

TEST REPORT

Applicant : Zhuhai Xprinter Electronics Technology Co., Ltd.

Address : 5/F, 1st Workshop, No.613 Huawei Road, Qianshan Industrial Zone,
Xiangzhou District, Zhuhai City, Guangdong Province, P.R.China

Manufacturer : Zhuhai Xprinter Electronics Technology Co., Ltd.

Address : 5/F, 1st Workshop, No.613 Huawei Road, Qianshan Industrial Zone,
Xiangzhou District, Zhuhai City, Guangdong Province, P.R.China

Factory : Zhuhai Xprinter Electronics Technology Co., Ltd.

Address : 5/F, 1st Workshop, No.613 Huawei Road, Qianshan Industrial Zone,
Xiangzhou District, Zhuhai City, Guangdong Province, P.R.China

Product Name : Thermal Label Printer, Thermal Barcode Printer

Model Number : XP-D20, XP-D21, XP-D22, XP-D23, XP-D24, XP-D25, XP-D26,
XP-D27, XP-D28, XP-D29

Trademark : **Xprinter** 芯烨

FCC ID : 2AWYK-XP-D20

Test Date : Apr. 01, 2026 - May. 20, 2026

Date of Report : May. 21, 2026

Test Result : This device described above has been tested by BKC, and the test results show that the equipment under test (EUT) is in compliance with the FCC CFR Title 47 Part 15 Subpart C Section 15.247 requirements. And it is applicable only to the tested sample identified in the report.

Test Procedure Used:

Standards : FCC CFR Title 47 Part 15 Subpart C Section 15.247
ANSI C63.10-2020+Cor 1-2023

Prepared by(Test Engineer):
Sten Huang



Approved(Manager):
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Approved(Manager):
Jerry Liao

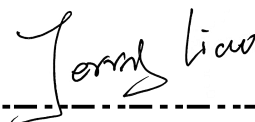
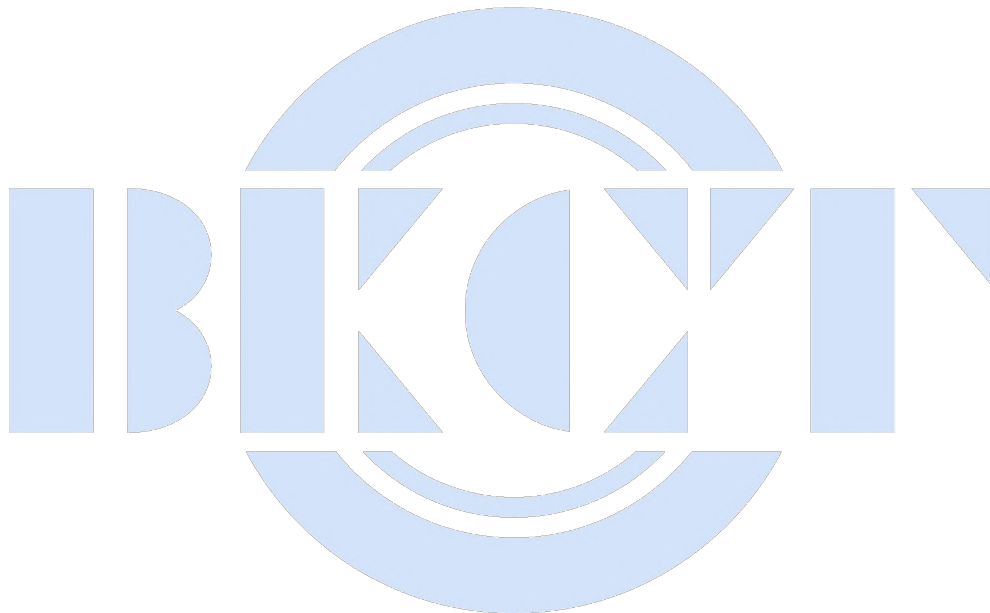


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1. General Information

1.1. Description of Device (EUT)

EUT Name	: Thermal Label Printer, Thermal Barcode Printer
Model No.	: XP-D20, XP-D21, XP-D22, XP-D23, XP-D24, XP-D25, XP-D26, XP-D27, XP-D28, XP-D29 (Note: This time, the "XP-D20" model is the main test model.)
Model Difference	: All the models have the same configuration, only the model number is different.
Power supply	: Input: 24.0V $\pm$ 1.5A
Adapter Information	: Model: YC36-24015005-E Input: 100-240V~ 50/60Hz 1.0A Output: 24.0V $\pm$ 1.5A 36.0W Manufacturer: ZHONGSHAN CITY YOUCHUANG ELECTRONICS TECHNOLOGY CO.,LTD
Operation frequency	: 2402-2480MHz
Max. RF output power:	: 0.12 dBm
Modulation	: GFSK, $\pi/4$ -DQPSK
Antenna Type	: PCB Antenna, Maximum Gain is -5.35dBi
Intend use environment	: Residential, commercial and light industrial environment

1.2. Channel List

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	1	2403	2	2404	3	2405
4	2406	5	2407	6	2408	7	2409
8	2410	9	2411	10	2412	11	2413
12	2414	13	2415	14	2416	15	2417
16	2418	17	2419	18	2420	19	2421
20	2422	21	2423	22	2424	23	2425
24	2426	25	2427	26	2428	27	2429
28	2430	29	2431	30	2432	31	2433
32	2434	33	2435	34	2436	35	2437
36	2438	37	2439	38	2440	39	2441
40	2442	41	2443	42	2444	43	2445
44	2446	45	2447	46	2448	47	2449
48	2450	49	2451	50	2452	51	2453
52	2454	53	2455	54	2456	55	2457
56	2458	57	2459	58	2460	59	2461
60	2462	61	2463	62	2464	63	2465
64	2466	65	2467	66	2468	67	2469
68	2470	69	2471	70	2472	71	2473
72	2474	73	2475	74	2476	75	2477
76	2478	77	2479	78	2480	-	-

1.3. Summary of test result

RF PART		
Test Items	Test Requirement	Result
Radiated Spurious Emissions	15.205(a) 15.209 15.247(d)	PASS
Band edge	15.247(d) 15.205(a)	PASS
Conduct Emission	15.207	PASS
20dB Bandwidth 99% Occupied Bandwidth	15.247(a)(1)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Frequency Separation	15.247(a)(1)	PASS
Number of Hopping Frequency	15.247(a)(1)(iii)	PASS
Dwell time	15.247(a)(1)(iii)	PASS
Antenna Requirement	15.203	PASS

Remark:
N/A is an abbreviation for Not Applicable.
Measurement Uncertainty is not taken into account for conformity statement

1.4. Special Accessories and Auxiliary Equipment

Description	Manufacturer	Model No.	Hardware Version	Software Version
/	/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/
/	/	/	/

1.5. Test mode

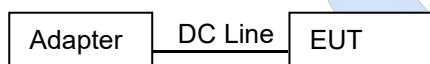
The special RF test software was used to control EUT work in Continuous BT TX mode, and select test channel, wireless mode.

Test mode	Low channel	Middle channel	High channel
GFSK	2402MHz	2441MHz	2480MHz
$\pi/4$ -DQPSK	2402MHz	2441MHz	2480MHz
/	/	/	/

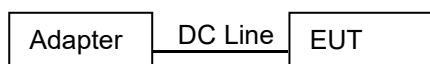
Note: The report only presents the worst test data.

1.6. Block Diagram

Conducted Emission



Radiated Emission



Conducted Spurious



1.7. Test Conditions

Category	Normal Conditions	Extreme Conditions
Temperature range	15-35°C	N/A
Humidity range	20-75%	N/A
Pressure range	86-106kPa	N/A
Power supply	24V---1.5A	N/A
Note: N/A is an abbreviation for Not Applicable.		

1.8. Measurement Uncertainty (95% confidence levels, k=2)

Item	MU	Remark
Uncertainty for radio frequency	$\pm 7 \times 10^{-8}$	
Conducted Emissions (150kHz~30MHz)	$\pm 2.54\text{dB}$	
Radiated Emission(9KHz~30MHz)	$\pm 1.6\text{ dB}$	
Radiated Emission(30MHz~1GHz)	Vertical: $\pm 4.14\text{dB}$ Horizontal: $\pm 4.25\text{dB}$	
Radiated Emission(1GHz~6GHz)	$\pm 3.9\text{dB}$	
Radiated Emission(6GHz~18GHz)	$\pm 4.3\text{dB}$	
Radiated Emission(18GHz~40GHz)	$\pm 3.38\text{dB}$	
Uncertainty for conducted RF Power	$\pm 0.20\text{dB}$	
Conducted spurious emissions	$\pm 0.24\text{dB}$	
Uncertainty for temperature	0.6°C	
Uncertainty for humidity	1%	
Bandwidth	$\pm 1.5 \times 10^{-6}$	
Time	$\pm 2\%$	
Duty Cycle	$\pm 2\%$	
Remark: The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95%		

1.9. Test Facility

Site Description	
Name of Firm	: Shenzhen BKC Testing Co., Ltd.
Site Location	: Room 103, 1/F, Huaya Building, Huaya Industrial Park, Longhua Community, Longhua District, Shenzhen, Guangdong, China.
ISED CAB identifier	: CN0188
ISED Company Number	: 34333
FCC Designation Number	: CN1416
FCC Test Firm Registration Number	: 701543

1.10. Test Equipment

Conducted Test Site

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	LISN	R&S	ENV216	102762	Mar. 11. 2026	Mar. 10. 2027
2	EMI Test Receiver	R&S	ESCI	101424	Mar. 11. 2026	Mar. 10. 2027
3	Rf cables	HTEC	HCE 2M-CE	N/A	Mar. 11. 2026	Mar. 10. 2027
4	Coupling/ Decoupling Network	Diamond	CX210	N/A	Mar. 11. 2026	Mar. 10. 2027
5	CE Testing software	EZ	EZ-EMC	/	/	/

Radiated Test Site(Below 1G and Above 1G)

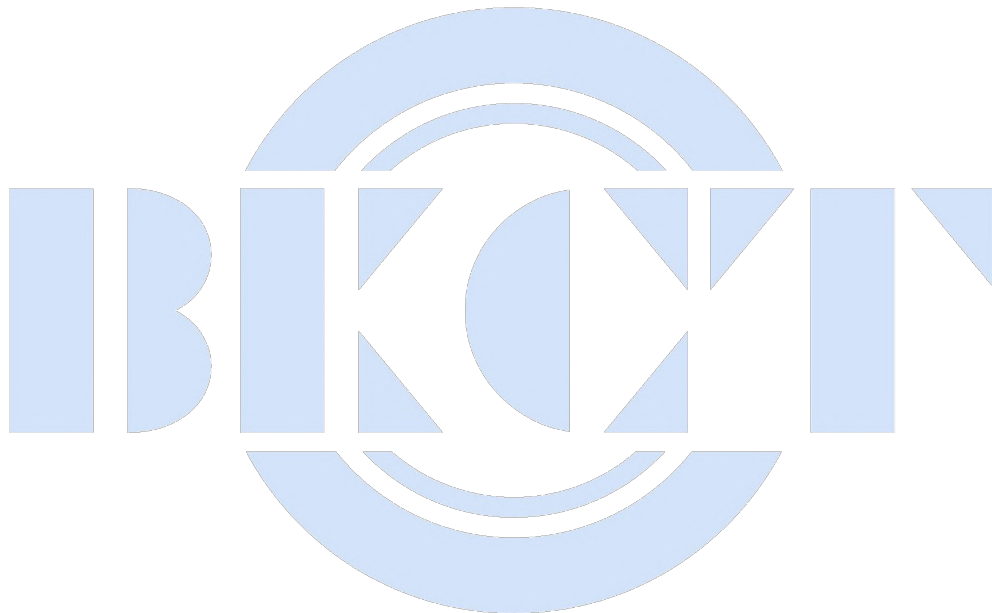
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Antenna	Schwarzbeck	VULB 9168	01321	Mar. 20. 2025	Mar. 19. 2028
2	EMI Test Receiver	R&S	ESRP	101478	Mar. 11. 2026	Mar. 10. 2027
3	Preamplifier	HP	8447D	2727A05345	Mar. 11. 2026	Mar. 10. 2027
4	Double Ridged Broadband	SCHWARZBECK	BBHA 9120D	02621	Mar. 11. 2026	Mar. 19. 2028
5	Preamplifier	Schwarzbeck	BBV 9718D	00041	Mar. 11. 2026	Mar. 10. 2027
6	Rf cables	HUBER+SUHNER	8M-RE	N/A	Mar. 11. 2026	Mar. 10. 2027
7	Rf cables	HUBER+SUHNER	1.5M-RE	N/A	Mar. 11. 2026	Mar. 10. 2027
8	Rf cables	HUBER+SUHNER	1.5M-AP-RE	N/A	Mar. 11. 2026	Mar. 10. 2027
9	Loop antenna	ANRF	ANRF-6603	091802	Mar. 09. 2025	Mar. 10. 2027
10	Spectrum analyzer	R&S	FSP40	200061	Mar. 11. 2026	Mar. 10. 2027
11	Double Ridged Broadband Horn Antenna	COM-POWER	AH-1840	10100009	Mar. 11. 2026	Mar. 10. 2027
12	Spectrum	Agilent	N9020A	MY50510311	Mar. 11. 2026	Mar. 10. 2027
13	Band Stop Filter	Bafang	BSF5G	2024052610	Mar. 11. 2026	Mar. 10. 2027
14	RE Testing software	EZ	EZ-EMC	/	/	/

RF Test Site

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum	Agilent	N9020A	MY50510311	Mar. 11. 2026	Mar. 10. 2027
2	Vector source	Agilent	N5182A	MY47420223	Mar. 11. 2026	Mar. 10. 2027
3	All instrument	Rohde & Schwarz	CMW 500	101131	Mar. 11. 2026	Mar. 10. 2027
4	control unit	MW	MW100-RFCB	MW200411BK-34	/	Mar. 10. 2027
5	RF Testing software	MW	MTS 8310	/	/	/
6	Spectrum analyzer	R&S	FSP40	200061	Mar. 11. 2026	Mar. 10. 2027

