Microtest
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Test Report

Report No.:	MTi211125016-03E3
Date of issue:	2023-09-22
Applicant:	Shenzhen Teneth Technology Co., Ltd
Product:	Cutting Plotter
Model(s):	X7-180GB, X7-230GB, C7-180GB, C7-230GB
FCC ID:	2A33R-X7-180GB

Shenzhen Microtest Co., Ltd.

http://www.mtitest.com

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Tel: (86-755)88850135 Fax: (86-755) 88850136 Web: www.mtitest.com E-mail: mti@51mti.com

Instructions

1. This test report shall not be partially reproduced without the written consent of the laboratory.

2. The test results in this test report are only responsible for the samples submitted

3. This test report is invalid without the seal and signature of the laboratory.

4. This test report is invalid if transferred, altered, or tampered with in any form without authorization.

5. Any objection to this test report shall be submitted to the laboratory within 15 days from the date of receipt of the report.

Contents

Test Result Certification	
Applicant:	**Shenzhen Teneth Technology Co., Ltd**
Address:	No.161, Pinghu Street, Pinghu Town, Longgang District, Shenzhen City, Guangdong Province, China.
Manufacturer:	**Shenzhen Teneth Technology Co., Ltd**
Address:	No.161, Pinghu Street, Pinghu Town, Longgang District, Shenzhen City, Guangdong Province, China.
Product description	
Product name:	Cutting Plotter
Trademark:	TENETH
Model name:	X7-180GB
Series Model:	X7-230GB, C7-180GB, C7-230GB
Standards:	FCC 47 CFR Part 15 Subpart C
Test method:	ANSI C63.10-2013
Date of Test	
Date of test:	2021-01-20 ~ 2022-07-25
Test result:	Pass

Test Engineer : Yanice Xie

(Yanice Xie)

Reviewed By: : Leon chen

(Leon Chen)

Approved By: : Tom Xue

(Tom Xue)

1 General Description

1.1 Description of the EUT

Product name:	Cutting Plotter
Model name:	X7-180GB
Series Model:	X7-230GB, C7-180GB, C7-230GB
Model difference:	All the models are the same circuit and module, except the model name.
Electrical rating:	Input: DC 24V 1.75A
Hardware version:	VER306
Software version:	VER161
Accessories:	1. Adapter: Model: GM42-240175-D Input: 100-240V~ 50/60Hz 1.5A Output: 24V⎓1.75A
Test sample(s) number:	MTi211125016-03S1001
RF specification:	
Bluetooth version:	V4.2
Operation frequency:	2402 MHz ~ 2480 MHz
Modulation type:	GFSK, π/4-DQPSK, 8DPSK
Antenna designation:	Antenna type: PCB antenna Antenna gain: -0.1 dBi
Max. peak conducted output power:	-2.08 dBm

1.2 Description of test modes

1.2.1 Operation channel list

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461	-	-

1.2.2 Test channels

Channel	Frequency
Lowest (CH0)	2402MHz
Middle (CH39)	2441MHz
Highest (CH78)	2480MHz

Note: The test software has been used to control EUT for working in engineering mode, that enables selectable channel, and capable of continuous transmitting mode.

1.2.3 Description of support units

Support equipment list			
Description	Model	Serial No.	Manufacturer
/	/	/	/

1.3 Measurement uncertainty

Parameter	Measurement uncertainty
AC power line conducted emission (9 kHz~30 MHz)	±2.5 dB
Occupied Bandwidth	±3 %
Conducted RF output power	±0.16 dB
Conducted spurious emissions	±0.21 dB
Radiated emission (9 kHz ~ 30 MHz)	±4.0 dB
Radiated emission (30 MHz~1 GHz)	±4.2 dB
Radiated emission (above 1 GHz)	±4.3 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2 Summary of Test Result

No.	FCC reference	Description of test	Result
1	§ 15.203	Antenna requirement	Pass
2	§ 15.207	AC power line conducted emissions	Pass
3	15.247(a)(1)	20dB occupied bandwidth	Pass
4	15.247(b)(1)	Conducted peak output power	Pass
5	15.247(a)(1)	Carrier Frequencies Separation	Pass
6	15.247(a)(1)	Average time of occupancy (Dwell time)	Pass
7	15.247(a)(1)	Number of hopping channels	Pass
8	15.247(d)	Conducted emission at the band edge	Pass
9	15.247(d)	Conducted spurious emissions	Pass
10	15.247(d)	Radiated spurious emissions	Pass

Note: N/A means not applicable.

3 Test Facilities and Accreditations

3.1 Test laboratory

Test laboratory:	Shenzhen Microtest Co., Ltd.
Test site location:	101, No. 7, Zone 2, Xinxing Industrial Park, Fuhai Avenue, Xinhe Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Telephone:	(86-755)88850135
Fax:	(86-755)88850136
CNAS Registration No.:	CNAS L5868
FCC Registration No.:	448573

4 Equipment List

Equipment No.	Equipment Name	Manufacturer	Model	Serial No.	Calibration date	Due date
MTI-E043	EMI Test Receiver	Rohde&schwarz	ESCI7	101166	2020/05/05	2021/05/04
MTI-E043	EMI Test Receiver	Rohde&schwarz	ESCI7	101166	2021/05/05	2022/05/04
MTI-E043	EMI Test Receiver	Rohde&schwarz	ESCI7	101166	2022/05/05	2023/05/04
MTI-E044	TRILOG Broadband Antenna	schwarabeck	VULB 9163	9163-1338	2019/05/30	2021/05/29
MTI-E044	TRILOG Broadband Antenna	schwarabeck	VULB 9163	9163-1338	2021/05/30	2023/05/29
MTI-E047	Amplifier	Hewlett-Packard	8447F	3113A06150	2020/05/05	2021/05/04
MTI-E047	Amplifier	Hewlett-Packard	8447F	3113A06150	2021/05/05	2022/05/04
MTI-E047	Amplifier	Hewlett-Packard	8447F	3113A06150	2022/05/05	2023/05/04
MTI-E089	ESG Vector Signal Generator	Agilent	N5182A	MY49060455	2020/05/05	2021/05/04
MTI-E089	ESG Vector Signal Generator	Agilent	N5182A	MY49060455	2021/05/05	2022/05/04
MTI-E089	ESG Vector Signal Generator	Agilent	N5182A	MY49060455	2022/05/05	2023/05/04
MTI-E058	ESG Series Analog Ssignal Generator	Agilent	E4421B	GB40051240	2020/05/05	2021/05/04
MTI-E058	ESG Series Analog Ssignal Generator	Agilent	E4421B	GB40051240	2021/05/05	2022/05/04
MTI-E058	ESG Series Analog Ssignal Generator	Agilent	E4421B	GB40051240	2022/05/05	2023/05/04
MTI-E062	PXA Signal Analyzer	Agilent	N9030A	MY51350296	2020/05/05	2021/05/04
MTI-E062	PXA Signal Analyzer	Agilent	N9030A	MY51350296	2021/05/05	2022/05/04
MTI-E062	PXA Signal Analyzer	Agilent	N9030A	MY51350296	2022/05/05	2023/05/04
MTI-E066	MXA Signal Analyzer	Agilent	N9020A	MY50143483	2020/05/05	2021/05/04
MTI-E066	MXA Signal Analyzer	Agilent	N9020A	MY50143483	2021/05/05	2022/05/04
MTI-E066	MXA Signal Analyzer	Agilent	N9020A	MY50143483	2022/05/05	2023/05/04
MTI-E078	Synthesized Sweeper	Agilent	83752A	3610A01957	2020/05/05	2021/05/04
MTI-E078	Synthesized Sweeper	Agilent	83752A	3610A01957	2021/05/05	2022/05/04
MTI-E078	Synthesized Sweeper	Agilent	83752A	3610A01957	2022/05/05	2023/05/04
MTI-E079	DC Power Supply	Agilent	E3632A	MY40027695	2020/05/05	2021/05/04
MTI-E079	DC Power Supply	Agilent	E3632A	MY40027695	2021/05/05	2022/05/04

MTI-E079	DC Power Supply	Agilent	E3632A	MY40027695	2022/05/05	2023/05/04
MTI-E045	Double Ridged Broadband Horn Antenna	schwarzbeck	BBHA 9120 D	9120D-2278	2019/05/30	2021/05/29
MTI-E045	Double Ridged Broadband Horn Antenna	schwarzbeck	BBHA 9120 D	9120D-2278	2021/05/30	2023/05/29
MTI-E021	EMI Test Receiver	Rohde&schwarz	ESCS30	100210	2020/05/05	2021/05/04
MTI-E021	EMI Test Receiver	Rohde&schwarz	ESCS30	100210	2021/05/05	2022/05/04
MTI-E021	EMI Test Receiver	Rohde&schwarz	ESCS30	100210	2022/05/05	2023/05/04
MTI-E022	Pulse Limiter	Schwarzbeck	VSTD 9561-F	00679	2020/05/05	2021/05/04
MTI-E022	Pulse Limiter	Schwarzbeck	VSTD 9561-F	00679	2021/05/05	2022/05/04
MTI-E022	Pulse Limiter	Schwarzbeck	VSTD 9561-F	00679	2022/05/05	2023/05/04
MTI-E023	Artificial mains network	Schwarzbeck	NSLK 8127	NSLK 8127 #841	2020/05/05	2021/05/04
MTI-E023	Artificial mains network	Schwarzbeck	NSLK 8127	NSLK 8127 #841	2021/05/05	2022/05/04
MTI-E023	Artificial mains network	Schwarzbeck	NSLK 8127	NSLK 8127 #841	2022/05/05	2023/05/04
MTI-E046	Active Loop Antenna	Schwarzbeck	FMZB 1519 B	00044	2019/05/30	2021/05/29
MTI-E046	Active Loop Antenna	Schwarzbeck	FMZB 1519 B	00044	2021/05/30	2023/05/29
MTI-E048	Amplifier	Agilent	8449B	3008A02400	2020/05/05	2021/05/04
MTI-E048	Amplifier	Agilent	8449B	3008A02400	2021/05/05	2022/05/04
MTI-E048	Amplifier	Agilent	8449B	3008A02400	2022/05/05	2023/05/04
MTI-E072	Thermometer Clock Humidity Monitor	-	HTC-1	/	2020/05/05	2021/05/04
MTI-E072	Thermometer Clock Humidity Monitor	-	HTC-1	/	2021/05/05	2022/05/04
MTI-E072	Thermometer Clock Humidity Monitor	-	HTC-1	/	2022/05/05	2023/05/04
Note: the calibration interval of the above test instruments is 12 or 24 months and the calibrations are traceable to international system unit (SI).						

5 Test Result

5.1 Antenna requirement

15.203 requirement

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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Description of the antenna of EUT

The antenna of EUT is PCB antenna (Antenna Gain: -0.1 dBi). which is no consideration of replacement.

5.2 AC power line conducted emissions

5.2.1 Limits

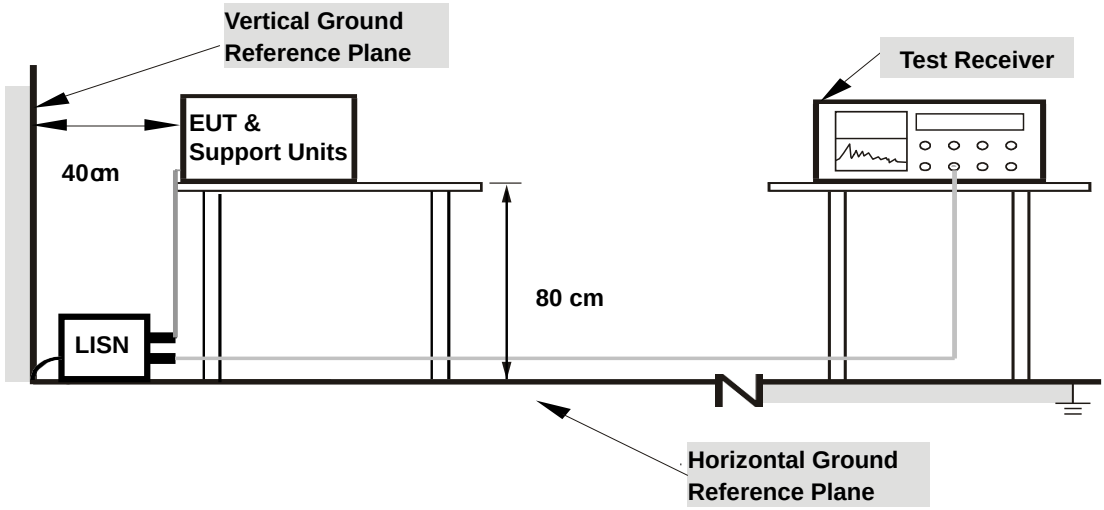
Frequency (MHz)	Detector type / Bandwidth	Limit-Quasi-peak dBµV	Limit-Average dBµV
0.15 -0.5	Average / 9 kHz	66 to 56	56 to 46
0.5 -5		56	46
5 -30		60	50

Note 1: the limit decreases with the logarithm of the frequency in the range of 0.15 MHz to 0.5 MHz.

5.2.2 Test Procedures

a) The test setup is refer to the standard ANSI C63.10-2013.
b) The EUT is connected to the main power through a line impedance stabilization network (LISN). All support equipment is powered from additional LISN(s).
c) Emissions were measured on each current carrying line of the EUT using an EMI test receiver connected to the LISN powering the EUT.
d) The test receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes described in Item 1.2.
e) The test data of the worst-case condition(s) was recorded.

5.2.3 Test setup



For the actual test configuration, please refer to the related item – Photographs of the test setup.

