FCC Part 15C TEST REPORT

FCC ID: 2BKWC-AT4

Product	:	**WIRELESS AUDIO TRANSMITTER**
Model Name	:	**AT4**
Brand	:	**RSL**
Report No.	:	**NCT24039612**

Prepared for

Rogersound Labs LLC

5304 Derry Avenue, Unit N, Agoura Hills, CA 91301 United States

Prepared by

Shenzhen NCT Testing Technology Co., Ltd.

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1 TEST RESULT CERTIFICATION

Applicant's name	:	Rogersound Labs LLC
Address	:	5304 Derry Avenue, Unit N, Agoura Hills, CA 91301 United States
Manufacture's name	:	Huizhou Yuanyun Electronics Co., Ltd
Address	:	XiaZhao, Dameng Village, Xialiao Committee, Longxi Town, Bolou, Huizhou, Guangdong, China
Product name	:	WIRELESS AUDIO TRANSMITTER
Model name	:	AT4
Additional model	:	N/A
Model difference	:	N/A
Standards	:	FCC CFR47 Part 15 Section 15.247
Test procedure	:	ANSI C63.10:2013
Date of test	:	Sep. 12, 2024 to Nov. 12, 2024
Date of Issue	:	Nov. 12, 2024
Test Result	:	Pass

This device described above has been tested by NCT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Test Engineer:

Hugh Zhang

Hugh Zhang / Engineer

Technical Manager:

Henry Wang / Manager

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2 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions and Restricted Bandedge	15.205(a) 15.209 15.247(d)	PASS
Conducted Unwanted emissions and Band edge	15.247(d) 15.205(a)	PASS
Conduct Emission	15.207	PASS
20dB Bandwidth & 99% OCB	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:

1. “N/A” denotes test is not applicable in this Test Report.

3 TEST FACILITY

Site Description

EMC Lab. : Accredited by CNAS, 2022-09-27

The certificate is valid until 2028.01.07

The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2017)

The Certificate Registration Number is L8251

Designation Number: CN1347

Test Firm Registration Number: 894804

Accredited by A2LA, June 14, 2023

The Certificate Registration Number is 6837.01

Accredited by Industry Canada, November 09, 2018

The Conformity Assessment Body Identifier is CN0150

Company Number: 30806

Name of Firm : Shenzhen NCT Testing Technology Co., Ltd.

Site Location : A101&2F B2, Fuqiao 6th Area, Xintian Community, Fuhai Street, Baoan District, Shenzhen, People's Republic of China

4 General Information

4.1 General Description of E.U.T.

Product Name	:	WIRELESS AUDIO TRANSMITTER
Model Name	:	AT4
Sample ID	:	240912010
Sample(s) Status:	:	Engineer sample
Additional model	:	N/A
Model difference	:	N/A
Operating frequency	:	2406-2478MHz
Number of Channels	:	25 channels
Type of Modulation	:	FSK
Antenna installation	:	PCB Antenna
Antenna Gain	:	3.54dBi
Power supply	:	DC5V/1A from adapter
Hardware Version	:	V2.0
Software Version	:	V1.0
Adapter information	:	Manufacturer:Shenzhen Shenghong Technology Co., LTD Model:SR-C50501000U1 Input:100-240VAC 50/60Hz 2.0A Output:5V/1000mA
Remark：the Antenna gain is provided by customer from Antenna spec. and the laboratory will not be responsible for the accumulated calculation results which covers the information provided by the applicant.		

4.2 Channel List

The EUT has been tested under its typical operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting. Only the worst case data were reported.

The EUT has been associated with peripherals pursuant to ANSI C63.10-2013 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 KHz to the 10th harmonics of the highest fundamental frequency or to 40 GHz, whichever is lower).

The EUT has been tested under TX operating condition.

This EUT is a FHSS system, were conducted to determine the final configuration from all possible combinations. We use software control the EUT, Let EUT hopping on and transmit with highest power, all the modes FSK have been tested. 25 Channels are provided by EUT. The 3 channels of lower, medium and higher were chosen for test.

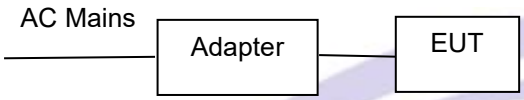
Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2406	09	2433	17	2457
01	2409	10	2436	18	2460
02	2412	11	2439	19	2463
03	2415	12	2442	20	2466
04	2418	13	2445	21	2469
05	2421	14	2448	22	2472
06	2424	15	2451	23	2475
07	2427	16	2454	24	2478
08	2430				

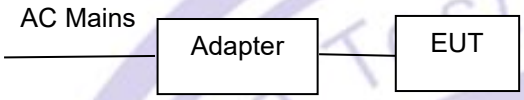
Channel	Frequency(MHz)
0	2406
11	2439
24	2478

4.3 Test Setup Configuration

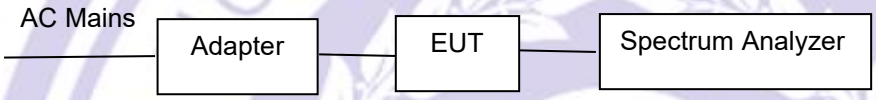
Conducted Emission



Radiated Emission



Conducted Spurious



4.4 Test Mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

Test Software	Test program: Switch the high, medium and low emission signals by touching the switch.
Power level setup	≤12dBm