Test software

Software name	RF Testing software
Software version	2.0.0.0
Software name	RE Testing software
Software version	EMEC-03A2 RE+
Software name	CE Testing software
Software version	EMEC-3A1+



2. Conducted emission at the mains terminals test

2.1. Limit

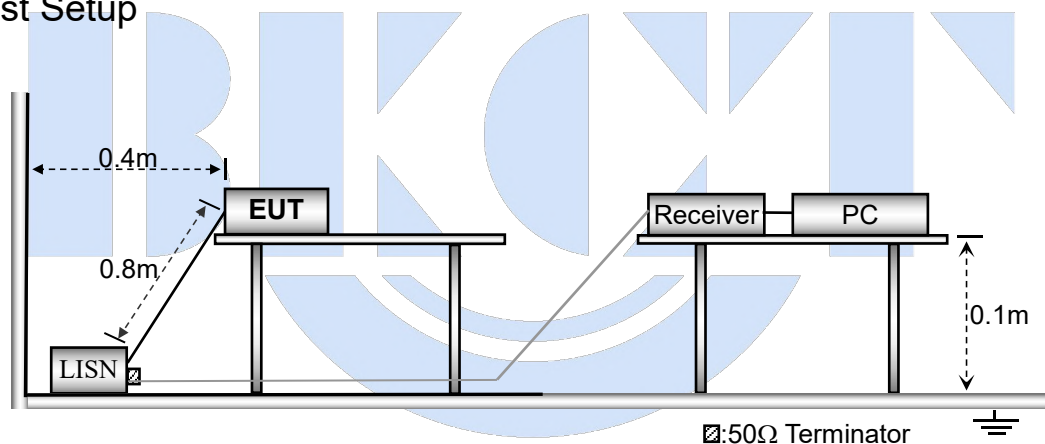
Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10-2020+Cor 1-2023
Test Frequency Range:	150KHz to 30MHz
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto

Frequency MHz	Limits dB(μ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66 ~ 56*	56 ~ 46*
0.50 ~ 5.00	56	46
5.00 ~ 30.00	60	50

Notes: 1. *Decreasing linearly with logarithm of frequency.

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

2.2. Test Setup



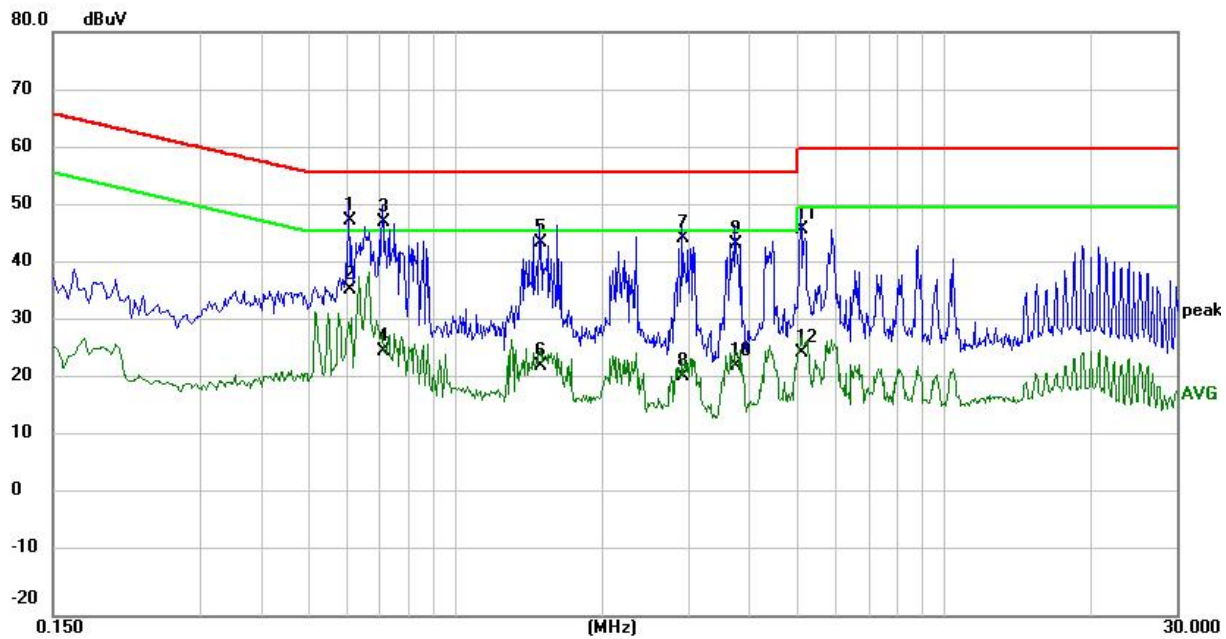
2.3. Test Procedure

1. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
2. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
3. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
4. LISN at least 80 cm from nearest part of EUT chassis.
5. For the actual test configuration, please refer to the related Item – EUT Test Photos.

2.4. Test Result

All the modulation modes were tested the data of the worst mode (GFSK: 2402MHz) are recorded in the following pages and the others modulation methods do not exceed the limits.

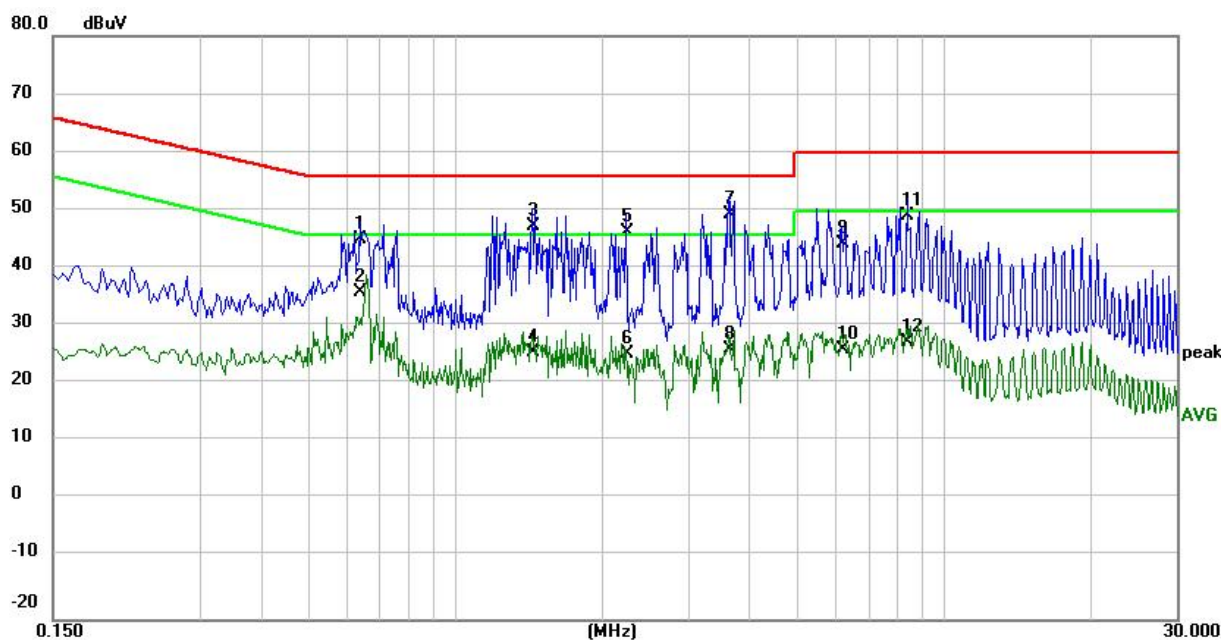
Conducted Emission At The Mains Terminals Test Data			
Temperature:	25.1°C	Relative Humidity:	56%
Pressure:	1008hPa	Phase :	Line
Test Voltage :	AC 120V/60Hz	Test Mode:	Working



No.	Frequency (MHz)	Reading Level(dBuV)	Factor (dB)	Measurement(dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.6059	25.76	21.89	47.65	56.00	-8.35	QP
2	0.6059	14.14	21.89	36.03	46.00	-9.97	AVG
3	0.7100	25.50	21.89	47.39	56.00	-8.61	QP
4	0.7100	3.54	21.89	25.43	46.00	-20.57	AVG
5	1.4939	22.68	21.39	44.07	56.00	-11.93	QP
6	1.4939	1.51	21.39	22.90	46.00	-23.10	AVG
7	2.9260	24.73	19.98	44.71	56.00	-11.29	QP
8	2.9260	1.12	19.98	21.10	46.00	-24.90	AVG
9	3.7459	23.85	19.94	43.79	56.00	-12.21	QP
10	3.7459	2.78	19.94	22.72	46.00	-23.28	AVG
11	5.1100	26.18	19.99	46.17	60.00	-13.83	QP
12	5.1100	5.00	19.99	24.99	50.00	-25.01	AVG

Conducted Emission At The Mains Terminals Test Data

Temperature:	25.1°C	Relative Humidity:	56%
Pressure:	1008hPa	Phase :	Neutral
Test Voltage :	AC 120V/60Hz	Test Mode:	Working



No.	Frequency (MHz)	Reading Level(dBuV)	Factor (dB)	Measure-ment(dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.6380	23.30	21.89	45.19	56.00	-10.81	QP
2	0.6380	14.21	21.89	36.10	46.00	-9.90	AVG
3	1.4380	25.97	21.44	47.41	56.00	-8.59	QP
4	1.4380	4.29	21.44	25.73	46.00	-20.27	AVG
5	2.2380	25.84	20.65	46.49	56.00	-9.51	QP
6	2.2380	5.03	20.65	25.68	46.00	-20.32	AVG
7	3.6300	29.47	19.93	49.40	56.00	-6.60	QP
8	3.6300	6.53	19.93	26.46	46.00	-19.54	AVG
9	6.1900	24.53	19.99	44.52	60.00	-15.48	QP
10	6.1900	6.25	19.99	26.24	50.00	-23.76	AVG
11	8.4460	29.28	19.98	49.26	60.00	-10.74	QP
12	8.4460	7.52	19.98	27.50	50.00	-22.50	AVG

3. Radiated Spurious Emissions

3.1. Limit

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247
Test Method: KDB 558074 D01 15.247 Meas Guidance v05r02;
ANSI C63.10-2020+Cor 1-2023
Test Result: PASS
Measurement Distance: 3m

Frequency	Detector	RBW	VBW	Value
9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120KHz	360KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

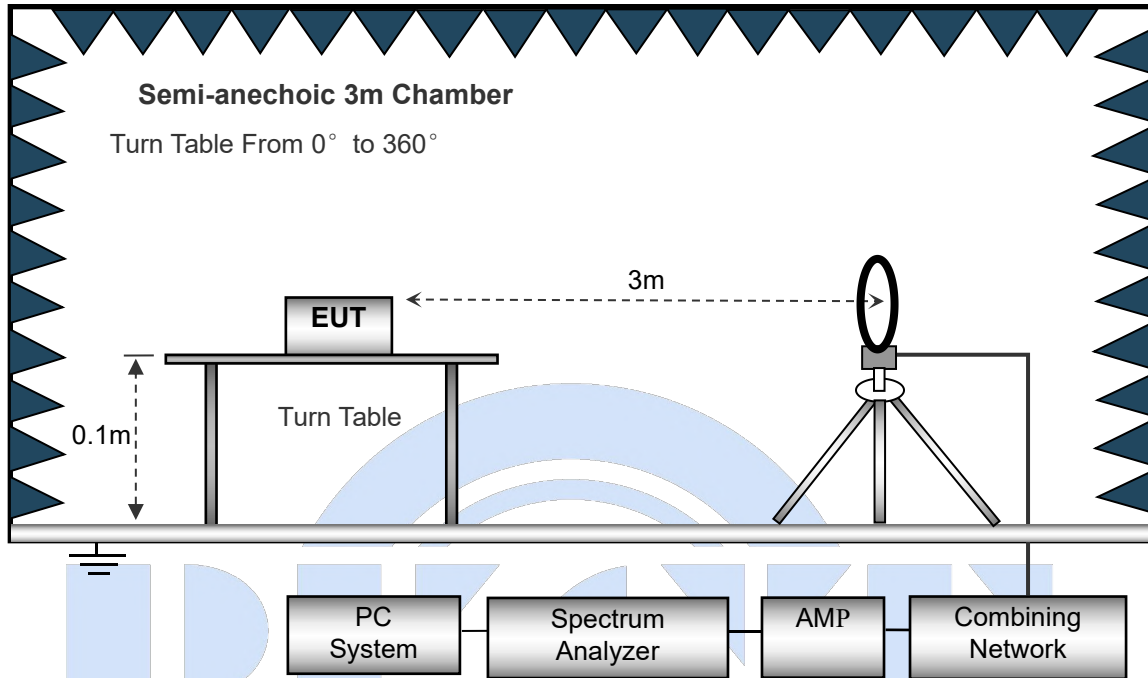
Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log(2400/F(\text{kHz})) + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log(24000/F(\text{kHz})) + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log(30) + 40$
30 ~ 88	100	3	100	$20\log(100)$
88 ~ 216	150	3	150	$20\log(150)$
216 ~ 960	200	3	200	$20\log(200)$
Above 960	500	3	500	$20\log(500)$

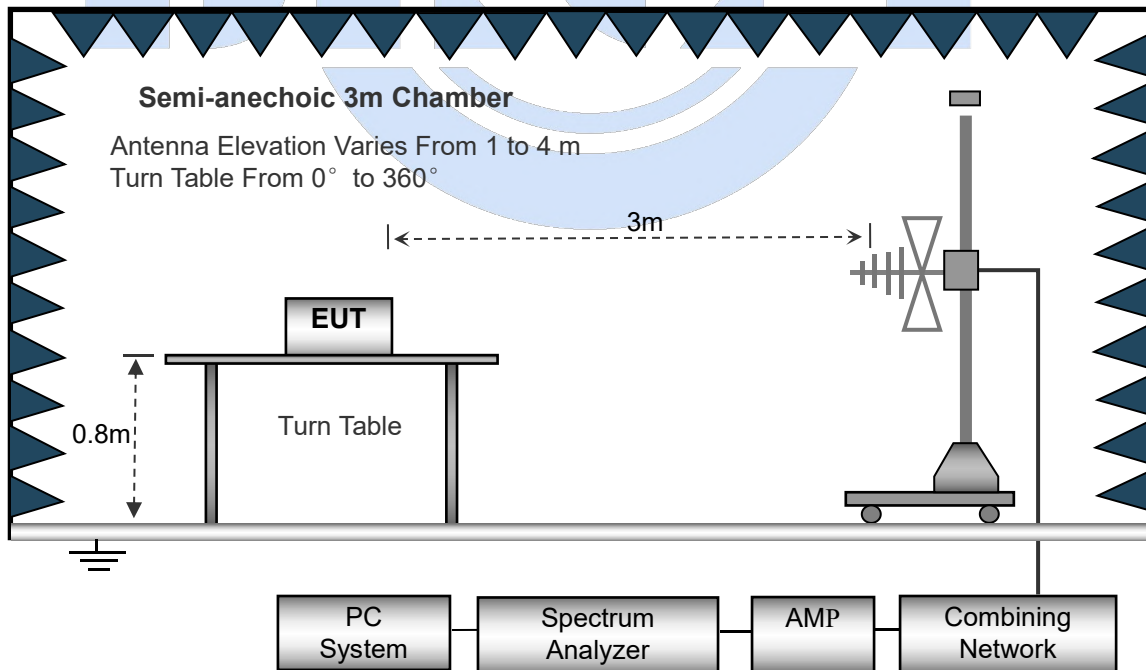
3.2. Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10-2020+Cor 1-2023 .

