands of 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz.

KDB 558074 D01：The measurement guidance provided herein is applicable only to Digital Transmission System (DTS) devices operating in the 902-928 MHz. 2400-2483.5 MHz and/or 5725-5850 MHz bands under §15.247 of the FCC rules (Title 47 of the Code of Federal Regulations).

ANSI C63.10-2020: American National Standard for Testing Unlicensed Wireless Devices.

1.2. Report version

Revised No.	Date of issue	Description
01	December 30, 2021	Original

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1.3. Test Description

FCC Part 15 Subpart C(15.247)			
Test Item	Standard Section	Result	Test Engineer
	FCC		
Antenna Requirement	15.203	Pass	Chen Zhijun
Conducted Emission	15.207	Pass	Chen Zhijun
Restricted Bands	15.205	Pass	Chen Zhijun
Hopping Channel Separation	15.247(a)(1)	Pass	Chen Zhijun
Dwell Time	15.247(a)(1)	Pass	Chen Zhijun
Peak Output Power	15.247(b)(1)	Pass	Chen Zhijun
Number of Hopping Frequency	15.247 (a)(1)	Pass	Chen Zhijun
Band Edge Emissions	15.247(d)	Pass	Chen Zhijun
Radiated Spurious Emission	15.247(c)&15.209	Pass	Chen Zhijun
99% Occupied Bandwidth & 20dB Bandwidth	15.247(a)(1)	Pass	Chen Zhijun
Pseudorandom Frequency Hopping Sequence	15.247 (a)(1)	Pass	Chen Zhijun

Note:

The measurement uncertainty is not included in the test result.

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1.4. Test Facility

Address of the report laboratory

KSIGN Testing Co., Ltd.

Building 5, No. 316, Jianghong South Road Binjiang District, Hangzhou 310052, China

Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L0461
KSIGN Testing Co., Ltd. Has been assessed and proved to be in Compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No.: 4749.01
KSIGN Testing Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence In the field of electrical testing, and proved to be in compliance with ISO/IEC 17025:2017 General Requirementsfor the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

IC Registration No.: CN0036

The 3m alternate test site of KSIGN Testing Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: CN0096

FCC-Registration No.: CN1254

KSIGN Testing Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

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1.5. Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the KSIGN(Guangdong) Testing Co., Ltd. system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. Below is the best measurement capability for KSIGN(Guangdong) Testing Co., Ltd.

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.42 dB	(1)
Transmitter power Radiated	2.14 dB	(1)
Conducted spurious emissions 9kHz~40GHz	1.60 dB	(1)
Radiated spurious emissions 9kHz~40GHz	2.20 dB	(1)
Conducted Emissions 9kHz~30MHz	3.20 dB	(1)
Radiated Emissions 30~1000MHz	4.70 dB	(1)
Radiated Emissions 1~18GHz	5.00 dB	(1)
Radiated Emissions 18~40GHz	5.54 dB	(1)
Occupied Bandwidth	2.80 dB	(1)

Note (1): This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

1.6. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba

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2. GENERAL INFORMATION

2.1. General Description of EUT

Test Sample Number:	1-1-1(Normal Sample),1-1-2(Engineering Sample)
Product Name:	Key Programmer
Trademark:	TOPDON
Model/Type reference:	TOP KEY
Listed Model(s):	N/A
Model Difference:	N/A
Power supply:	DC 9V~18V
Power supply(Battery):	N/A
Hardware version:	V3-20211011
Software version:	V1.0
Bluetooth	
Modulation:	GFSK, π/4-DQPSK, 8DPSK
Operation frequency:	2402MHz~2480MHz
Max Peak Output Power:	1.35dBm
Channel number:	79
Channel separation:	1MHz
Antenna type:	PCB Antenna
Antenna gain:	2dBi

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2.2. Operation state

Operation Frequency List: The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing. BT EDR, 79 channels are provided to the EUT. Channels 00/39/78 were selected for testing.

Operation Frequency List:

Channel	Frequency (MHz)
00	**2402**
01	2403
⋮	⋮
38	2440
39	**2441**
40	2442
⋮	⋮
77	2479
78	**2480**

Note: The display in gray were the channel selected for testing.

Test mode

NO.	TEST MODE DESCRIPTION
1	Low channel GFSK
2	Middle channel GFSK
3	High channel GFSK
4	Low channel π/4-DQPSK
5	Middle channel π/4-DQPSK
6	High channel π/4-DQPSK
7	Low channel 8DPSK
8	Middle channel 8DPSK
9	High channel 8DPSK
10	Hopping mode GFSK
11	Hopping mode π/4-DQPSK
12	Hopping mode 8DPSK

Note:

1. Only the result of the worst case was recorded in the report, if no other cases.
2.The test software is the Blue Test 3 which can set the EUT into the individual test modes.

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2.3. Measurement Instruments List

Tonscend JS0806-2 Test system					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
1	Spectrum Analyzer	R&S	FSV40-N	101798	04/07/2022
2	Vector Signal Generator	Agilent	N5182A	MY50142520	04/07/2022
3	Analog Signal Generator	HP	83752A	3344A00337	04/07/2022
4	Power Sensor	Agilent	E9304A	MY50390009	04/07/2022
5	Power Sensor	Agilent	E9300A	MY41498315	04/07/2022
6	Wideband Radio Communication Tester	R&S	CMW500	157282	04/07/2022
7	Climate Chamber	Angul	AGNH80L	1903042120	04/07/2022
8	Dual Output DC Power Supply	Agilent	E3646A	MY40009992	04/07/2022
9	RF Control Unit	Tonscend	JS0806-2	/	04/07/2022

Transmitter spurious emissions & Receiver spurious emissions					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
1	EMI Test Receiver	R&S	ESR	102525	04/07/2022
2	High Pass Filter	Chengdu E-Microwave	OHF-3-18-S	0E01901038	03/27/2022
3	High Pass Filter	Chengdu E-Microwave	OHF-6.5-18-S	0E01901039	03/27/2022
4	Spectrum Analyzer	HP	8593E	3831U02087	04/07/2022
5	Ultra-Broadband logarithmic period Antenna	Schwarzbeck	VULB 9163	01230	03/29/2023
6	Loop Antenna	Beijin ZHINAN	ZN30900C	18050	03/25/2022
7	Spectrum Analyzer	R&S	FSV40-N	101798	04/07/2022
8	Horn Antenna	Schwarzbeck	BBHA 9120 D	2023	03/29/2023
9	Pre-Amplifier	Schwarzbeck	BBV 9745	9745#129	04/07/2022
10	Pre-Amplifier	EMCI	EMC051835SE	980662	04/07/2022
11	Pre-Amplifier	Schwarzbeck	BBV-9721	57	04/07/2022
12	Horn Antenna	Schwarzbeck	BBHA 9170	00939	03/29/2022

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	LISN	R&S	ENV432	1326.6105.02	03/27/2022
2	EMI Test Receiver	R&S	ESR	102524	04/07/2022
3	Manual RF Switch	JS TOYO	/	MSW-01/002	04/07/2022

Note:

1)The Cal. Interval was one year.

2)The cable loss has calculated in test result which connection between each test instruments.

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2.4. Test Software

Software name	Model	Version
Conducted emission Measurement Software	EZ-EMC	EMC-Con 3A1.1
Radiated emission Measurement Software	EZ-EMC	FA-03A.2.RE
Bluetooth and WIFI Test System	JS1120-3	2.5.77.0418

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3. TEST ITEM AND RESULTS

3.1. 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 an 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.

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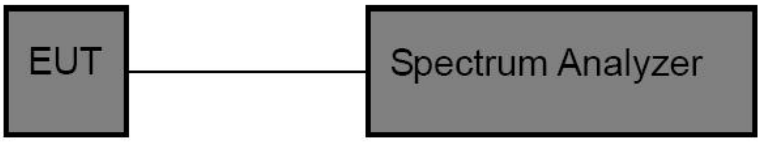
3.2. Peak Output Power

Limit

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. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
2. Spectrum Setting:
   Peak Detector: RBW=1 MHz, VBW=3 MHz for bandwidth less than 1MHz.
   RBW=3 MHz, VBW=10 MHz for bandwidth more than 1MHz.

Test Mode

Please refer to the clause 2.2

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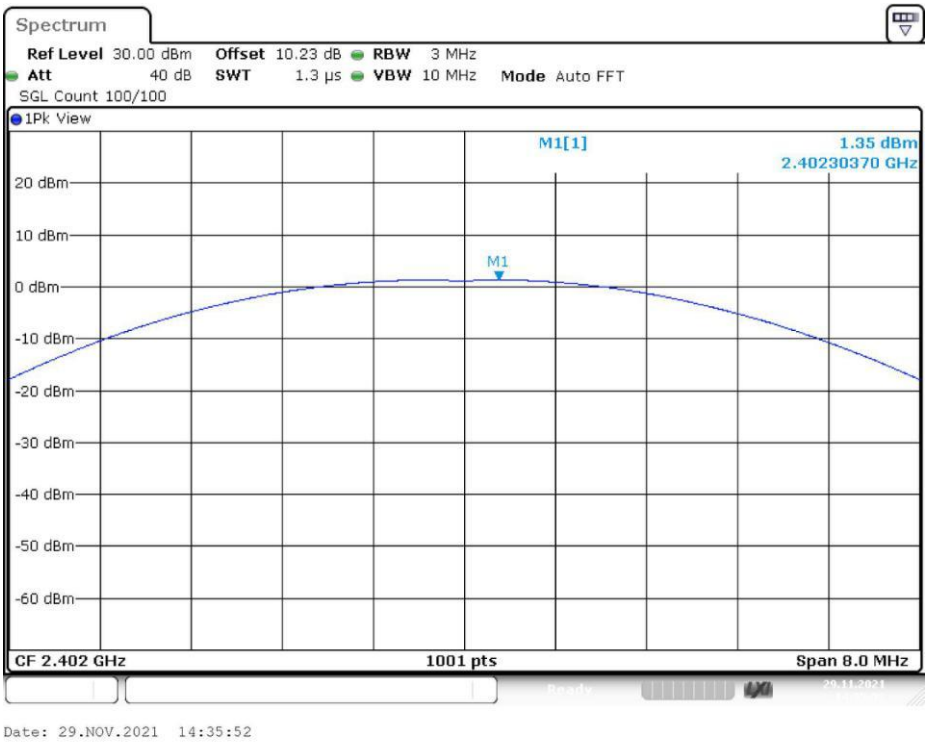
Test Result

Test Mode:	DH5	
Channel frequency (MHz)	Test Result (dBm)	Limit (dBm)
2402	1.35	30
2441	0.92	
2480	-0.19	
2402 MHz		



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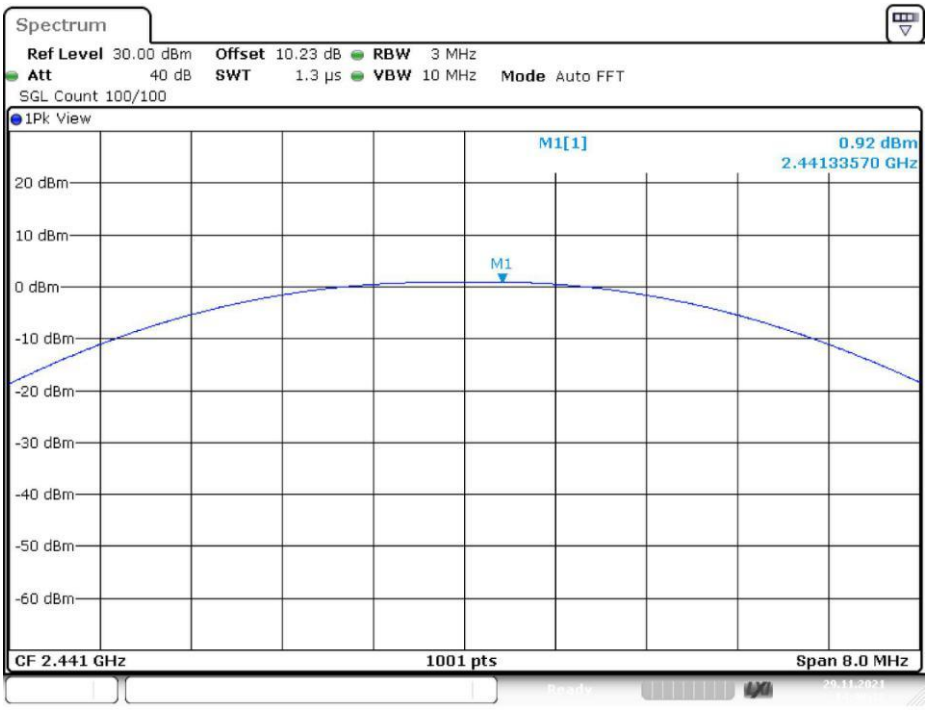
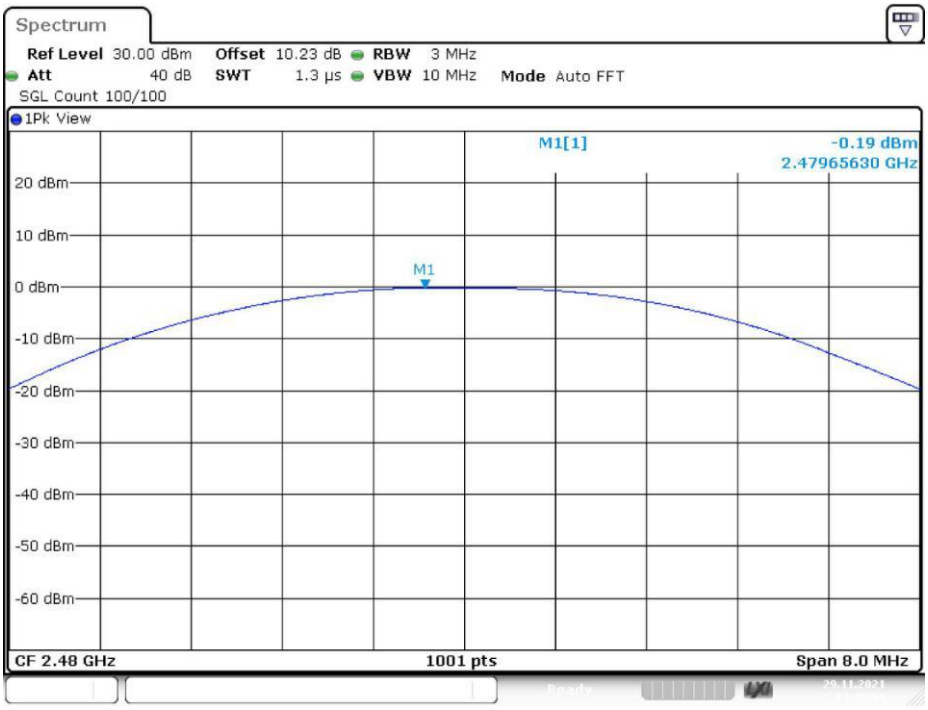
2441 MHz