5.2.4 Test Result

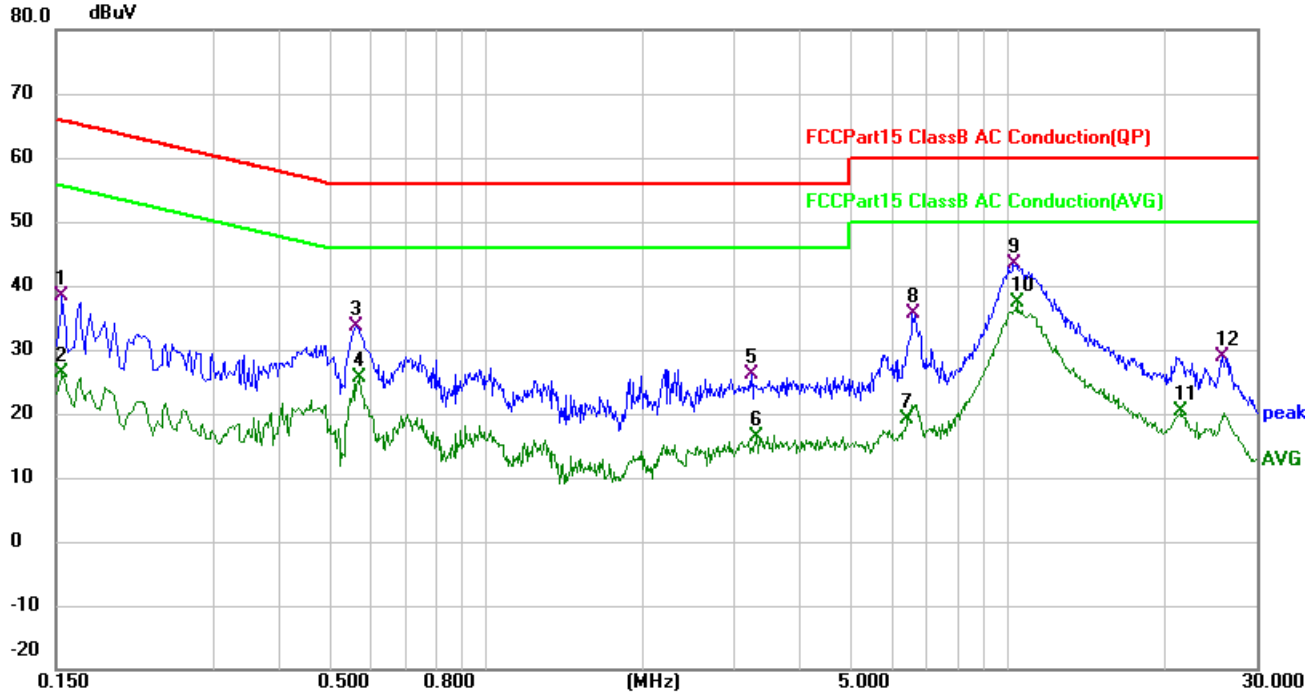
Notes:

All modes of operation of the EUT were investigated, and only the worst-case results are reported.

Calculation formula:

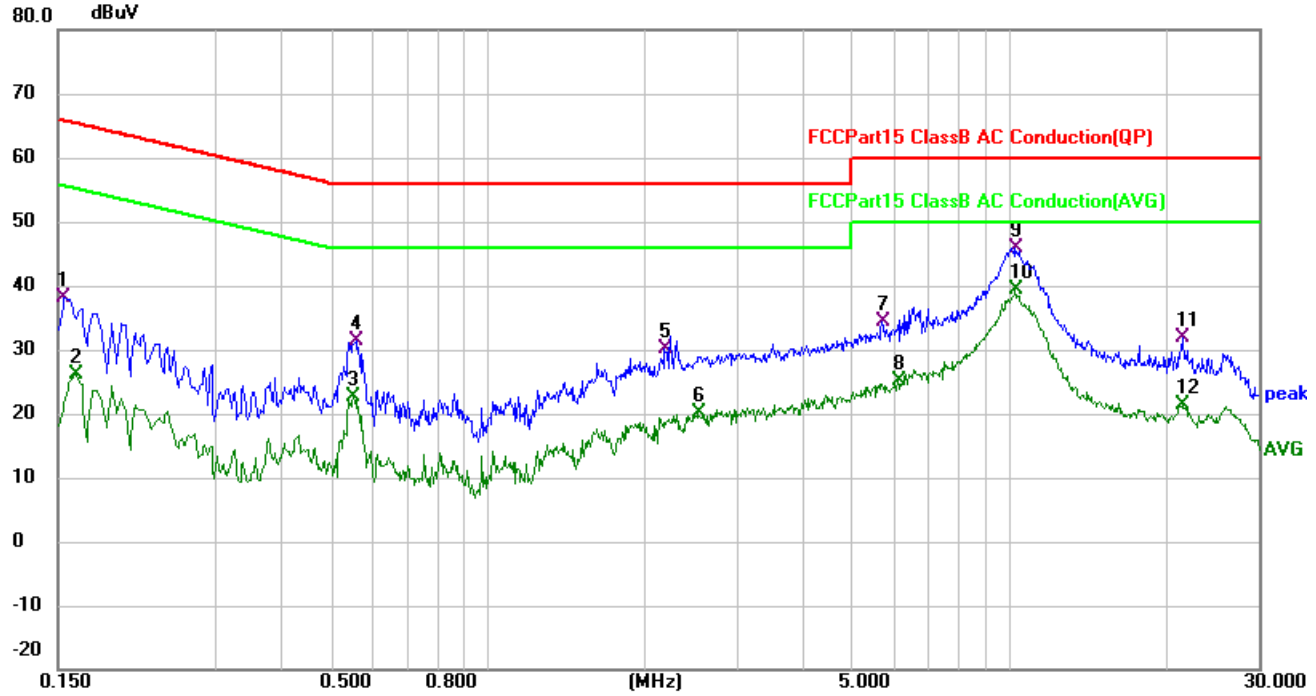
Measurement (dBµV) = Reading Level (dBµV) + Correct Factor (dB)
Over (dB) = Measurement (dBµV) – Limit (dBµV**)**

Test mode:	TX	Phase:	L
Power supply:	Power by AC/DC adapter (AC 120V/60Hz)	Test site:	CE chamber 1



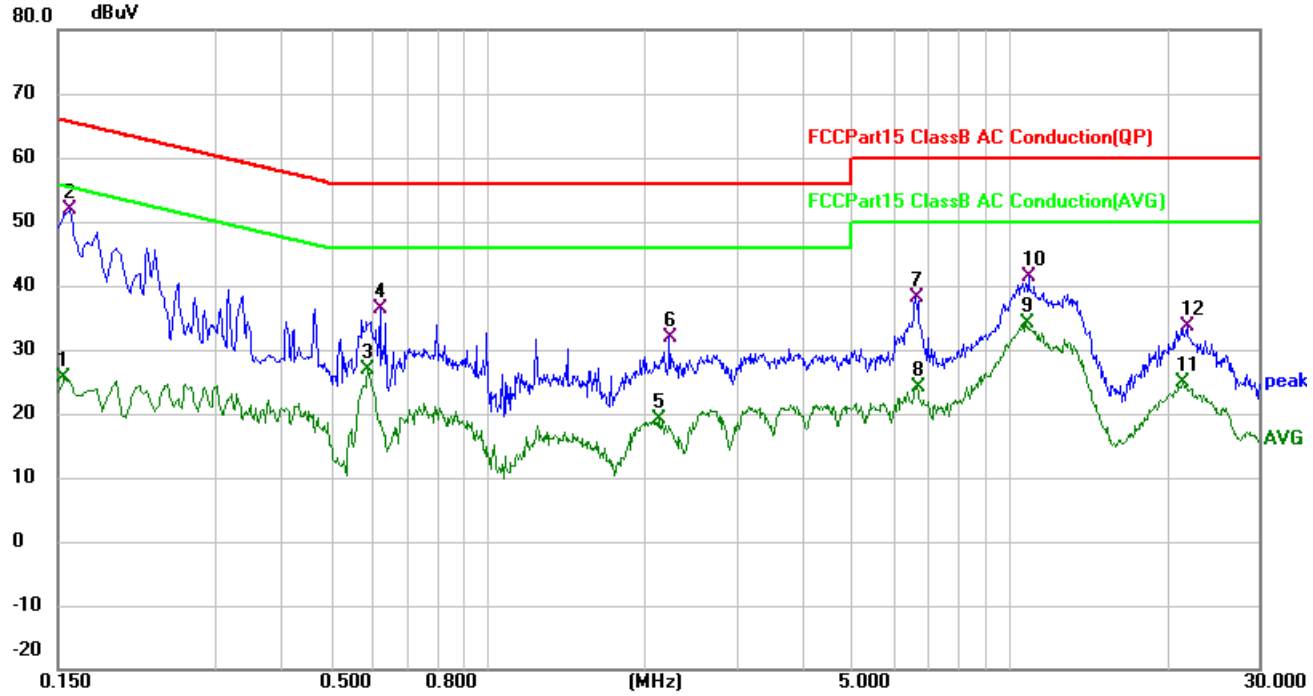
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1539	27.32	10.99	38.31	65.79	-27.48	QP
2		0.1539	15.49	10.99	26.48	55.79	-29.31	AVG
3		0.5660	22.44	11.08	33.52	56.00	-22.48	QP
4		0.5740	14.47	11.07	25.54	46.00	-20.46	AVG
5		3.2380	14.73	11.39	26.12	56.00	-29.88	QP
6		3.3020	5.00	11.40	16.40	46.00	-29.60	AVG
7		6.4500	7.47	11.58	19.05	50.00	-30.95	AVG
8		6.5820	24.01	11.59	35.60	60.00	-24.40	QP
9		10.2780	31.85	11.58	43.43	60.00	-16.57	QP
10	*	10.4300	25.70	11.58	37.28	50.00	-12.72	AVG
11		21.5980	8.46	11.82	20.28	50.00	-29.72	AVG
12		25.8620	17.05	11.77	28.82	60.00	-31.18	QP

Test mode:	TX	Phase:	N
Power supply:	Power by AC/DC adapter (AC 120V/60Hz)	Test site:	CE chamber 1



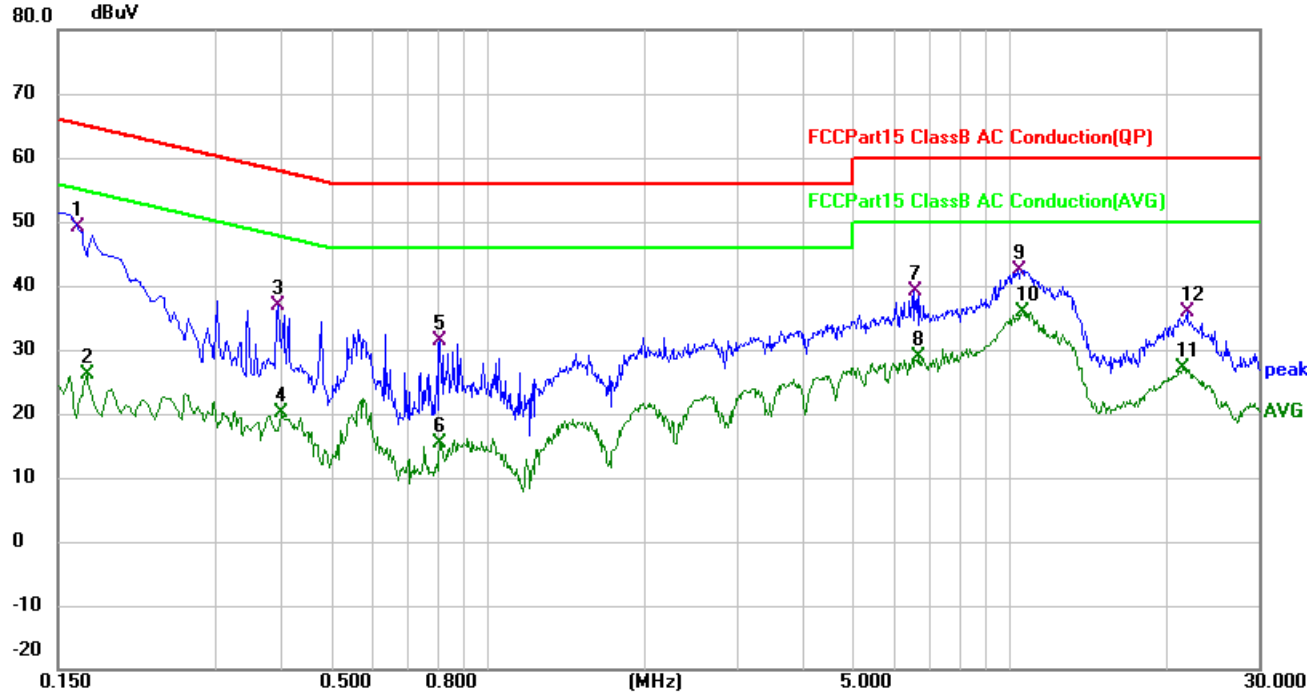
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1539	27.07	10.98	38.05	65.79	-27.74	QP
2		0.1620	15.17	10.98	26.15	55.36	-29.21	AVG
3		0.5540	11.58	10.94	22.52	46.00	-23.48	AVG
4		0.5580	20.36	10.94	31.30	56.00	-24.70	QP
5		2.1820	14.33	15.76	30.09	56.00	-25.91	QP
6		2.5380	8.73	11.38	20.11	46.00	-25.89	AVG
7		5.6860	23.05	11.39	34.44	60.00	-25.56	QP
8		6.1060	13.69	11.40	25.09	50.00	-24.91	AVG
9		10.2860	34.28	11.56	45.84	60.00	-14.16	QP
10	*	10.2860	27.73	11.56	39.29	50.00	-10.71	AVG
11		21.4780	19.99	11.82	31.81	60.00	-28.19	QP
12		21.4780	9.52	11.82	21.34	50.00	-28.66	AVG