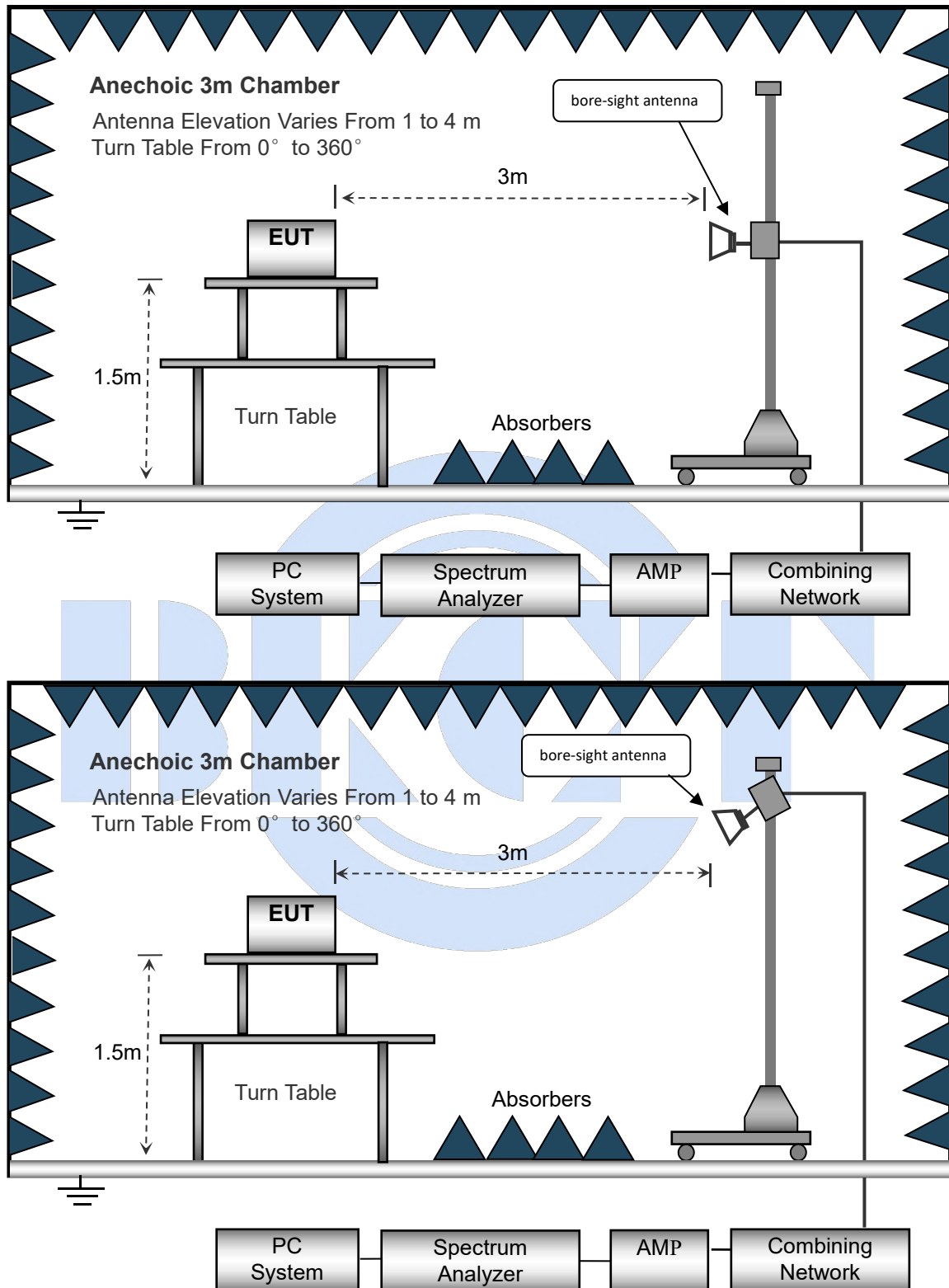
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



3.3. Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane for below 1GHz and 1.5m for above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X,Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),the worst condition was tested putting the eut in Z axis,so the worst data were shown as follow.
8. A 2.4GHz high - pass filter is used during radiated emissions above 1GHz measurement.



3.4. Test Result

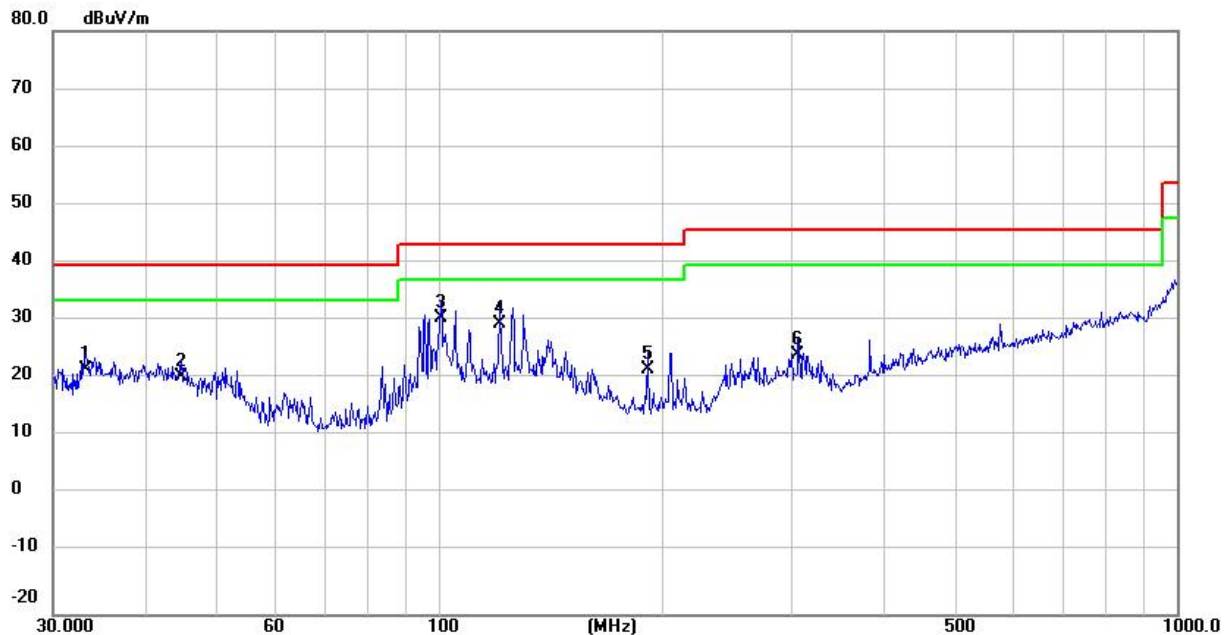
Test Frequency: 9KHz~30MHz

The measurements were more than 20 dB below the limit and not reported.

Test Frequency : 30MHz ~ 1GHz

All the modulation modes were tested the data of the worst mode (GFSK: 2402MHz) are recorded in the following pages and the others modulation methods do not exceed the limits.

Radiation Emission Test Data			
Temperature:	25.1°C	Relative Humidity:	56%
Pressure:	1008hPa	Phase :	Horizontal
Test Voltage :	AC 120V/60Hz	Test Mode	Working



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark			
1	33.2111	26.01	-3.92	22.09	40.00	-17.91	QP			
2	44.7433	24.80	-3.87	20.93	40.00	-19.07	QP			
3	100.5806	35.67	-4.74	30.93	43.50	-12.57	QP			
4	120.6991	33.06	-3.18	29.88	43.50	-13.62	QP			
5	191.7450	29.25	-7.07	22.18	43.50	-21.32	QP			
6	306.7536	26.18	-1.52	24.66	46.00	-21.34	QP			

Radiation Emission Test Data

Temperature:	25.1°C	Relative Humidity:	56%
Pressure:	1008hPa	Phase :	Vertical
Test Voltage :	AC 120V/60Hz	Test Mode	Working



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark			
1	31.6202	40.19	-5.55	34.64	40.00	-5.36	QP			
2	39.0245	35.81	-2.03	33.78	40.00	-6.22	QP			
3	43.0505	36.20	-3.22	32.98	40.00	-7.02	QP			
4	51.1209	35.51	-6.27	29.24	40.00	-10.76	QP			
5	126.3286	38.86	-3.24	35.62	43.50	-7.88	QP			
6	144.8418	38.63	-3.00	35.63	43.50	-7.87	QP			

Spurious Emission Above 1GHz (1GHz to 25GHz)

BT mode have been tested, and the worst (GFSK) result was report as below:

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-ampl ifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/ m)	Margin (dB)	Detect or Type
Low Channel:2402MHz									
V	4804.000	44.00	30.55	5.77	33.52	52.74	74.00	-21.26	Pk
V	4804.000	22.25	30.55	5.77	33.52	30.99	54.00	-23.01	AV
V	7206.000	44.51	30.33	6.32	36.30	56.80	74.00	-17.20	Pk
V	7206.000	23.09	30.33	6.32	36.30	35.38	54.00	-18.62	AV
V	9608.000	44.93	30.85	7.45	38.80	60.33	74.00	-13.67	Pk
V	9608.000	25.65	30.85	7.45	38.80	41.05	54.00	-12.95	AV
V	12010.000	43.79	31.02	8.99	39.50	61.26	74.00	-12.74	Pk
V	12010.000	27.52	31.02	8.99	39.50	44.99	54.00	-9.01	AV
H	4804.000	43.58	30.55	5.77	33.52	52.32	74.00	-21.68	Pk
H	4804.000	20.16	30.55	5.77	33.52	28.90	54.00	-25.10	AV
H	7206.000	40.14	30.33	6.32	36.30	52.43	74.00	-21.57	Pk
H	7206.000	24.12	30.33	6.32	36.30	36.41	54.00	-17.59	AV
H	9608.000	42.62	30.85	7.45	38.80	58.02	74.00	-15.98	Pk
H	9608.000	25.62	30.85	7.45	38.80	41.02	54.00	-12.98	AV
H	12010.000	42.06	31.02	8.99	39.50	59.53	74.00	-14.47	Pk
H	12010.000	31.69	31.02	8.99	39.50	49.16	54.00	-4.84	AV
Low Channel:2441MHz									
V	4882.00	41.38	30.55	5.77	33.60	50.20	74.00	-23.80	Pk
V	4882.00	20.94	30.55	5.77	33.60	29.76	54.00	-24.24	AV
V	7323.00	43.63	30.33	6.32	36.40	56.02	74.00	-17.98	Pk
V	7323.00	22.52	30.33	6.32	36.40	34.91	54.00	-19.09	AV
V	9764.00	41.21	30.85	7.45	38.80	56.61	74.00	-17.39	Pk
V	9764.00	26.63	30.85	7.45	38.80	42.03	54.00	-11.97	AV
V	12205.00	42.62	31.02	8.99	39.50	60.09	74.00	-13.91	Pk
V	12205.00	31.45	31.02	8.99	39.50	48.92	54.00	-5.08	AV
H	4882.00	44.49	30.55	5.77	33.60	53.31	74.00	-20.69	Pk
H	4882.00	24.64	30.55	5.77	33.60	33.46	54.00	-20.54	AV
H	7323.00	43.44	30.33	6.32	36.40	55.83	74.00	-18.17	Pk
H	7323.00	21.60	30.33	6.32	36.40	33.99	54.00	-20.01	AV
H	9764.00	43.96	30.85	7.45	38.80	59.36	74.00	-14.64	Pk
H	9764.00	26.98	30.85	7.45	38.80	42.38	54.00	-11.62	AV
H	12205.00	46.52	31.02	8.99	39.50	63.99	74.00	-10.01	Pk
H	12205.00	31.42	31.02	8.99	39.50	48.89	54.00	-5.11	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-ampl ifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/ m)	Margin (dB)	Detect or Type
Low Channel:2480MHz									
V	4960.00	40.03	30.55	5.77	33.70	48.95	74.00	-25.05	Pk
V	4960.00	21.84	30.55	5.77	33.70	30.76	54.00	-23.24	AV
V	7440.00	43.30	30.33	6.32	36.50	55.79	74.00	-18.21	Pk
V	7440.00	20.72	30.33	6.32	36.50	33.21	54.00	-20.79	AV
V	9920.00	43.49	30.85	7.45	38.80	58.89	74.00	-15.11	Pk
V	9920.00	26.83	30.85	7.45	38.80	42.23	54.00	-11.77	AV
V	12400.00	43.63	31.02	8.99	39.50	61.10	74.00	-12.90	Pk
V	4960.00	40.03	30.55	5.77	33.70	48.95	74.00	-25.05	AV
H	4960.00	43.41	30.55	5.77	33.70	52.33	74.00	-21.67	Pk
H	4960.00	24.23	30.55	5.77	33.70	33.15	54.00	-20.85	AV
H	7440.00	41.07	30.33	6.32	36.50	53.56	74.00	-20.44	Pk
H	7440.00	22.39	30.33	6.32	36.50	34.88	54.00	-19.12	AV
H	9920.00	40.24	30.85	7.45	38.80	55.64	74.00	-18.36	Pk
H	9920.00	28.66	30.85	7.45	38.80	44.06	54.00	-9.94	AV
H	12400.00	43.21	31.02	8.99	39.50	60.68	74.00	-13.32	Pk
H	12400.00	31.25	31.02	8.99	39.50	48.72	54.00	-5.28	AV