2480 MHz



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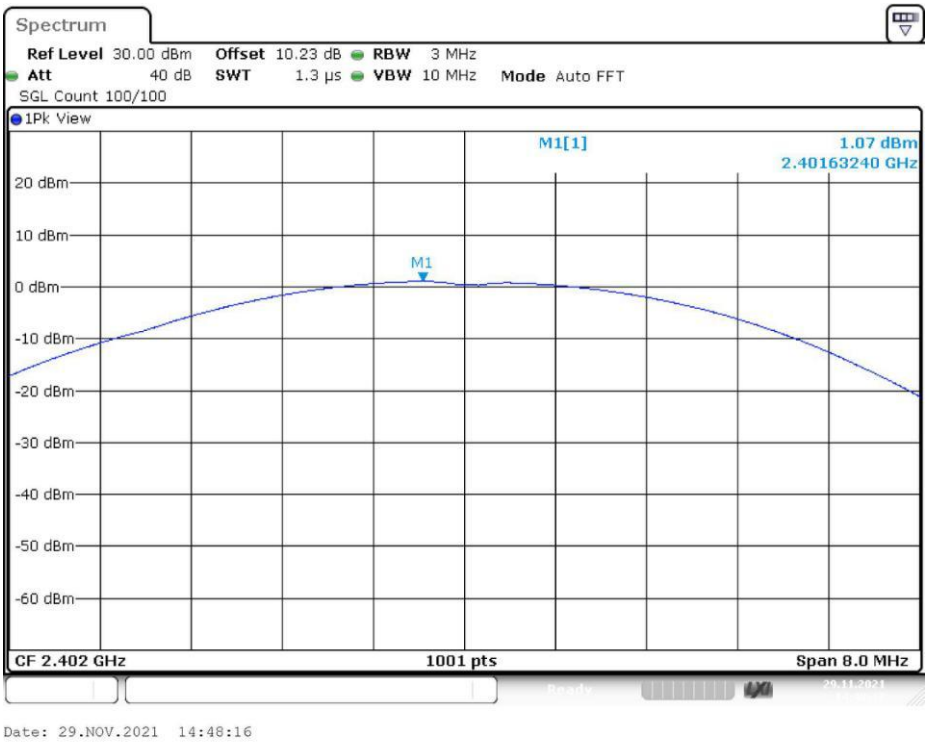
Test Mode:	2DH5	
Channel frequency (MHz)	Test Result (dBm)	Limit (dBm)
2402	1.07	30
2441	0.6	
2480	-0.26	
2402 MHz		



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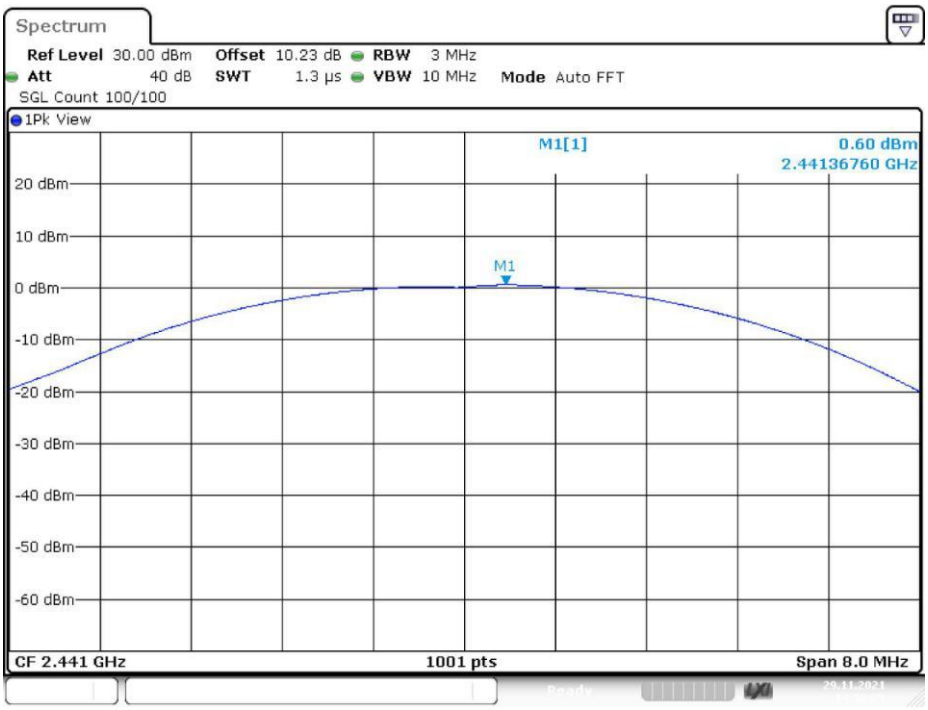
2441 MHz



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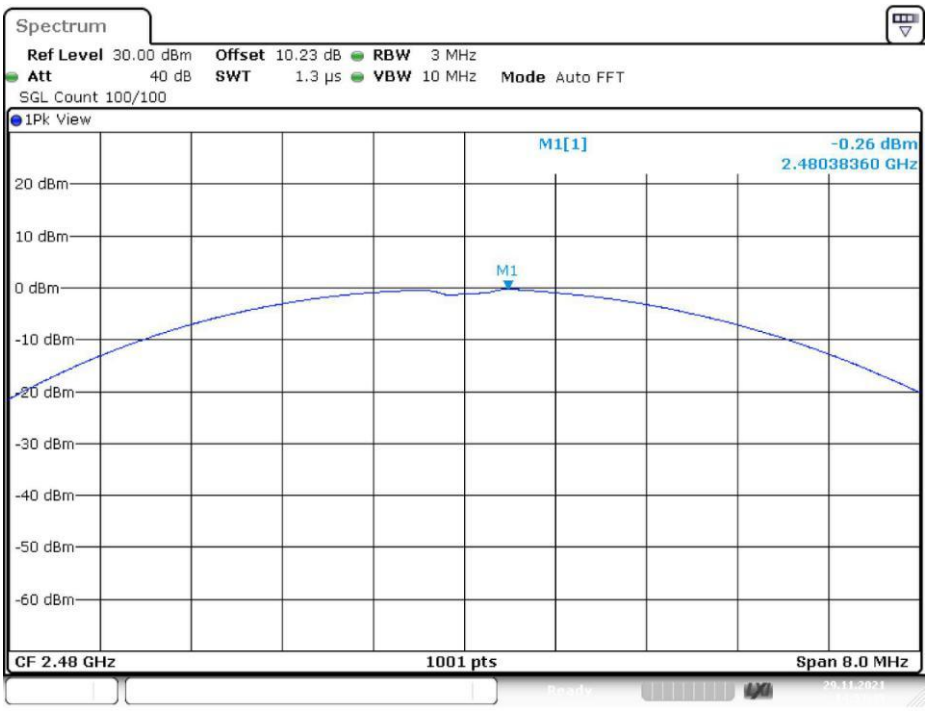
2480 MHz



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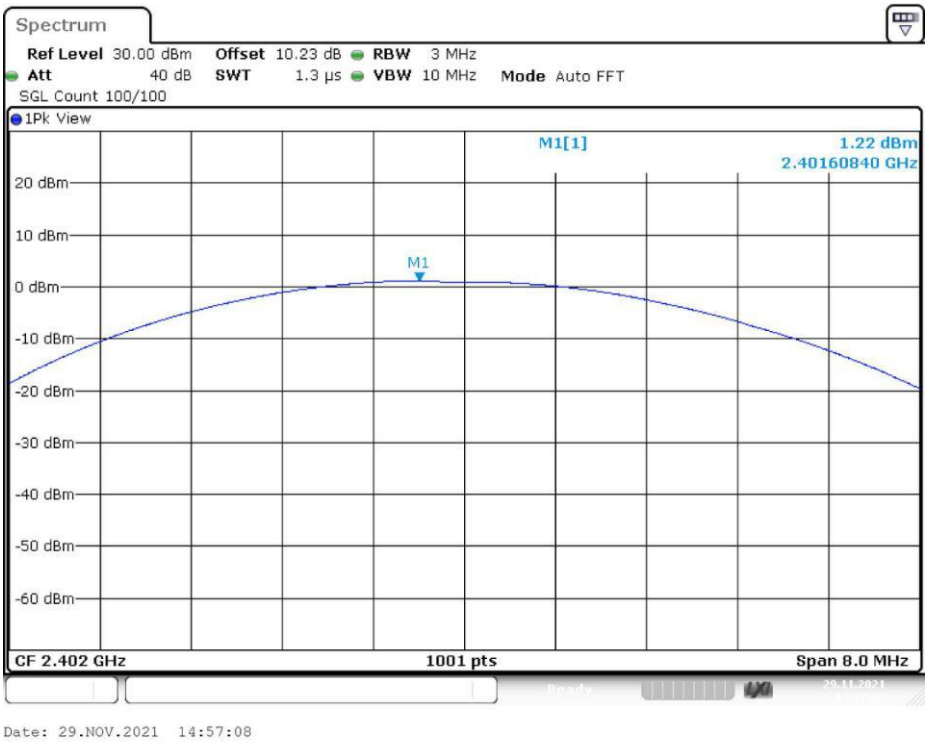
Test Mode:	3DH5	
Channel frequency (MHz)	Test Result (dBm)	Limit (dBm)
2402	1.22	30
2441	0.69	
2480	-0.23	
2402 MHz		



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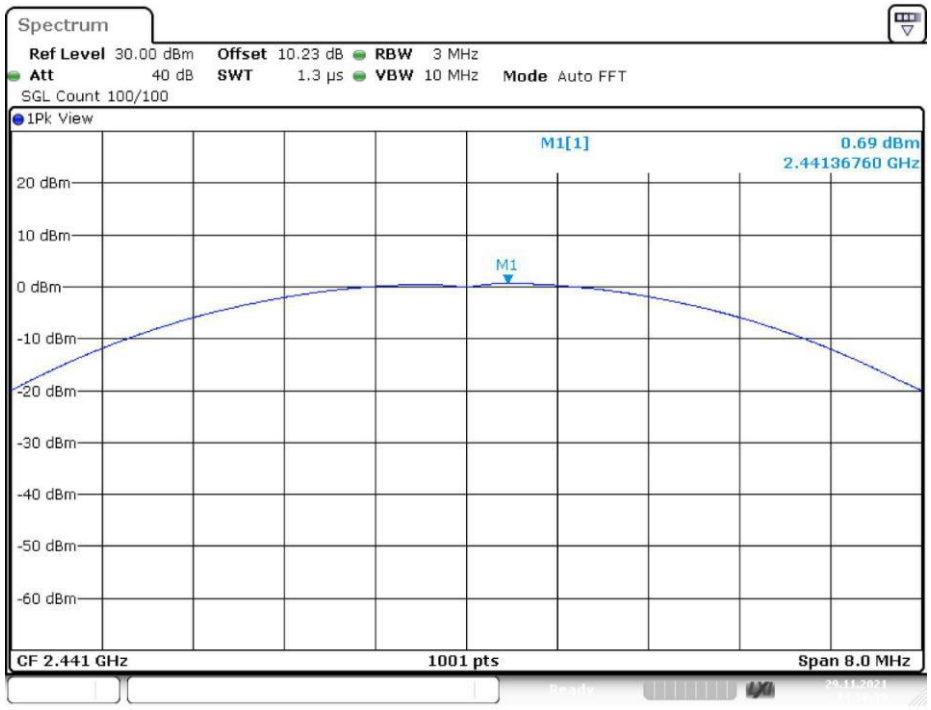
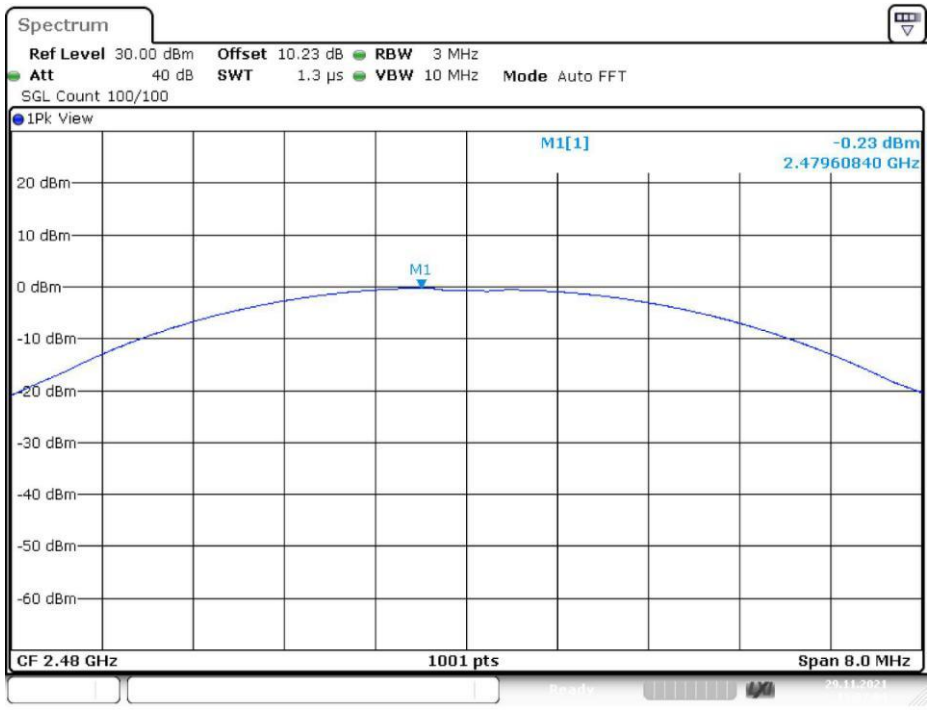
2441 MHz