5 Equipment During Test

5.1 Equipments List

Conducted emission Test Equipment

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
944 Shielded Room	944 Room	/	EMToni	2022/5/31	2025/5/30
EMI Test Receiver	ESPI	101604	Rohde & Schwarz	2024/6/17	2025/6/16
LISN	ENV 216	102796	Rohde & Schwarz	2024/6/17	2025/6/16
LISN	VN1-13S	004023	CRANAGE	2024/6/17	2025/6/16
Cable	RG223-1500MM	NA	RG	2024/6/17	2025/6/16

Radiated emission & Radio Frequency Test Equipment

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
966 Shielded Room	966 Room	/	EMToni	2022/5/31	2025/5/30
EMI Test Receiver	ESCI	101178	Rohde & Schwarz	2024/6/17	2025/6/16
Spectrum Analyze （10Hz-26.5GHz）	N9020A	MY50510202	Agilent	2024/6/17	2025/6/16
Amplifi （30MHz-1GHz）	BBV 9743 B	00374	SCHNWARZBECK	2024/6/17	2025/6/16
Bilog Antenna （30MHz-1GHz）	VULB9162	00473	SCHNWARZBECK	2023/3/19	2025/3/18
Horn antenna （1GHz-18GHz）	BBHA 9120 D	02622	SCHNWARZBECK	2023/3/19	2025/3/18
Pream plifier （1GHz-18GHz）	BBV 9718D	00042	SCHNWARZBECK	2024/6/17	2025/6/16
Spectrum Analyze （1GHz-40GHz）	FSV 40	100952	Rohde & Schwarz	2024/6/17	2025/6/16
Pream plifier （15GHz-40GHz）	BBV 9718D	0024	SCHNWARZBECK	2024/6/17	2025/6/16
Broadband Antenna （15GHz-40GHz）	SAS-574	588	A.H.System	2023/3/19	2025/3/18
Loop Antenna (9KHz-30MHz)	FMZB1519B	014	SCHNWARZBECK	2024/6/20	2025/6/19

Capacitive voltage probe	CVP 9222 C	00109	SCHNWARZBECK	2024/6/18	2025/6/17
MXG Signal Analyzer	N9020A	MY50510202	Agilent	2024/6/17	2025/6/16
MXG Vector Signal Generator	N5182A	MY50140020	Agilent	2024/6/17	2025/6/16
MXG Analog Signal Generator	N5181A	MY47420919	Agilent	2024/6/17	2025/6/16
Power Sensor	TR1029-2	512364	Techoy	2024/6/17	2025/6/16
RF Swith	TR1029-1	512364	Techoy	2024/6/17	2025/6/16
Cable	DA800-4000MM	NA	DA	2024/6/17	2025/6/16
Cable	DA800-11000MM	NA	DA	2024/6/17	2025/6/16

Other

Item	Name	Manufacturer	Model	Software version
1	EMC Conduction Test System	FALA	EZ-EMC	Ver.EMC-CON 3A1.1+
2	EMC radiation test system	FALA	EZ-EMC	Ver.FA-03A2 RE+
3	RF test system	TACHOY	RFTest	V1.0.0
4	RF communication test system	TACHOY	RFTest	V1.0.0

5.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10^{-6}
Bandwidth	± 1.5 x 10^{-6}
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(9kHz~30MHz)	±3.27dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB
Conducted Spurious(30MHz~25GHz)	±2.76dB

5.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	WIRELESS AUDIO TRANSMITTER	RSL	AT4	N/A	EUT
E-2	Notebook	Lenovo	300-15SK	GB14477457	AE

Note:

(1) The support equipment was authorized by Declaration of Confirmation.

(2) For detachable type I/O cable should be specified the length in cm in『Length』column.

6 Conducted Emission

Test Requirement:	:	FCC CFR 47 Part 15 Section 15.207
Test Method:	:	ANSI C63.10:2013
Test Result:	:	PASS
Frequency Range:	:	150kHz to 30MHz
Class/Severity:	:	Class B
Detector:	:	Peak for pre-scan (9kHz Resolution Bandwidth)

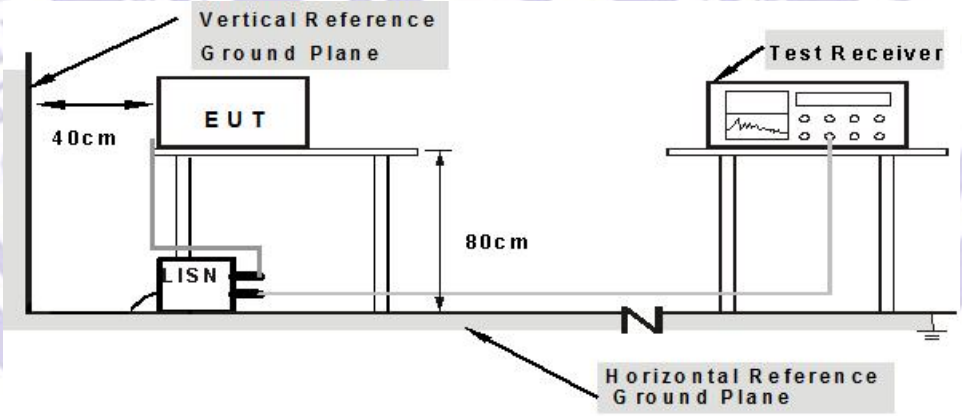
6.1 E.U.T. Operation

Operating Environment **:**

Temperature:	:	23.2°C
Humidity:	:	51 % RH
Atmospheric Pressure:	:	101.12 kPa
Test Voltage	:	AC 120V/60Hz