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss - Pre-amplifier,
Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz

	Polar (H/V)	Frequenc y (MHz)	Meter Reading (dBuV)	Pre- amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV /m)	Detec tor Type	Result
GFSK	Low Channel: 2402MHz									
	H	2310.00	53.57	30.22	4.85	23.98	52.18	74.00	Pk	PASS
	H	2310.00	44.23	30.22	4.85	23.98	42.84	54.00	AV	PASS
	H	2390.00	53.53	30.22	4.85	23.98	52.14	74.00	Pk	PASS
	H	2390.00	44.03	30.22	4.85	23.98	42.64	54.00	AV	PASS
	V	2310.00	53.26	30.22	4.85	23.98	51.87	74.00	Pk	PASS
	V	2310.00	44.97	30.22	4.85	23.98	43.58	54.00	AV	PASS
	V	2390.00	54.48	30.22	4.85	23.98	53.09	74.00	Pk	PASS
	V	2390.00	44.99	30.22	4.85	23.98	43.60	54.00	AV	PASS
	High Channel: 2480MHz									
	H	2483.50	53.69	30.22	4.85	23.98	52.30	74.00	Pk	PASS
	H	2483.50	44.26	30.22	4.85	23.98	42.87	54.00	AV	PASS
	H	2500.00	54.90	30.22	4.85	23.98	53.51	74.00	Pk	PASS
	H	2500.00	44.85	30.22	4.85	23.98	43.46	54.00	AV	PASS
	V	2483.50	54.52	30.22	4.85	23.98	53.13	74.00	Pk	PASS
	V	2483.50	44.76	30.22	4.85	23.98	43.37	54.00	AV	PASS
	V	2500.00	54.72	30.22	4.85	23.98	53.33	74.00	Pk	PASS
	V	2500.00	44.26	30.22	4.85	23.98	42.87	54.00	AV	PASS
	Hopping Mode									
	H	2390.00	54.13	30.22	4.85	23.98	52.74	74.00	Pk	PASS
	H	2390.00	44.06	30.22	4.85	23.98	42.67	54.00	AV	PASS
	H	2400.00	53.47	30.22	4.85	23.98	52.08	74.00	Pk	PASS
	H	2400.00	44.78	30.22	4.85	23.98	43.39	54.00	AV	PASS
	H	2483.50	54.37	30.22	4.85	23.98	52.98	74.00	Pk	PASS
	H	2483.50	44.31	30.22	4.85	23.98	42.92	54.00	AV	PASS
	H	2500.00	53.62	30.22	4.85	23.98	52.23	74.00	Pk	PASS
	H	2500.00	44.48	30.22	4.85	23.98	43.09	54.00	AV	PASS
	V	2390.00	54.86	30.22	4.85	23.98	53.47	74.00	Pk	PASS
	V	2390.00	44.44	30.22	4.85	23.98	43.05	54.00	AV	PASS
	V	2400.00	53.79	30.22	4.85	23.98	52.40	74.00	Pk	PASS
	V	2400.00	44.06	30.22	4.85	23.98	42.67	54.00	AV	PASS
	V	2483.50	53.51	30.22	4.85	23.98	52.12	74.00	Pk	PASS
	V	2483.50	44.66	30.22	4.85	23.98	43.27	54.00	AV	PASS
	V	2500.00	53.19	30.22	4.85	23.98	51.80	74.00	Pk	PASS
	V	2500.00	44.80	30.22	4.85	23.98	43.41	54.00	AV	PASS

Remark:

1. Emission Level = Meter Reading+Antenna Factor+Cable Loss-Pre-amplifier, Margin= Emission Level-Limit
2. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

4. Maximum Peak Output Power

4.1. Limit

Test Requirement: FCC CFR47 Part 15 Section 15.247.

Test Method: KDB 558074 D01 15.247 Meas Guidance v05r02;

ANSI C63.10-2020+Cor 1-2023

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Peak Output Power	1 watt or 21dBm	2400-2483.5	PASS

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.

4.2. Test Setup



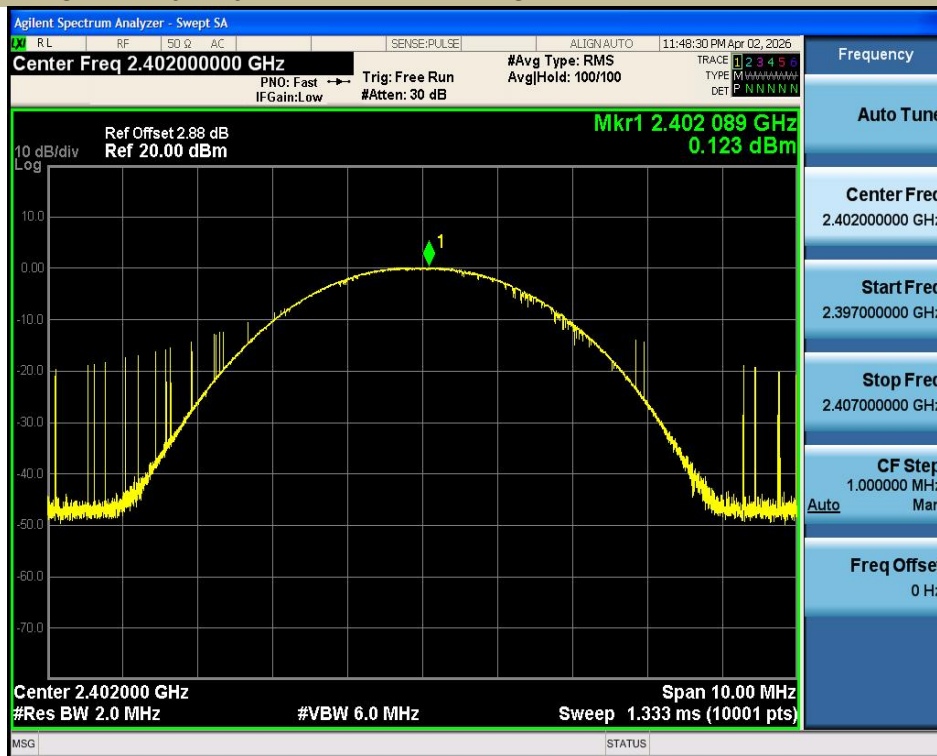
4.3. Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above,
2. Spectrum Setting:
 RBW > the 20 dB bandwidth of the emission being measured
 Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
 VBW ≥ RBW
 Sweep = auto
 Detector function = peak
 Trace = max hold

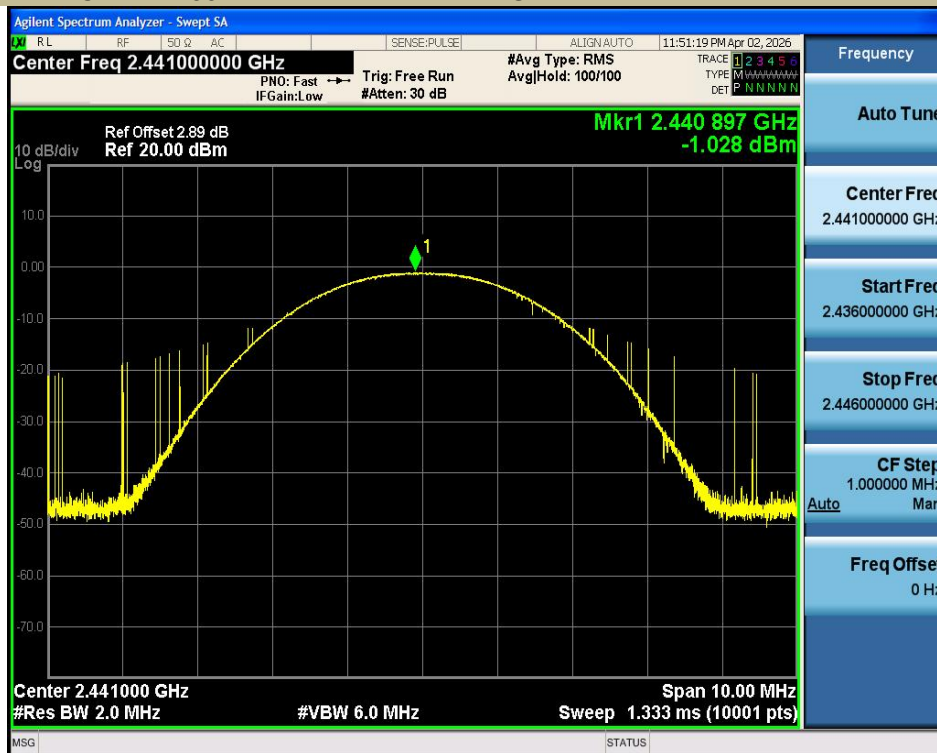
4.4. Test Result

Operation Mode	Channel Number	Channel Frequency (MHz)	Measurement Level (dBm)	Limit (dBm)	Verdict
GFSK	0	2402	0.12	21	PASS
	39	2441	-1.03	21	PASS
	78	2480	-0.44	21	PASS
π/4-DQPSK	0	2402	0.01	21	PASS
	39	2441	-1.12	21	PASS
	78	2480	-0.51	21	PASS
Note: N/A					

