KSIGN®
KSIGN (Guangdong) Testing Co., Ltd.
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TEST REPORT

Report No.....:	**KS2010S01328E02**
FCC ID.....:	**2AXPW-MD011**
Applicant.....:	**Shenzhen Moldull Acoustic Technology**
Address.....:	403 Huiyi Wealth Center No.9, Zhongxin Road, Dalang, Longhua New Area, ShenZhen
Manufacturer.....:	Shenzhen Moldull Acoustic Technology
Address.....:	403 Huiyi Wealth Center No.9, Zhongxin Road, Dalang, Longhua New Area, ShenZhen
Product Name.....:	TWS **Bluetooth Headset**
Trade Mark.....:	MOLDULL 魔都
Model/Type reference.....:	MD011
Listed Model(s).....:	/
Standard.....:	**FCC CFR Title 47 Part 15 Subpart C Section 15.247**
Date of Receipt.....:	Oct. 10, 2020
Date of Test Date.....:	Oct. 10, 2020- Oct. 29, 2020
Date of issue.....:	Oct. 29, 2020
Test result.....:	**Pass**

Compiled by: (Printed name+signature)	Rory Huang	Rory Huang
Supervised by: (Printed name+signature)	Eder Zhan	Eder.Zhan
Approved by: (Printed name+signature)	Cary Luo	Cary Luo

KSIGN(Guangdong) Testing Co.,Ltd. KSIGN APPROVED

Testing Laboratory Name.....:	**KSIGN(Guangdong) Testing Co., Ltd.**
Address.....:	West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu,Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, People's Republic of 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.

ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.

1.2. Report version

Revised No.	Date of issue	Description
01	Nov. 09, 2020	Original

1.3. Test Description

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

Note: The measurement uncertainty is not included in the test result.

1.4. Test Facility

Address of the report laboratory

KSIGN(Guangdong) Testing Co., Ltd.

West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu,Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, People's Republic of China

Laboratory accreditation

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

CNAS-Lab Code: L13261

KSIGN(Guangdong) 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.: 5457.01

KSIGN(Guangdong) 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 Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

IC Registration No.: CN0096

The 3m alternate test site of KSIGN(Guangdong) 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.: CN1272

KSIGN(Guangdong) 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.

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

2. GENERAL INFORMATION

2.1. Client Information

Applicant:	Shenzhen Moldull Acoustic Technology
Address:	403 Huiyi Wealth Center No.9, Zhongxin Road, Dalang, Longhua New Area, ShenZhen
Manufacturer:	Shenzhen Moldull Acoustic Technology
Address:	403 Huiyi Wealth Center No.9, Zhongxin Road, Dalang, Longhua New Area, ShenZhen

2.2. General Description of EUT

Product Name:	**TWS Bluetooth Headset**
Marketing Name:	MD011
Model/Type reference:	/
Listed Model(s):	/
Model Difference:	/
Power supply(Battery):	Input :DC 3.7V 50mAh Input(Storage box) :DC 5V 1A ; Battery:DC3.7V 400mAh
Hardware version:	V1.0
Software version:	V1.0
Bluetooth 5.0	
Modulation:	GFSK(DH5), π/4-DQPSK(2DH5), 8DPSK(3DH5)
Operation frequency:	2402MHz~2480MHz
Max Peak Output Power:	DH5：-1.0dBm 2DH5：2.47dBm 3DH5：2.88dBm
Channel number:	79
Channel separation:	1MHz
Antenna type:	FPC Antenna
Antenna gain:	1.0dBi

2.3. 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 grey were the channel selected for testing.

Test mode

For RF test items:
The engineering test program was provided and enabled to make EUT continuous transmit
For AC power line conducted emissions:
The EUT was set to connect with the Bluetooth instrument under large package sizes transmission.
For Radiated spurious emissions test item:
The engineering test program was provided and enabled to make EUT continuous transmit. The EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

2.4. 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	04/07/2021
2	Vector Signal Generator	Agilent	N5182A	MY50142520	04/07/2021
3	Analog Signal Generator	HP	83752A	3344A00337	04/07/2021
4	Power Sensor	Agilent	E9304A	MY50390009	04/07/2021
5	Power Sensor	Agilent	E9300A	MY41498315	04/07/2021
6	Wideband Radio Communication Tester	R&S	CMW500	157282	04/07/2021
7	Climate Chamber	Angul	AGNH80L	1903042120	04/07/2021
8	Dual Output DC Power Supply	Agilent	E3646A	MY40009992	04/07/2021
9	RF Control Unit	Tonscend	JS0806-2	/	04/07/2021

Transmitter spurious emissions & Receiver spurious emissions					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
1	EMI Test Receiver	R&S	ESR	102525	04/07/2021
2	High Pass Filter	Chengdu E-Microwave	OHF-3-18-S	0E01901038	03/27/2021
3	High Pass Filter	Chengdu E-Microwave	OHF-6.5-18-S	0E01901039	03/27/2021
4	Spectrum Analyzer	HP	8593E	3831U02087	04/07/2021
5	Ultra-Broadband logarithmic period Antenna	Schwarzbeck	VULB 9163	01230	03/29/2023
6	Loop Antenna	Beijin ZHINAN	ZN30900C	18050	03/25/2021
7	Spectrum Analyzer	R&S	FSV40-N	101798	04/07/2021
8	Horn Antenna	Schwarzbeck	BBHA 9120 D	2023	03/29/2023
9	Pre-Amplifier	Schwarzbeck	BBV 9745	9745#129	04/07/2021
10	Pre-Amplifier	EMCI	EMC051835SE	980662	04/07/2021
11	Pre-Amplifier	Schwarzbeck	BBV-9721	57	04/07/2021
12	Horn Antenna	Schwarzbeck	BBHA 9170	00939	03/29/2021

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	LISN	R&S	ENV432	1326.6105.02	03/27/2021
2	EMI Test Receiver	R&S	ESR	102524	04/07/2021
3	Manual RF Switch	JS TOYO	/	MSW-01/002	04/07/2021

Note:
1)The Cal. Interval was one year.
2)The cable loss has calculated in test result which connection between each test instruments.

2.5. 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

3. TEST ITEM AND RESULTS

3.1. Antenna requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C Section 15.203:

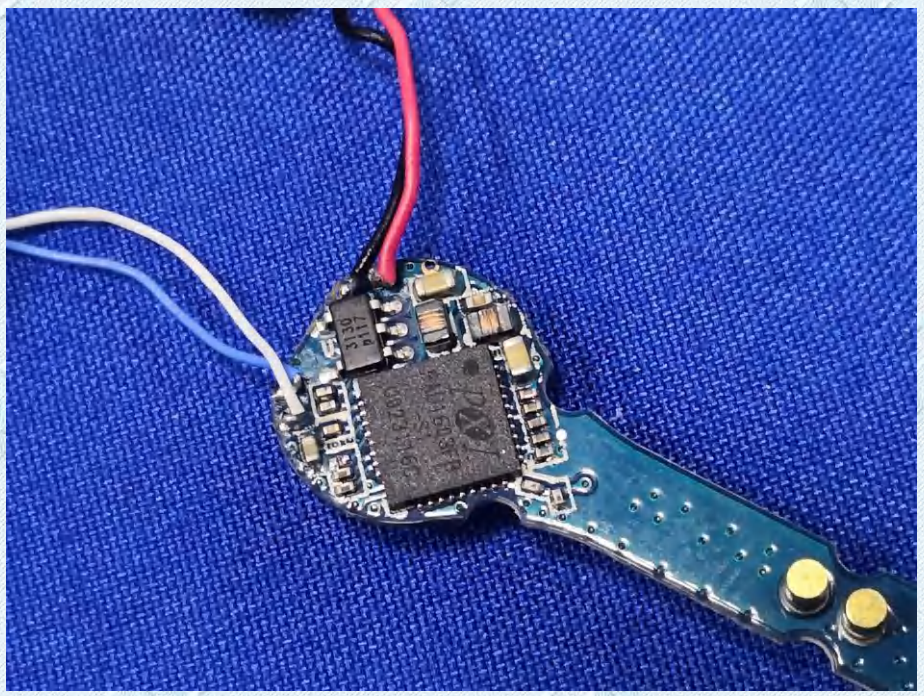
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit 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.



3.2. Conducted Emission

Limit

Conducted Emission Test Limit

Frequency	Maximum RF Line Voltage (dBμV)	
	Quasi-peak Level	Average Level
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
500kHz~5MHz	56	46
5MHz~30MHz	60	50

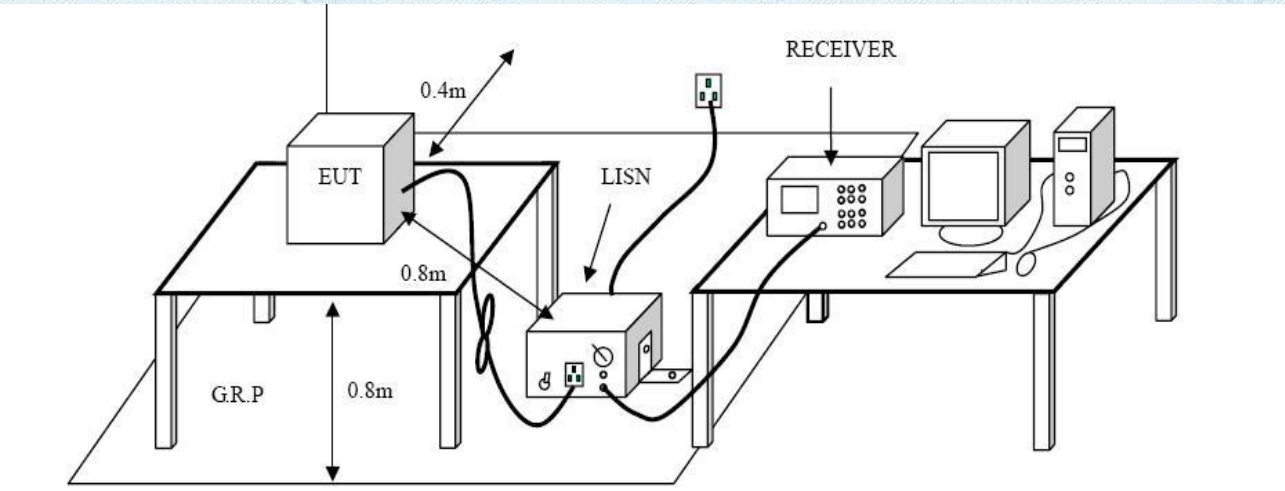
Notes:

(1) *Decreasing linearly with logarithm of the frequency.