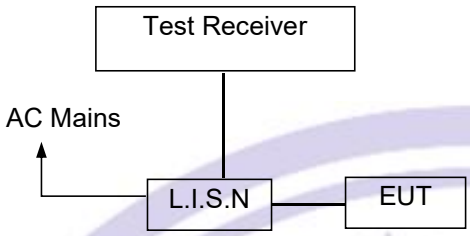
6.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10: 2013



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80
from other units and other metal planes

6.3 Test SET-UP (Block Diagram of Configuration)



6.4 Measurement Procedure:

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

6.5 Conducted Emission Limit

Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies
2.The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

6.6 Measurement Description

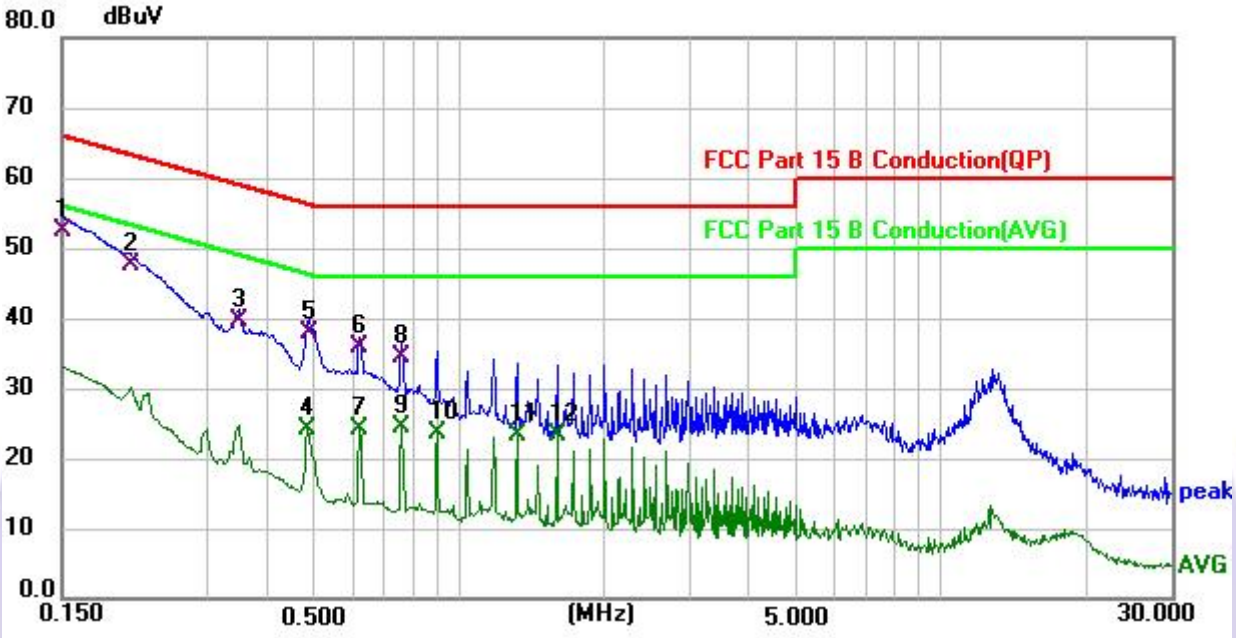
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.7 Conducted Emission Test Result

Pass

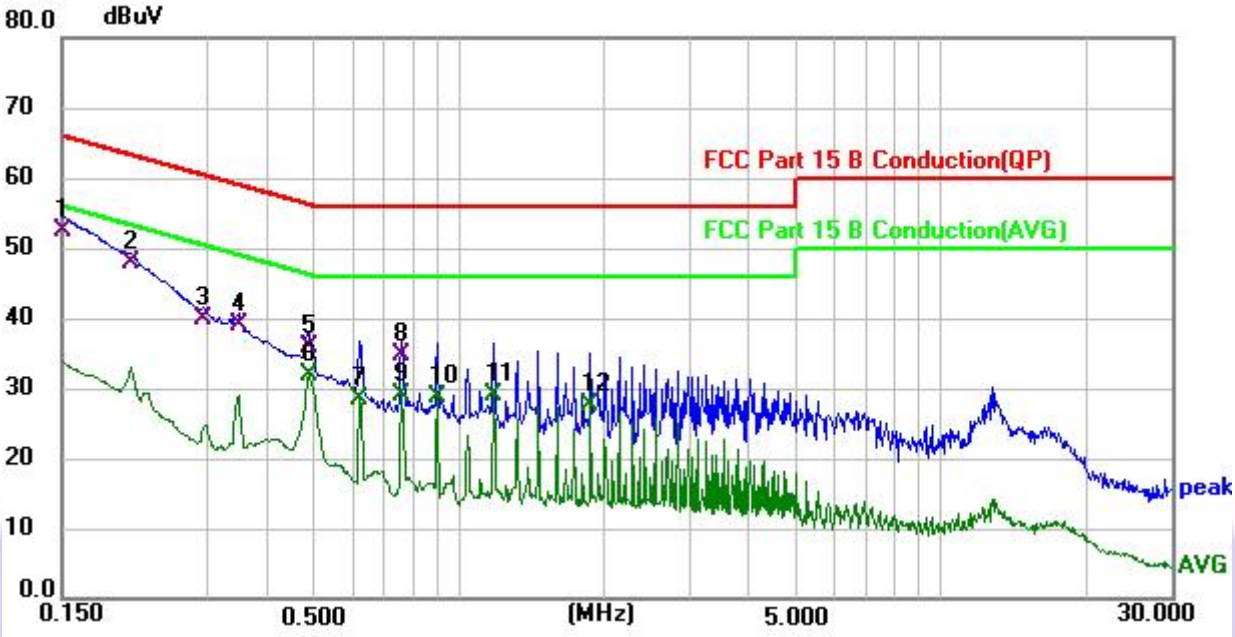
Conducted emission at both 120V & 240V is assessed, and emission at 120V represents the worst case. All the modulation modes were tested the data of the worst mode (FSK) are recorded in the following pages and the others modulation methods do not exceed the limits.