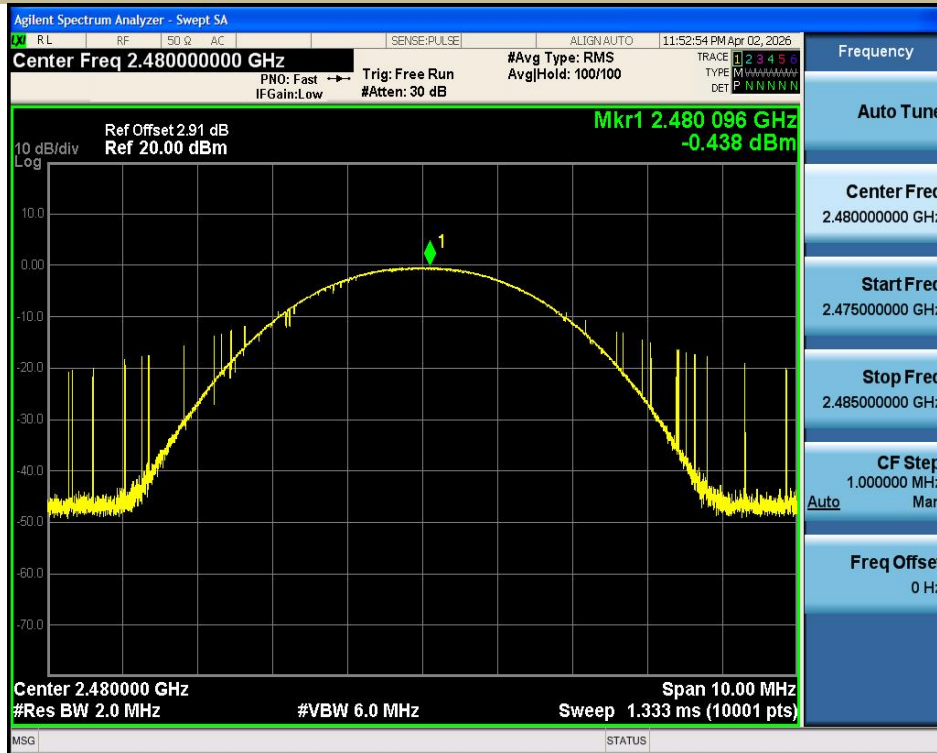
Test Model

Maximum Peak Conducted Output Power
Channel 0: 2402MHz
GFSK


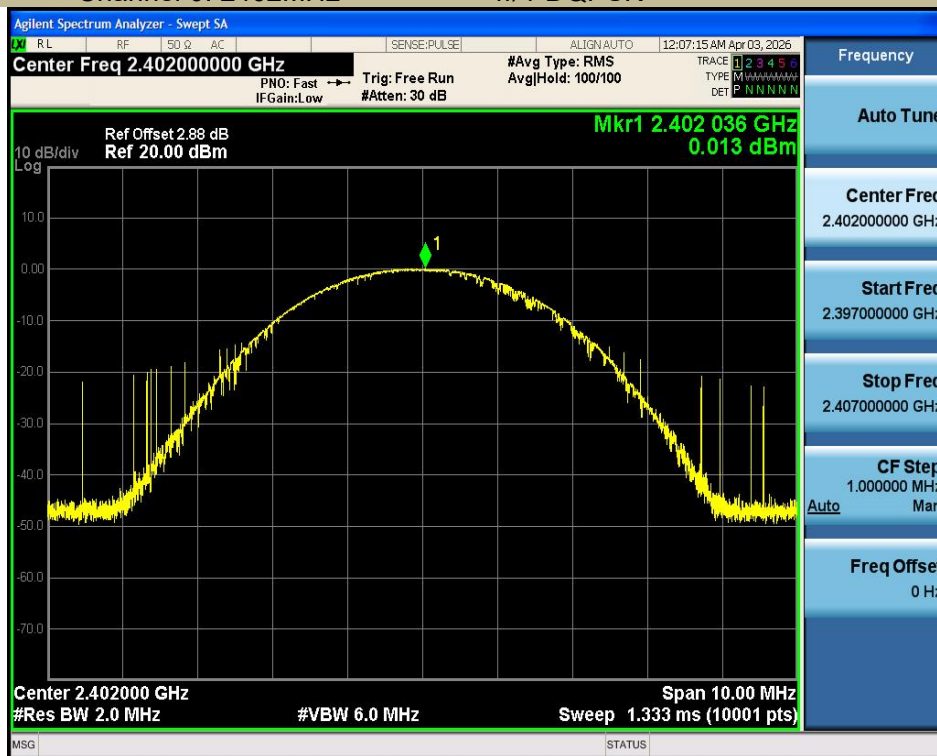
Test Model

Maximum Peak Conducted Output Power
Channel 39: 2441MHz
GFSK


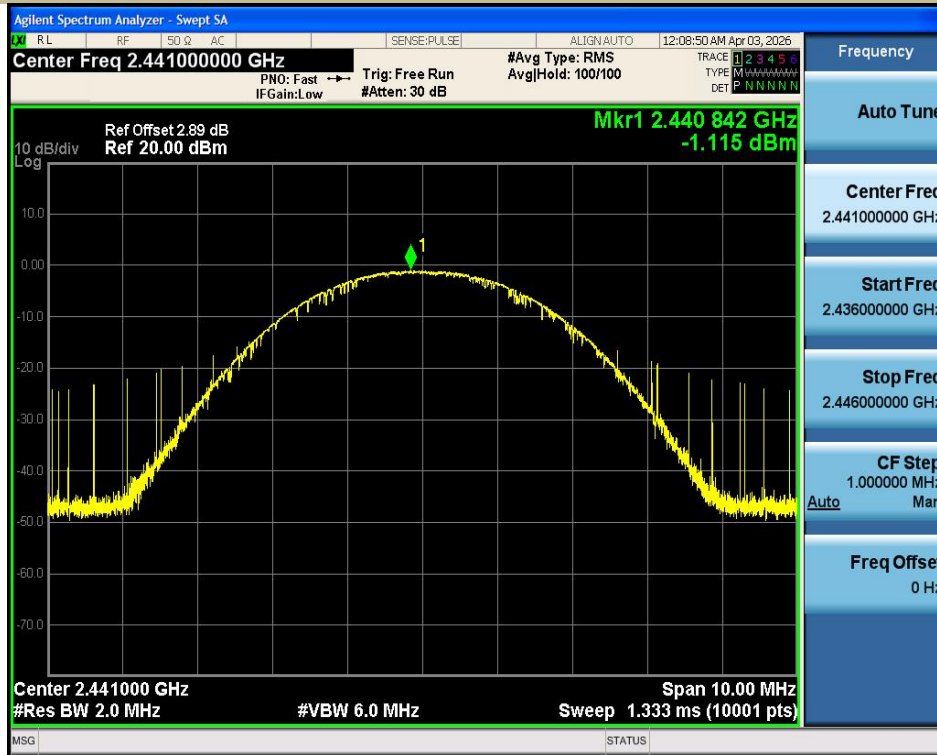
Test Model

Maximum Peak Conducted Output Power
Channel 78: 2480MHz
GFSK


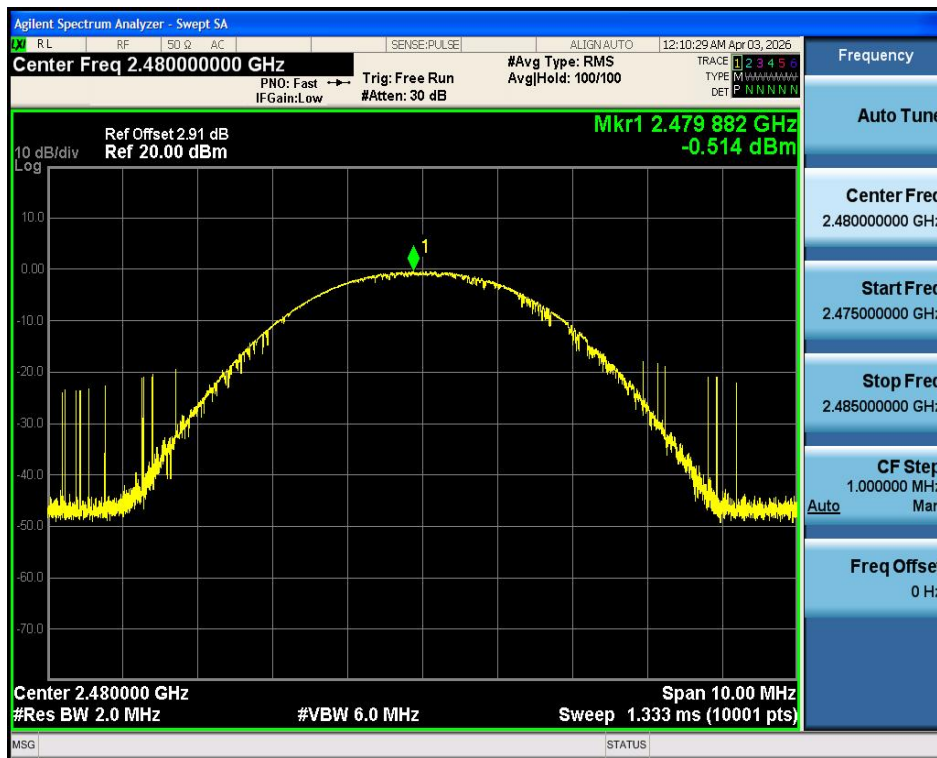
Test Model

Maximum Peak Conducted Output Power
Channel 0: 2402MHz
 $\pi/4$ -DQPSK


Test Model Maximum Peak Conducted Output Power
Channel 39: 2441MHz $\pi/4$ -DQPSK



Test Model Maximum Peak Conducted Output Power
Channel 78: 2480MHz $\pi/4$ -DQPSK



5. -20 dB Bandwidth Measurement

5.1. Limit

Test Requirement: FCC CFR47 Part 15 Section 15.247.

Test Method: KDB 558074 D01 15.247 Meas Guidance v05r02; ANSI C63.10-2020+Cor 1-2023

5.2. Test Setup



5.3. Test Procedure

For 20dB Bandwidth Measurement

Using the following spectrum analyzer settings:

1. Span= approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel.
2. Set the RBW = 30 kHz.
3. Set the VBW = 100 kHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

For 99% Bandwidth Measurement

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 1%-5% OBW, VBW $\geq$ 3RBW

5.4. Test Result

Modulation Mode	Channel Number	Channel Frequency (MHz)	Measurement Bandwidth (MHz)	99%Bandwidth h (MHz)	Limit (MHz)	Verdict
GFSK	00	2402	0.841	0.801	N/A	PASS
	39	2441	0.918	0.778	N/A	PASS
	78	2480	0.886	0.808	N/A	PASS
π /4-DQPSK	00	2402	1.179	1.136	N/A	PASS
	39	2441	1.215	1.141	N/A	PASS
	78	2480	1.190	1.131	N/A	PASS

Note: N/A (Not Applicable)

Test Model

20dB Bandwidth
Channel 0: 2402MHz

GFSK Modulation

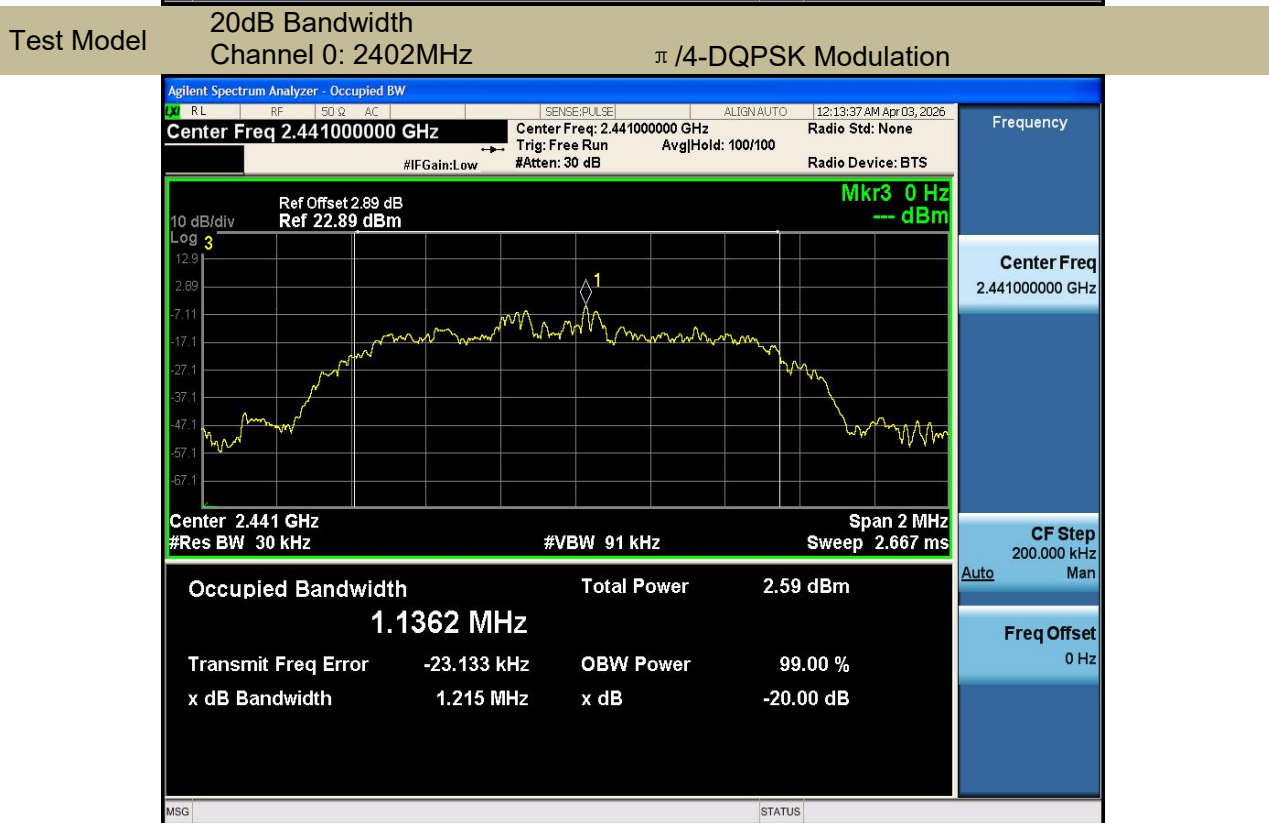


Test Model

20dB Bandwidth
Channel 39: 2441MHz

GFSK Modulation





Test Model 20dB Bandwidth
Channel 39: 2441MHz $\pi/4$ -DQPSK Modulation



Test Model 20dB Bandwidth
Channel 78: 2480MHz $\pi/4$ -DQPSK Modulation



6. Carrier Frequency Separation Test

6.1. Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)
Test Limit	>25KHz or >two-thirds of the 20 dB bandwidth

6.2. Test Setup



6.3. Test Procedure

The EUT must have its hopping function enabled. Using the following spectrum analyzer settings:

1. Span= Wide enough to capture the peaks of two adjacent channels
2. Set the RBW = 30 kHz.
3. Set the VBW = 100 kHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

6.4. Test Result

Modulation Mode	Channel Number	Channel Frequency (MHz)	Measurement Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	0	2402	0.978	>0.561	PASS
	39	2441	1.158	>0.612	PASS
	78	2480	1.022	>0.591	PASS
$\pi/4$ -DQPSK	0	2402	0.994	>0.786	PASS
	39	2441	0.982	>0.81	PASS
	78	2480	1.158	>0.793	PASS