Test mode:	TX	Phase:	L
Power supply:	Power by AC/DC adapter (AC 240V/60Hz)	Test site:	CE chamber 1



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1539	14.58	10.99	25.57	55.79	-30.22	AVG
2	*	0.1580	40.84	10.99	51.83	65.57	-13.74	QP
3		0.5899	15.83	11.07	26.90	46.00	-19.10	AVG
4		0.6220	25.29	11.07	36.36	56.00	-19.64	QP
5		2.1260	3.36	15.68	19.04	46.00	-26.96	AVG
6		2.2340	15.90	15.88	31.78	56.00	-24.22	QP
7		6.6180	26.60	11.59	38.19	60.00	-21.81	QP
8		6.6340	12.43	11.59	24.02	50.00	-25.98	AVG
9		10.7739	22.50	11.60	34.10	50.00	-15.90	AVG
10		10.8580	29.69	11.60	41.29	60.00	-18.71	QP
11		21.5740	13.01	11.82	24.83	50.00	-25.17	AVG
12		21.8380	21.83	11.82	33.65	60.00	-26.35	QP

Test mode:	TX	Phase:	N
Power supply:	Power by AC/DC adapter (AC 240V/60Hz)	Test site:	CE chamber 1



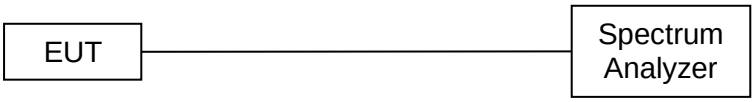
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1632	38.24	10.97	49.21	65.30	-16.09	QP
2		0.1700	15.05	10.96	26.01	54.96	-28.95	AVG
3		0.3940	25.88	10.91	36.79	57.98	-21.19	QP
4		0.4020	9.24	10.91	20.15	47.81	-27.66	AVG
5		0.8100	20.22	11.13	31.35	56.00	-24.65	QP
6		0.8100	4.23	11.13	15.36	46.00	-30.64	AVG
7		6.5619	27.66	11.39	39.05	60.00	-20.95	QP
8		6.7100	17.61	11.39	29.00	50.00	-21.00	AVG
9		10.3819	30.84	11.56	42.40	60.00	-17.60	QP
10	*	10.5700	24.39	11.57	35.96	50.00	-14.04	AVG
11		21.4100	15.37	11.82	27.19	50.00	-22.81	AVG
12		21.8860	24.15	11.82	35.97	60.00	-24.03	QP

5.3 20dB occupied bandwidth

5.3.1 Limits

None, for reporting purposes only.

5.3.2 Test setup



5.3.3 Test procedures

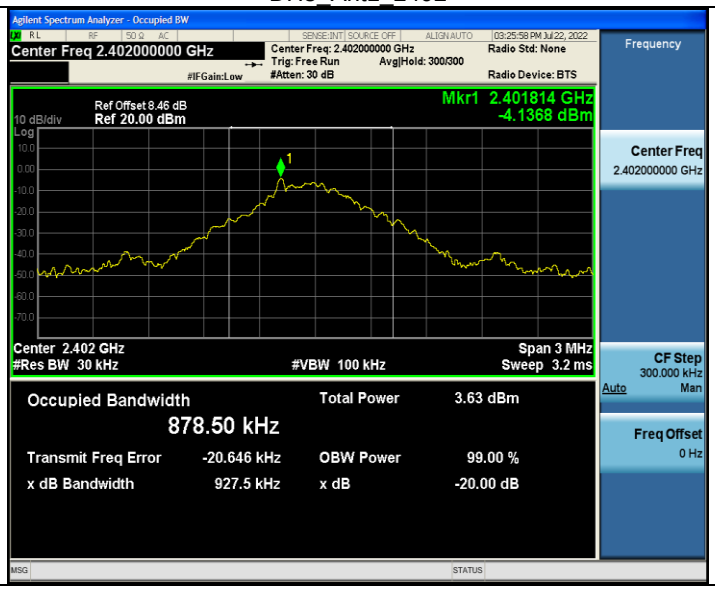
a) Test method: ANSI C63.10-2013 Section 6.9.2.
b) The transmitter output of EUT is connected to the spectrum analyzer.
c) Spectrum analyzer setting: RBW=30 kHz, VBW=100 kHz, detector= Peak

5.3.4 Test results

Mode	Test channel	Frequency (MHz)	20dB Bandwidth (MHz)
GFSK	CH0	2402	0.9275
	CH39	2441	0.8619
	CH78	2480	0.8662
π/4-DQPSK	CH0	2402	1.236
	CH39	2441	1.235
	CH78	2480	1.219
8DPSK	CH0	2402	1.257
	CH39	2441	1.270
	CH78	2480	1.264

Test Graphs

DH5_Ant1_2402



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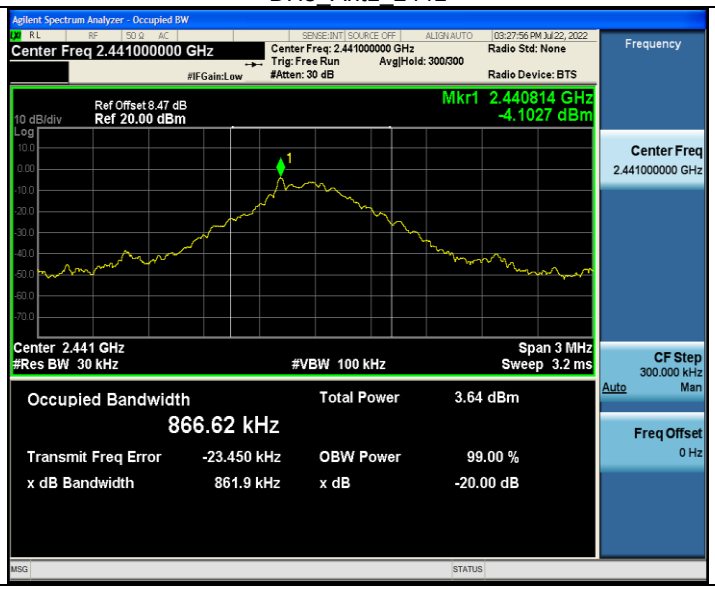
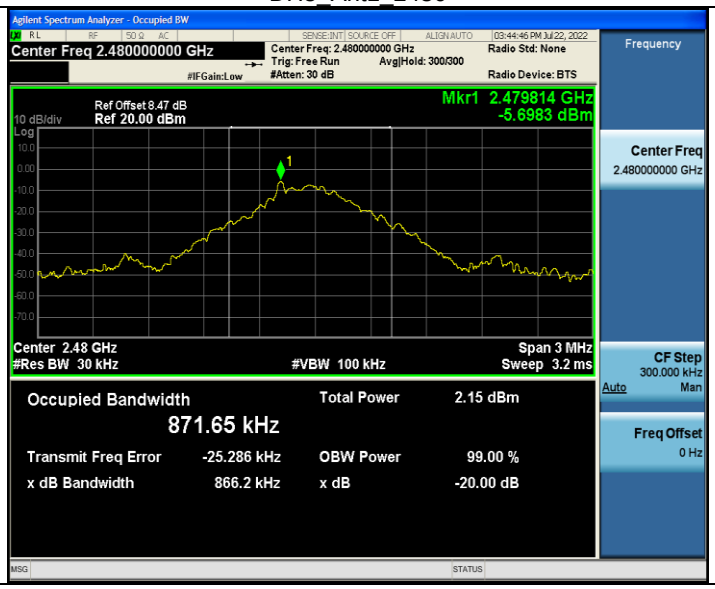
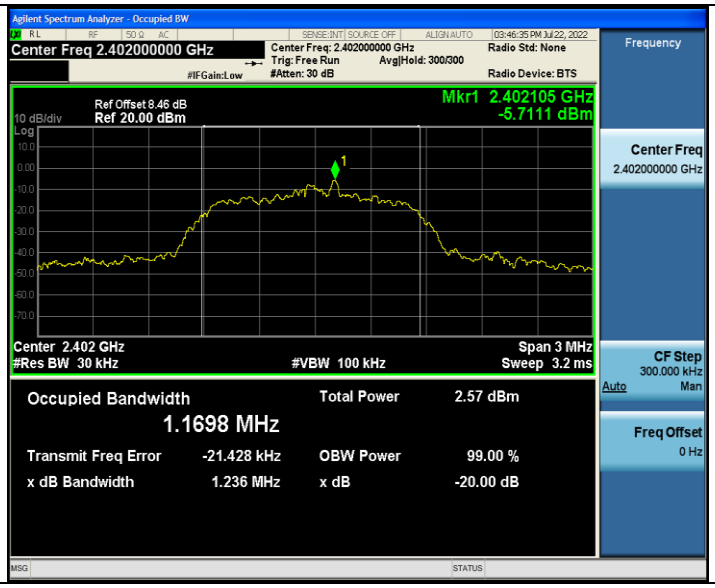