(2) The lower limit shall apply at the transition frequencies.

(3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

Test Configuration



Test Procedure

1. The EUT was setup according to ANSI C63.10:2013 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50ohm /50uH coupling impedance for the measuring equipment.
   The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
4. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
5. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
6. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
7. During the above scans, the emissions were maximized by cable manipulation.

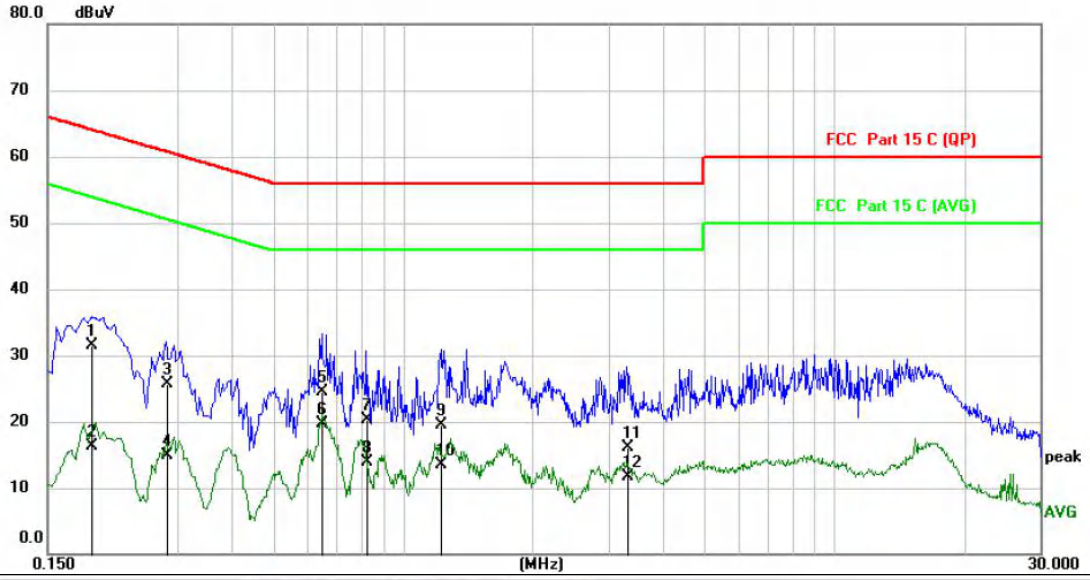
Test Mode:

Please refer to the clause 2.3.

Test Results

Pre-scan DH5, 2DH5,3DH5 modulation, and found the 2DH5 modulation 2402MHz which it is worse case, so only show the test data for worse case.

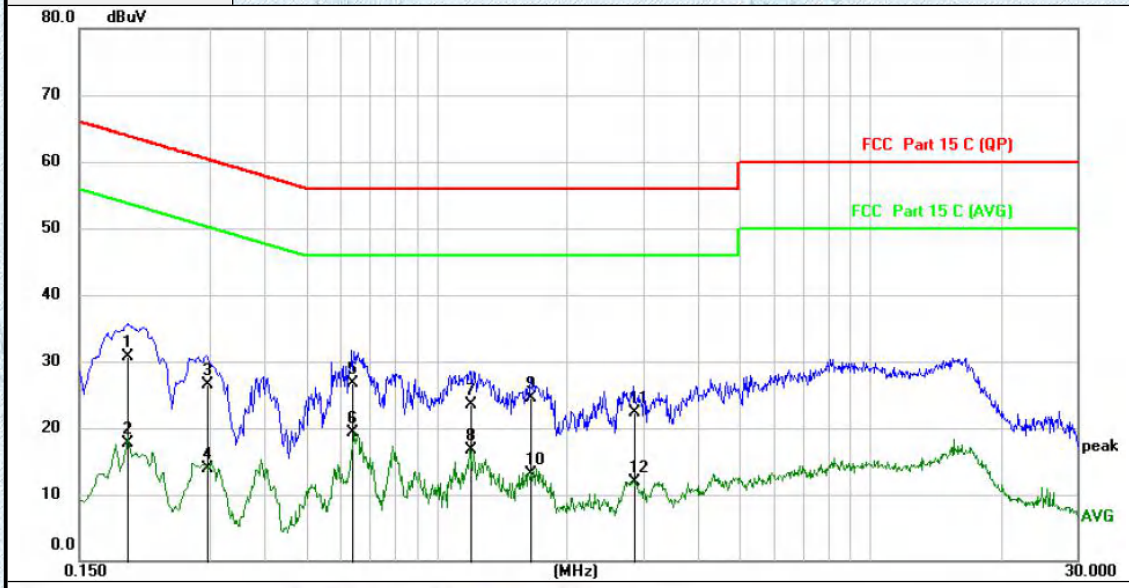
Test Voltage:	AC 120V/60 Hz
Terminal:	Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1900	20.59	10.87	31.46	64.04	-32.58	QP	
2		0.1900	5.50	10.87	16.37	54.04	-37.67	AVG	
3		0.2819	14.88	10.88	25.76	60.76	-35.00	QP	
4		0.2819	3.93	10.88	14.81	50.76	-35.95	AVG	
5		0.6500	13.55	10.89	24.44	56.00	-31.56	QP	
6	*	0.6500	8.78	10.89	19.67	46.00	-26.33	AVG	
7		0.8220	9.50	10.88	20.38	56.00	-35.62	QP	
8		0.8220	2.95	10.88	13.83	46.00	-32.17	AVG	
9		1.2260	8.57	10.88	19.45	56.00	-36.55	QP	
10		1.2260	2.62	10.88	13.50	46.00	-32.50	AVG	
11		3.2940	5.22	10.93	16.15	56.00	-39.85	QP	
12		3.2940	0.71	10.93	11.64	46.00	-34.36	AVG	

Remarks:
1.Measurement = Reading Level+ Correct Factor
2.Over = Measurement -Limit

Test Voltage:	AC 120V/60 Hz
Terminal:	Neutral



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1940	19.81	10.88	30.69	63.86	-33.17	QP	
2		0.1940	6.78	10.88	17.66	53.86	-36.20	AVG	
3		0.2940	15.65	10.84	26.49	60.41	-33.92	QP	
4		0.2940	3.12	10.84	13.96	50.41	-36.45	AVG	
5		0.6380	15.81	10.87	26.68	56.00	-29.32	QP	
6	*	0.6380	8.38	10.87	19.25	46.00	-26.75	AVG	
7		1.1940	12.64	10.87	23.51	56.00	-32.49	QP	
8		1.1940	5.77	10.87	16.64	46.00	-29.36	AVG	
9		1.6500	13.60	10.88	24.48	56.00	-31.52	QP	
10		1.6500	2.30	10.88	13.18	46.00	-32.82	AVG	
11		2.8500	11.41	10.92	22.33	56.00	-33.67	QP	
12		2.8500	1.06	10.92	11.98	46.00	-34.02	AVG	

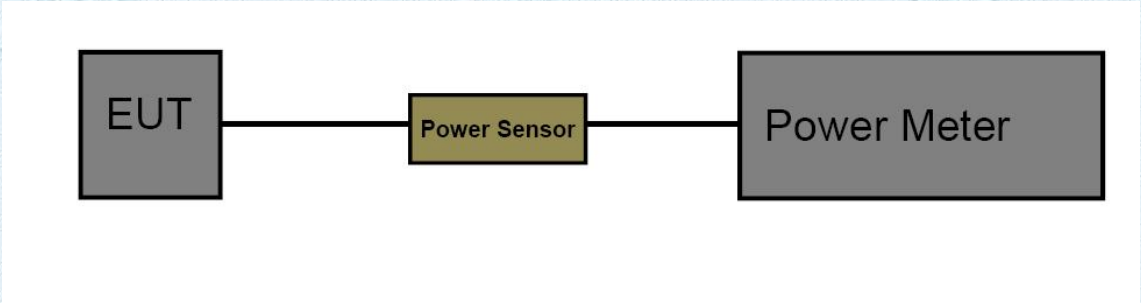
Remarks:
1.Measurement = Reading Level+ Correct Factor
2.Over = Measurement -Limit

3.3. 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.