Note: Limit = 20dB bandwidth * 2/3

Test Model

Carrier Frequency Separation
Channel 0: 2402MHz

GFSK Modulation



Test Model

Carrier Frequency Separation
Channel 39: 2441MHz

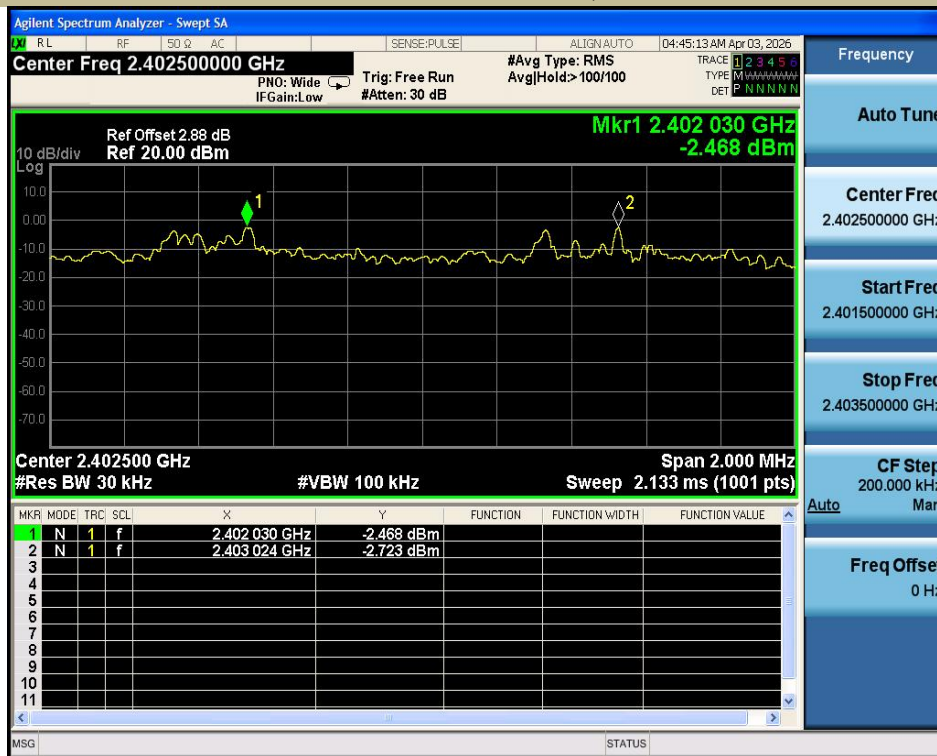
GFSK Modulation



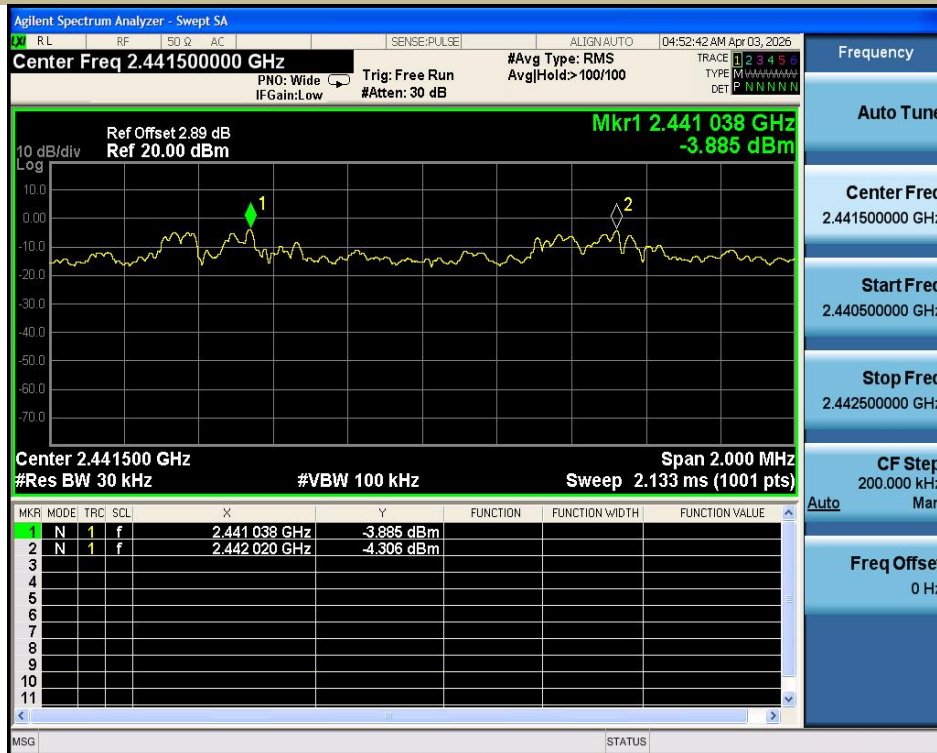
Test Model
Carrier Frequency Separation
Channel 78: 2480MHz
GFSK Modulation



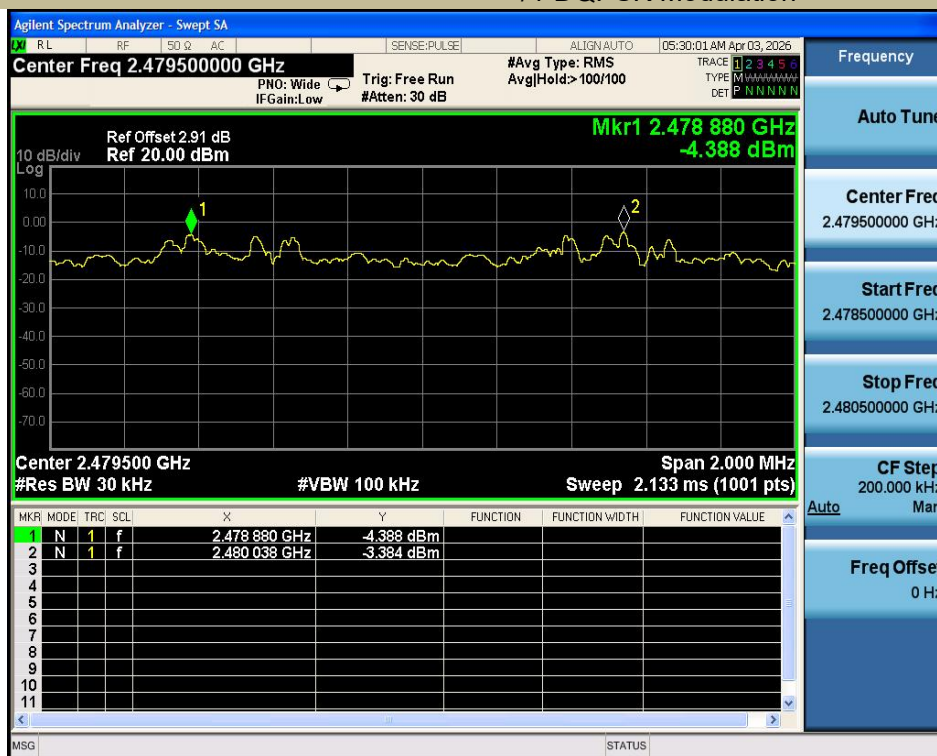
Test Model
Carrier Frequency Separation
Channel 0: 2402MHz
 $\pi/4$ -DQPSK Modulation



Test Model
Carrier Frequency Separation
Channel 39: 2441MHz
 π /4-DQPSK Modulation



Test Model
Carrier Frequency Separation
Channel 78: 2480MHz
 π /4-DQPSK Modulation



7. Number of Hopping Channel Test

7.1. Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)
Test Limit	>15 channels

7.2. Test Setup



7.3. Test Procedure

The EUT must have its hopping function enabled. Using the following spectrum analyzer settings:

1. Span= Wide enough to capture the peaks of two adjacent channels
2. Set the RBW = 30 kHz.
3. Set the VBW = 100 kHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

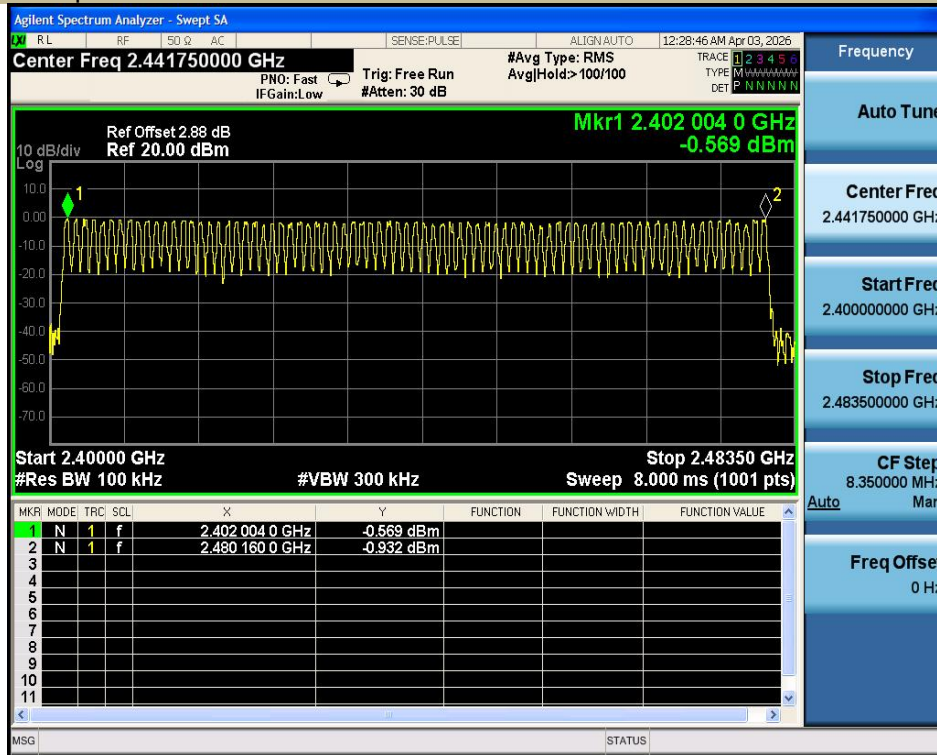
7.4. Test Result

Modulation Mode	Hopping Channel Frequency Range	Quantity of Hopping Channel	Quantity of Hopping Channel limit
GFSK	2402-2480	79	> 15
$\pi/4$ -DQPSK	2402-2480	79	> 15

Test Model

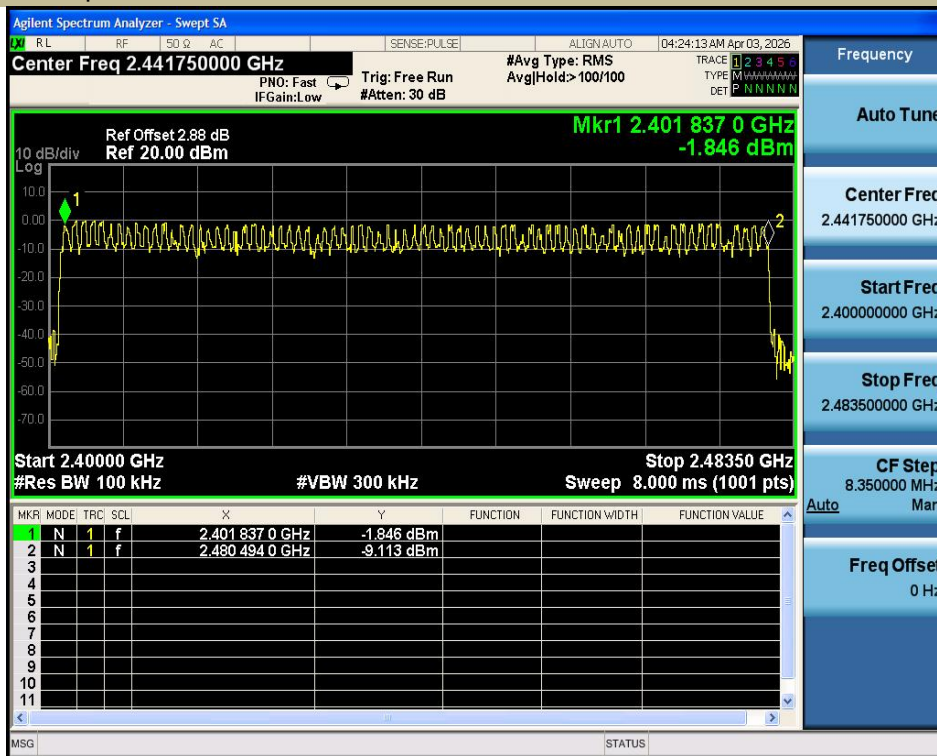
Number Of Hopping Frequencies
Span: 2400-2483.5MHz

GFSK Modulation



Test Model

Number Of Hopping Frequencies
Span: 2400-2483.5MHz

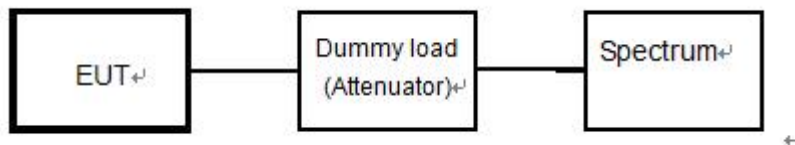
 π /4-DQPSK Modulation


8. Dwell Time Test

8.1. Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)
Test Limit	0.4 sec

8.2. Test setup



8.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span= zero span, centered on a hopping channel
2. Set the RBW = 1 MHz.
3. Set the VBW = 1 MHz.
4. Sweep time = as necessary to capture the entire dwell time per hopping channel.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

8.4. Test Result

Modulation Mode	Packet type	Frequency (MHz)	Pulse width (ms)	Dwell Time (ms)	Limit (ms)	Verdict
GFSK	DH1	2402	0.382	122.24	<400	PASS
	DH3	2402	1.637	261.92	<400	PASS
	DH5	2402	2.886	307.84	<400	PASS
Note: Dwell Time(DH1)=PW*(1600/2/79)*31.6 Dwell Time(DH3)=PW*(1600/4/79)*31.6 Dwell Time(DH5)=PW*(1600/6/79)*31.6						

All the modes have tested and recorded the worst mode (GFSK:2402MHz) in the report

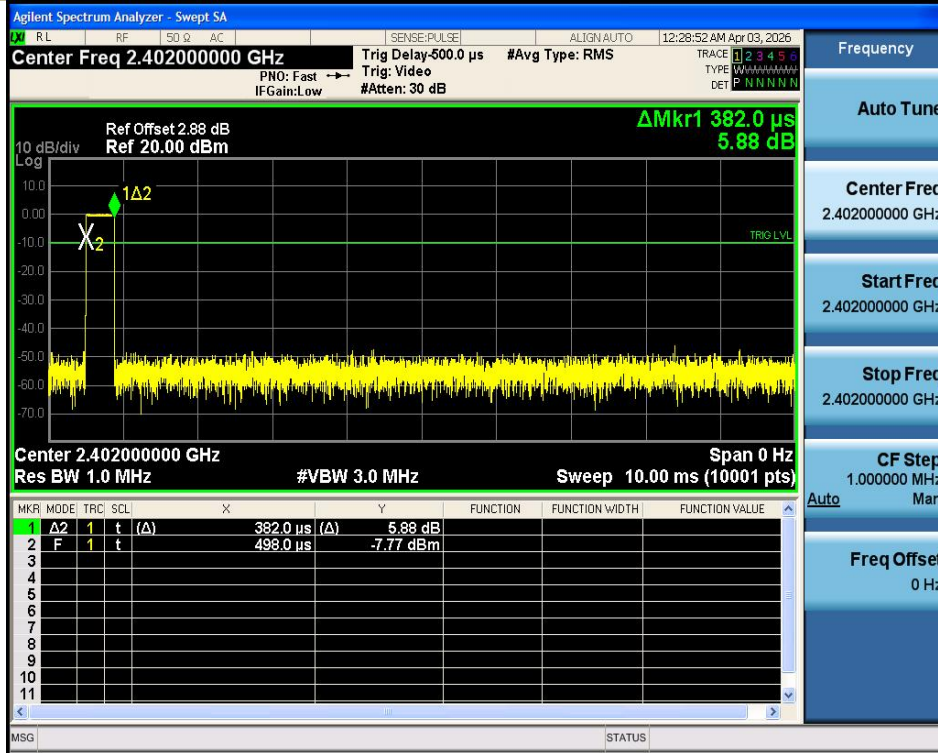
Test Model

Average Time Of Occupancy (Dwell Time)