2480 MHz



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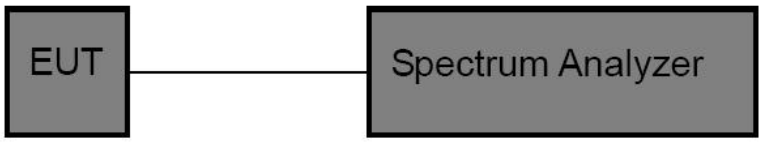
3.3. 20dB Bandwidth

Limit

Test Item	Limit	Frequency Range(MHz)
Bandwidth	N/A	2400~2483.5

Test Configuration



Test Procedure

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
2. Spectrum Setting:

   (1) Set RBW = 30 kHz.
   (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 2.2.

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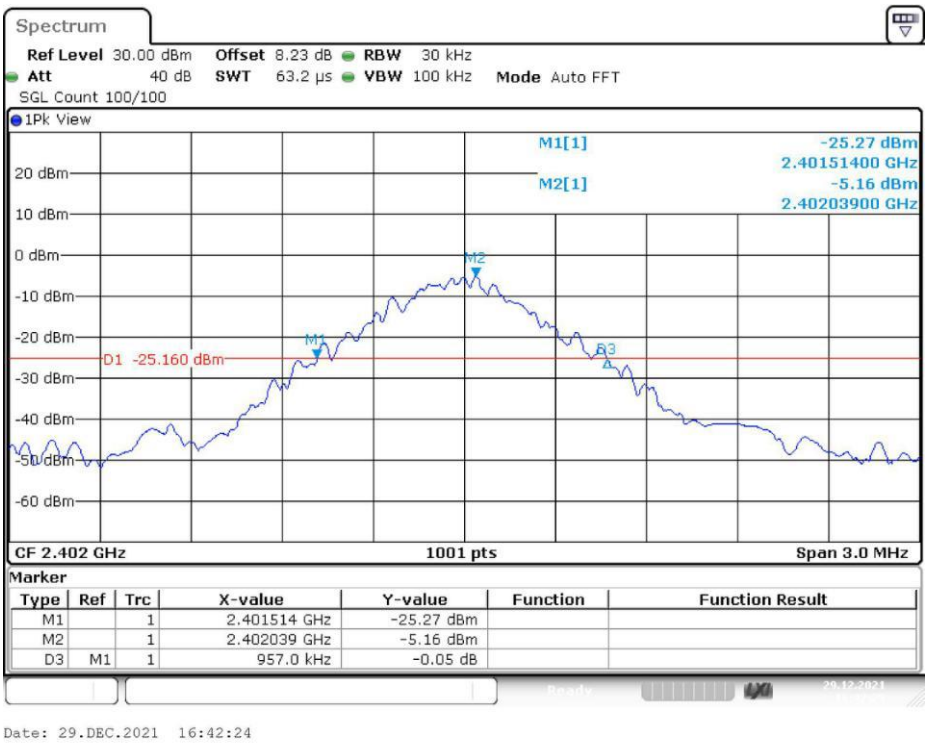
Test Results

Test Mode:	DH5			
Channel frequency (MHz)	20dB Bandwidth [MHz]	FL[MHz]	FH[MHz]	Verdict
2402	0.957	2401.51	2402.47	PASS
2441	0.960	2440.51	2441.47	PASS
2480	0.966	2479.51	2480.47	PASS
2402 MHz				



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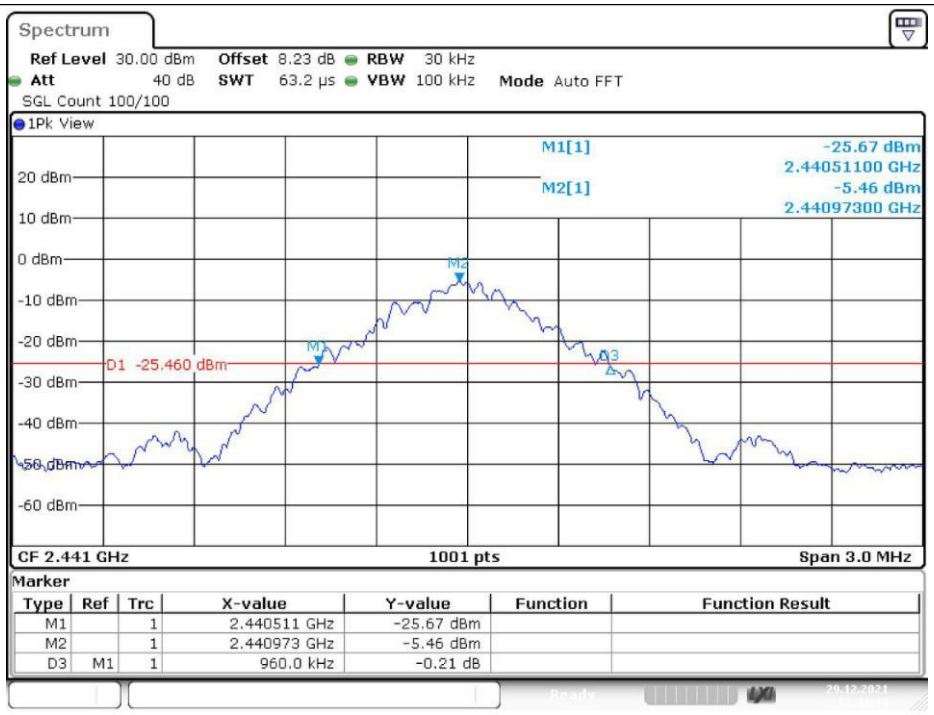
2441 MHz



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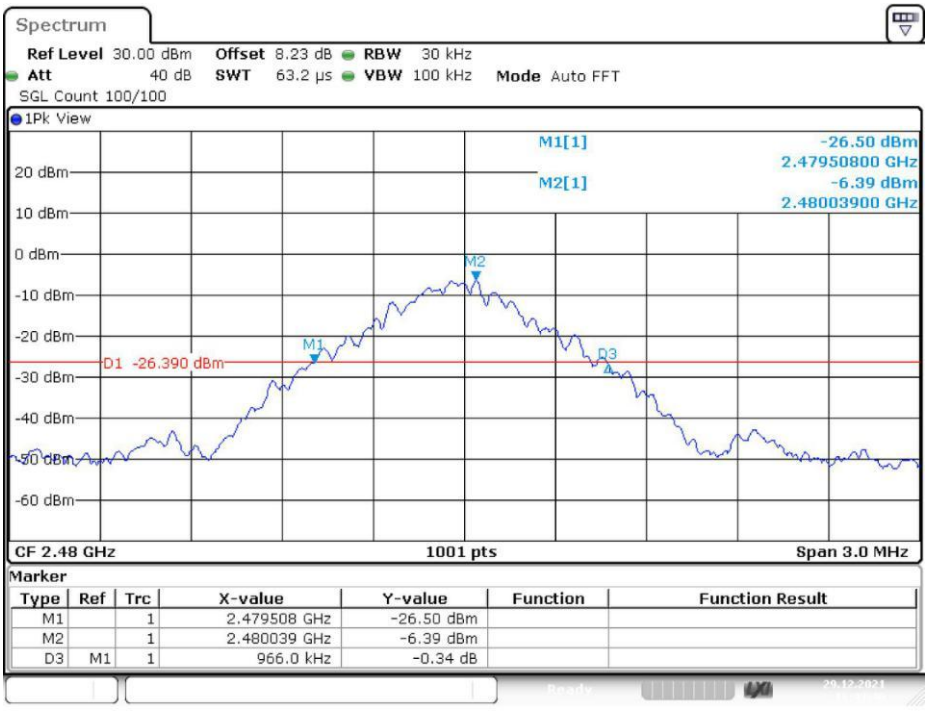
2480 MHz



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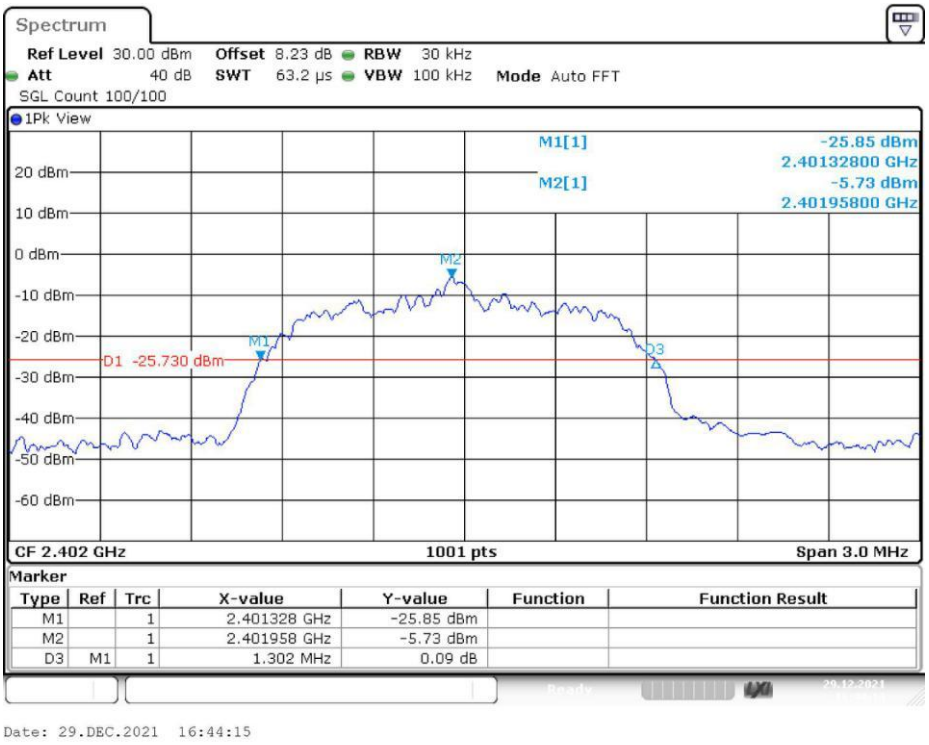
Test Mode:	2DH5			
Channel frequency (MHz)	20dB Bandwidth [MHz]	FL[MHz]	FH[MHz]	Verdict
2402	1.302	2401.33	2402.63	PASS
2441	1.362	2440.30	2441.67	PASS
2480	1.293	2479.35	2480.64	PASS
2402 MHz				