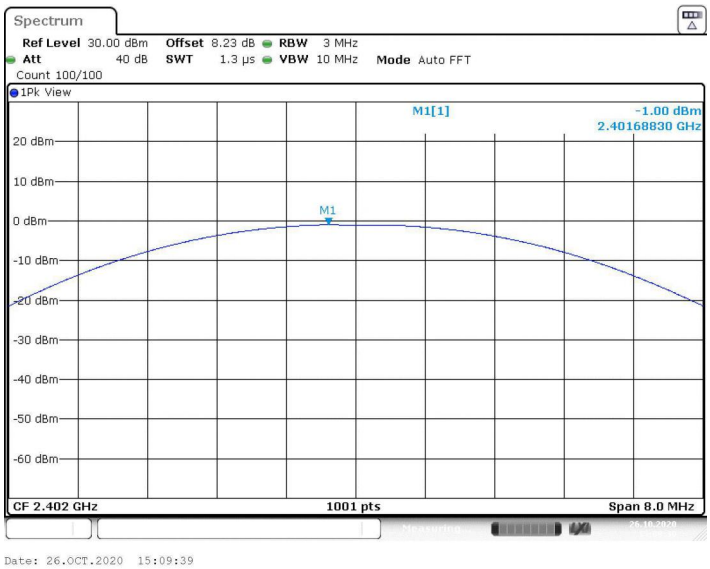
Test Mode

Please refer to the clause 2.3

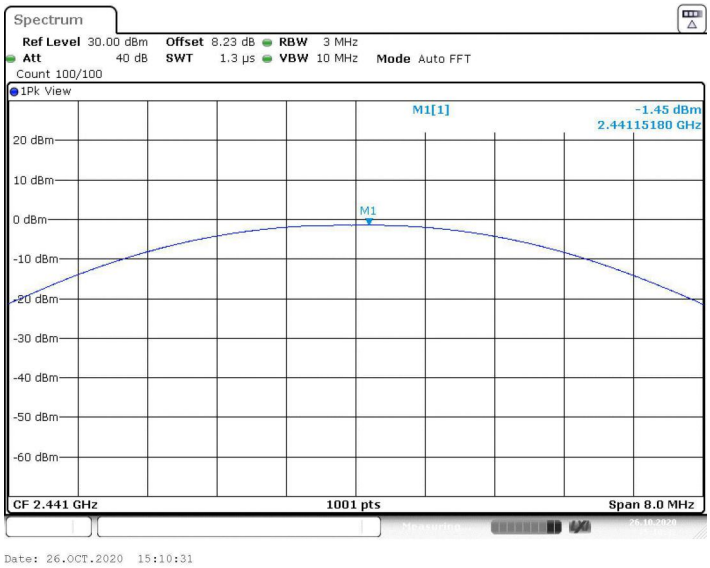
Test Result

Test Mode:	DH5	
Channel frequency (MHz)	**Test Result (dBm)**	**Limit (dBm)**
2402	-1	**30**
2441	-1.45	
2480	-2.24	

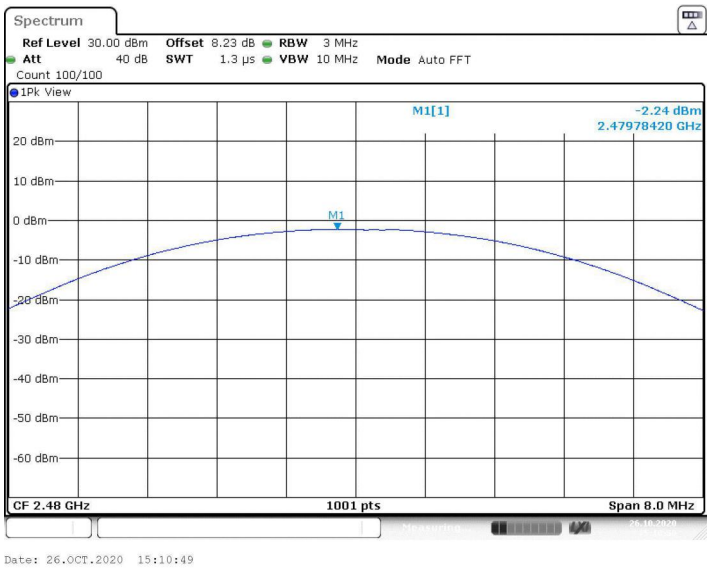
2402 MHz



2441 MHz

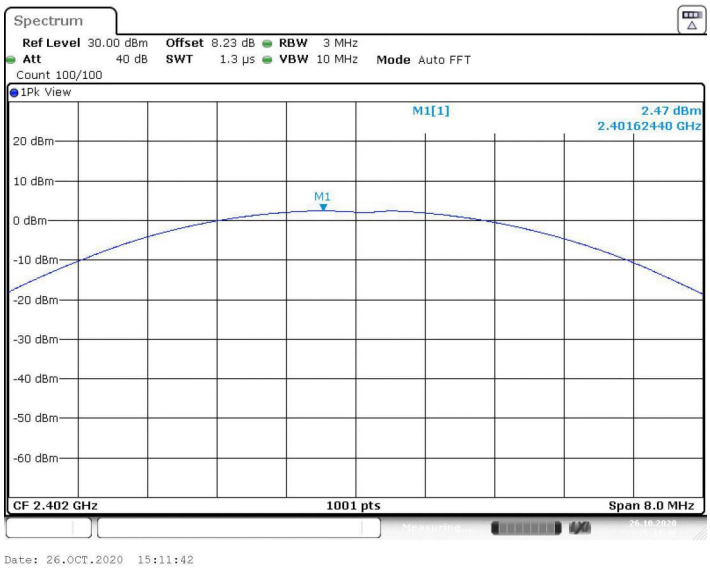


2480 MHz

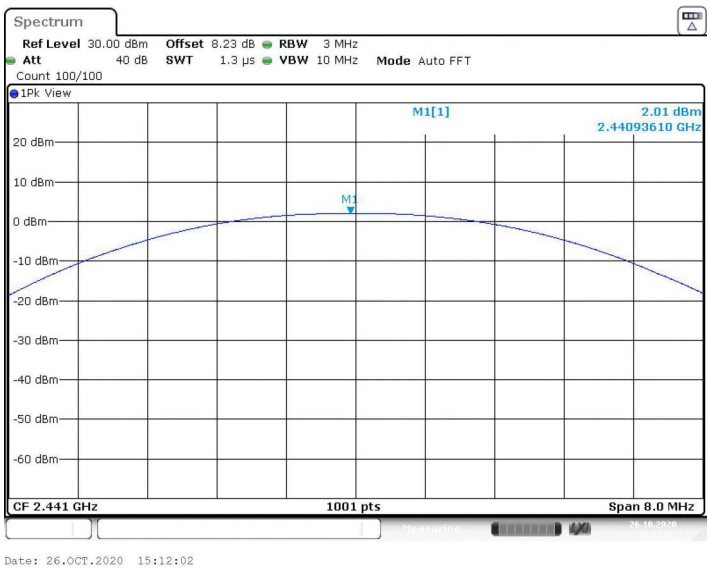

Spectrum
Ref Level 30.00 dBm Offset 8.23 dB RBW 3 MHz
Att 40 dB SWT 1.3 µs VBW 10 MHz Mode Auto FFT
Count 100/100
1Pk View
M1[1] -2.24 dBm
2.47978420 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
M1
CF 2.48 GHz
1001 pts
Span 8.0 MHz
Date: 26.OCT.2020 15:10:49

Test Mode:	2DH5	
Channel frequency (MHz)	**Test Result (dBm)**	**Limit (dBm)**
2402	2.47	**30**
2441	2.01	
2480	1.32	