Bluetooth V5.3

CH 0: 2402MHz

GFSK DH1



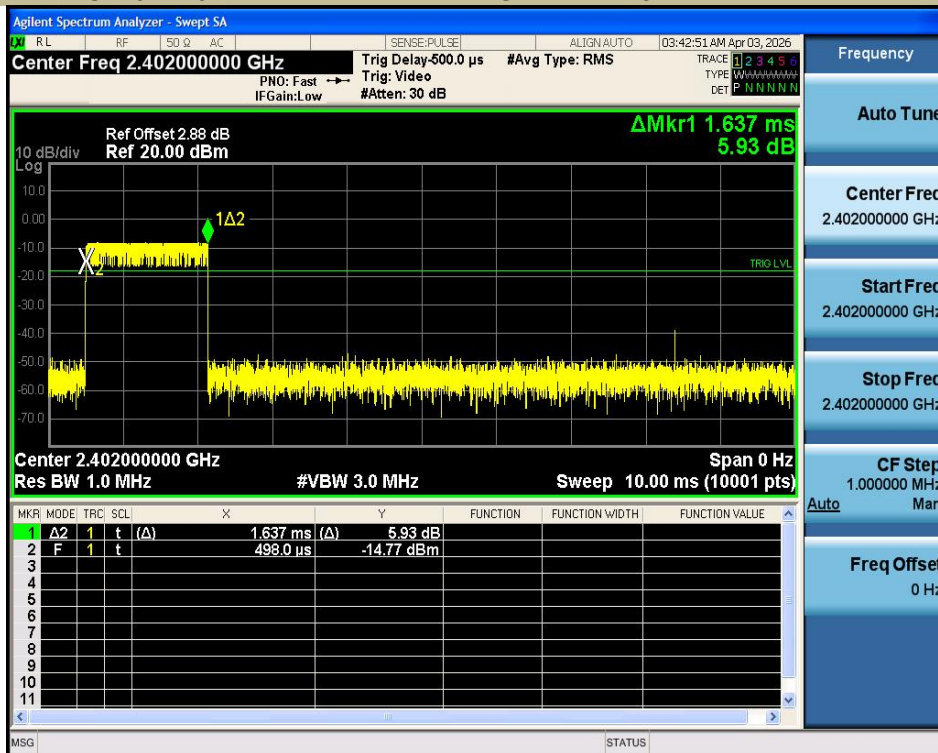
Test Model

Average Time Of Occupancy (Dwell Time)

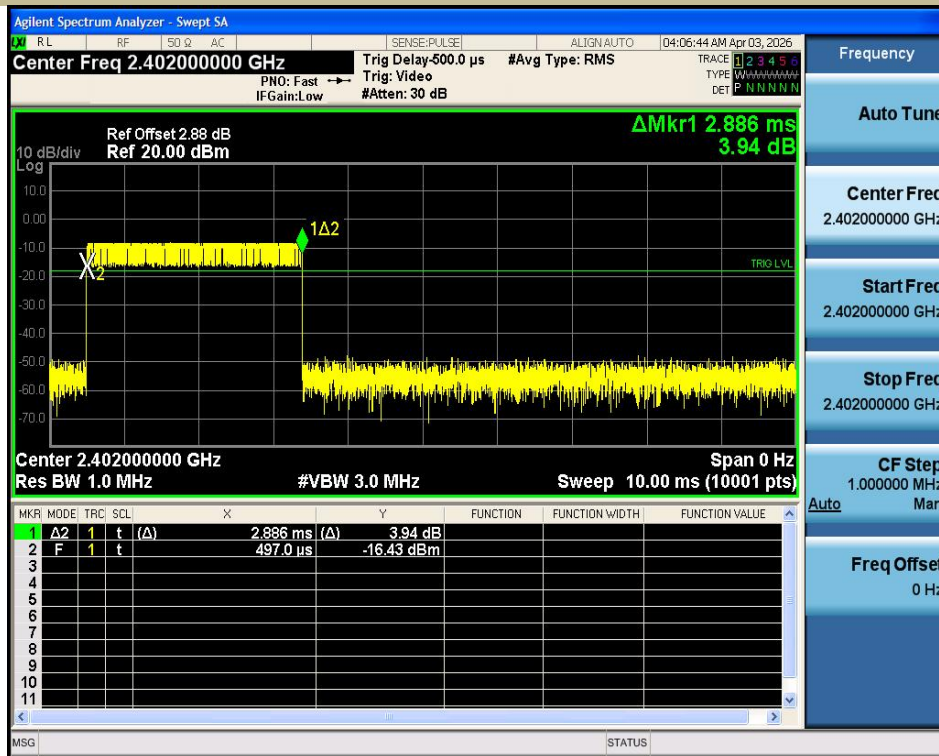
Bluetooth V5.3

CH 0: 2402MHz

GFSK DH3



Test Model Average Time Of Occupancy (Dwell Time)
CH 0: 2402MHz CH 0: 2402MHz

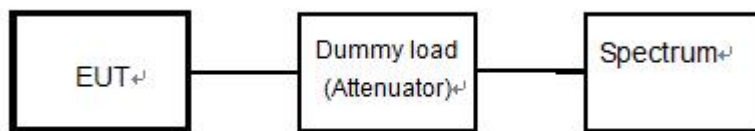


9. Conducted Spurious Emissions and Band Edge Requirement

9.1. Limit

Test Standard	FCC Part15 C Section 15.247 (d)
Test Limit	in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, 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).

9.2. Test Setup



9.3. Test Procedure

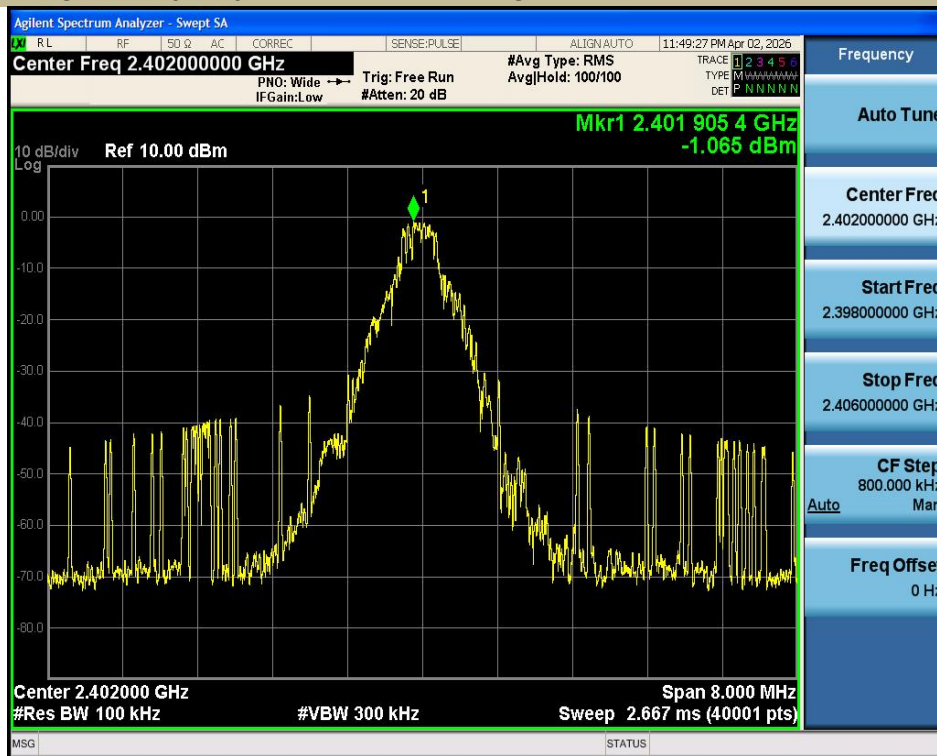
The EUT must have its hopping/Non-hopping function enabled. Using the following spectrum analyzer setting:

1. Set the RBW = 100kHz.
2. Set the VBW = 300kHz.
3. Sweep time = auto couple.
4. Detector function = peak.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.