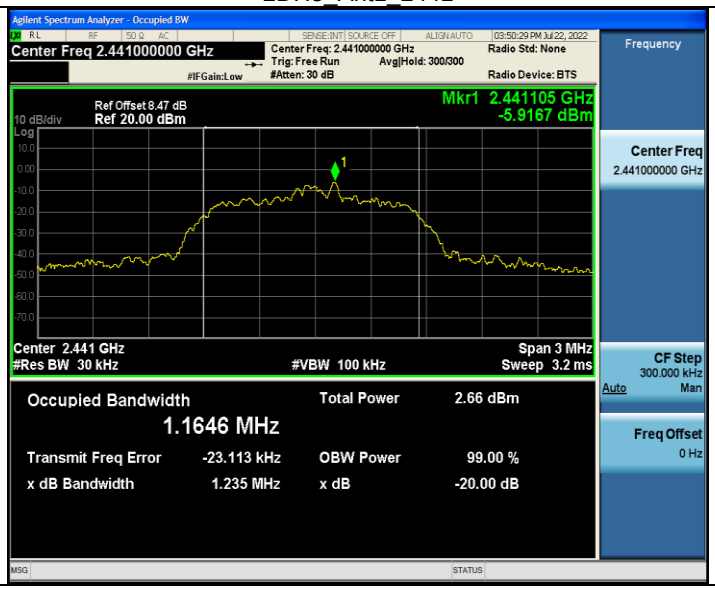
DH5_Ant1_2480



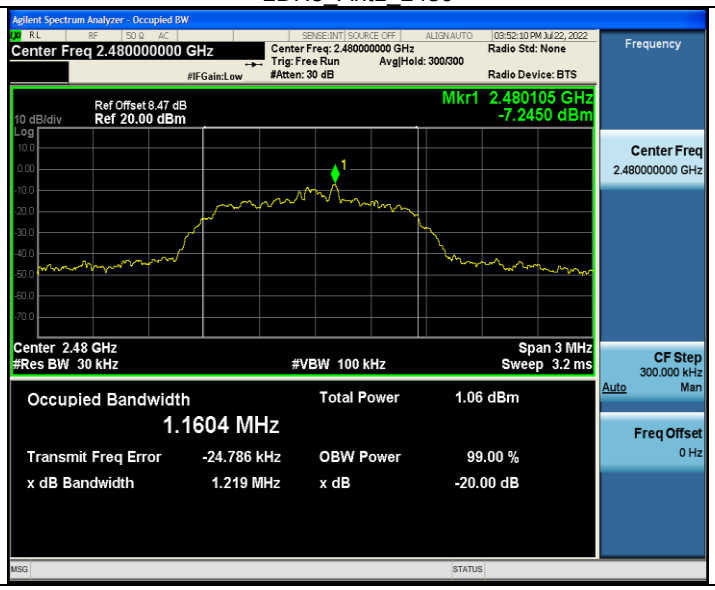
2DH5_Ant1_2402



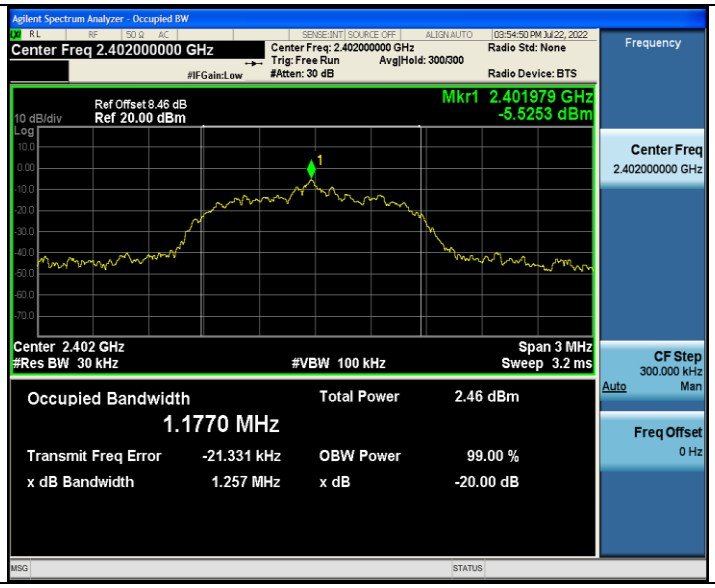
2DH5_Ant1_2441



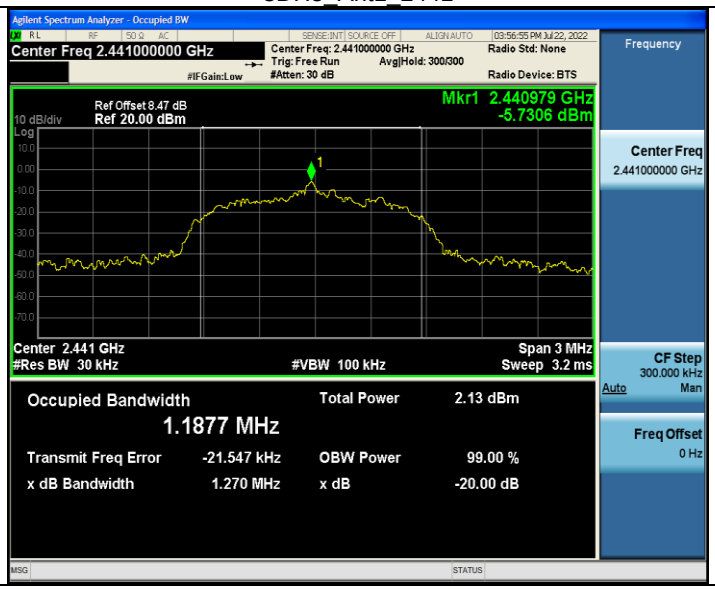
2DH5_Ant1_2480



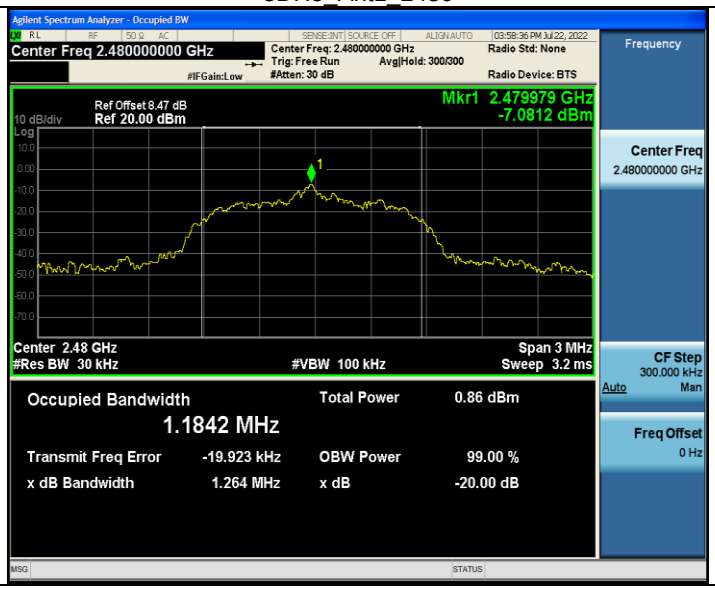
3DH5_Ant1_2402



3DH5_Ant1_2441



3DH5_Ant1_2480

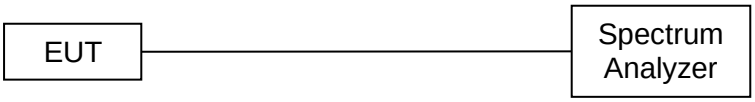


5.4 Conducted peak output power

5.4.1 Limits

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

5.4.2 Test setup



5.4.3 Test procedure

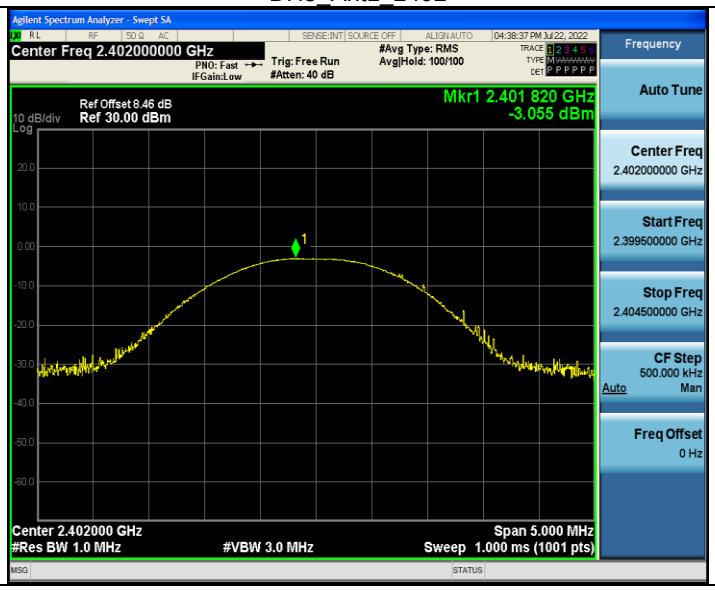
a) Test method: ANSI C63.10-2013 Section 7.8.5.
b) The EUT was set to continuously transmitting in the max power during the test.
c) The transmitter output of EUT is connected to the spectrum analyzer.
d) Spectrum analyzer setting: RBW > 20dB occupied bandwidth, VBW ≥ RBW, detector= Peak

5.4.4 Test results

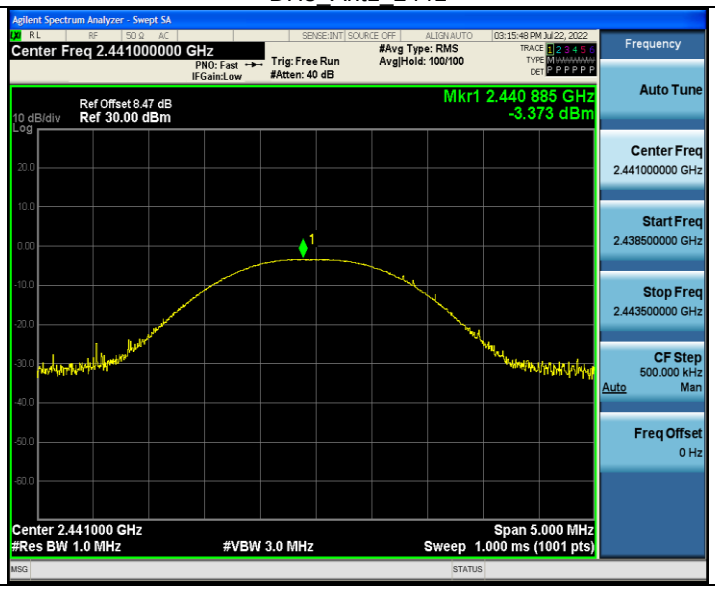
Mode	Test channel	Frequency (MHz)	Conducted peak output power (dBm)	Limit (dBm)
GFSK	CH0	2402	-3.06	≤ 20.97
	CH39	2441	-3.37	≤ 20.97
	CH78	2480	-4.5	≤ 20.97
π/4-DQPSK	CH0	2402	-2.48	≤ 20.97
	CH39	2441	-2.79	≤ 20.97
	CH78	2480	-3.84	≤ 20.97
8DPSK	CH0	2402	-2.08	≤ 20.97
	CH39	2441	-2.41	≤ 20.97
	CH78	2480	-3.56	≤ 20.97