Channel:	Low	Phase :	L



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1 *	0.150	42.12	10.34	52.46	66.00	-13.54	QP	P
2	0.208	37.36	10.18	47.54	63.28	-15.74	QP	P
3	0.348	29.54	10.14	39.68	59.01	-19.33	QP	P
4	0.483	13.83	10.21	24.04	46.29	-22.25	AVG	P
5	0.487	27.65	10.23	37.88	56.22	-18.34	QP	P
6	0.623	25.63	10.33	35.96	56.00	-20.04	QP	P
7	0.623	13.70	10.33	24.03	46.00	-21.97	AVG	P
8	0.762	24.14	10.37	34.51	56.00	-21.49	QP	P
9	0.762	14.01	10.37	24.38	46.00	-21.62	AVG	P
10	0.901	13.76	9.94	23.70	46.00	-22.30	AVG	P
11	1.315	13.16	10.23	23.39	46.00	-22.61	AVG	P
12	1.594	13.15	10.11	23.26	46.00	-22.74	AVG	P

Channel:	Low	Phase :	N



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1 *	0.150	42.03	10.33	52.36	66.00	-13.64	QP	P
2	0.208	37.84	10.12	47.96	63.28	-15.32	QP	P
3	0.294	29.58	10.28	39.86	60.41	-20.55	QP	P
4	0.348	28.86	10.09	38.95	59.01	-20.06	QP	P
5	0.487	25.64	10.32	35.96	56.22	-20.26	QP	P
6	0.487	21.43	10.32	31.75	46.22	-14.47	AVG	P
7	0.623	18.24	10.13	28.37	46.00	-17.63	AVG	P
8	0.762	24.48	10.37	34.85	56.00	-21.15	QP	P
9	0.762	18.64	10.37	29.01	46.00	-16.99	AVG	P
10	0.901	18.47	10.25	28.72	46.00	-17.28	AVG	P
11	1.180	18.61	10.27	28.88	46.00	-17.12	AVG	P
12	1.873	17.25	10.31	27.56	46.00	-18.44	AVG	P

Notes:
1.An initial pre-scan was performed on the line and neutral lines with peak detector.
2.Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3.Mesurement Level = Reading level + Correct Factor

7 Radiated Spurious Emissions

Test Requirement : FCC CFR47 Part 15 Section 15.209

Test Method : ANSI C63.10:2013

Test Result : PASS

Measurement Distance : 3m

Limit : See the follow table

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(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
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	$20\log^{(500)}$

7.1 EUT Operation

Operating Environment :

Temperature : 24.5 °C

Humidity : 55.5% RH

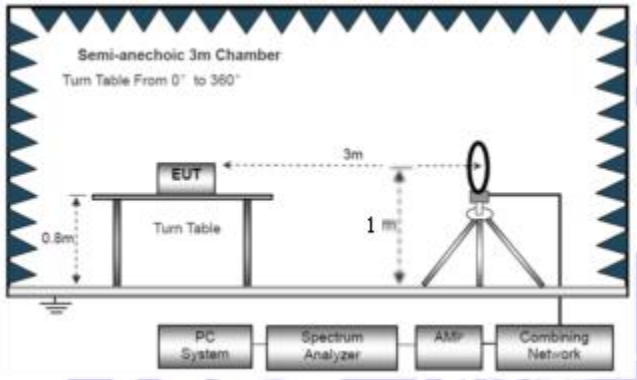
Atmospheric Pressure : 101.3kPa

Test Voltage : AC 120V60Hz

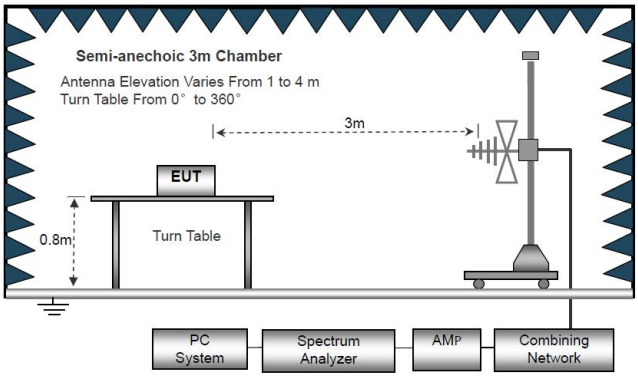
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

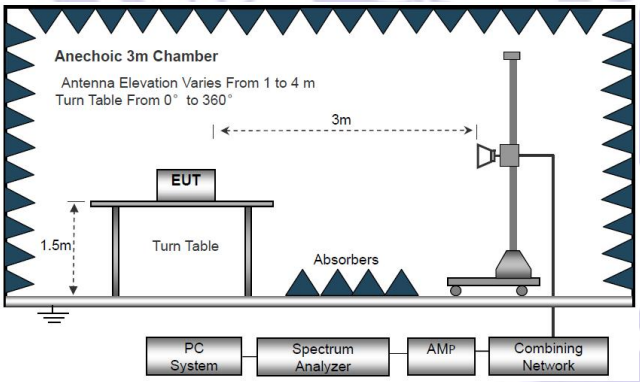
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / *10Hz* for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

7.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.