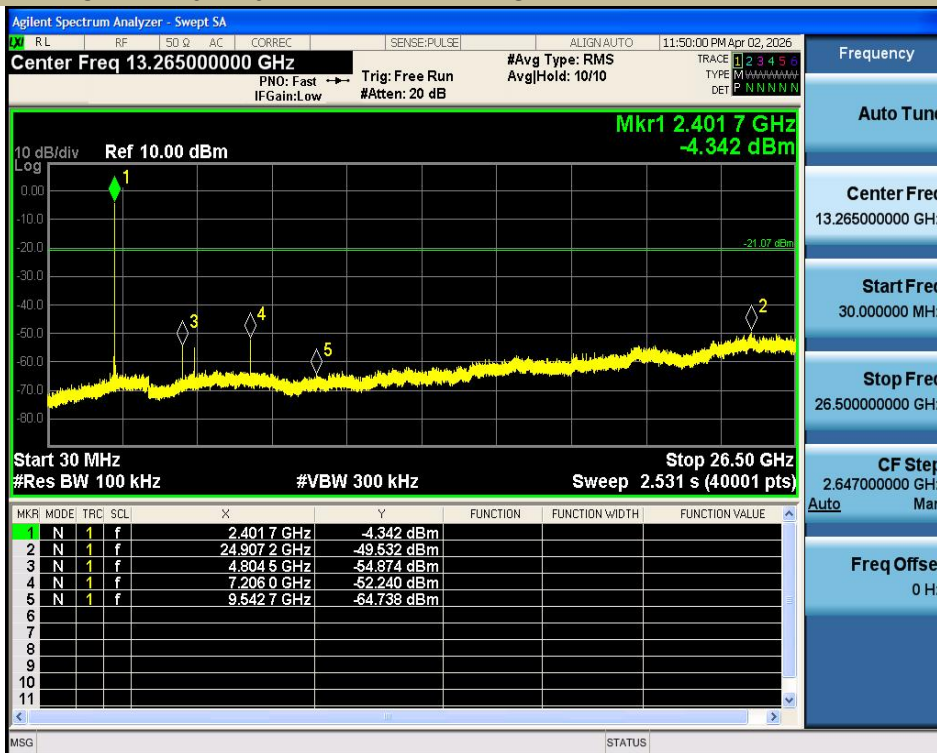
9.4. Test Result

All the modes have tested and recorded the worst mode(GFSK) in the report

Test Model

Maximum Conducted Level RBW=100kHz
Channel 0: 2402MHz
GFSK


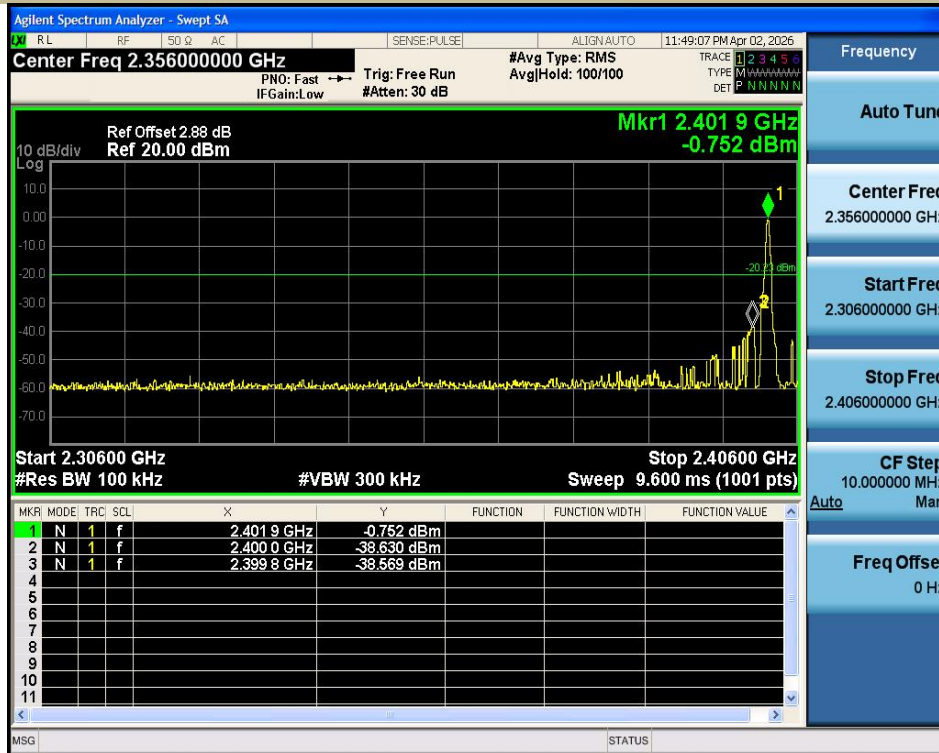
Test Model

Conducted Spurious RF Conducted Emission
Channel 0: 2402MHz
GFSK


Test Model

Band-edge Conducted Emissions
Channel 0: 2402MHz

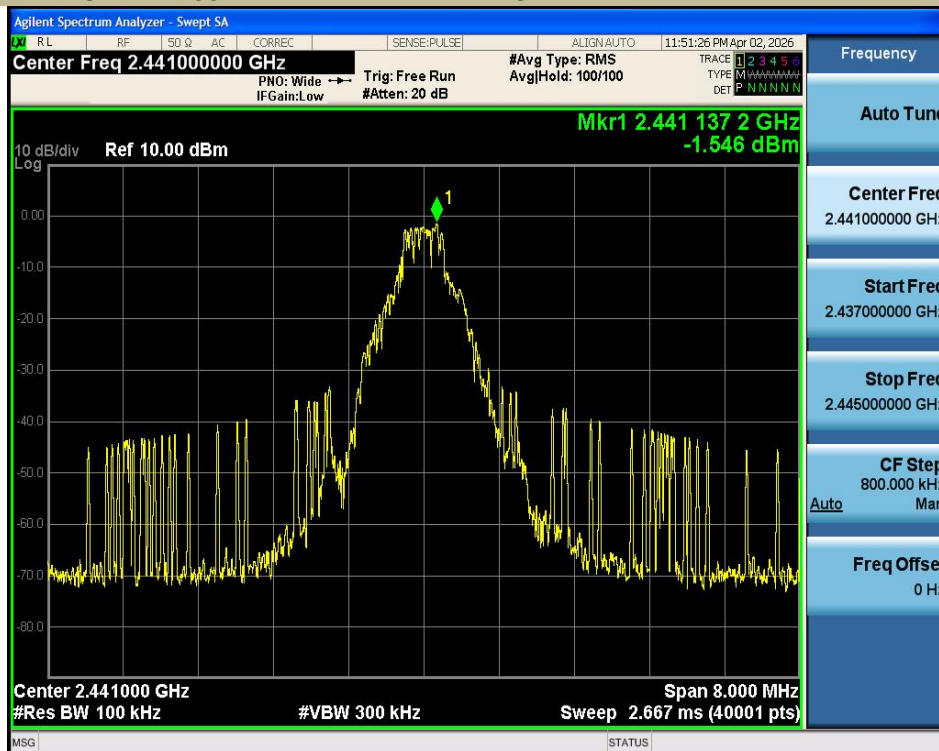
GFSK



Test Model

Maximum Conducted Level RBW=100kHz
Channel 39: 2441MHz

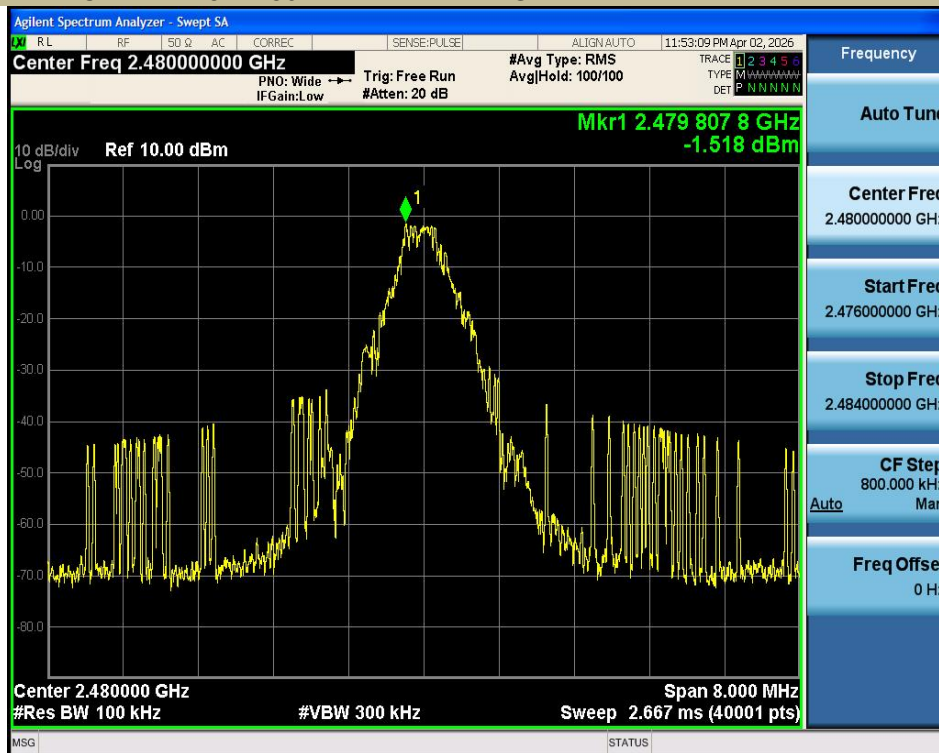
GFSK



Test Model

Conducted Spurious RF Conducted Emission
Channel 39: 2441MHz
GFSK

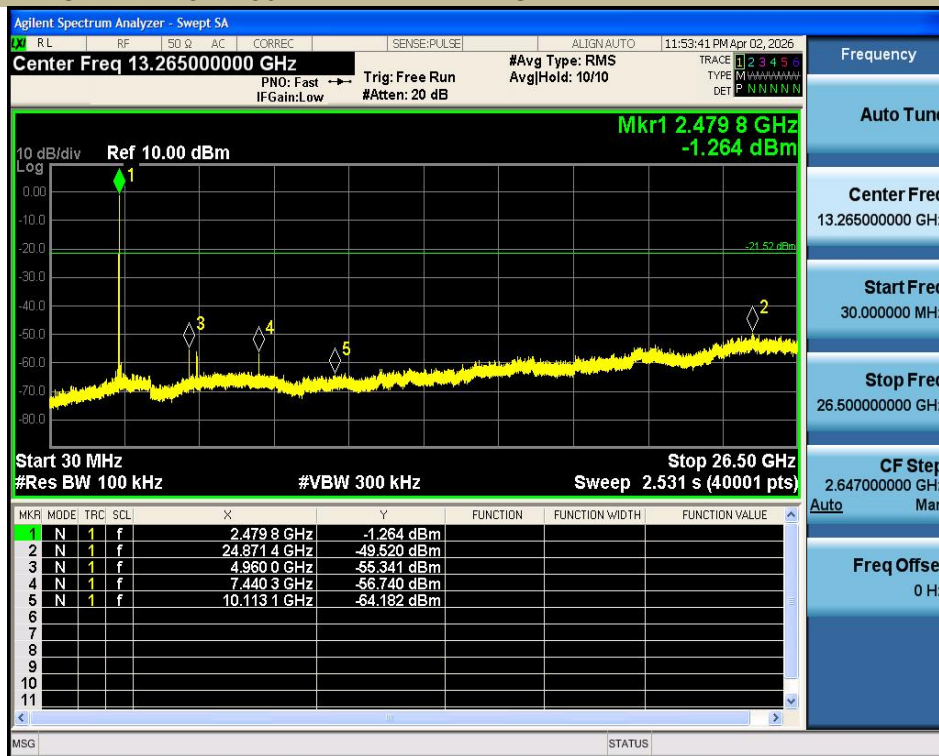

Test Model

Maximum Conducted Level RBW=100kHz
Channel 78: 2480MHz
GFSK


Test Model

Conducted Spurious RF Conducted Emission
Channel 78: 2480MHz

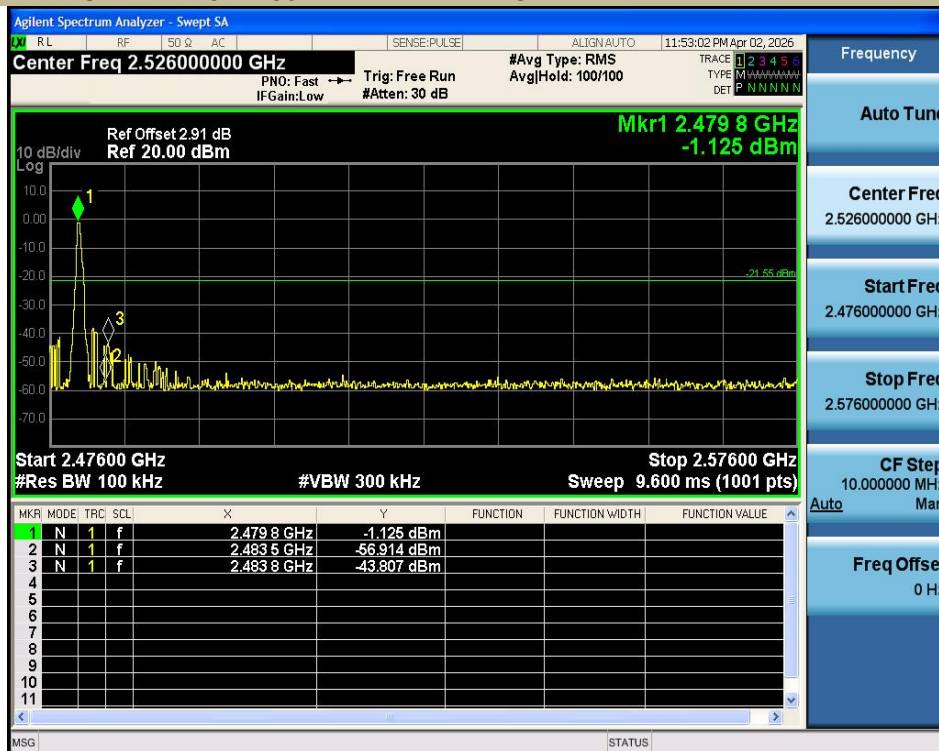
GFSK



Test Model

Band-edge Conducted Emissions
Channel 78: 2480MHz

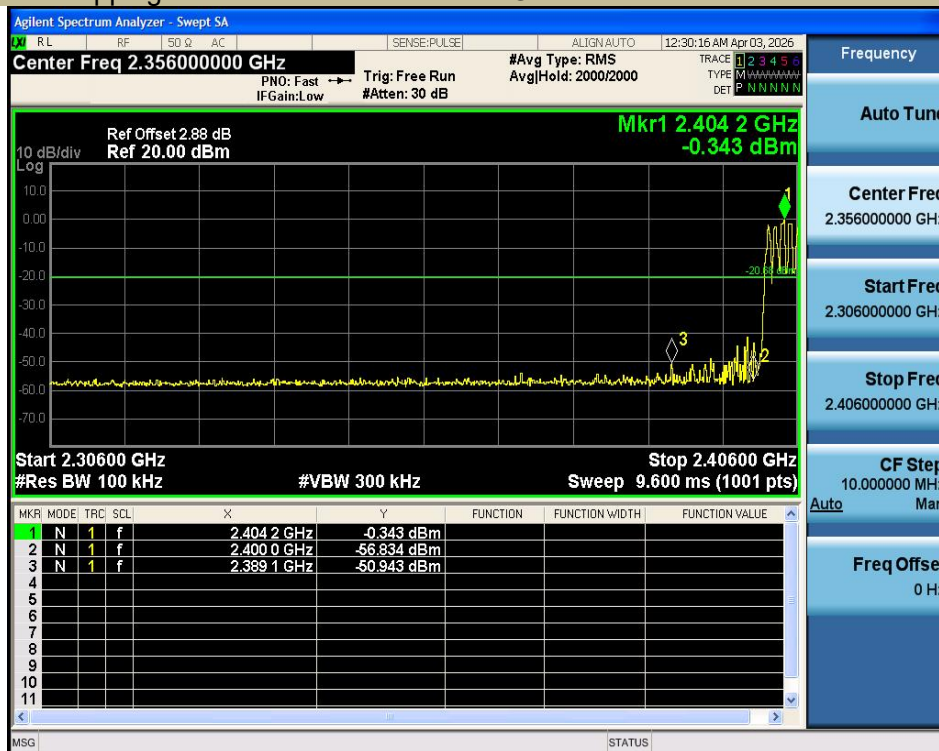
GFSK



Test Model

Maximum Conducted Level RBW=100kHz
Hopping
GFSK


Test Model

Conducted Spurious RF Conducted Emission
Hopping
GFSK


Test Model

Band-edge Conducted Emissions
Hopping

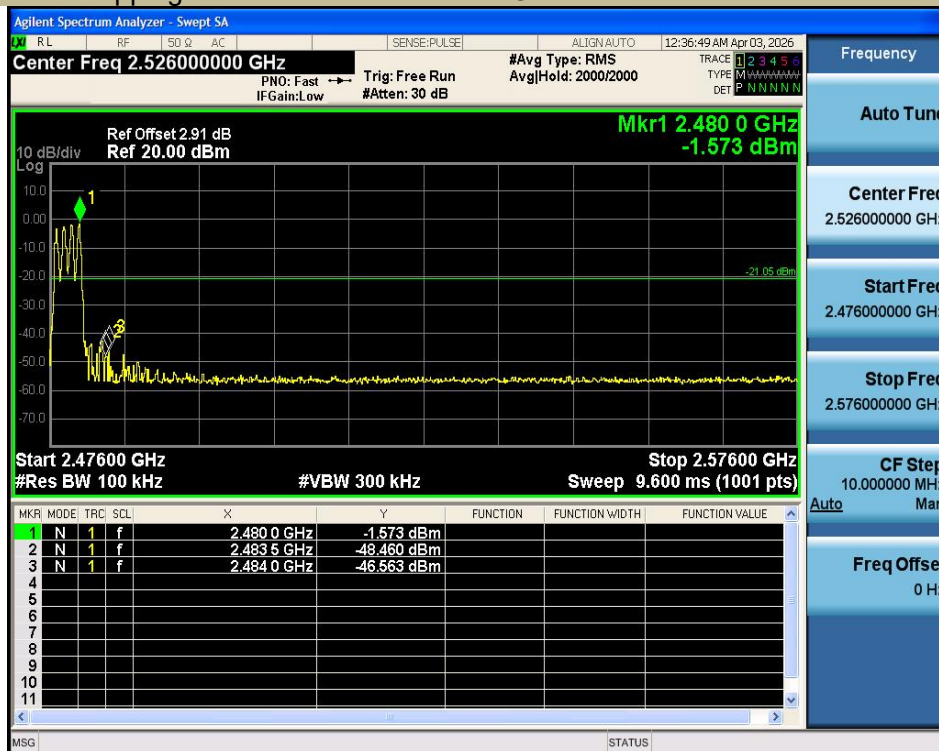
GFSK



Test Model

Band-edge Conducted Emissions
Hopping

GFSK



10. Antenna Requirement

According to the FCC Part 15 Paragraph 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.

This product has an PCB antenna, and the maximum antenna gain is -5.35dBi, fulfill the requirement of this section.

11. Test Photographs

Please see the attachment for Test Photographs.

12. Photos of the EUT

Please see the attachment

***** END OF REPORT *****