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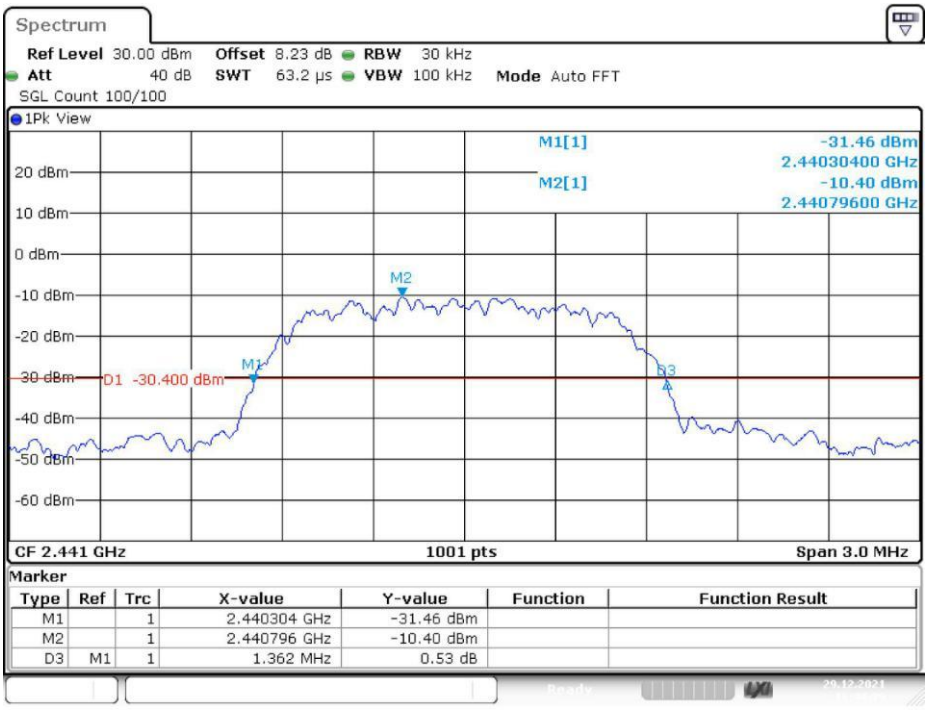
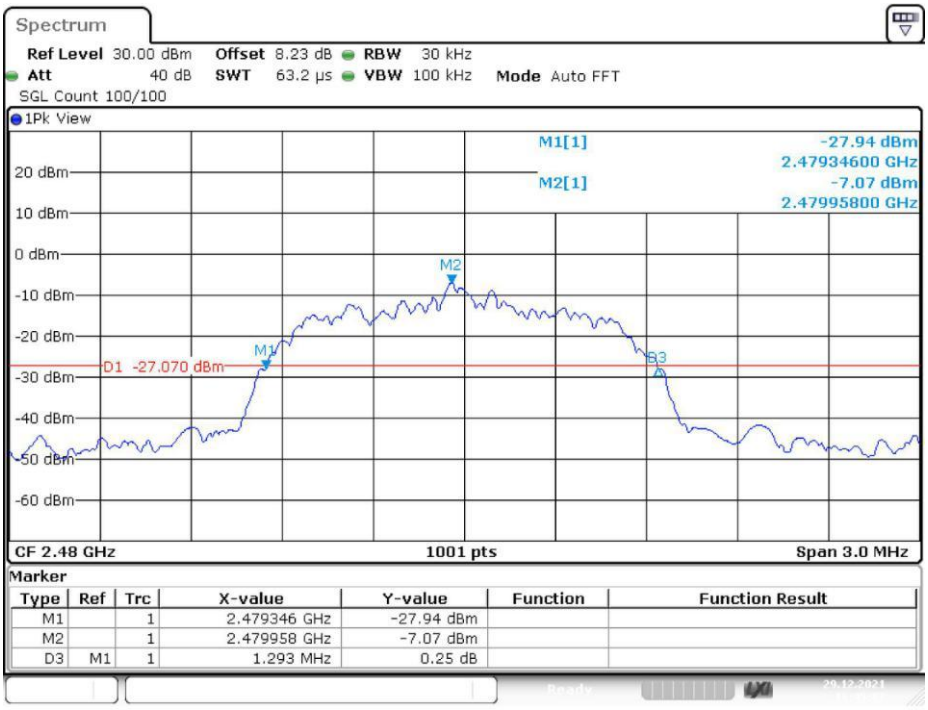
2441 MHz



Date: 29.DEC.2021 16:44:40

2480 MHz



Date: 29.DEC.2021 16:45:07

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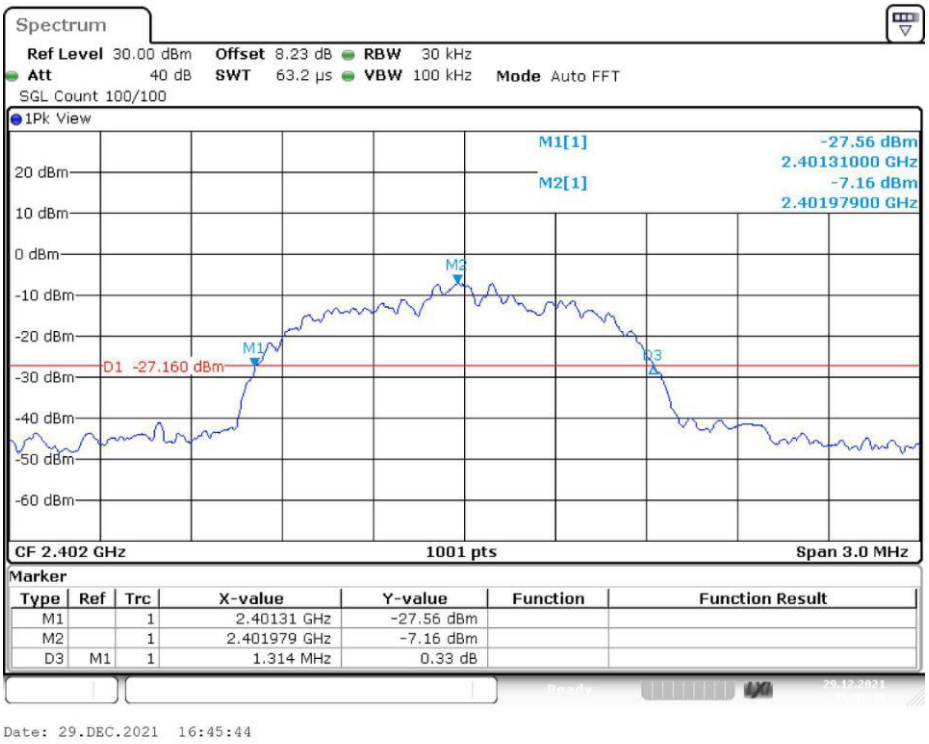
Tel：+(86) 0755-2985 2678 Fax: +(86) 0755-2985 2397 E-mail：info@gdksign.cn Web: www.gdksign.com

Test Mode:	3DH5			
Channel frequency (MHz)	20dB Bandwidth [MHz]	FL[MHz]	FH[MHz]	Verdict
2402	1.314	2401.31	2402.62	PASS
2441	1.326	2440.32	2441.64	PASS
2480	1.314	2479.33	2480.64	PASS
2402 MHz				



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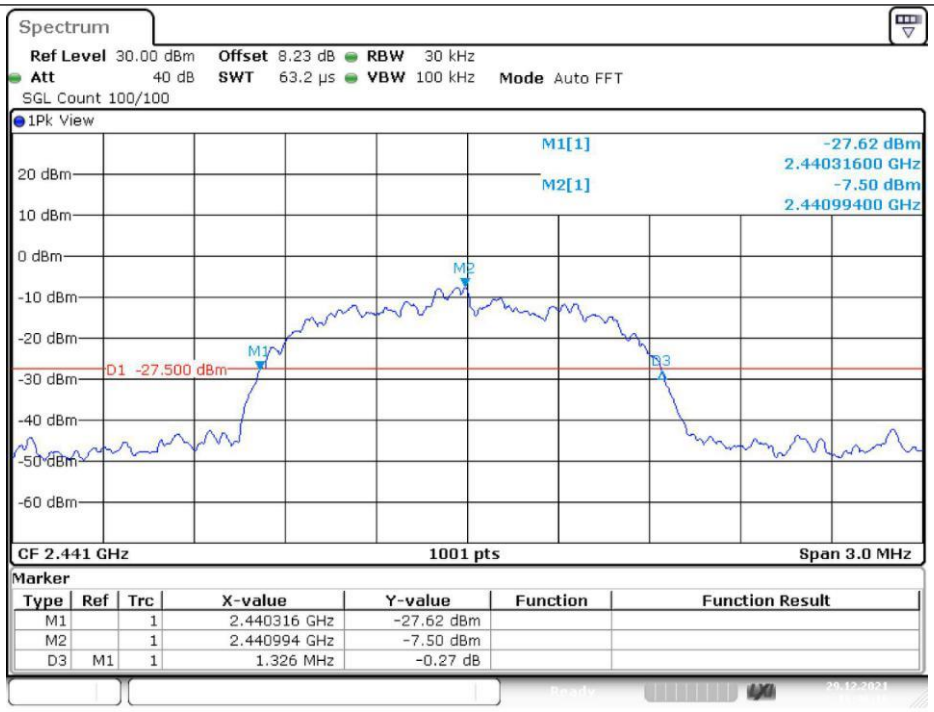
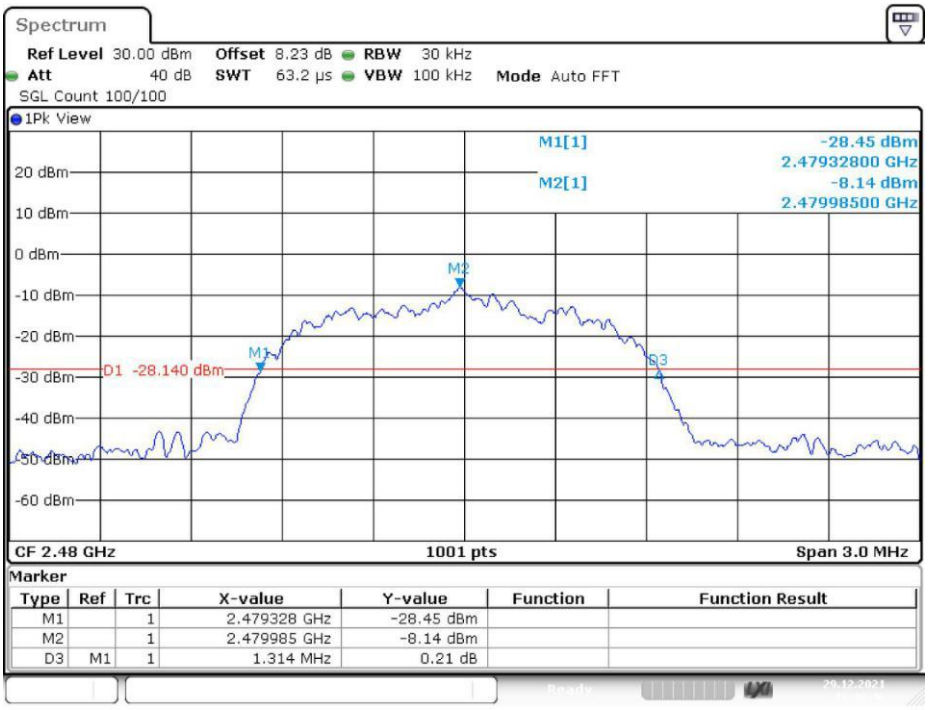
2441 MHz



Date: 29.DEC.2021 16:46:15

2480 MHz



Date: 29.DEC.2021 16:46:46

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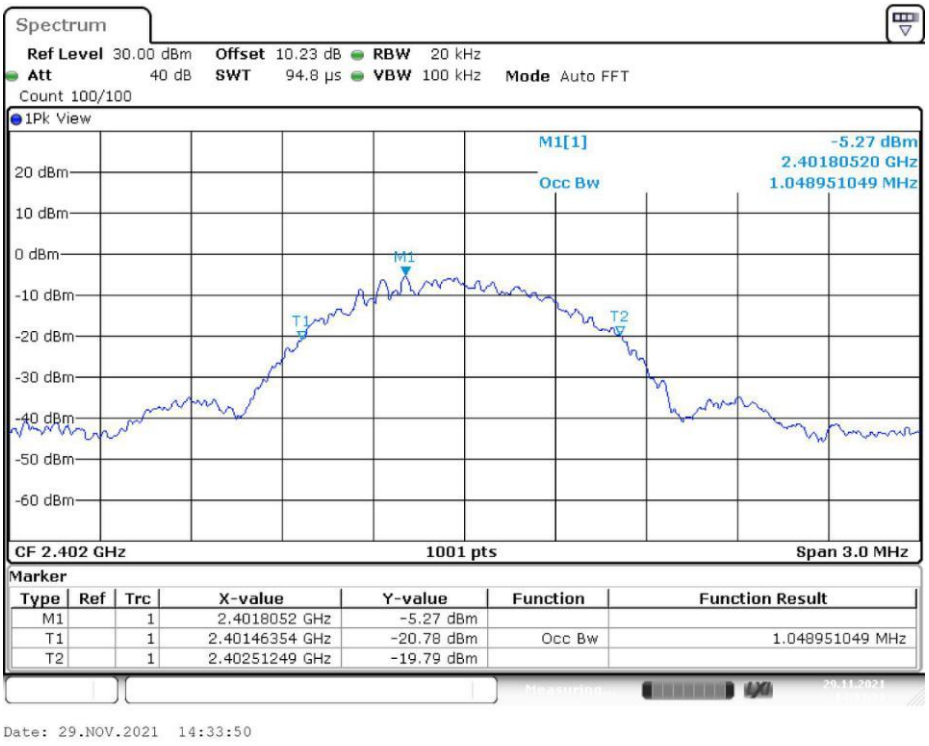
Test Mode:	DH5			
Channel frequency (MHz)	99% OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
2402	1.049	2401.464	2402.512	PASS
2441	1.049	2440.464	2441.512	PASS
2480	1.052	2479.461	2480.512	PASS
2402 MHz				