2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.

3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.

5. Set to the maximum power setting and enable the EUT transmit continuously.

6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.

7. Test Procedure of measurement (For Above 1GHz):

1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).

2) Change the antenna polarization and repeat 1) with vertical polarization.

3) Make a hardcopy of the spectrum.

4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.

5) Change the analyser mode to Clear/ Write and found the cone of emission.

6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.

7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.

8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.

7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

7.5 Summary of Test Results

Test Frequency: 9KHz-30MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	>20

Note:

The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

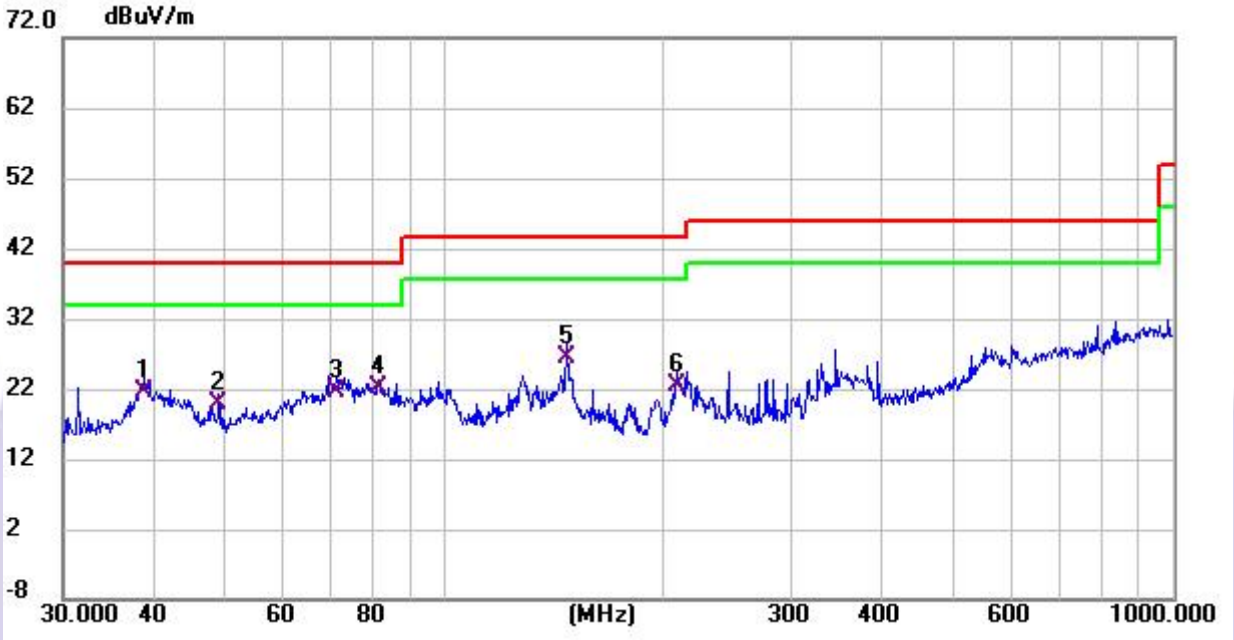
Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

Test Frequency: 30MHz ~ 1GHz

Please refer to the following test plots,Low Channel (2406MHz) Worst case FSK for record:

Channel:	Low

Test plot for Horizontal

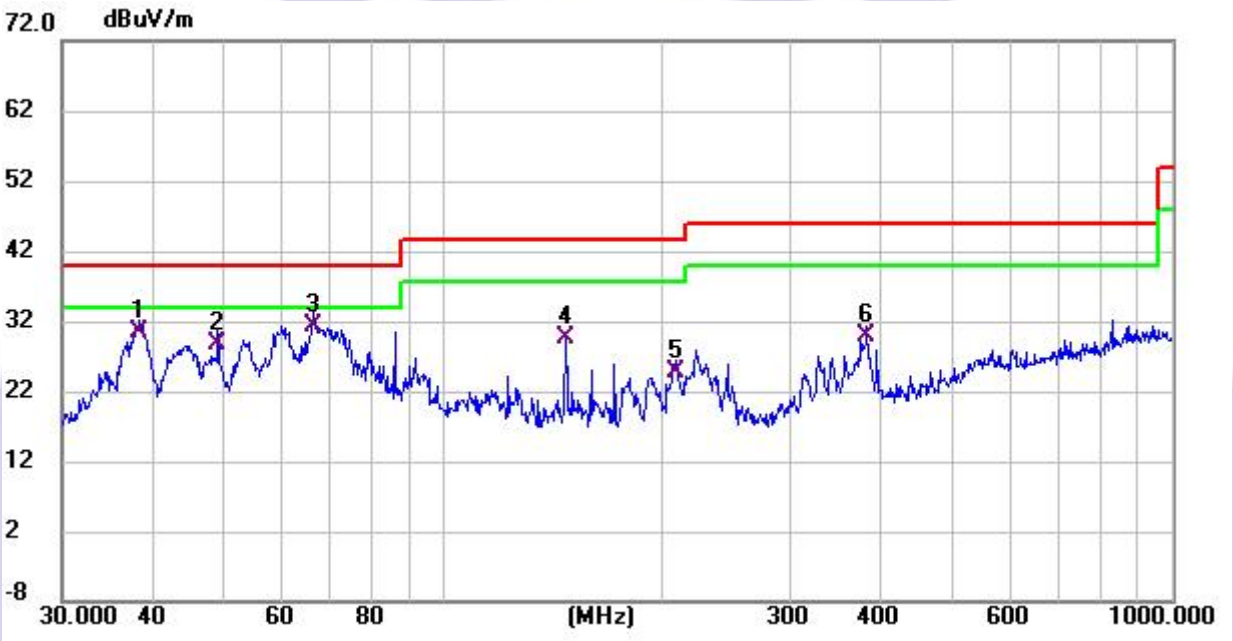


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	38.752	9.18	12.35	21.53	40.00	-18.47	QP
2	49.014	7.65	12.21	19.86	40.00	-20.14	QP
3	71.330	10.36	11.27	21.63	40.00	-18.37	QP
4	81.497	10.66	11.35	22.01	40.00	-17.99	QP
5 *	147.404	13.26	13.27	26.53	43.50	-16.97	QP
6	209.313	11.66	10.70	22.36	43.50	-21.14	QP

Remark:Emission Level=Reading+ Factor

Channel:	Low

Test plot for Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	38.346	17.66	12.90	30.56	40.00	-9.44	QP
2	49.014	15.20	13.39	28.59	40.00	-11.41	QP
3 *	66.266	15.65	15.77	31.42	40.00	-8.58	QP
4	147.404	17.67	11.96	29.63	43.50	-13.87	QP
5	209.313	13.93	10.70	24.63	43.50	-18.87	QP
6	381.249	14.15	15.71	29.86	46.00	-16.14	QP

Remark:Emission Level=Reading+Factor

Test Frequency 1GHz-25GHz

RSL(FSK)mode have been tested, and the worst result(FSK) was report as below

FSK

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Low Channel:2406MHz									
V	4812	49.77	34.12	5.03	32.39	53.07	74	-20.93	Pk
V	4812	41.56	34.12	5.03	32.39	44.86	54	-9.14	AV
V	7218	42.17	32.54	6.29	35.86	51.78	74	-22.22	Pk
V	7218	32.34	32.54	6.29	35.86	41.95	54	-12.05	AV
V	9624	39.68	32.98	7.55	38.4	52.65	74	-21.35	Pk
V	9624	29.87	32.98	7.55	38.4	42.84	54	-11.16	AV
V	12030	36.70	32.09	8.93	39	52.54	74	-21.46	Pk
V	12030	29.63	32.09	8.93	39	45.47	54	-8.53	AV
H	4812	50.78	34.12	5.03	32.39	54.08	74	-19.92	Pk
H	4812	40.75	34.12	5.03	32.39	44.05	54	-9.95	AV
H	7218	42.28	32.54	6.29	35.86	51.89	74	-22.11	Pk
H	7218	33.19	32.54	6.29	35.86	42.80	54	-11.20	AV
H	9624	40.13	32.98	7.55	38.4	53.10	74	-20.90	Pk
H	9624	32.22	32.98	7.55	38.4	45.19	54	-8.81	AV
H	12030	39.56	32.09	8.93	39	55.40	74	-18.60	Pk
H	12030	29.01	32.09	8.93	39	44.85	54	-9.15	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Middle Channel:2439MHz									
V	4878	49.99	34.07	5.09	32.59	53.60	74	-20.40	Pk
V	4878	40.86	34.07	5.09	32.59	44.47	54	-9.53	AV
V	7317	41.29	32.63	6.34	35.96	50.96	74	-23.04	Pk
V	7317	32.05	32.63	6.34	35.96	41.72	54	-12.28	AV
V	9756	40.90	32.92	7.59	38.4	53.97	74	-20.03	Pk
V	9756	33.44	32.92	7.59	38.4	46.51	54	-7.49	AV
V	12195	40.22	31.96	8.88	39.04	56.18	74	-17.82	Pk
V	12195	29.03	31.96	8.88	39.04	44.99	54	-9.01	AV
H	4878	50.56	34.07	5.09	32.59	54.17	74	-19.83	Pk
H	4878	40.99	34.07	5.09	32.59	44.60	54	-9.40	AV
H	7317	42.15	32.63	6.34	35.96	51.82	74	-22.18	Pk
H	7317	33.21	32.63	6.34	35.96	42.88	54	-11.12	AV
H	9756	41.86	32.92	7.59	38.4	54.93	74	-19.07	Pk
H	9756	30.34	32.92	7.59	38.4	43.41	54	-10.59	AV
H	12195	38.95	31.96	8.88	39.04	54.91	74	-19.09	Pk
H	12195	29.74	31.96	8.88	39.04	45.70	54	-8.30	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
High Channel:2478MHz									
V	4956	50.97	34.02	5.15	32.8	54.90	74	-19.10	Pk
V	4956	40.52	34.02	5.15	32.8	44.45	54	-9.55	AV
V	7434	41.27	32.71	6.4	36.05	51.01	74	-22.99	Pk
V	7434	31.99	32.71	6.4	36.05	41.73	54	-12.27	AV
V	9912	42.26	32.86	7.62	38.4	55.42	74	-18.58	Pk
V	9912	30.99	32.86	7.62	38.4	44.15	54	-9.85	AV
V	12390	38.77	31.82	8.84	39.08	54.87	74	-19.13	Pk
V	12390	28.18	31.82	8.84	39.08	44.28	54	-9.72	AV
H	4956	49.96	34.02	5.15	32.8	53.89	74	-20.11	Pk
H	4956	41.58	34.02	5.15	32.8	45.51	54	-8.49	AV
H	7434	43.10	32.71	6.4	36.05	52.84	74	-21.16	Pk
H	7434	34.25	32.71	6.4	36.05	43.99	54	-10.01	AV
H	9912	41.90	32.86	7.62	38.4	55.06	74	-18.94	Pk
H	9912	29.76	32.86	7.62	38.4	42.92	54	-11.08	AV
H	12390	39.41	31.82	8.84	39.08	55.51	74	-18.49	Pk
H	12390	29.53	31.82	8.84	39.08	45.63	54	-8.37	AV