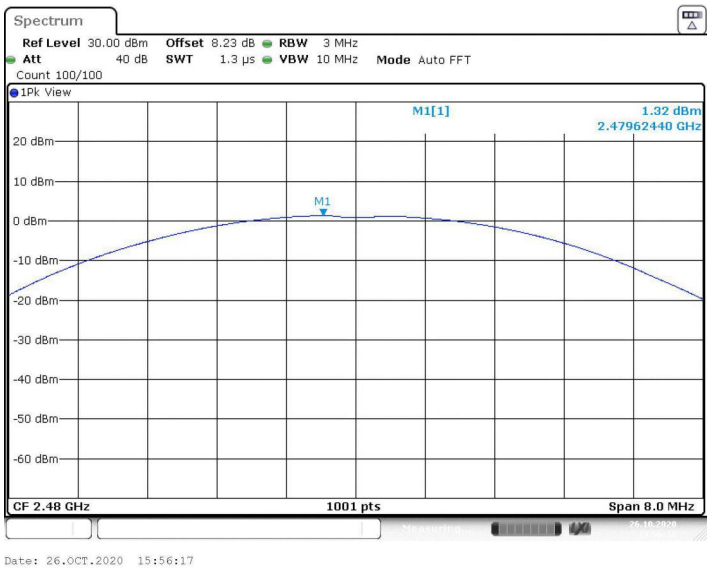
2402 MHz



2441 MHz

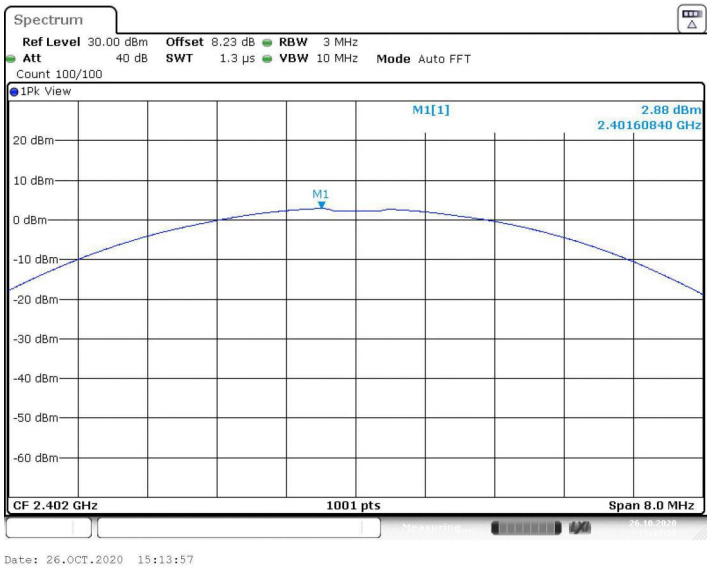


2480 MHz

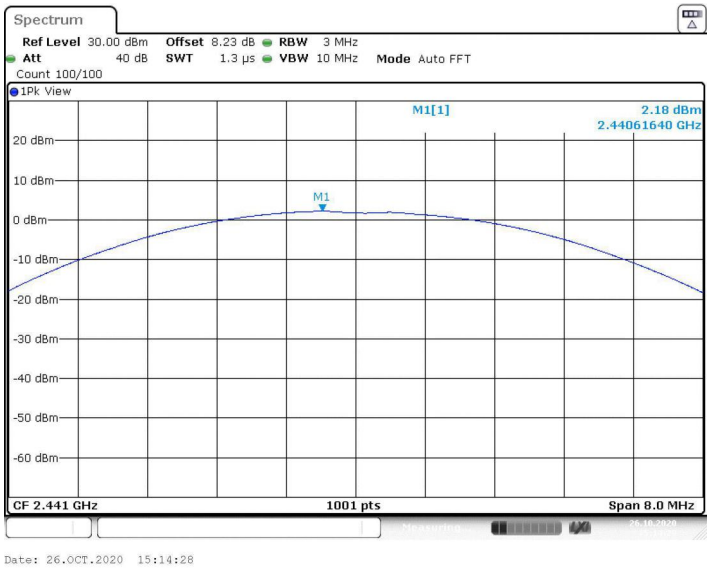

Spectrum
Ref Level 30.00 dBm Offset 8.23 dB RBW 3 MHz
Att 40 dB SWT 1.3 µs VBW 10 MHz Mode Auto FFT
Count 100/100
1Pk View
M1[1] 1.32 dBm
2.47962440 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
M1
CF 2.48 GHz
1001 pts
Span 8.0 MHz
Date: 26.OCT.2020 15:56:17

Test Mode:	3DH5	
Channel frequency (MHz)	**Test Result (dBm)**	**Limit (dBm)**
2402	2.88	**30**
2441	2.18	
2480	1.75	

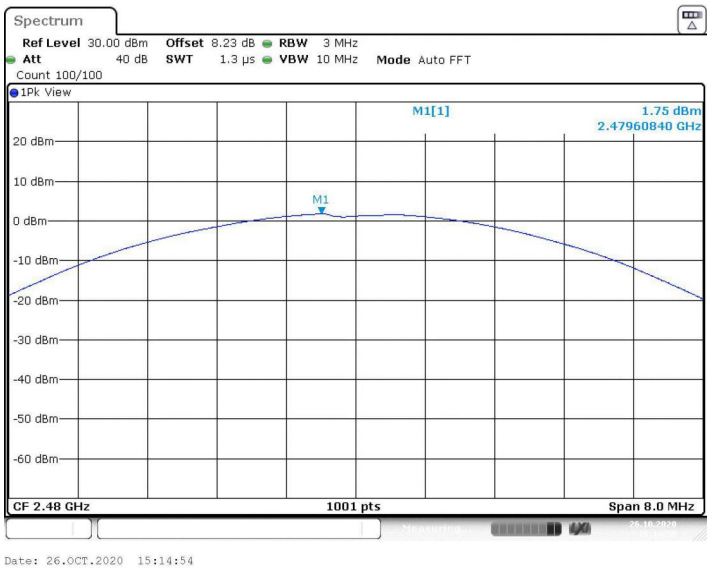
2402 MHz



2441 MHz



2480 MHz

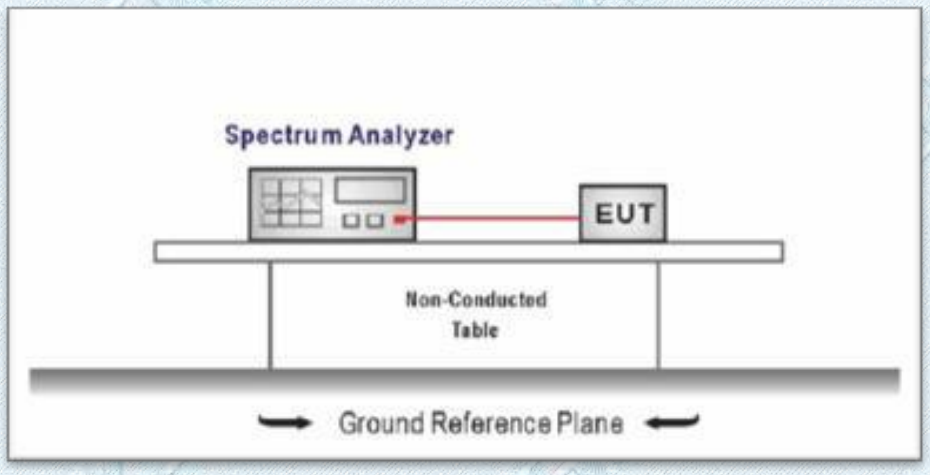

Spectrum
Ref Level 30.00 dBm Offset 8.23 dB RBW 3 MHz
Att 40 dB SWT 1.3 µs VBW 10 MHz Mode Auto FFT
Count 100/100
1Pk View
M1[1] 1.75 dBm
2.47960840 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
M1
CF 2.48 GHz
1001 pts
Span 8.0 MHz
Date: 26.OCT.2020 15:14:54

3.4. 99% Occupied Bandwidth & 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.

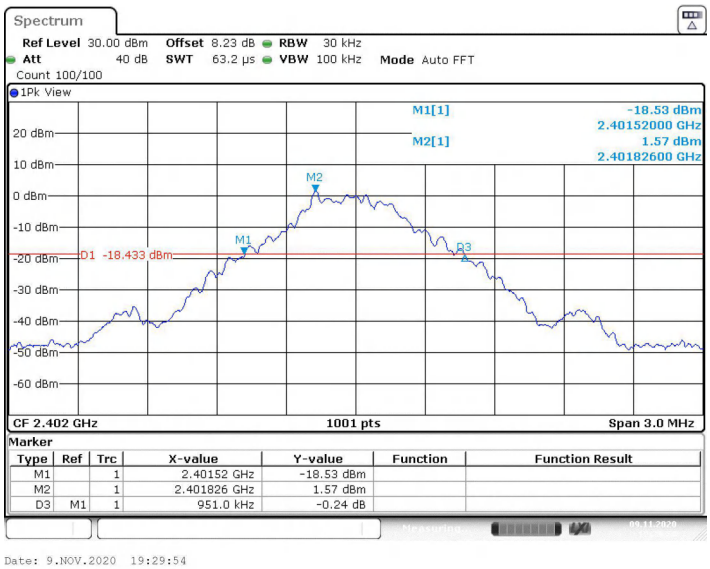
Test Mode

Please refer to the clause 2.3.

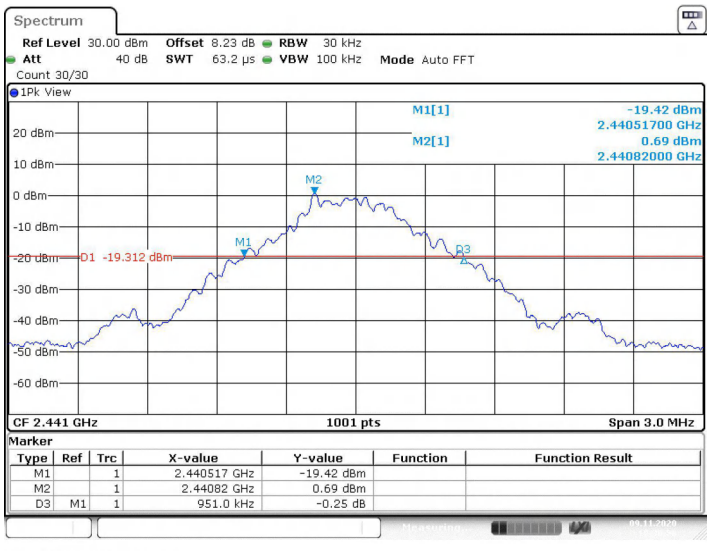
Test Results

Test Mode:	DH5			
Channel frequency (MHz)	20dB Bandwidth [MHz]	FL[MHz]	FH[MHz]	Verdict
2402	0.951	2401.520	2418.826	PASS
2441	0.951	2440.517	2441.468	PASS
2480	0.954	2479.514	2480.468	PASS