Test Graphs

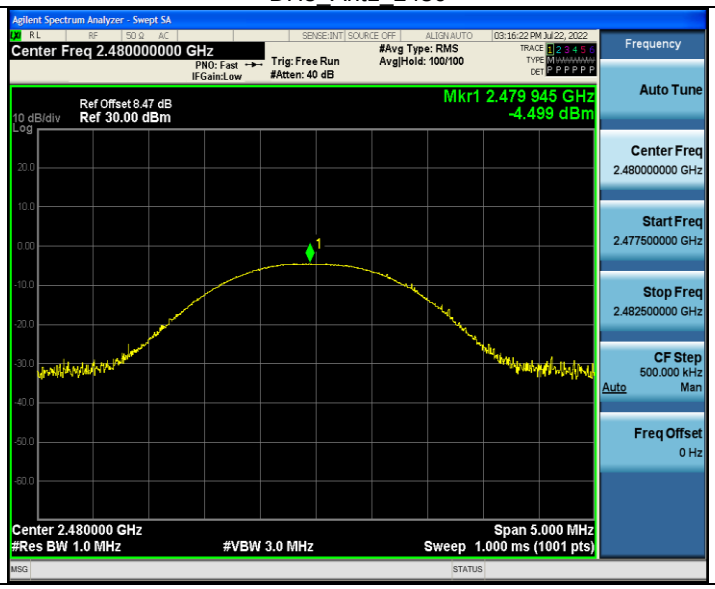
DH5_Ant1_2402



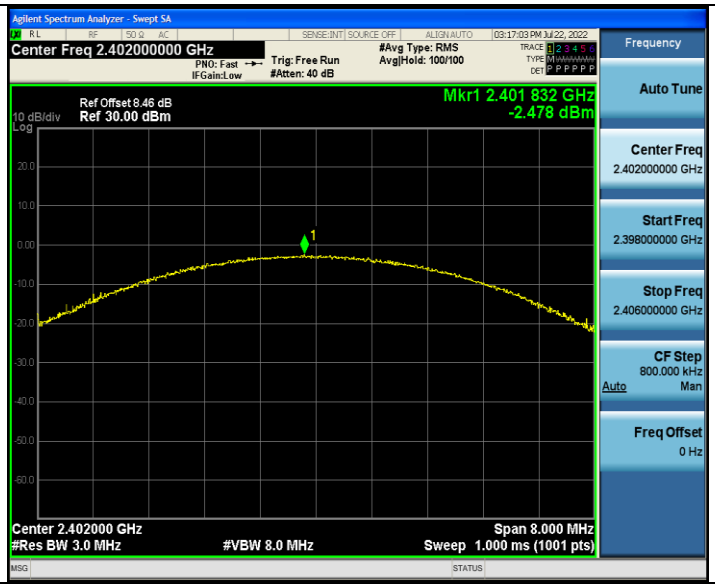
DH5_Ant1_2441



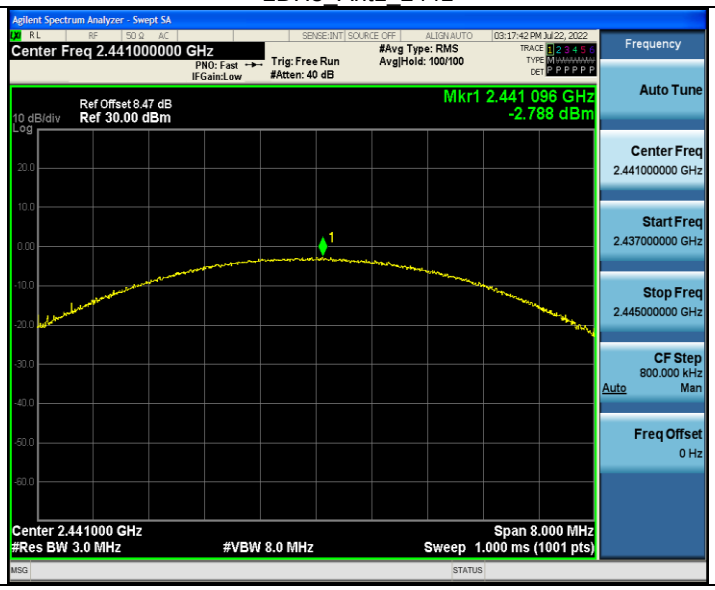
DH5_Ant1_2480



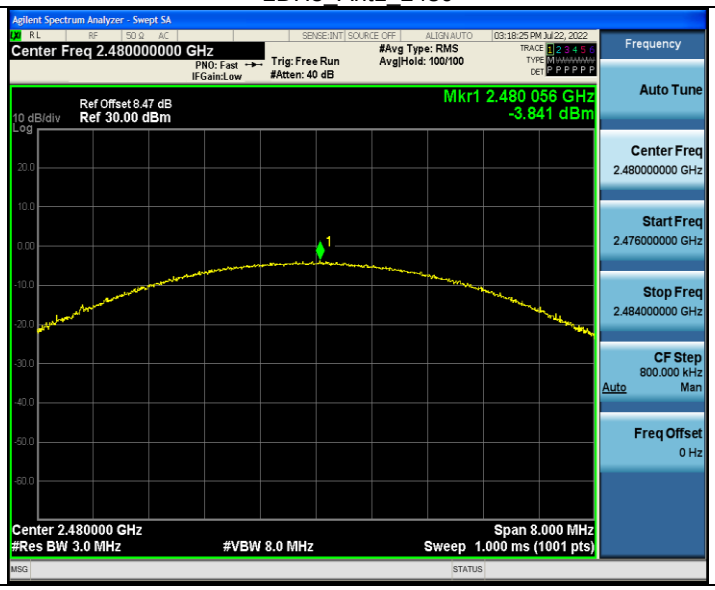
2DH5_Ant1_2402



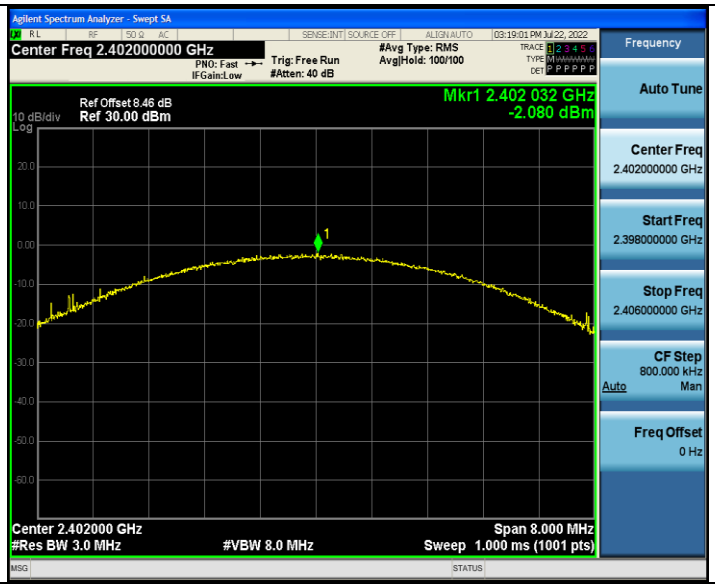
2DH5_Ant1_2441



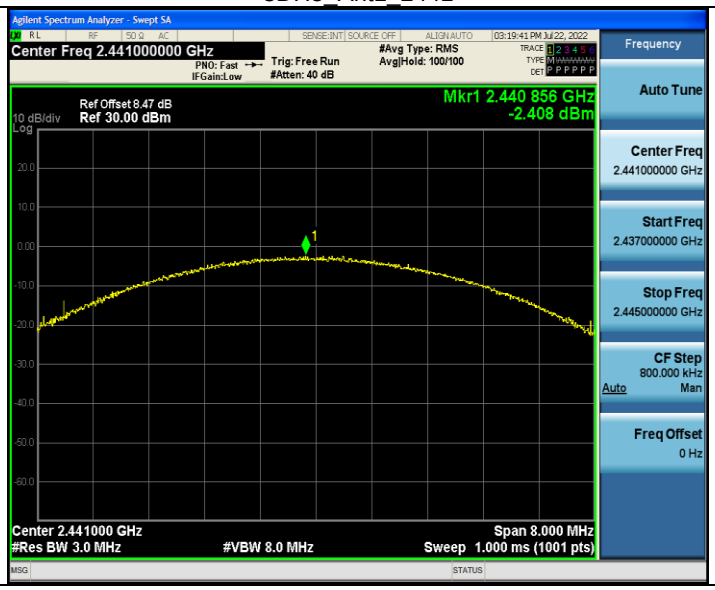
2DH5_Ant1_2480



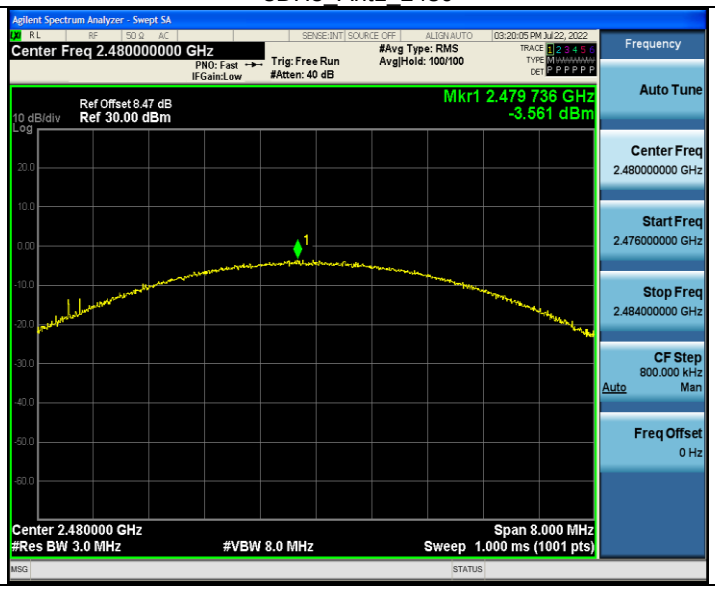
3DH5_Ant1_2402



3DH5_Ant1_2441



3DH5_Ant1_2480



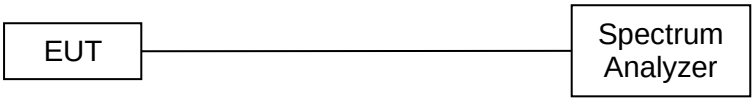
5.5 Carrier frequency separation

5.5.1 Limits

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater

5.5.2 Test setup



5.5.3 Test procedure

a) Test method: ANSI C63.10-2013 Section 7.8.2.
b) The EUT was set to hopping mode during the test.
c) The transmitter output of EUT is connected to the spectrum analyzer.
d) Spectrum Setting: RBW = 30 kHz, VBW = 100 kHz, detector= Peak.

5.5.4 Test results

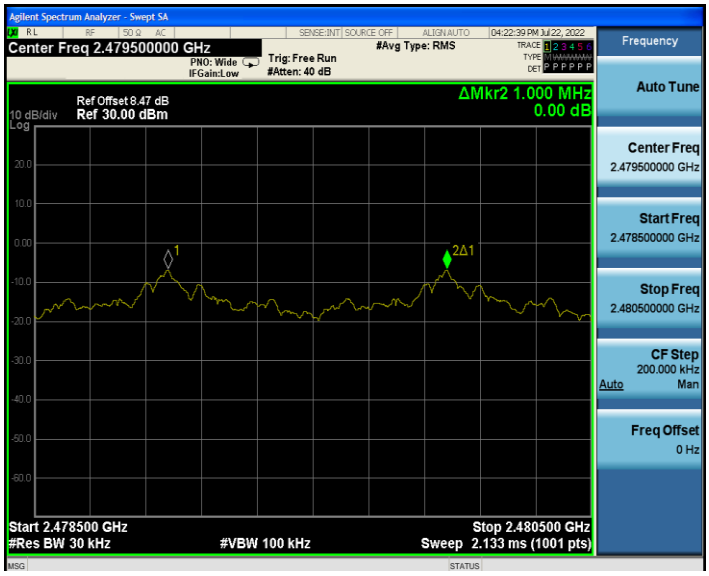
Mode	Test channel	Test Result (MHz)	Limit (MHz)	Result
GFSK	Hop-mode	1.000	>=0.618	Pass
π/4-DQPSK	Hop-mode	1.000	>=0.824	Pass
8DPSK	Hop-mode	1.000	>=0.847	Pass

Carrier frequency separation

GFSK

π/4-DQPSK

8DPSK

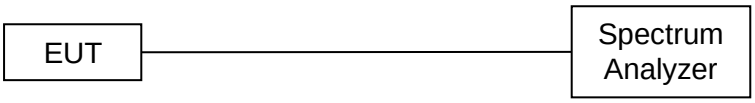


5.6 Average time of occupancy

5.6.1 Limits

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

5.6.2 Test setup



5.6.3 Test procedure

a) Test method: ANSI C63.10-2013 Section 7.8.4

b) The EUT was set to hopping mode during the test.

c) The tranistter output of EUT is connneted to the specturm analyzer.

d) Spectrum analyzer setting: RBW = 1MHz, VBW = 3MHz, Span = 0Hz, Detector = Peak, weep time: As necessary to capture the entire dwell time per hopping channel.

e) Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

f) The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements.

5.6.4 Test results

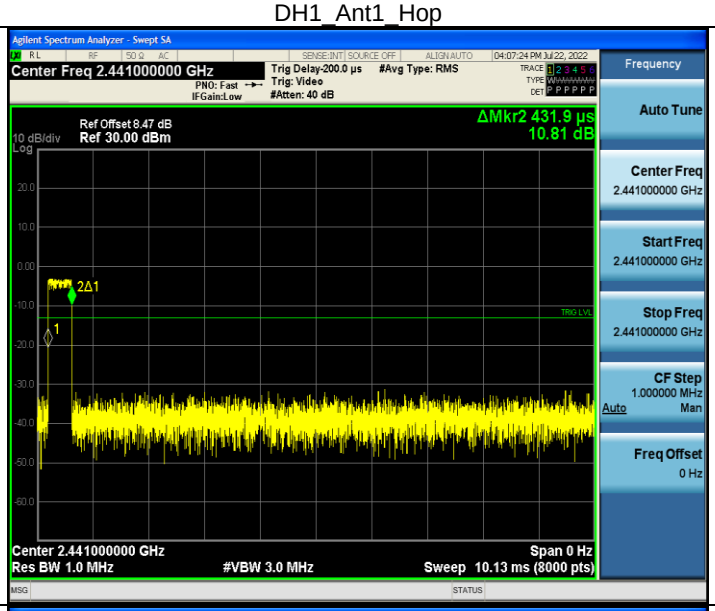
Mode	Data Packet	Frequency (MHz)	Pulse width (ms)	Number of pulses in 3.16 s	Average time of occupancy (s)	Limit (s)	Result
GFSK	DH1	2441	0.43	5	0.022	<=0.4	Pass
	DH3	2441	1.63	5	0.082	<=0.4	Pass
	DH5	2441	2.83	5	0.142	<=0.4	Pass
π/4-DQPSK	2DH1	2441	0.49	2	0.010	<=0.4	Pass
	2DH3	2441	1.69	5	0.085	<=0.4	Pass
	2DH5	2441	2.89	5	0.145	<=0.4	Pass
8DPSK	3DH1	2441	0.42	9	0.038	<=0.4	Pass
	3DH3	2441	1.67	4	0.067	<=0.4	Pass
	3DH5	2441	2.76	2	0.055	<=0.4	Pass

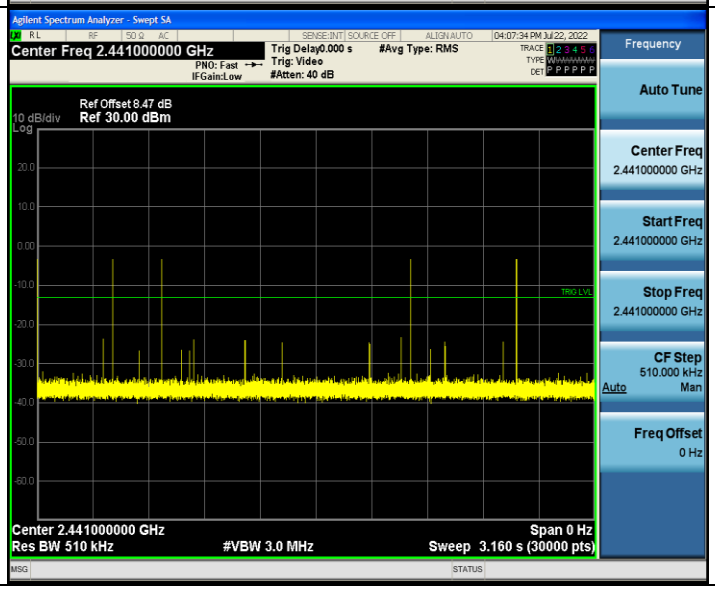
Notes:

1. Period time = 0.4 (s) * 79 = 31.6(s)
2. Average time of occupancy = Pulse width * Number of pulses in 3.16s * 10

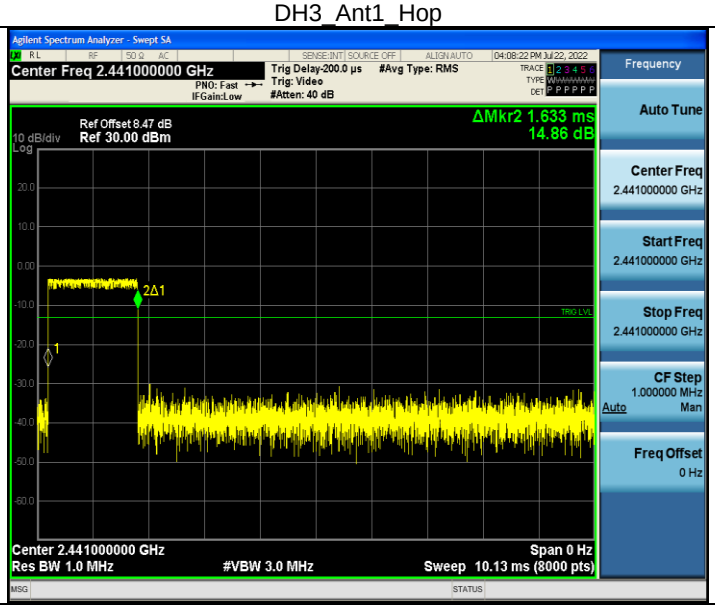
Test Graphs

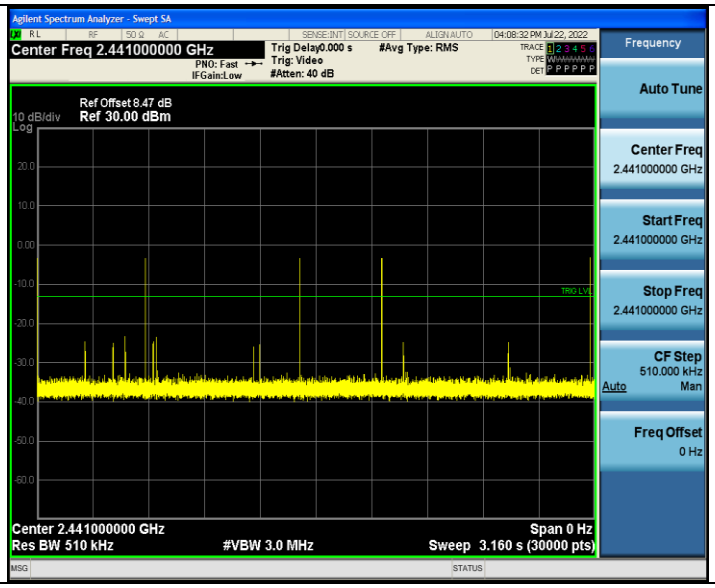
DH1_Ant1_Hop



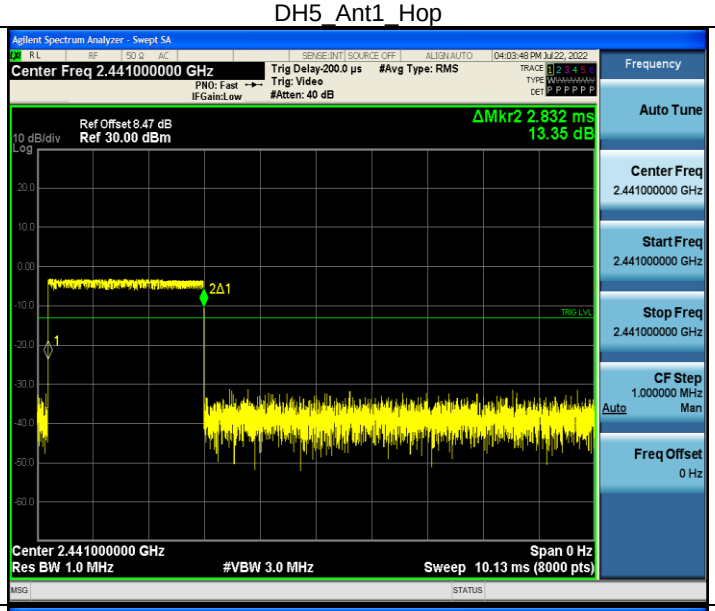


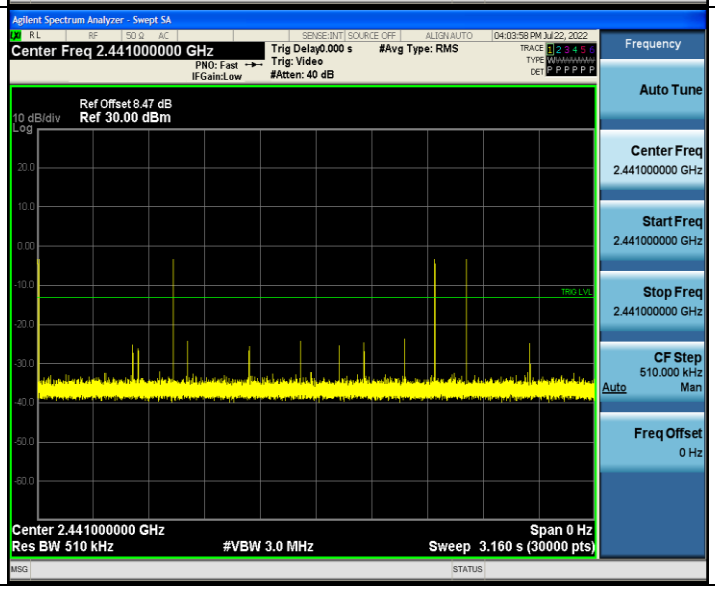
DH3_Ant1_Hop



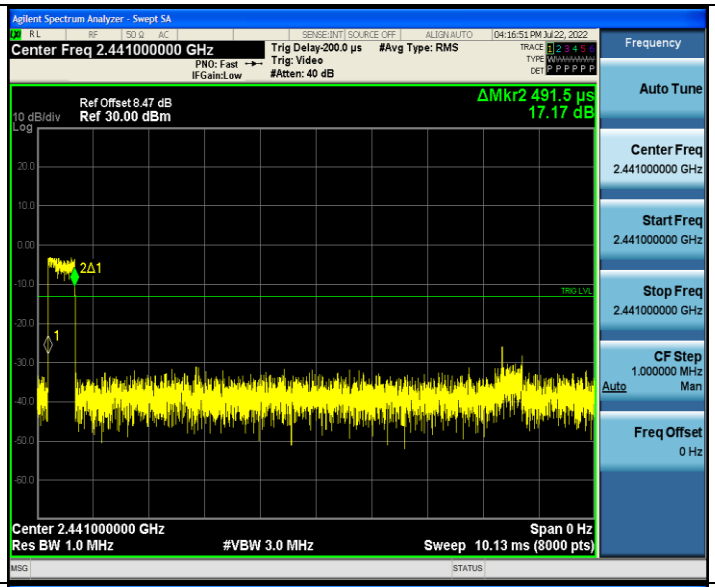


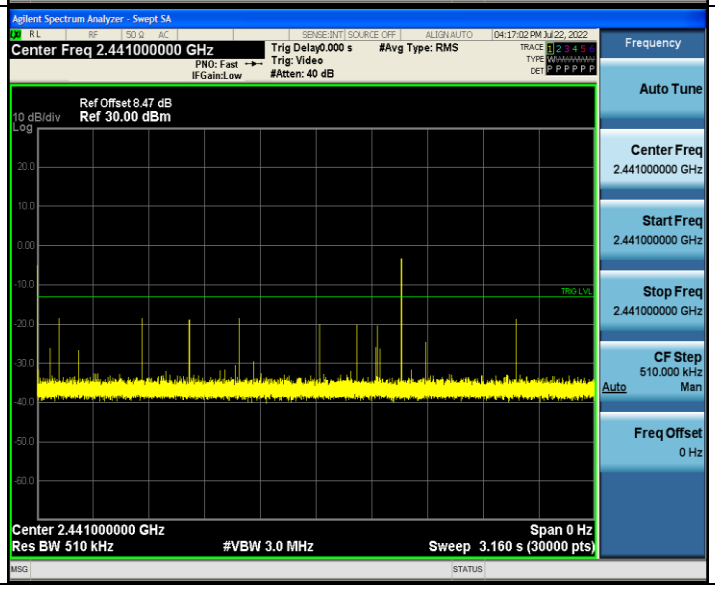
DH5_Ant1_Hop



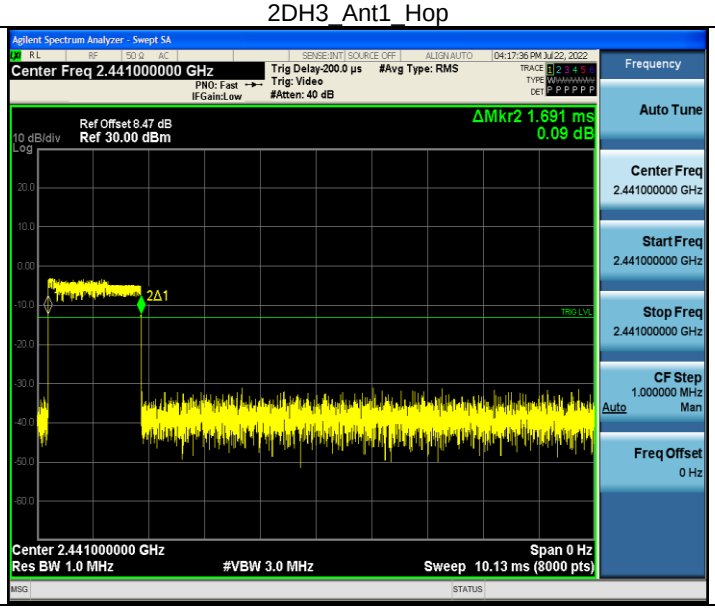


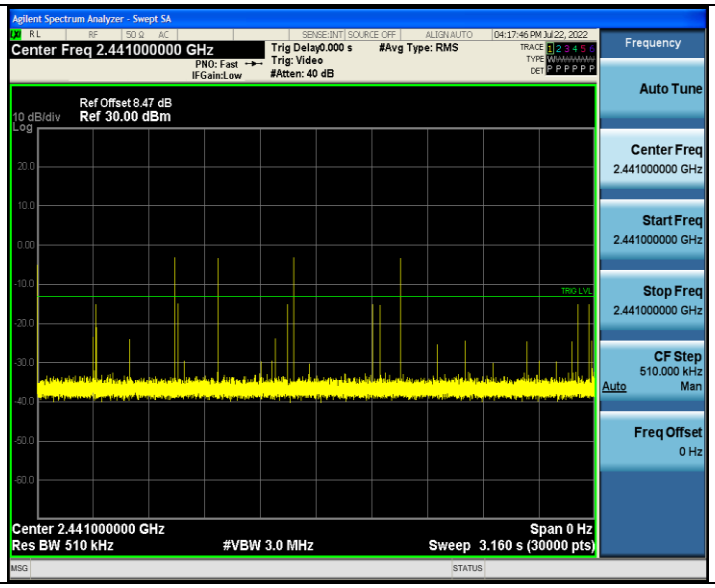
2DH1_Ant1_Hop



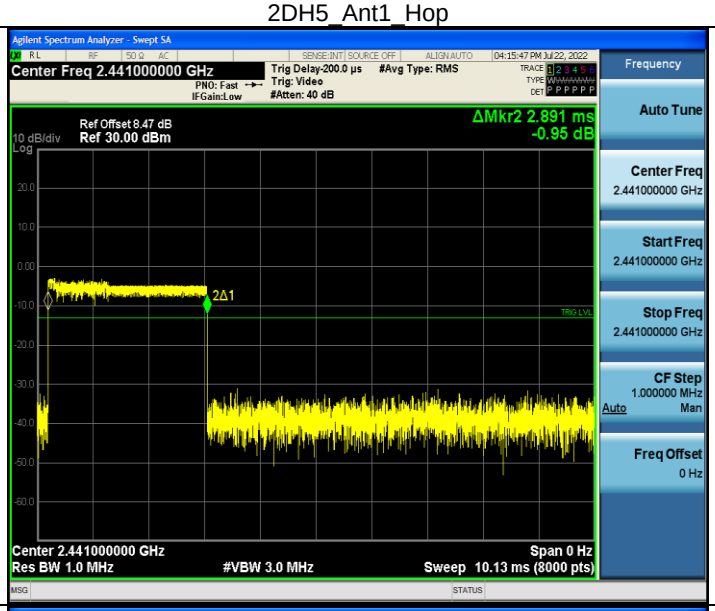


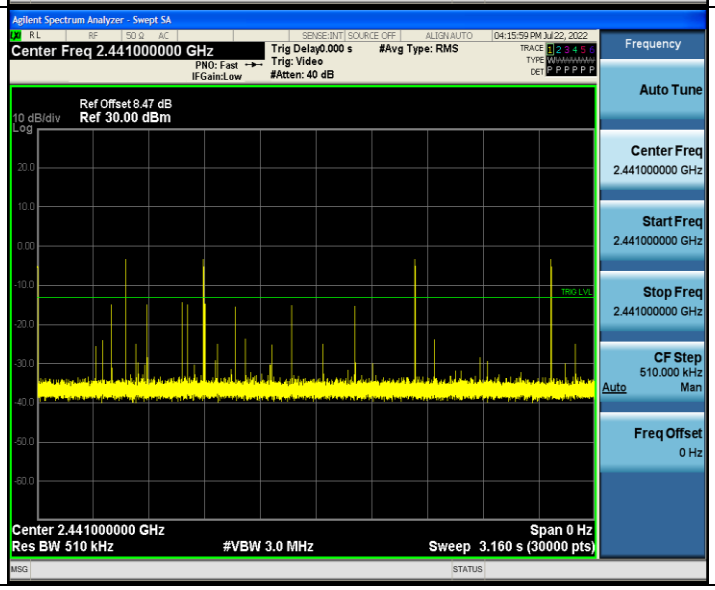
2DH3_Ant1_Hop



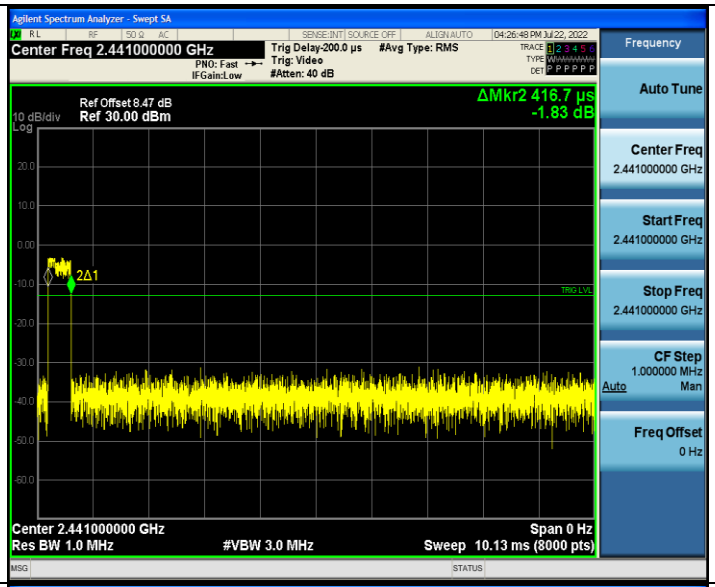


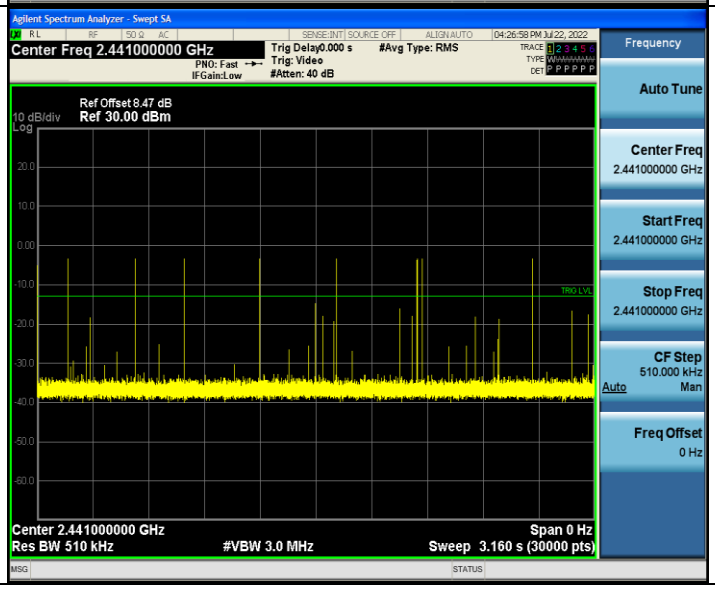
2DH5_Ant1_Hop



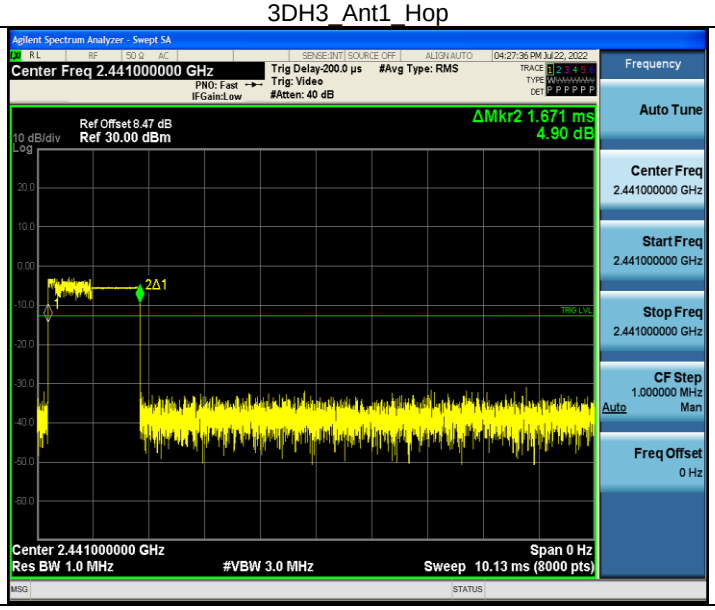


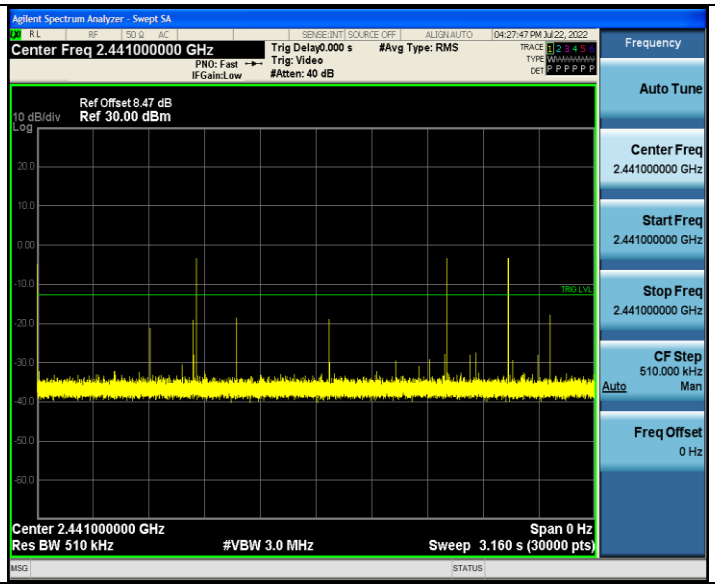
3DH1_Ant1_Hop



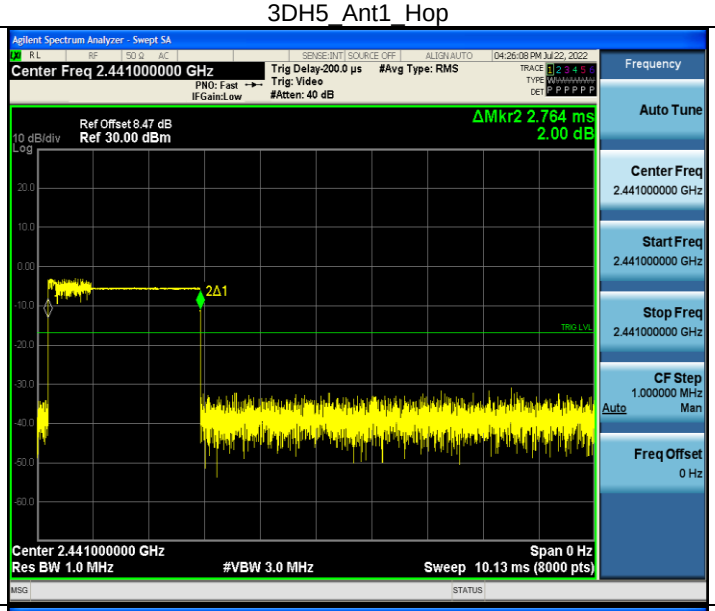


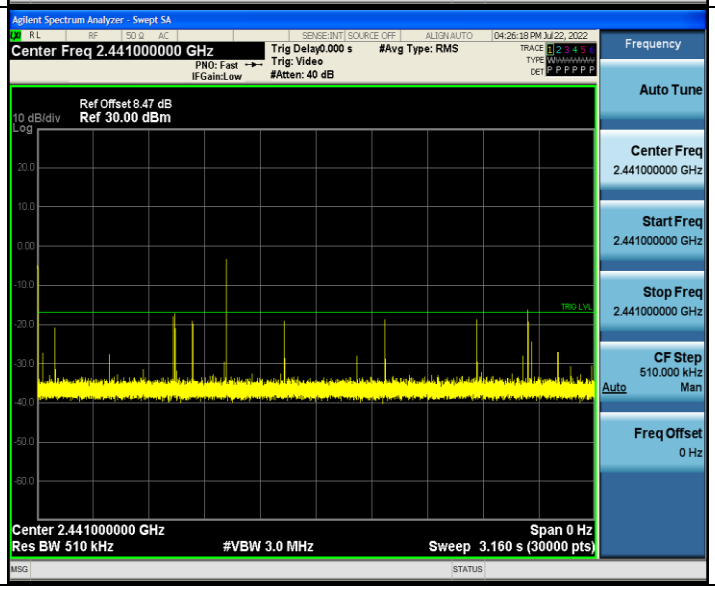
3DH3_Ant1_Hop





3DH5_Ant1_Hop



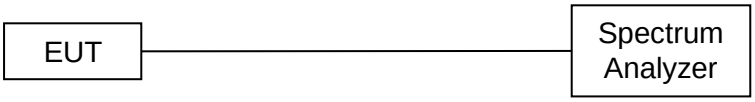


5.7 Number of hopping channels

5.7.1 Limit

Frequency hopping systems in the 2400-2483.5MHz band shall use at least 15 channels.