Note: 1. The testing has been conformed to 10*2480MHz=24800MHz.

2. All other emissions more than 30dB below the limit.

3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Emission Level = Reading + Factor
Margin=Emission Level-Limit

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

	Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV/m)	Margin(dB)	Detector Type	Result
FSK	Low Channel: 2406MHz										
	H	2390	55.63	35.17	3.48	27.49	51.43	74	-22.57	PK	PASS
	H	2390	46.69	35.17	3.48	27.49	42.49	54	-11.51	AV	PASS
	H	2400	57.12	35.16	3.49	27.52	52.97	74	-21.03	PK	PASS
	H	2400	45.55	35.16	3.49	27.52	41.40	54	-12.60	AV	PASS
	V	2390	55.43	35.17	3.48	27.49	51.23	74	-22.77	PK	PASS
	V	2390	46.01	35.17	3.48	27.49	41.81	54	-12.19	AV	PASS
	V	2400	56.76	35.16	3.49	27.52	52.61	74	-21.39	PK	PASS
	V	2400	46.33	35.16	3.49	27.52	42.18	54	-11.82	AV	PASS
	High Channel: 2478MHz										
	H	2483.5	55.95	35.11	3.56	27.75	52.15	74	-21.85	PK	PASS
	H	2483.5	46.63	35.11	3.56	27.75	42.83	54	-11.17	AV	PASS
	H	2500	57.19	35.1	3.57	27.8	53.46	74	-20.54	PK	PASS
	H	2500	46.11	35.1	3.57	27.8	42.38	54	-11.62	AV	PASS
	V	2483.5	57.10	35.11	3.56	27.75	53.30	74	-20.70	PK	PASS
	V	2483.5	55.64	35.11	3.56	27.75	51.84	54	-2.16	AV	PASS
	V	2500	56.77	35.1	3.57	27.8	53.04	74	-20.96	PK	PASS
	V	2500	47.70	35.1	3.57	27.8	43.97	54	-10.03	AV	PASS

Remark:

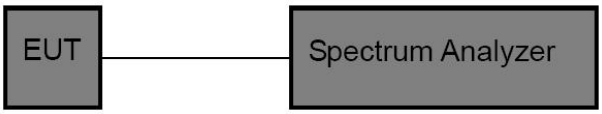
1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier, Margin= Emission Level - Limit

8 Maximum Peak Output Power Test

8.1 Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (b)(1)
Test Limit	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. For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W.

8.2 Test Setup



8.3 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

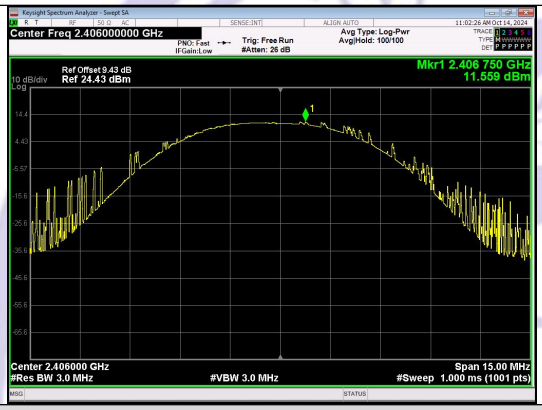
   Detector function = peak

   Trace = max hold

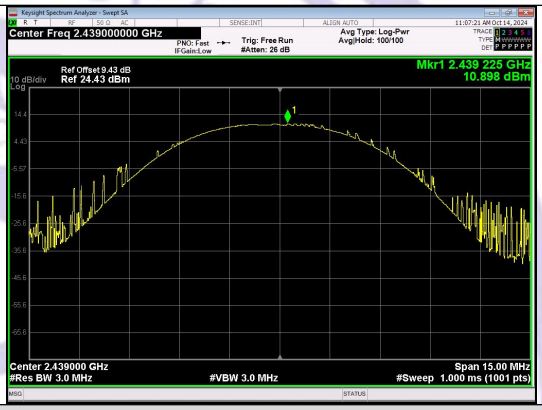
   EIRP=Peak Output Power+Antenna Gain

8.4 Test Data

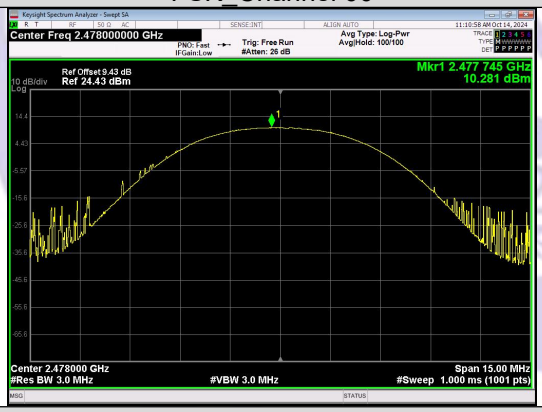
Modulation	Channel	Peak Output Power (dBm)	Peak Output Power (mW)	Max. Avg. Power (dBm)	Limit (dBm)	Result
FSK	0	11.559	14.319	None	21	PASS
	11	10.898	12.297	None		PASS
	24	10.281	10.668	None		PASS