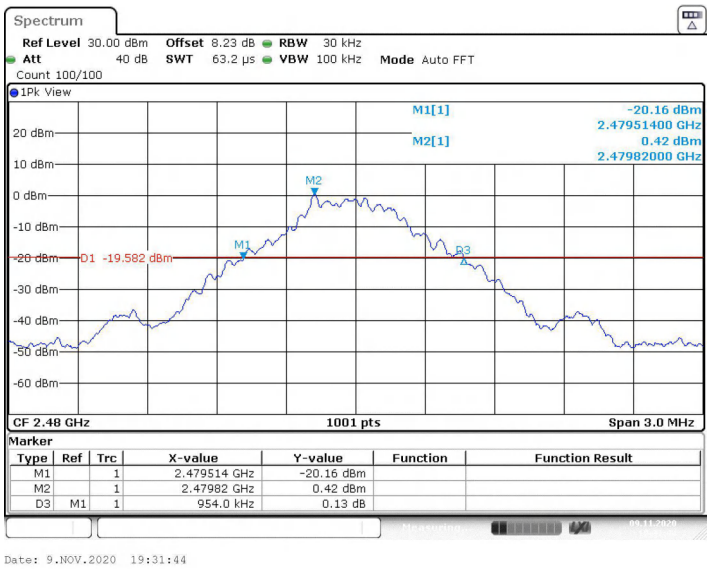
2402 MHz



2441 MHz

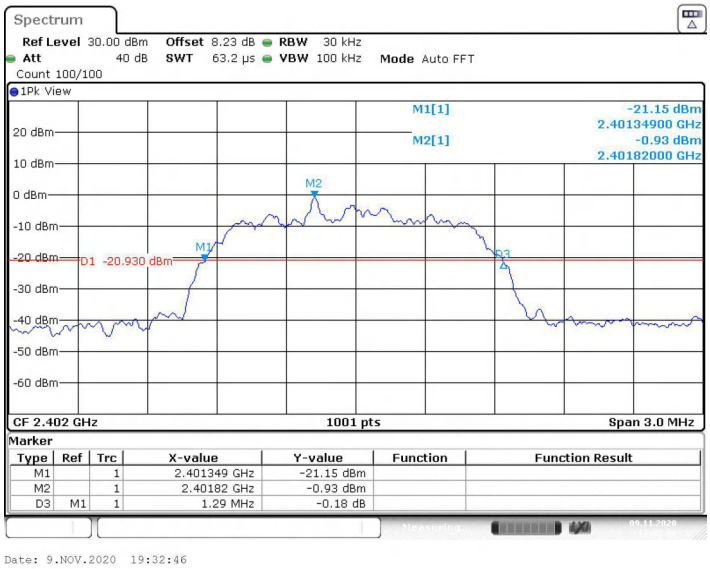


2480 MHz

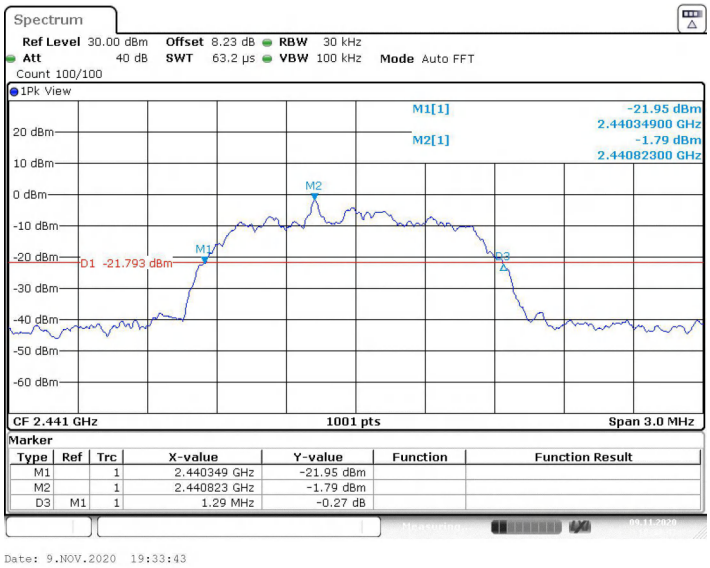

Spectrum
Ref Level 30.00 dBm Offset 8.23 dB RBW 30 kHz
Att 40 dB SWT 63.2 µs VBW 100 kHz Mode Auto FFT
Count 100/100
1Pk View
M1[1] -20.16 dBm
2.47951400 GHz
M2[1] 0.42 dBm
2.47982000 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
D1 -19.582 dBm
M1
M2
D3
CF 2.48 GHz
1001 pts
Span 3.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.479514 GHz -20.16 dBm
M2 1 2.47982 GHz 0.42 dBm
D3 M1 1 954.0 kHz 0.13 dB
Date: 9.NOV.2020 19:31:44

Test Mode:	2DH5			
Channel frequency (MHz)	20dB Bandwidth [MHz]	FL[MHz]	FH[MHz]	Verdict
2402	1.290	2401.349	2402.639	PASS
2441	1.290	2440.349	2441.639	PASS
2480	1.386	2479.289	2480.675	PASS

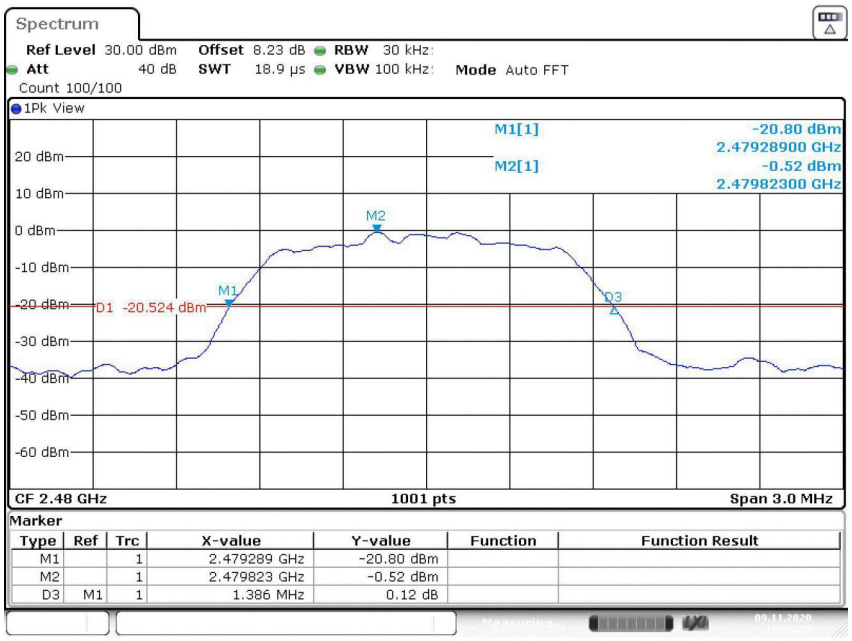
2402 MHz



2441 MHz

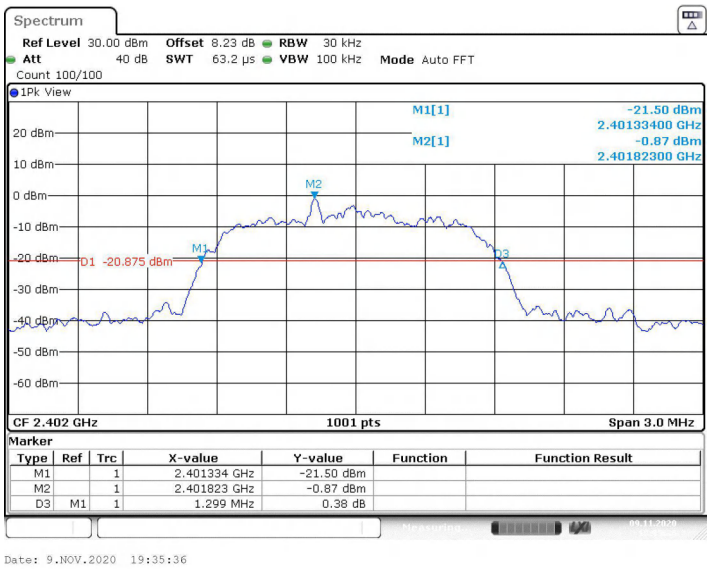


2480 MHz

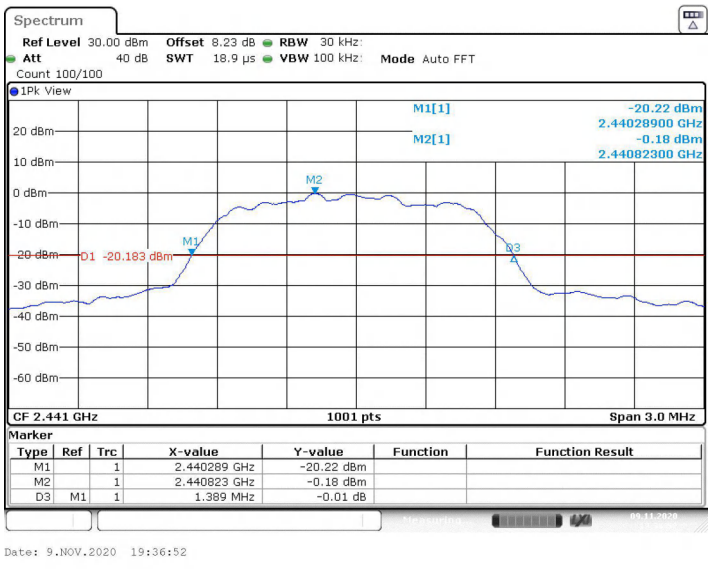

Spectrum
Ref Level 30.00 dBm Offset 8.23 dB RBW 30 kHz
Att 40 dB SWT 18.9 µs VBW 100 kHz Mode Auto FFT
Count 100/100
1Pk View
M1[1] -20.80 dBm
2.47928900 GHz
M2[1] -0.52 dBm
2.47982300 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
D1 -20.524 dBm
M1
M2
D3
CF 2.48 GHz
1001 pts
Span 3.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.479289 GHz -20.80 dBm
M2 1 2.479823 GHz -0.52 dBm
D3 M1 1 1.386 MHz 0.12 dB
Date: 9.NOV.2020 19:34:27

Test Mode:	3DH5			
Channel frequency (MHz)	20dB Bandwidth [MHz]	FL[MHz]	FH[MHz]	Verdict
2402	1.299	2401.334	2402.633	PASS
2441	1.389	2440.289	2441.678	PASS
2480	1.392	2479.289	2480.681	PASS