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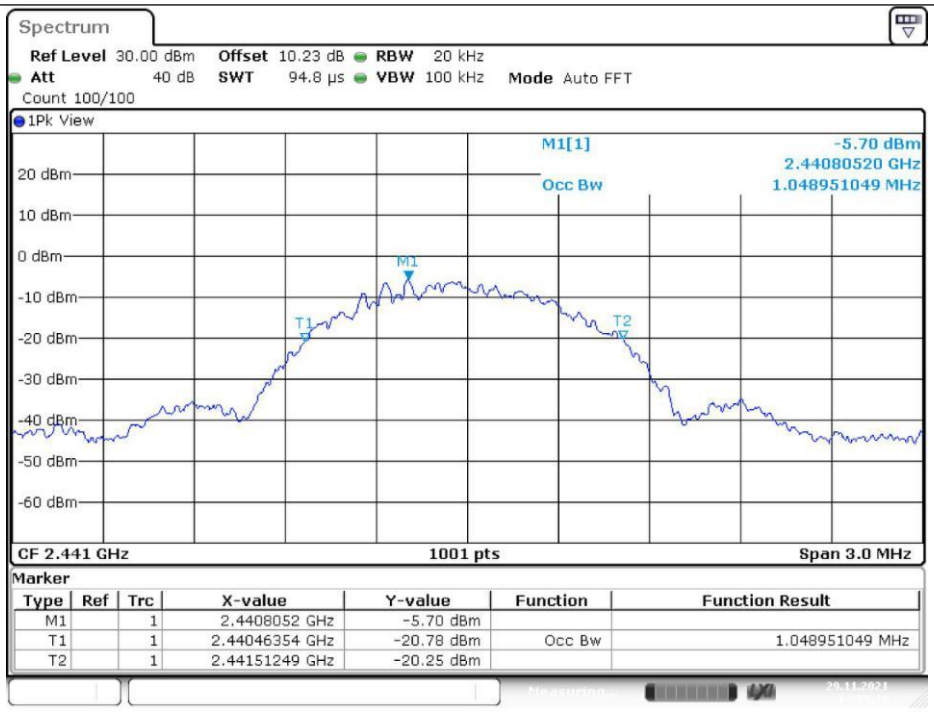
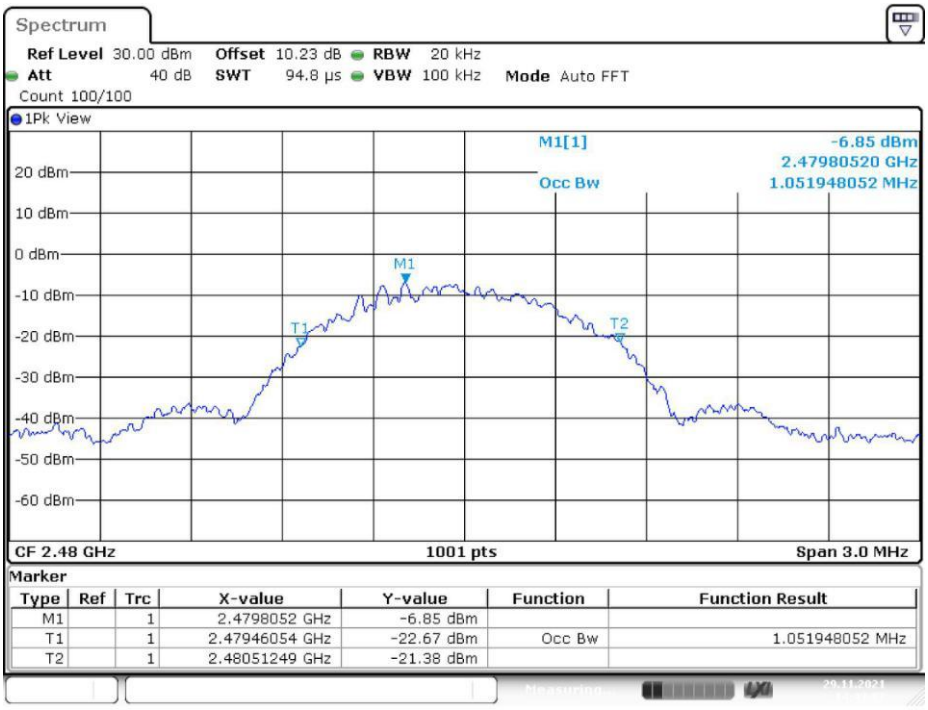
2441 MHz



Date: 29.NOV.2021 14:39:19

2480 MHz



Date: 29.NOV.2021 14:43:07

Add：Building 5, No. 316, Jianghong South Road Binjiang District, Hangzhou 310052, China
Tel：+(86) 0755-2985 2678 Fax: +(86) 0755-2985 2397 E-mail：info@gdksign.cn Web: www.gdksign.com

Test Mode:	2DH5			
Channel frequency (MHz)	99% OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
2402	1.196	2401.380	2402.575	PASS
2441	1.196	2440.383	2441.578	PASS
2480	1.196	2479.386	2480.581	PASS
2402 MHz				

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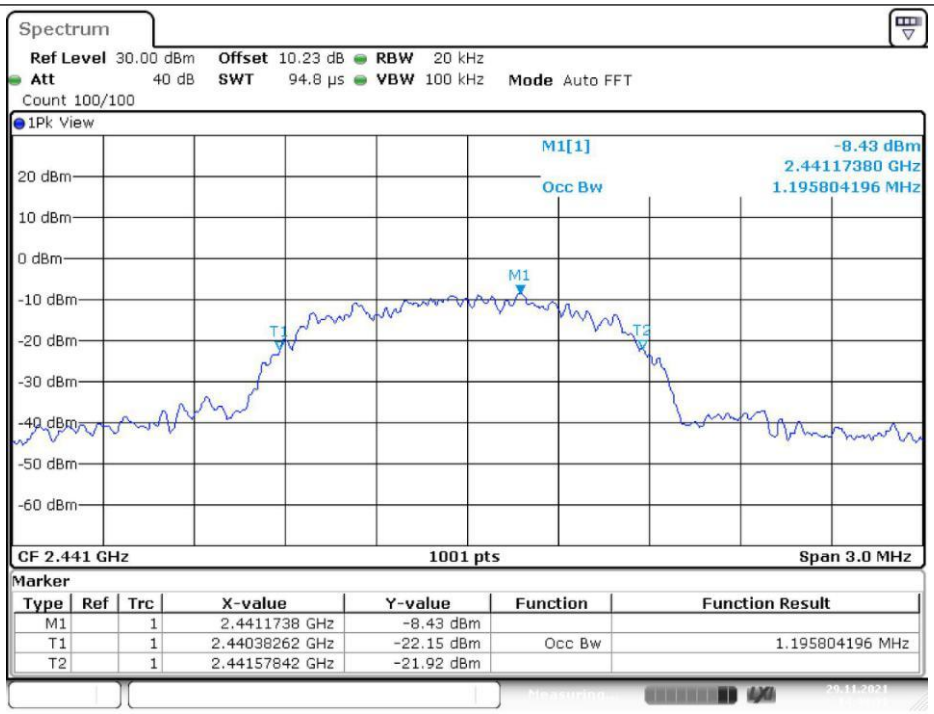
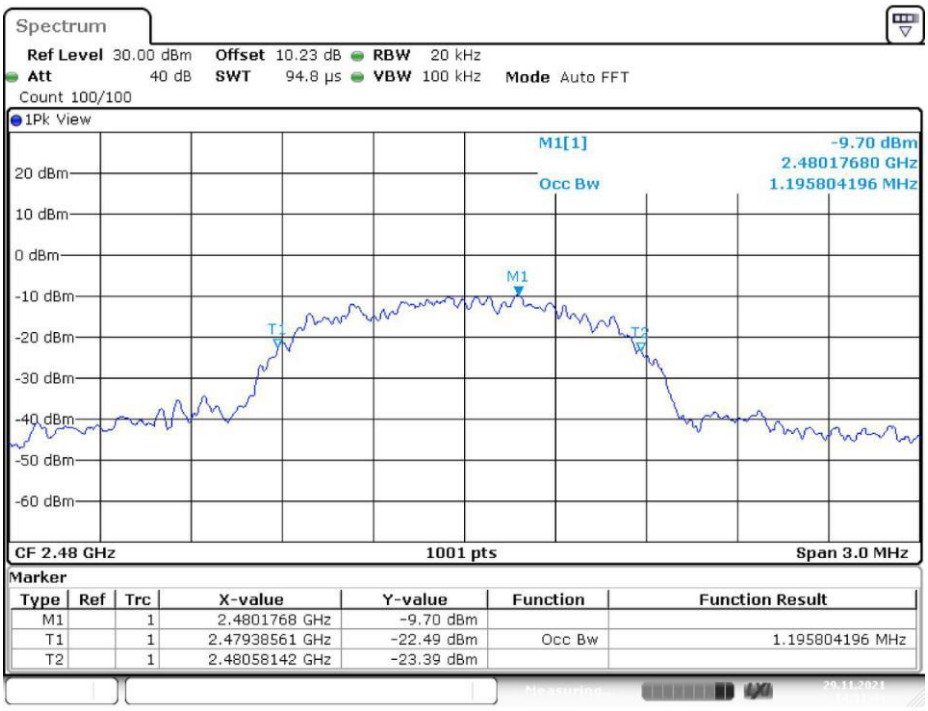
2441 MHz



2480 MHz



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Test Mode:	3DH5			
Channel frequency (MHz)	99% OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
2402	1.202	2401.368	2402.569	PASS
2441	1.205	2440.371	2441.575	PASS
2480	1.199	2479.377	2480.575	PASS
2402 MHz				

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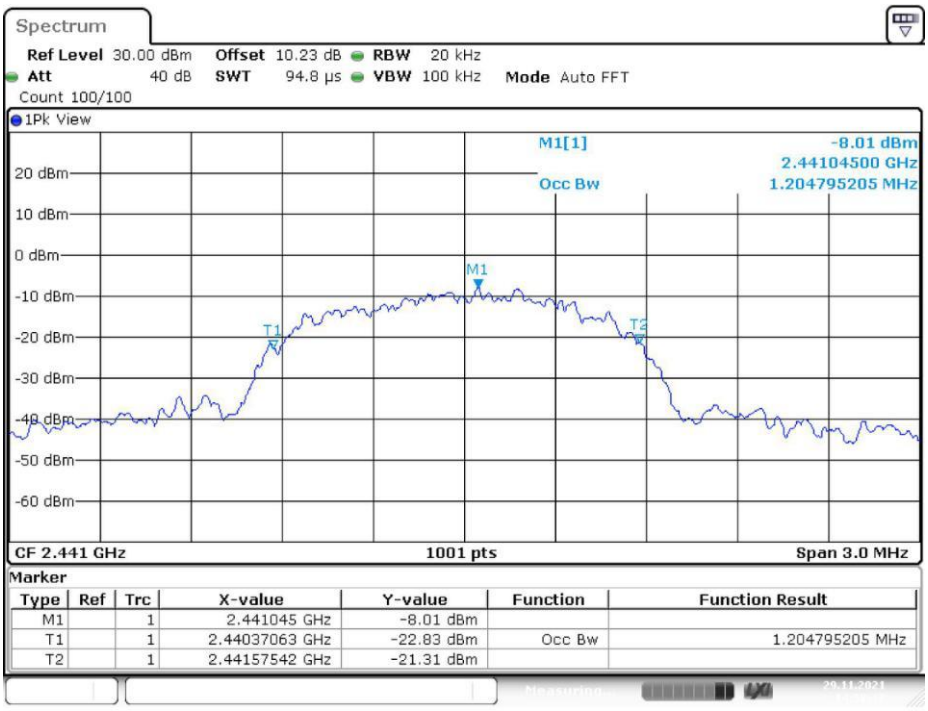
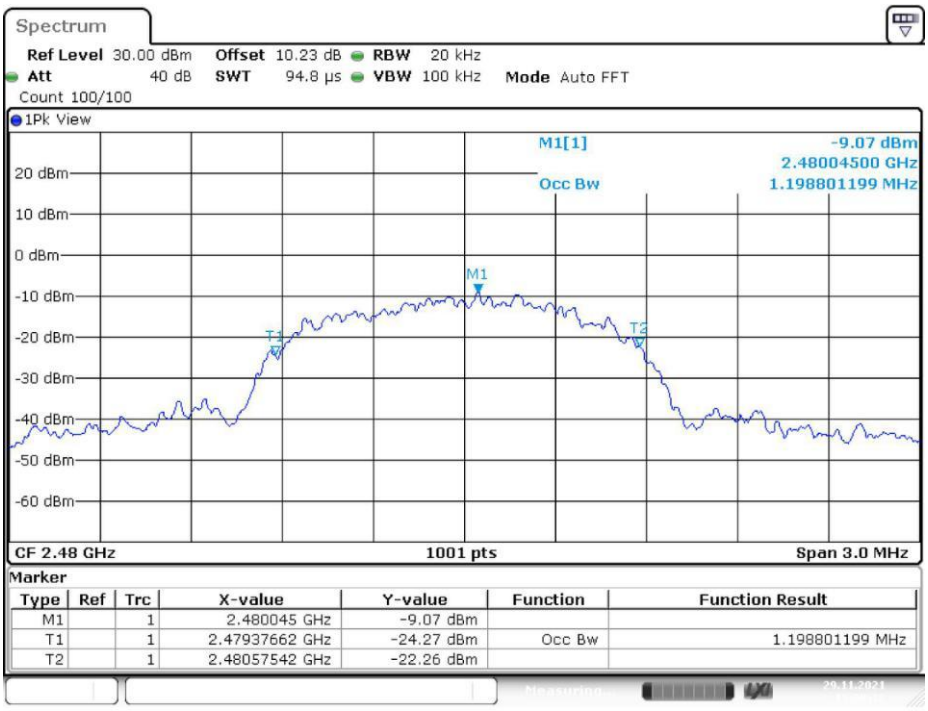
2441 MHz



2480 MHz



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3.4. Carrier Frequencies Separation

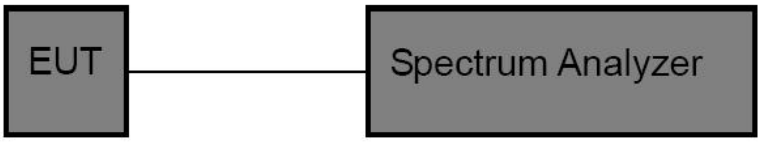
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):

frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

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.Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
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.