5.7.2 Test setup



5.7.3 Test procedure

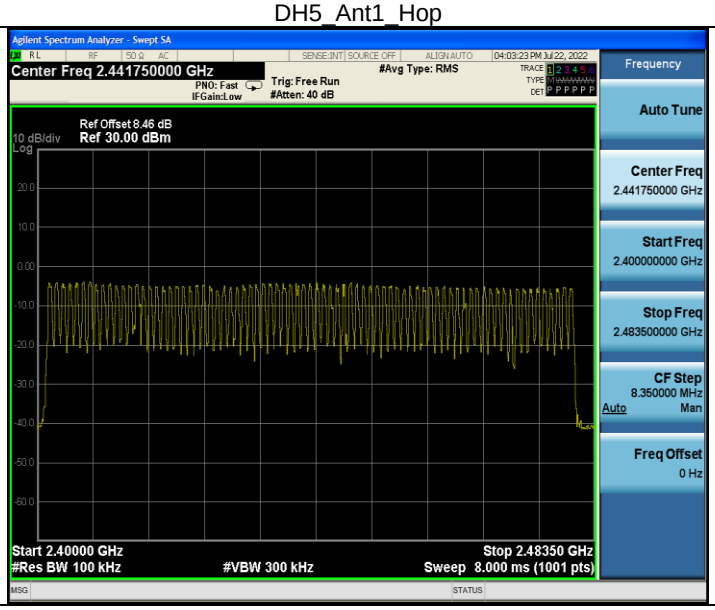
a) Test method: ANSI C63.10-2013 Section 7.8.3
b) The EUT was set to hopping mode during the test.
c) The tranistter output of EUT is connneted to the specturm analyzer.
d) Spectrum analyzer setting: RBW = 100 kHz, VBW = 300 klHz, Detector = Peak.

5.7.4 Test results

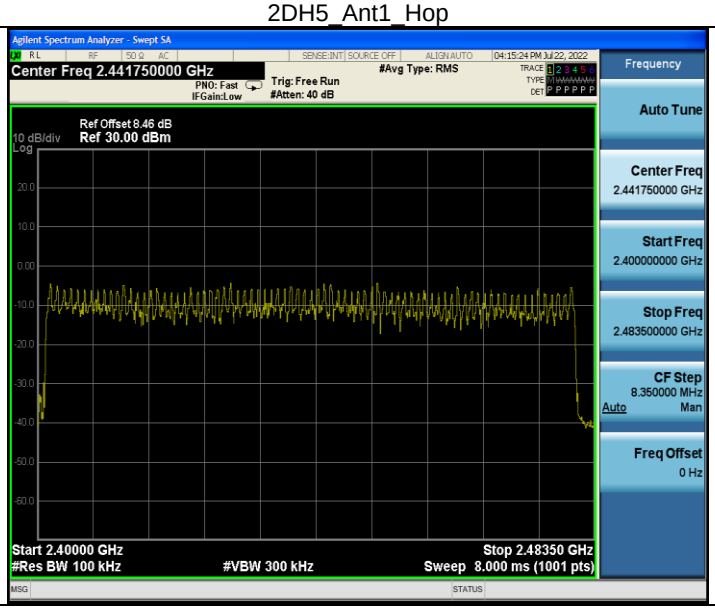
Mode	Quantity of Hopping Channel	Limit	Results
GFSK	79	≥15	Pass
π/4-DQPSK	79	≥15	Pass
8DPSK	79	≥15	Pass

Test Graphs

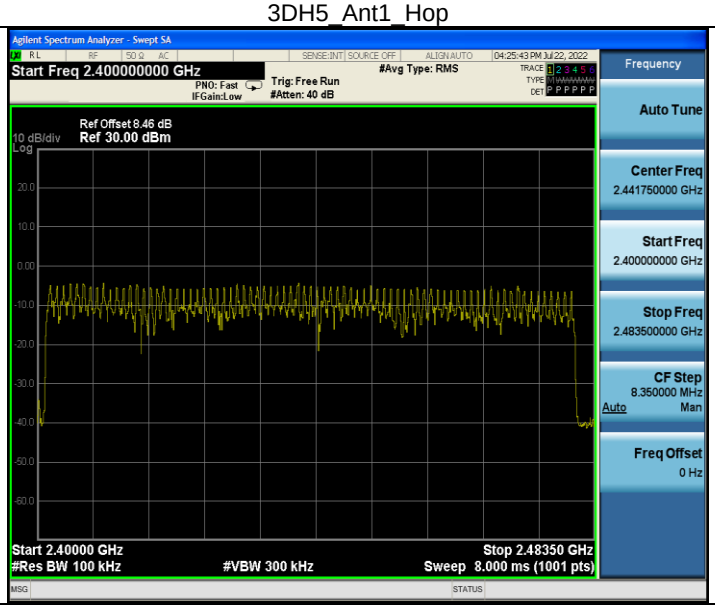
DH5_Ant1_Hop



2DH5_Ant1_Hop



3DH5_Ant1_Hop

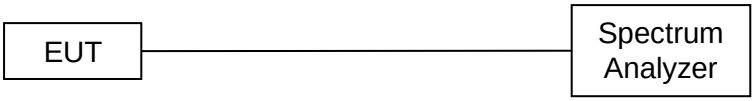


5.8 Conducted emissions at the band edge

5.8.1 Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

5.8.2 Test setup



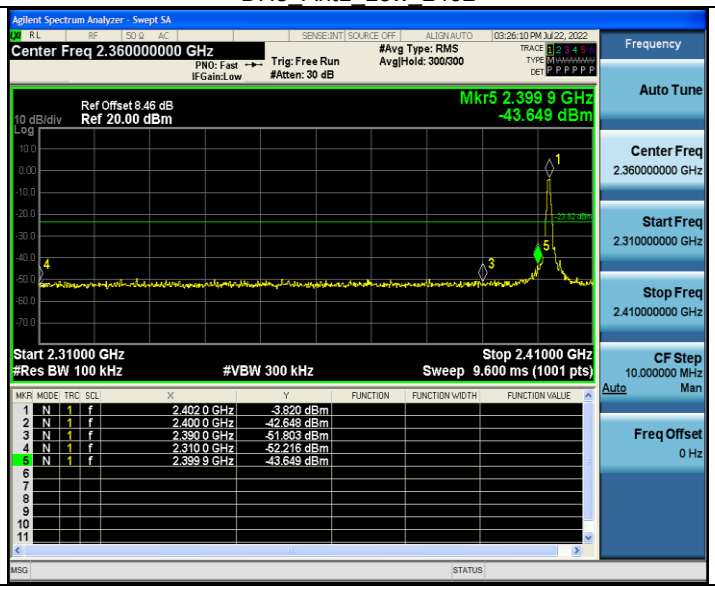
5.8.3 Test procedure

a) Test method: ANSI C63.10-2013 Section 6.10.4
b) The EUT was set to non-hopping mode & hopping mode during the test.
c) The transmitter output of EUT is connected to the spectrum analyzer.
d) Spectrum analyzer setting: RBW = 100 kHz, VBW = 300 kHz, Detector = Peak.