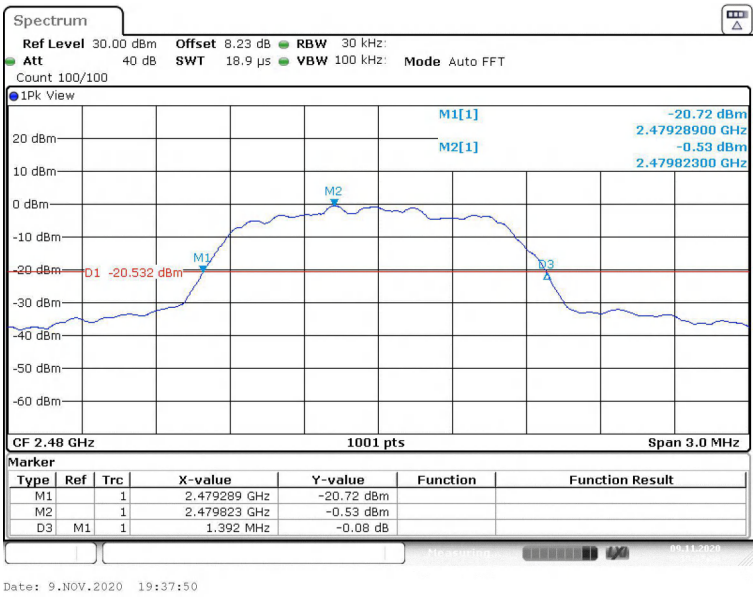
2402 MHz



2441 MHz

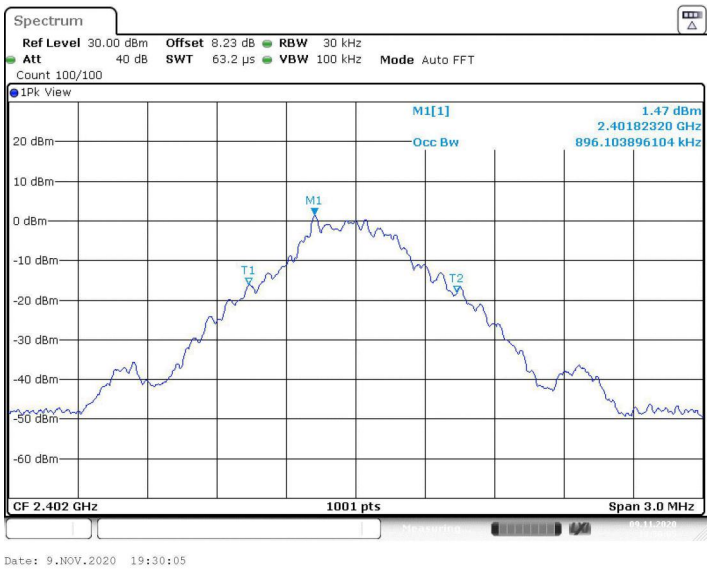


2480 MHz

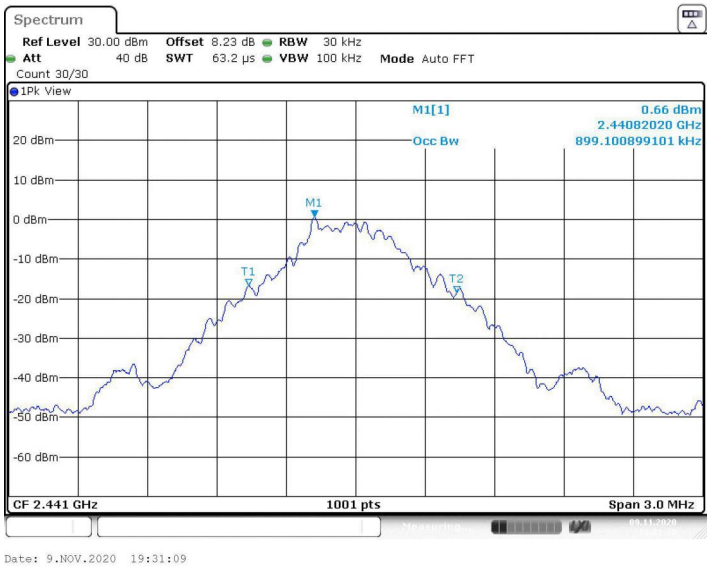

Spectrum
Ref Level 30.00 dBm Offset 8.23 dB RBW 30 kHz
Att 40 dB SWT 18.9 µs VBW 100 kHz Mode Auto FFT
Count 100/100
1Pk View
M1[1] -20.72 dBm
2.47928900 GHz
M2[1] -0.53 dBm
2.47982300 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
D1 -20.532 dBm
M1
M2
D3
CF 2.48 GHz
1001 pts
Span 3.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.479289 GHz -20.72 dBm
M2 1 2.479823 GHz -0.53 dBm
D3 M1 1 1.392 MHz -0.08 dB
Date: 9.NOV.2020 19:37:50

Test Mode:	DH5			
Channel frequency (MHz)	99% OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
2402	0.896	2401.541	2402.432	PASS
2441	0.899	2440.535	2441.435	PASS
2480	0.902	2479.532	2480.435	PASS

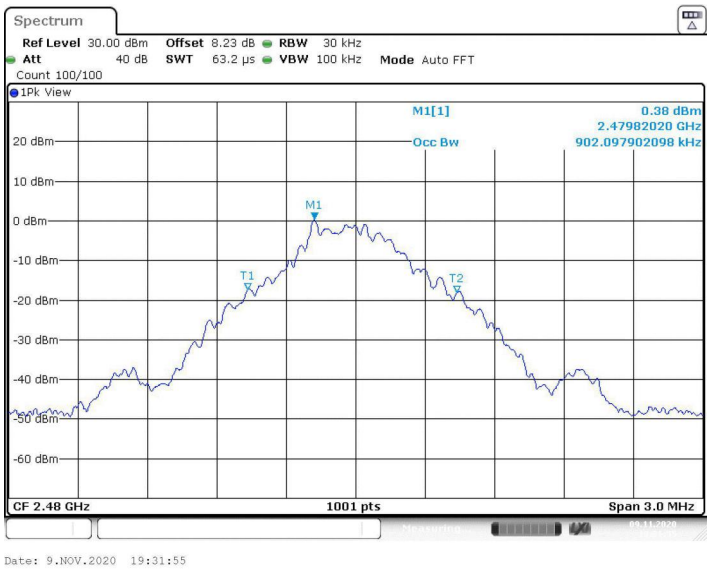
2402 MHz



2441 MHz

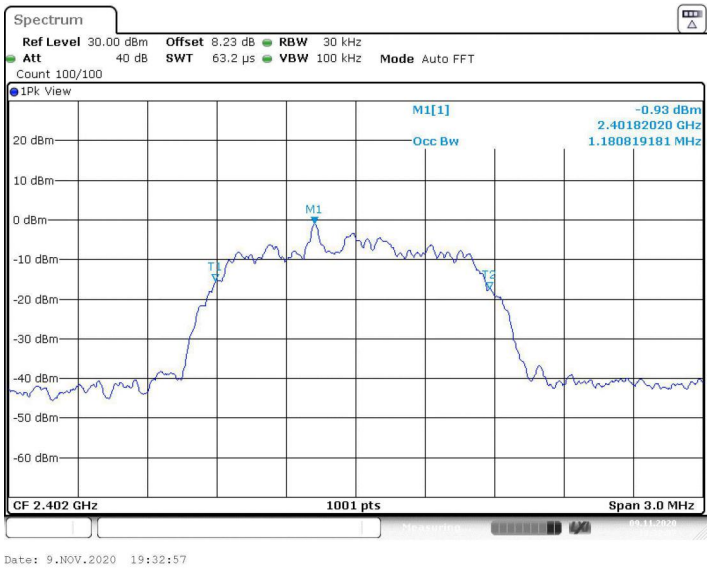


2480 MHz

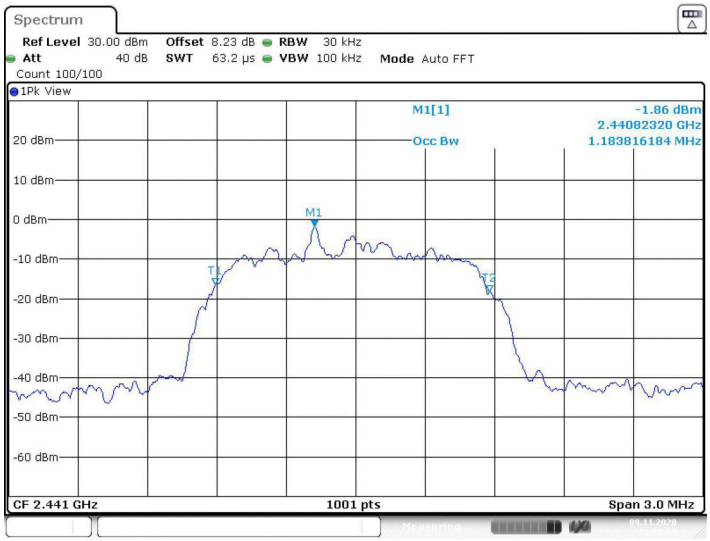


Test Mode:	2DH5			
Channel frequency (MHz)	99% OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
2402	1.181	2401.395	2402.575	PASS
2441	1.184	2440.392	2441.575	PASS
2480	1.181	2479.395	2480.575	PASS