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 2.2.

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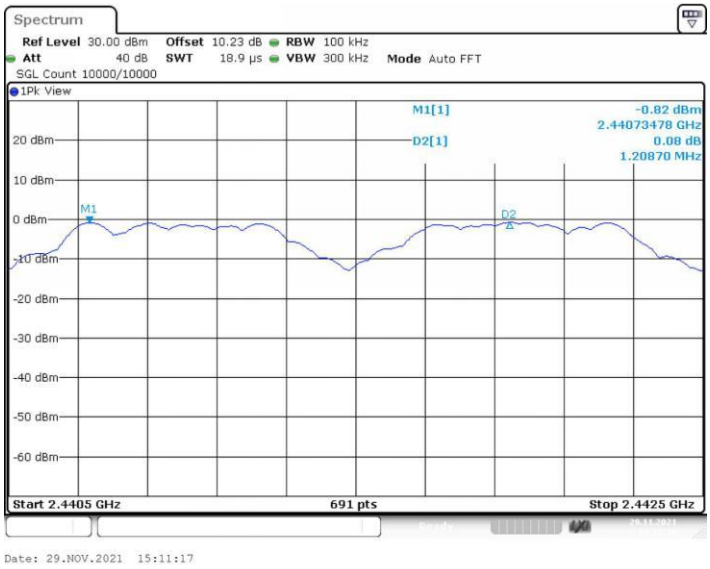
Test Results

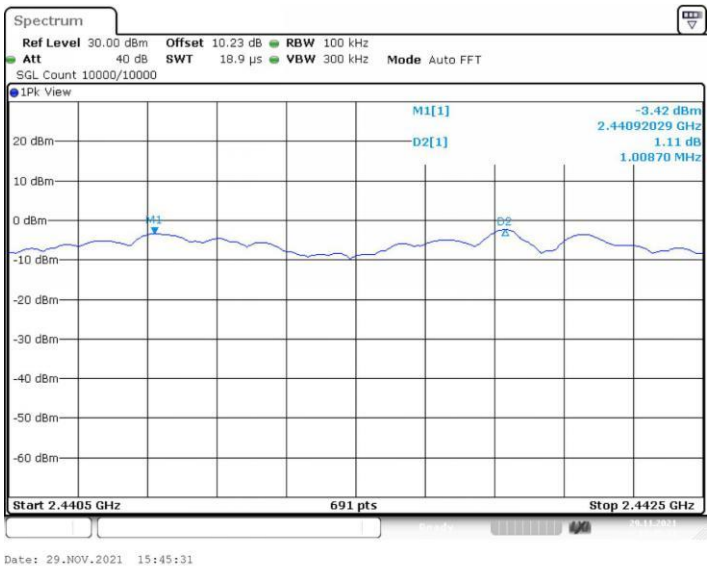
Test Mode:	DH5 Hopping Mode		
Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	1.209	>=0.78	PASS

DH5 Hopping Mode



Test Mode:	2DH5 Hopping Mode		
Test Mode	Result[MHz]	Limit[MHz]	Verdict
2DH5	1.009	>=0.9	PASS

2DH5 Hopping Mode



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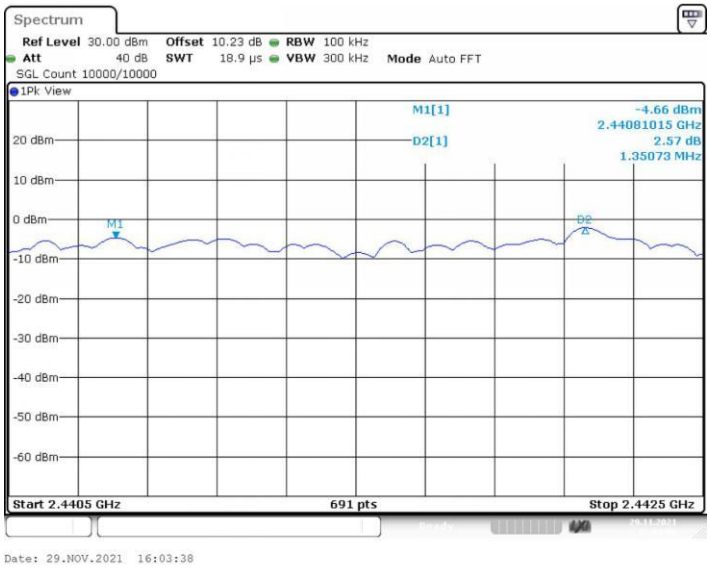
Test Mode:	3DH5 Hopping Mode		
Test Mode	Result[MHz]	Limit[MHz]	Verdict
3DH5	1.351	>=0.9	PASS
3DH5 Hopping Mode			



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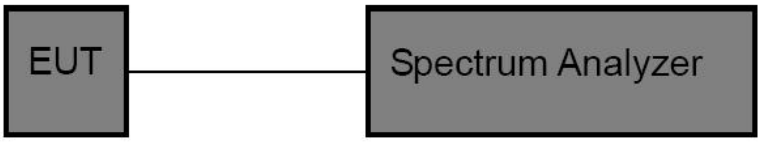
3.5. Number of Hopping Channel

Limit

Section	Test Item	Limit
15.247	Number of Hopping Channel	>15

Test Configuration



Test Procedure

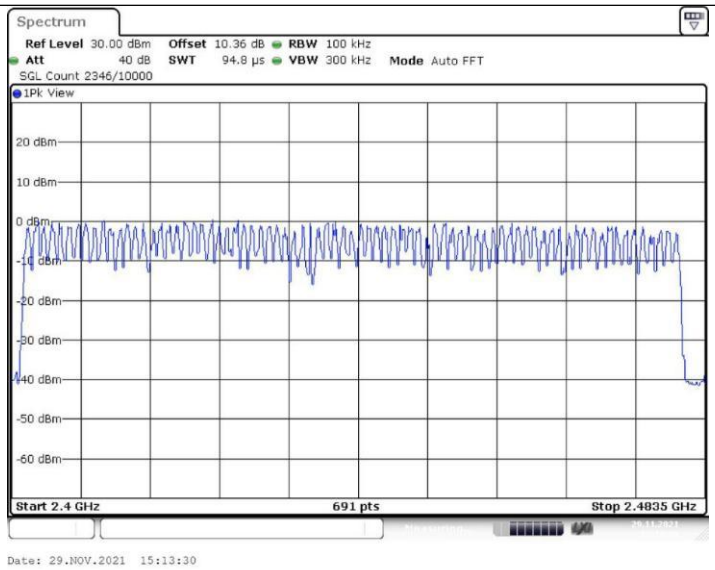
1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
2. Spectrum Setting:
   (1) Peak Detector: RBW=100 kHz, VBW≥RBW, Sweep time= Auto.

Test Mode

Please refer to the clause 2.2.

Test Result

Test Mode:	DH5 Hopping Mode		
Frequency Range	Test Mode	Quantity of Hopping Channel	Limit
2402MHz~2483.5MHz	DH5	79	>15
DH5 Mode			



Note: The GFSK（DH5）modulation is the worst case and recorded in the report.

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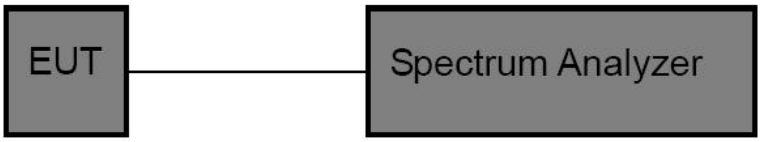
3.6. Dwell Time

Limit

Section	Test Item	Limit
15.247(a)(1)	Average Time of Occupancy	0.4 sec

Test Configuration



Test Procedure

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
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 2.2

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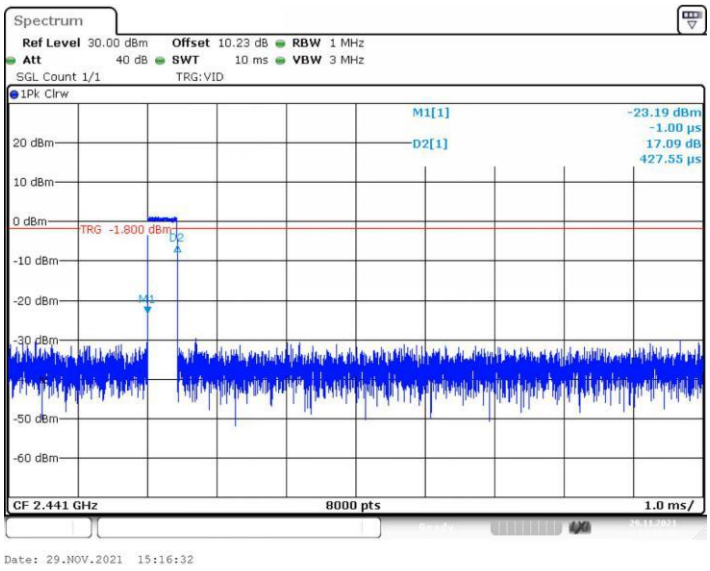
Test Result

Mode	Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (ms)	Limit(s)	Conclusion
GFSK	DH1	2441	0.43	137.60	<0.4	Pass
	DH3	2441	1.62	259.20	<0.4	Pass
	DH5	2441	2.81	299.73	<0.4	Pass
π/4 DQPSK	2DH1	2441	0.49	156.80	<0.4	Pass
	2DH3	2441	1.68	268.80	<0.4	Pass
	2DH5	2441	2.87	306.13	<0.4	Pass
8DPSK	3DH1	2441	0.41	131.20	<0.4	Pass
	3DH3	2441	1.66	265.60	<0.4	Pass
	3DH5	2441	2.75	293.33	<0.4	Pass

Note:
1. A period time = 0.4 (s) * 79 = 31.6(s)
2. DH1 time slot = Pulse Duration * (1600/(2*79)) * A period time
   DH3 time slot = Pulse Duration * (1600/(4*79)) * A period time
   DH5 time slot = Pulse Duration * (1600/(6*79)) * A period time
3. For GFSK, π/4-DQPSK and 8DPSK: The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

Test plots

GFSK mode-DH1



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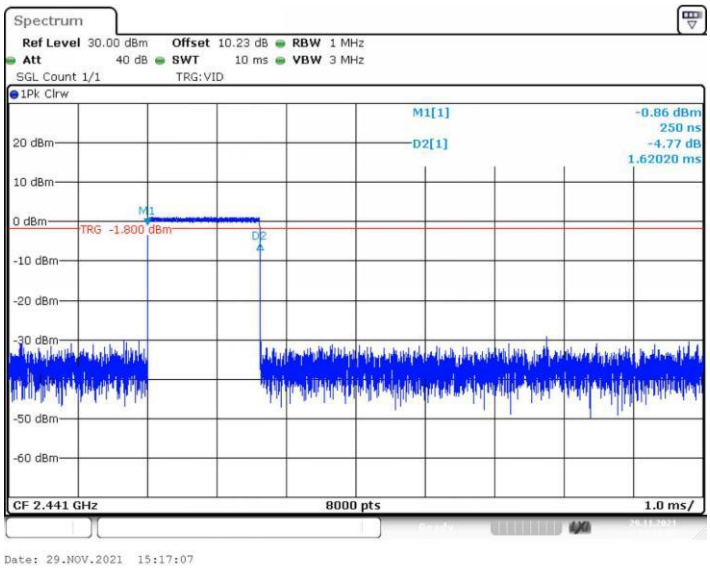
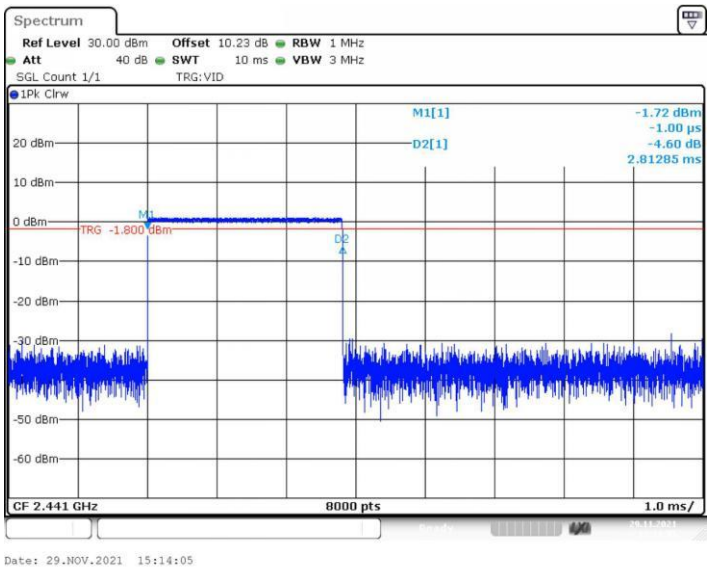
GFSK mode-DH3