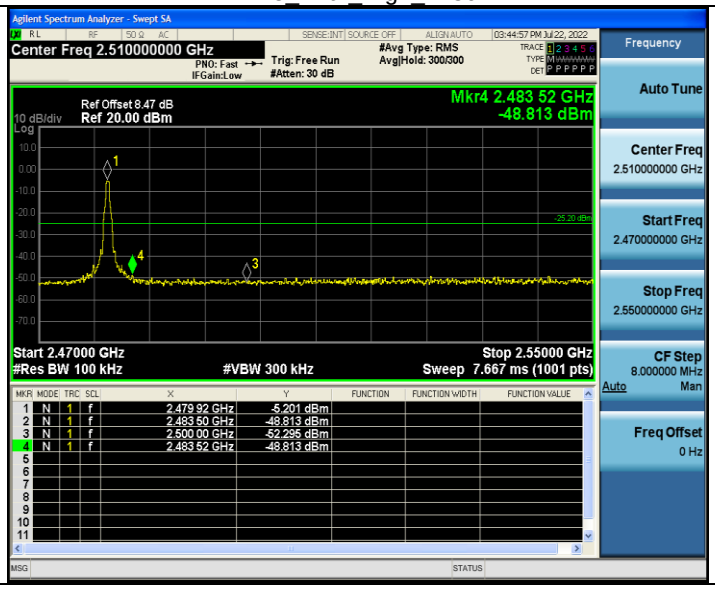
5.8.4 Test results

Test Graphs

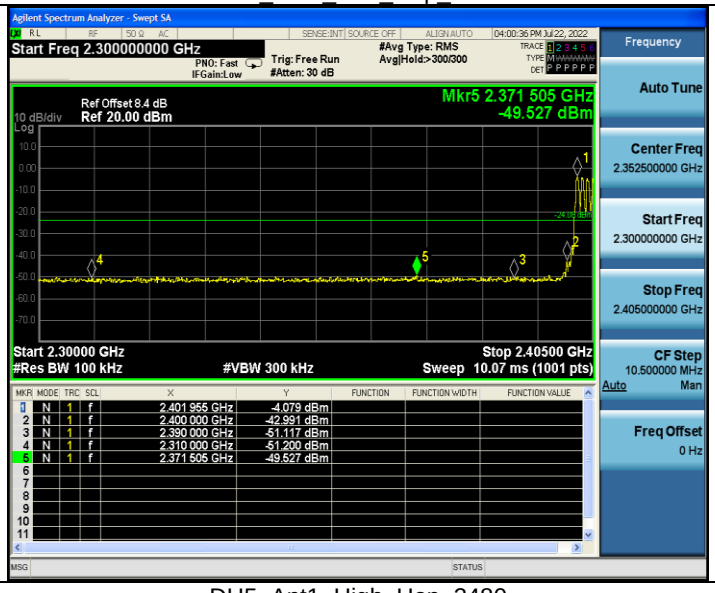
DH5_Ant1_Low_2402



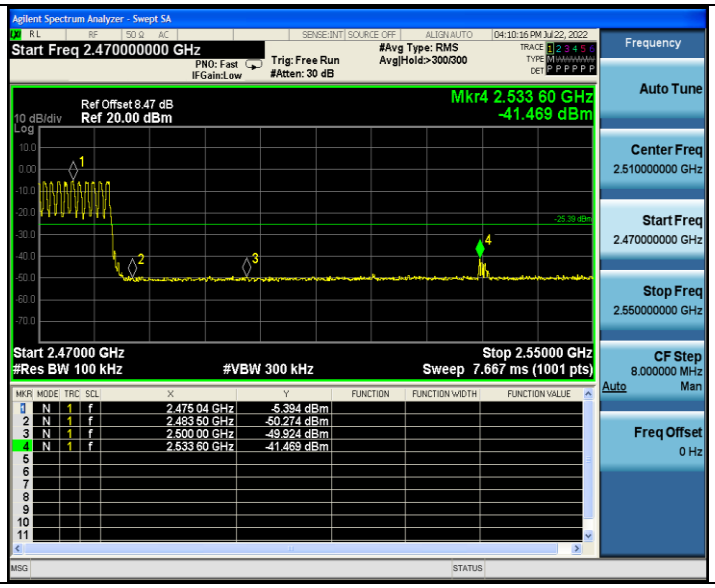
DH5_Ant1_High_2480



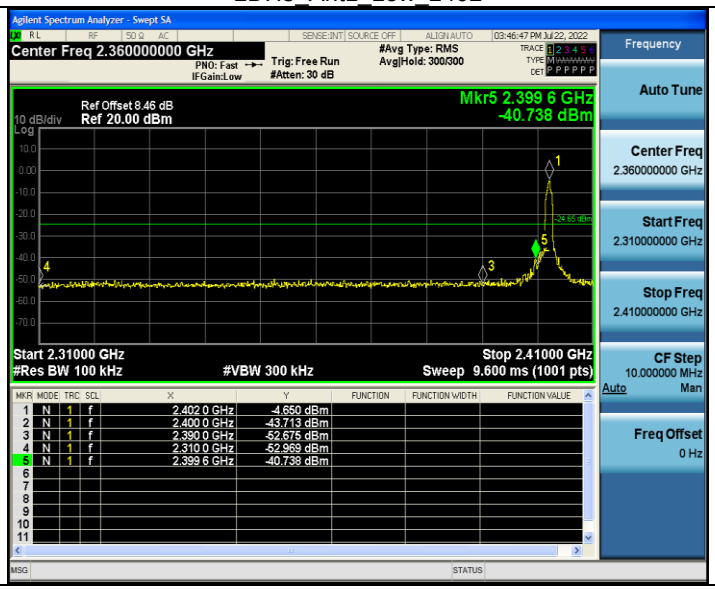
DH5_Ant1_Low_Hop_2402



DH5_Ant1_High_Hop_2480



2DH5_Ant1_Low_2402



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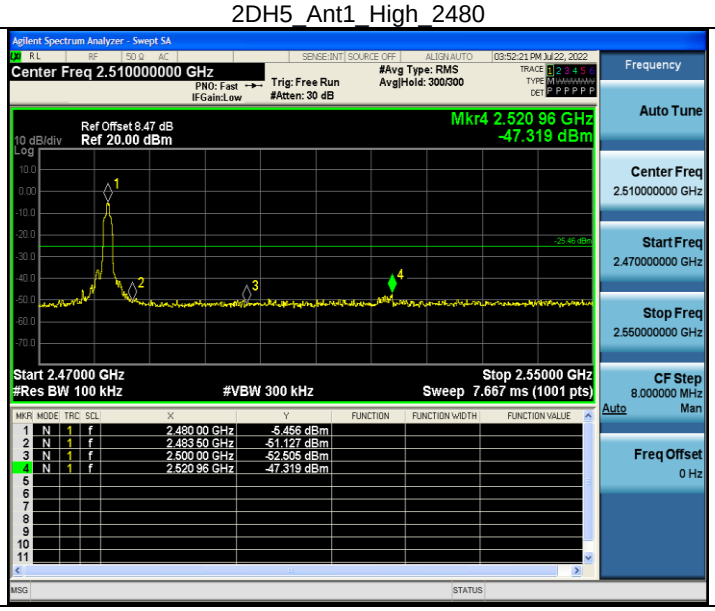
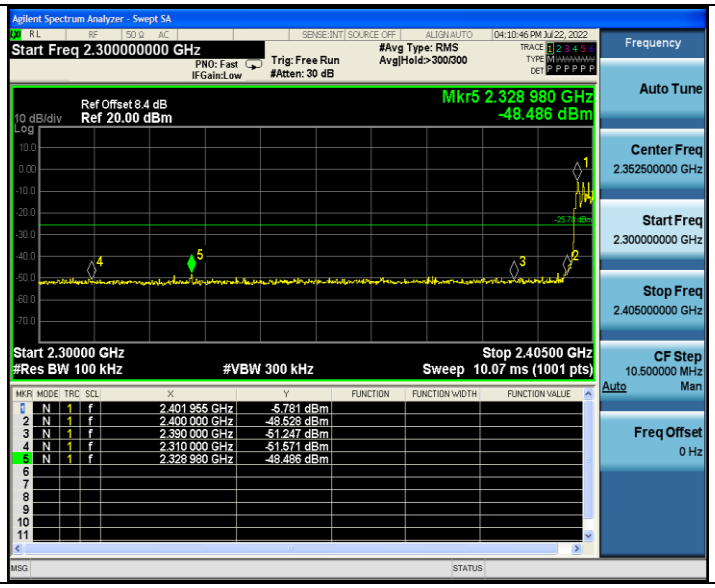
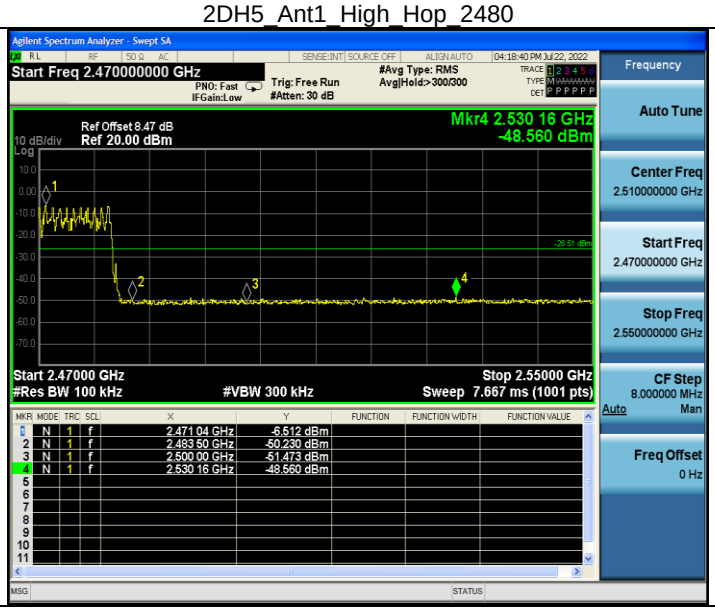


2DH5_Ant1_Low_Hop_2402



2DH5_Ant1_High_Hop_2480



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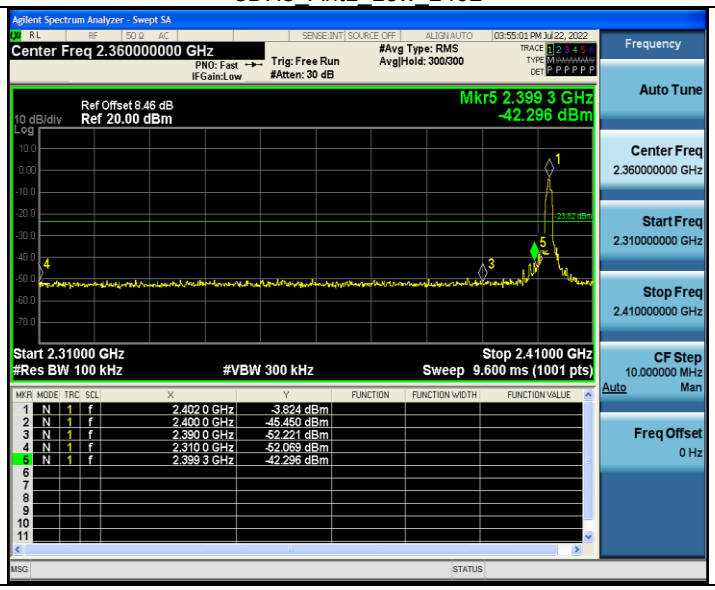

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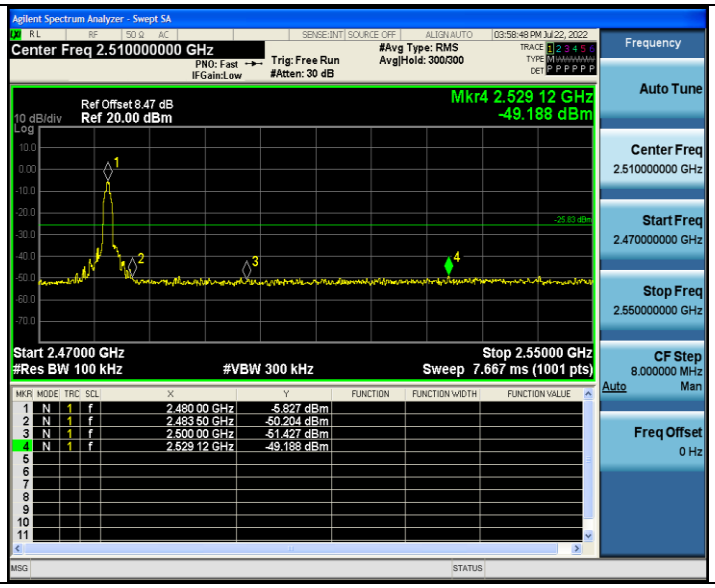

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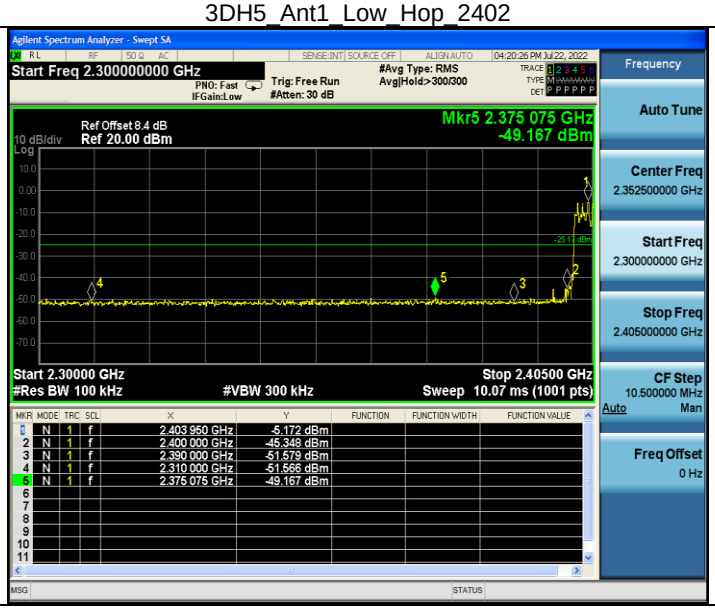

3DH5_Ant1_High_Hop_2480