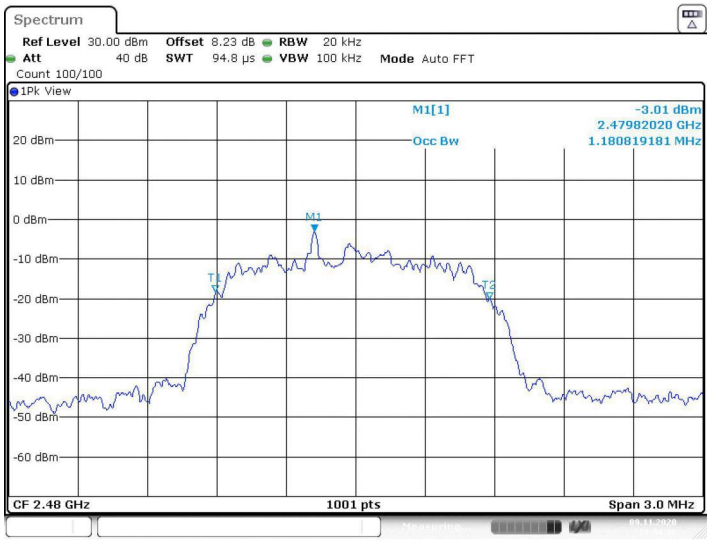
2402 MHz



2441 MHz

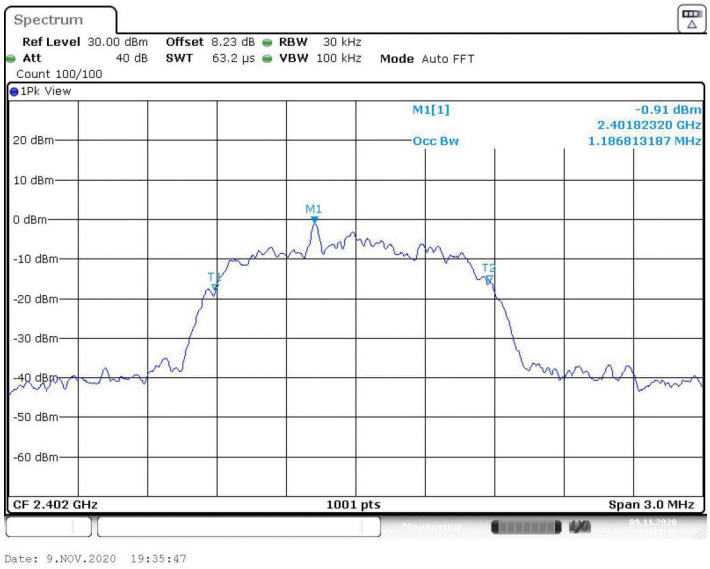


2480 MHz

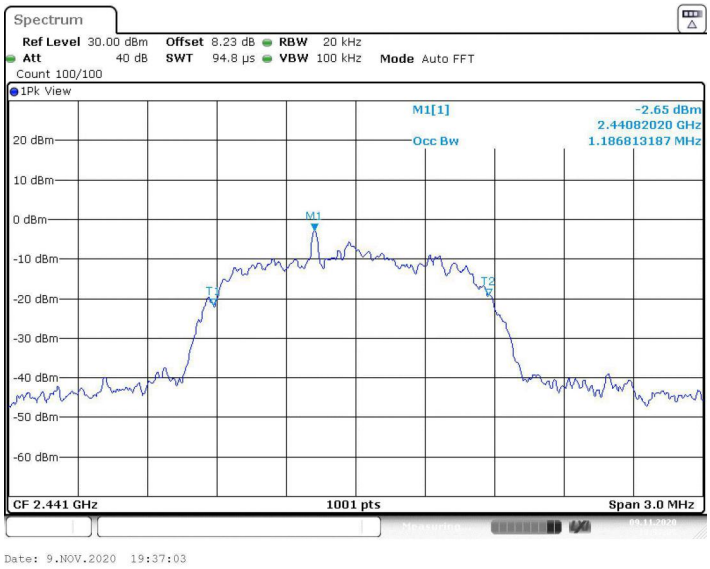


Test Mode:	3DH5			
Channel frequency (MHz)	99% OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
2402	1.187	2401.392	2402.578	PASS
2441	1.187	2440.386	2441.572	PASS
2480	1.19	2479.386	2480.575	PASS

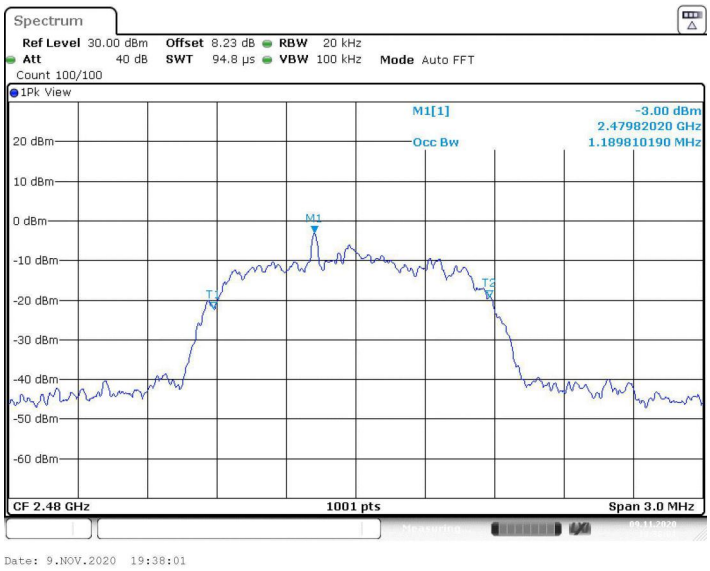
2402 MHz



2441 MHz



2480 MHz


Spectrum
Ref Level 30.00 dBm Offset 8.23 dB RBW 20 kHz
Att 40 dB SWT 94.8 µs VBW 100 kHz Mode Auto FFT
Count 100/100
1Pk View
M1[1] -3.00 dBm
2.47982020 GHz
Occ Bw 1.189810190 MHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
M1
CF 2.48 GHz
1001 pts
Span 3.0 MHz
Date: 9.NOV.2020 19:38:01

3.5. Carrier Frequencies Separation

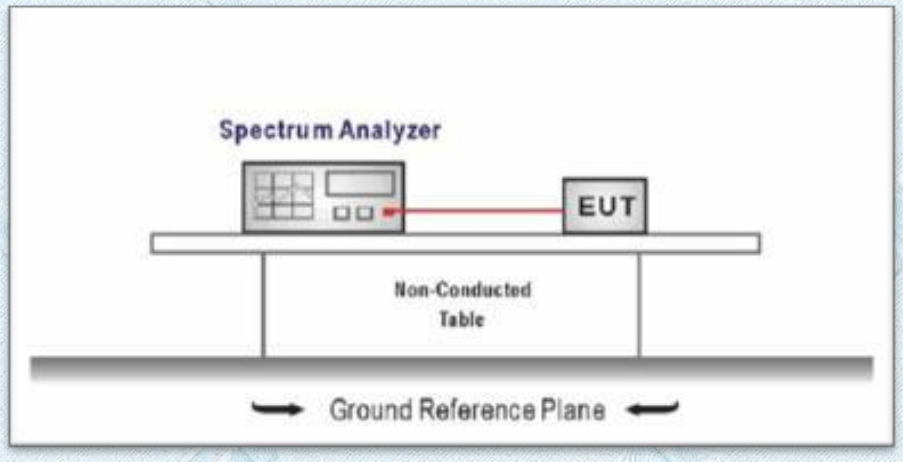
LIMIT

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.

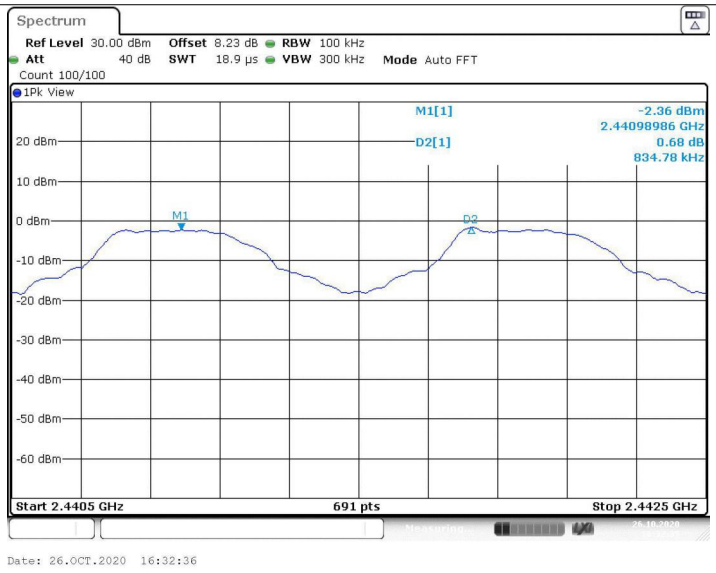
Test Mode

Please refer to the clause 2.3.