GFSK mode-DH5



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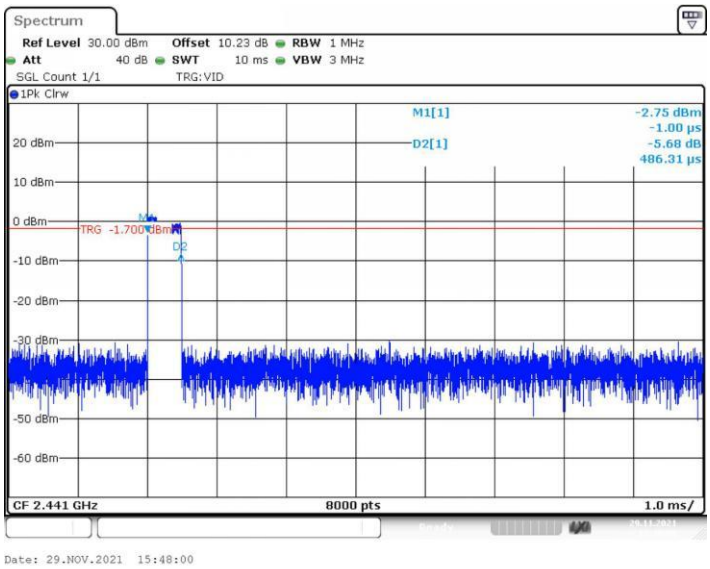
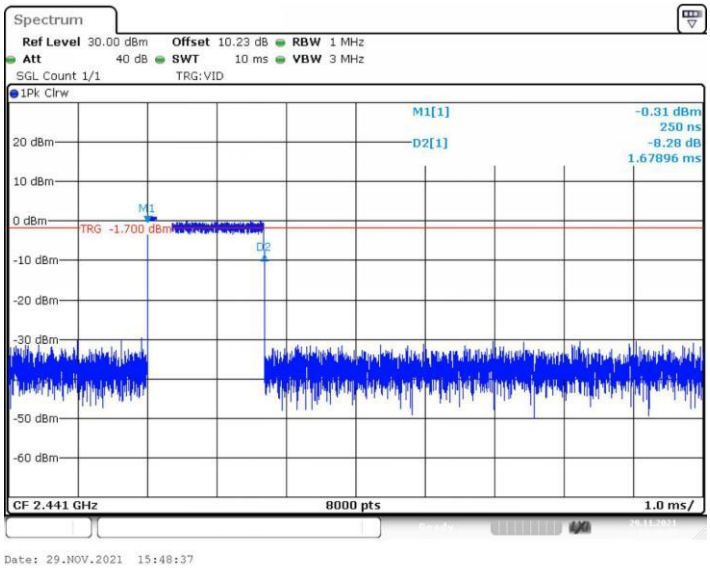
π/4-DQPSK mode-2DH1

π/4-DQPSK mode-2DH3


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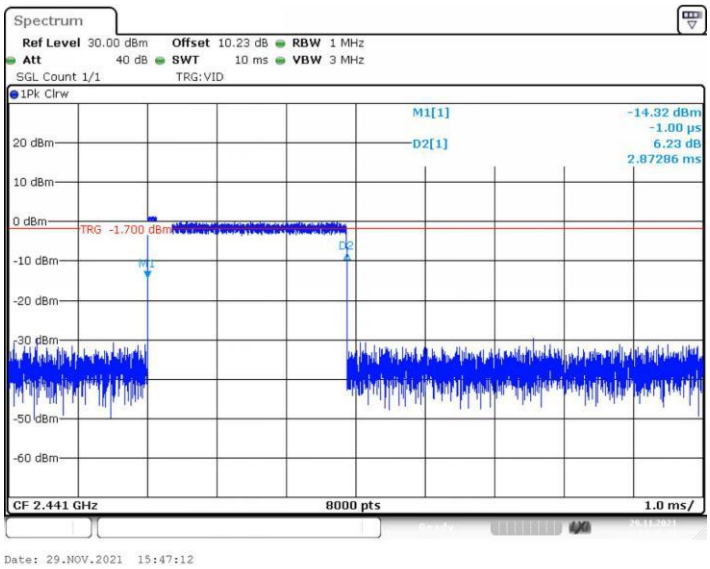
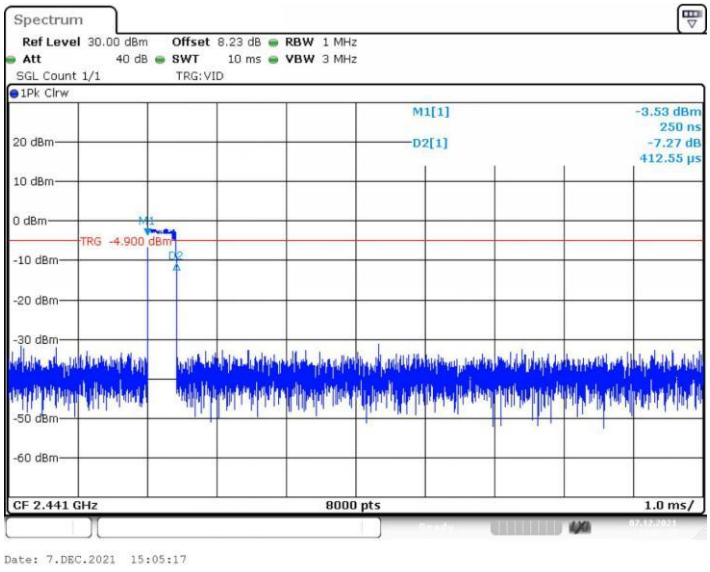
π/4-DQPSK mode-2DH5

8DPSK mode-3DH1


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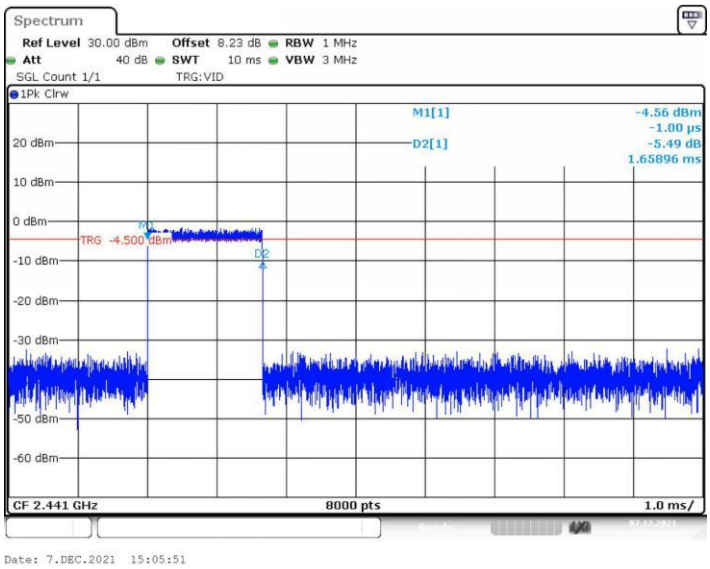
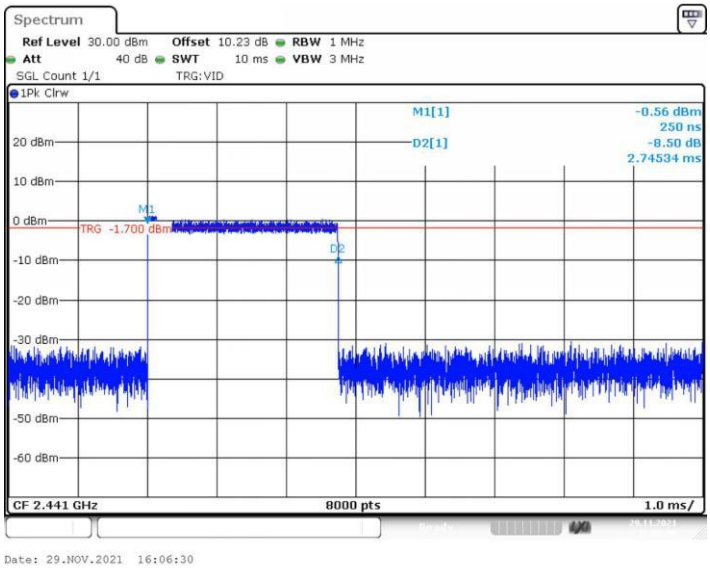
8DPSK mode-3DH3

8DPSK mode-3DH5


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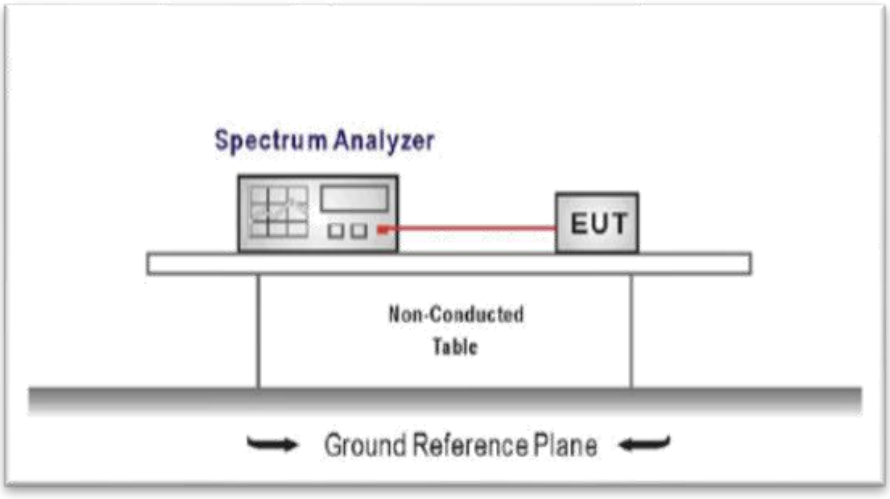
3.7. Band Edge and Spurious Emission (conducted)

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section15.247 (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. Connect EUT RF Output port to the Spectrum Analyzer through an RF attenuator.
2. Spectrum Setting:
   RBW=100KHz
   VBW=3*RBW.
   Detector function: Peak.
   Trace: Max hold.
   Sweep = Auto couple.

   Allow the trace to stabilize.

TEST MODE:

Please refer to the clause 2.2.

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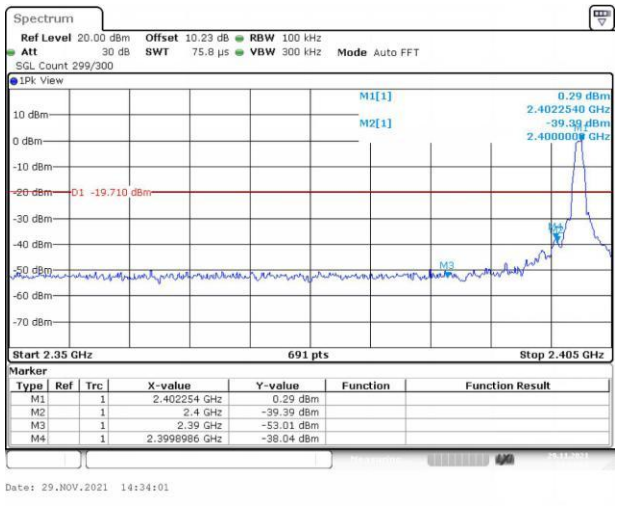
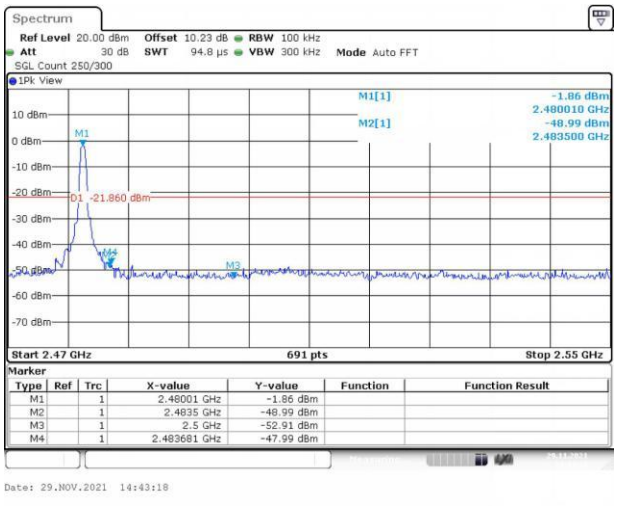
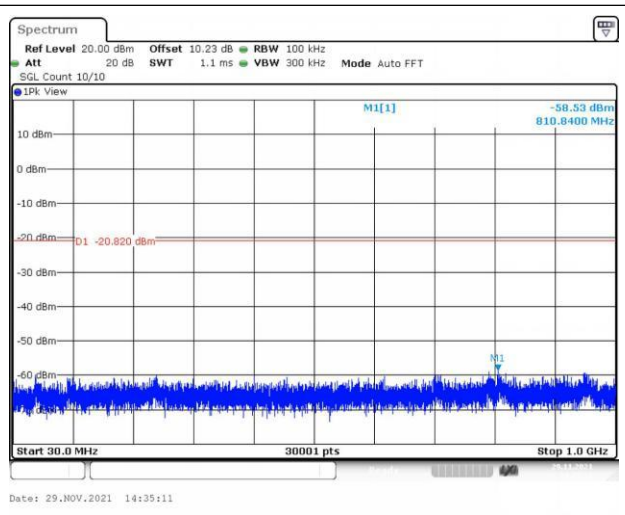
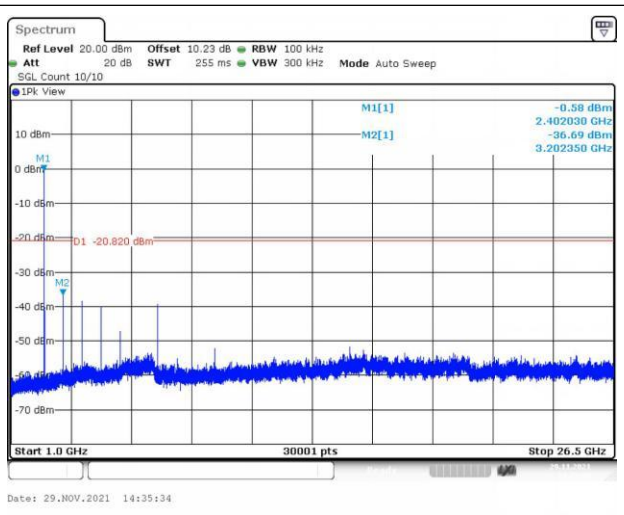
TEST RESULTS

DH5	
CH00-Bandedge	CH78-Bandedge
	

DH5	
CH00-SE	
	

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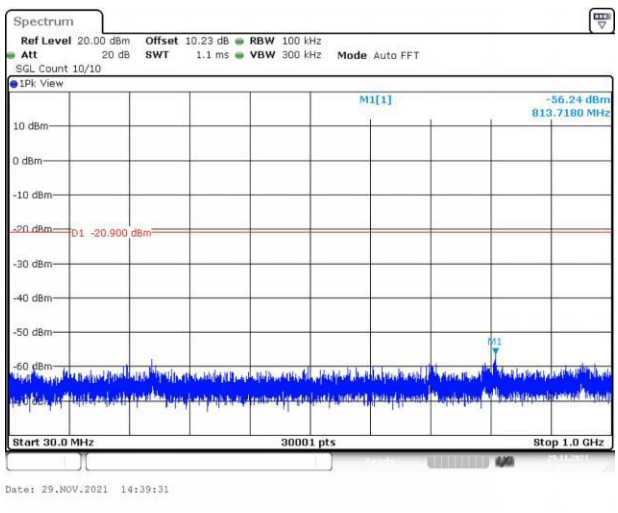
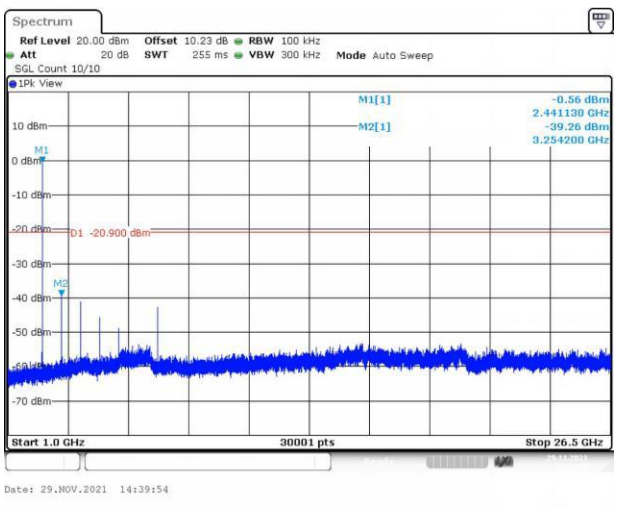
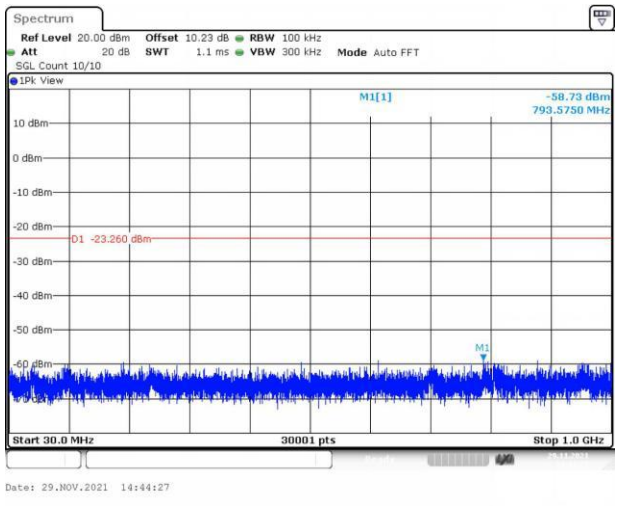
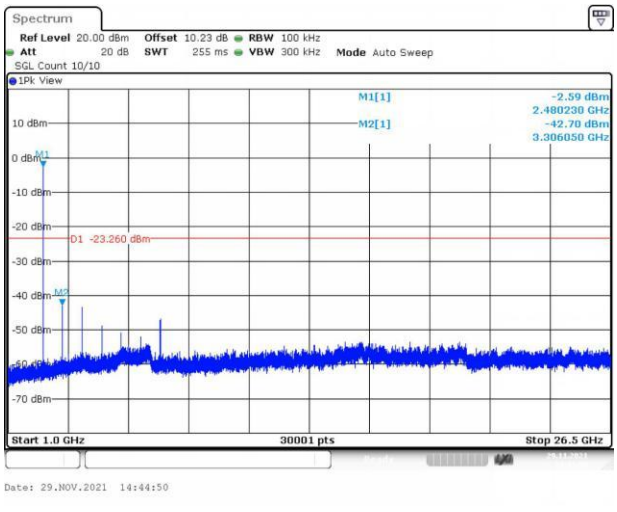
CH39-SE	
	
CH78-SE	
	

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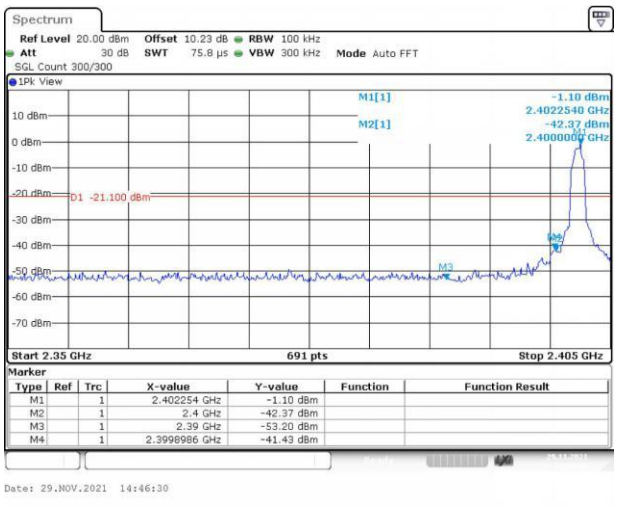	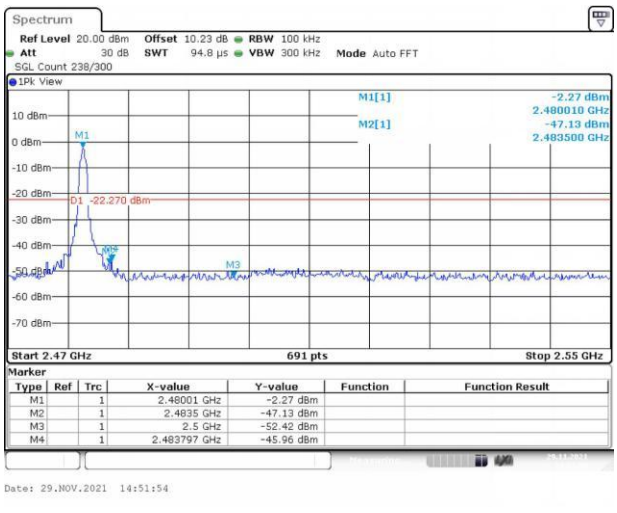

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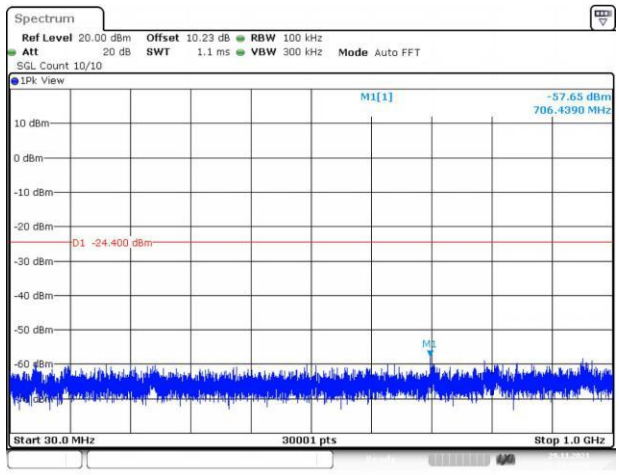	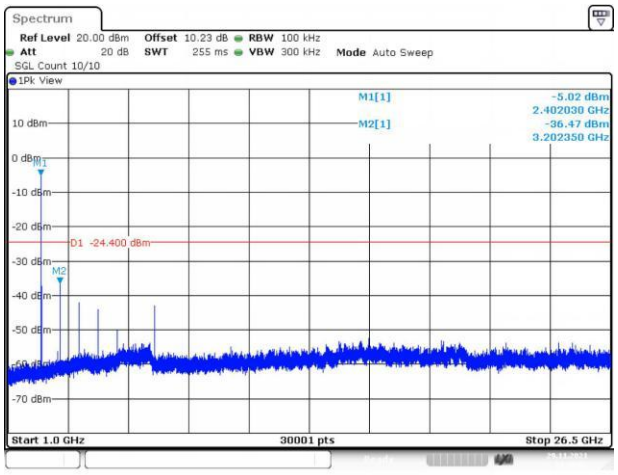
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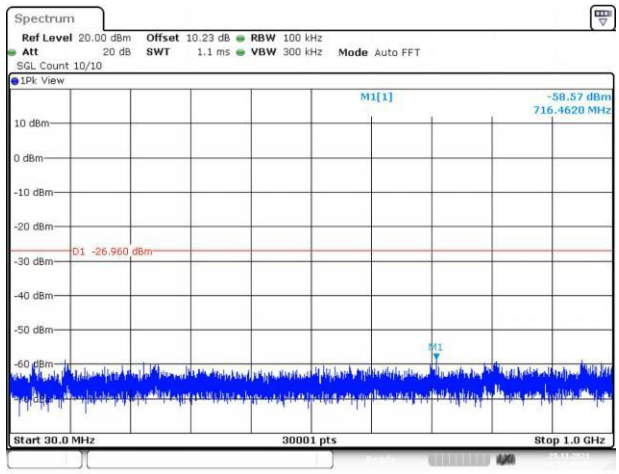	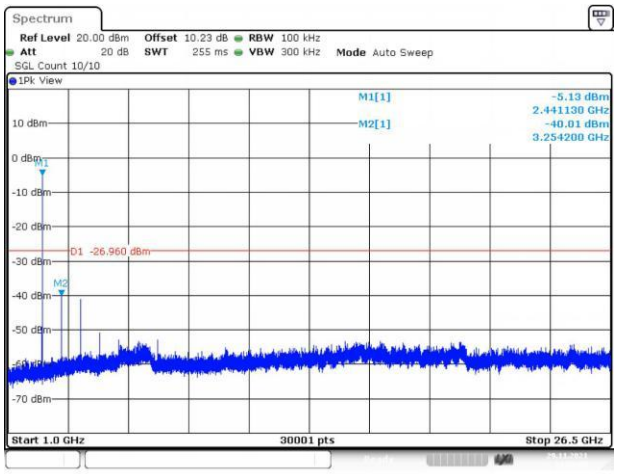
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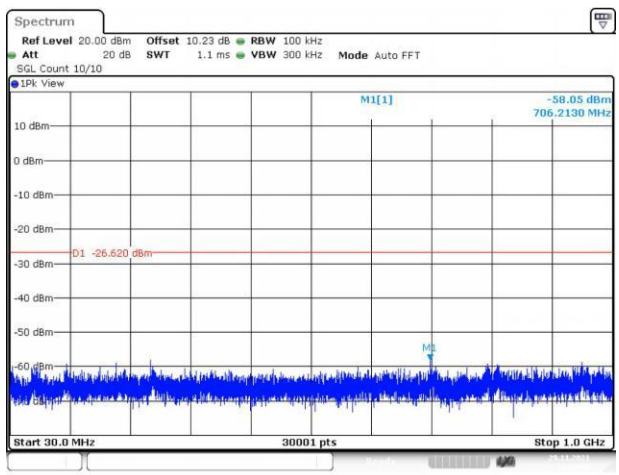	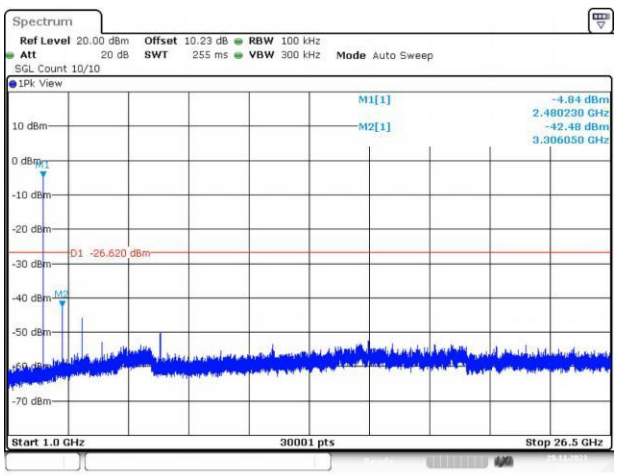

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