Test Results

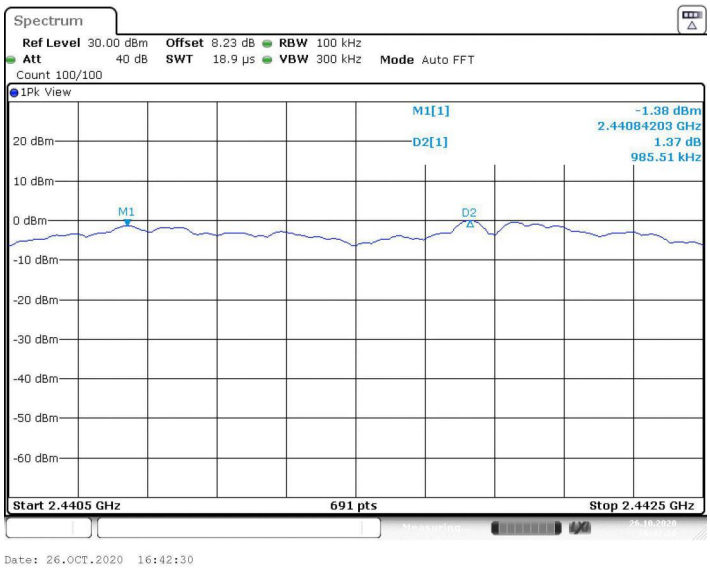
Test Mode:	DH5 Hopping Mode		
Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	0.835	>=0.870	PASS

DH5 Hopping Mode

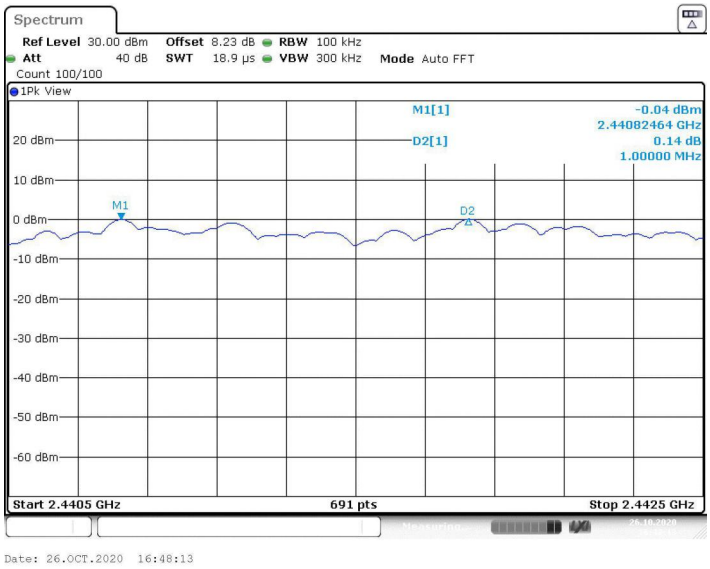


Test Mode:	2DH5 Hopping Mode		
Test Mode	Result[MHz]	Limit[MHz]	Verdict
2DH5	0.986	>=0.882	PASS

2DH5 Hopping Mode



Test Mode:	3DH5 Hopping Mode		
Test Mode	Result[MHz]	Limit[MHz]	Verdict
3DH5	1	>=0.860	PASS
3DH5 Hopping Mode			

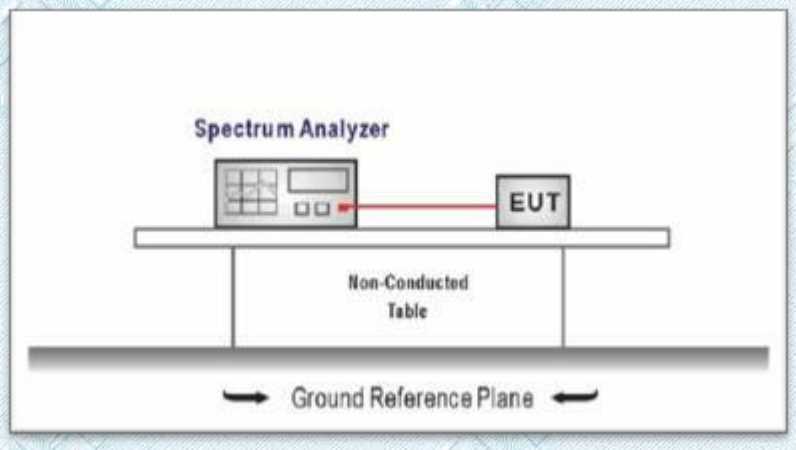


3.6. Number of Hopping Channel

Limit

Section	Test Item	Limit
15.247	Number of Hopping Channel	>15

Test Configuration



Test Procedure

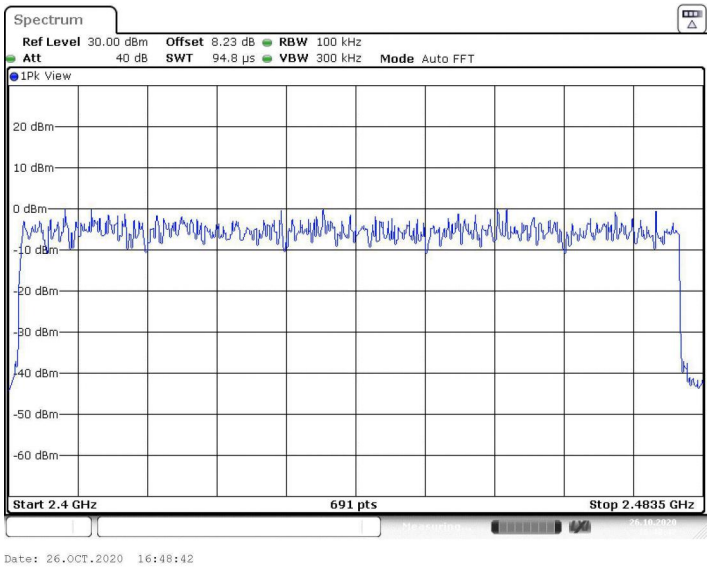
1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
2. Spectrum Setting:
   (1) Peak Detector: RBW=100 kHz, VBW≥RBW, Sweep time= Auto.

Test Mode

Please refer to the clause 2.3.

Test Result

Test Mode:	3DH5 Hopping Mode		
Frequency Range	**Test Mode**	**Quantity of Hopping Channel**	**Limit**
2402MHz~2483.5MHz	3DH5	79	**>15**
3DH5 Mode			



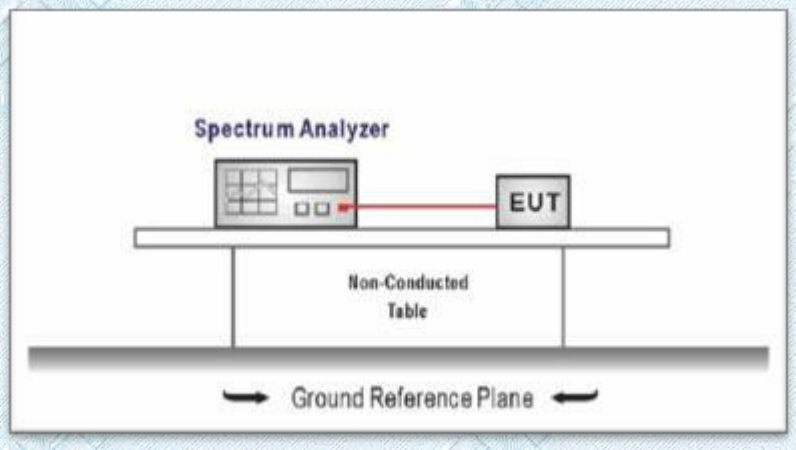
Note: The 8-DPSK modulation is the worst case and recorded in the report.

3.7. 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.

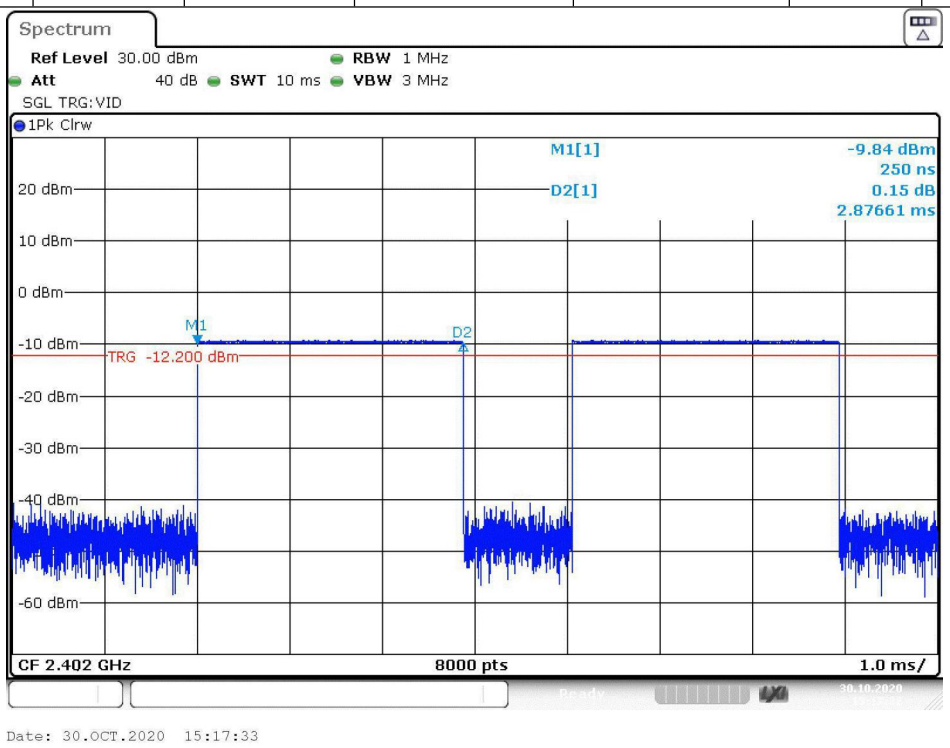
Test Mode

Please refer to the clause 2.3

Test Result

The 3DH5 modulation is the worst case and recorded in the report.

Test Mode	Channel (MHz)	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
3DH5	2402	2.88	307.60	31.60	**400**	**PASS**



Test Mode	Channel (MHz)	Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
3DH5	2441	2.89	308.67	31.60	**400**	**PASS**