Peak Output Power
FSK_Channel 00



Peak Output Power
FSK_Channel 11



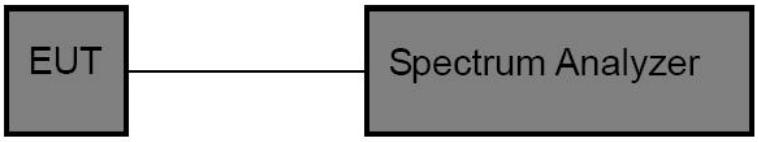
Peak Output Power
FSK_Channel 24

9 20DB Occupy Bandwidth & 99% OCB Test

9.1 Test Standard

Test Standard	FCC Part15 C Section 15.247 (a)(1)

9.2 Test Setup



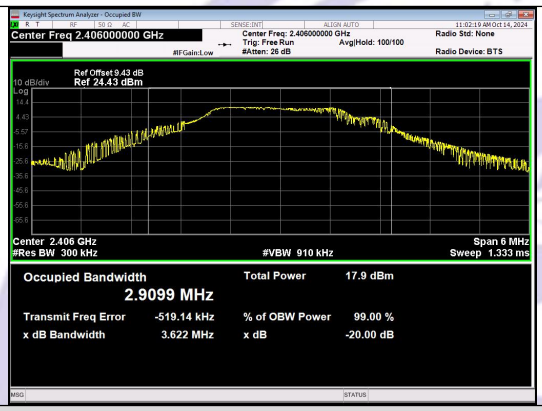
9.3 Test Procedure

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.

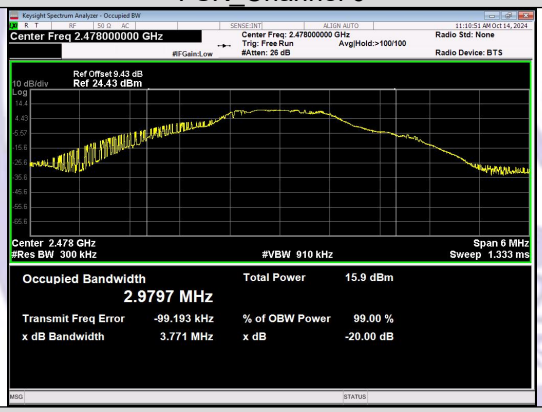
9.4 Test Data

Mode	Test channel	20dB Emission Bandwidth (MHz)	99% Bandwidth (MHz)	Result
FSK	Lowest	3.622	2.9099	Pass
	Middle	3.348	2.9505	
	Highest	3.771	2.9797	



FSK_Channel 0

FSK_Channel 11



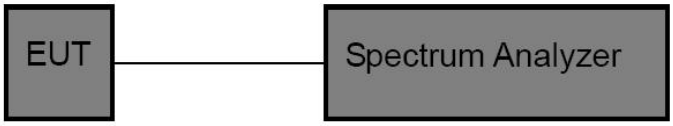
FSK_Channel 24

10 Carrier Frequency Separation Test

10.1 Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)
Test Limit	FSK: 0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)

10.2 Test Setup



10.3 Test Procedure

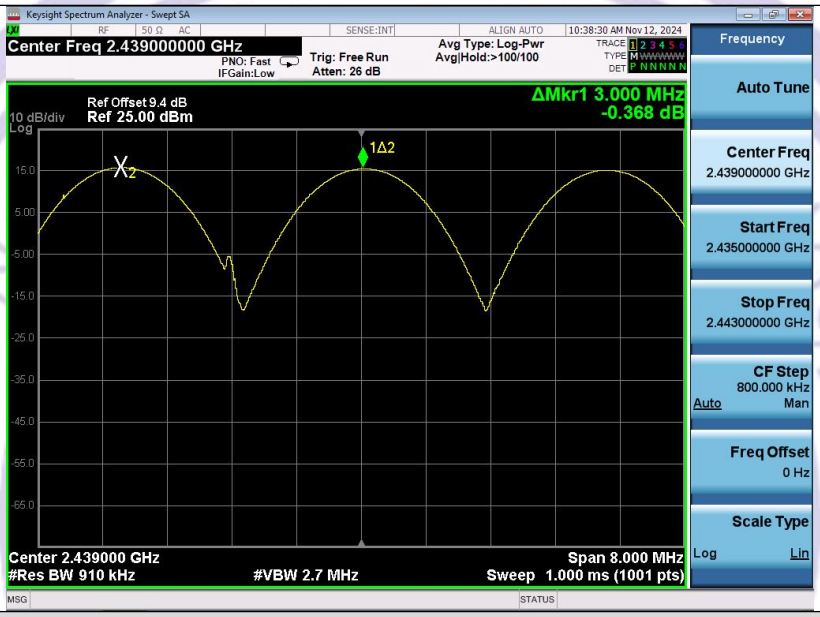
The EUT must have its hopping function enabled. Using the following spectrum analyzer settings:

1. Span= Wide enough to capture the peaks of two adjacent channels
2. Set the RBW = 900 kHz.
3. Set the VBW = 2700 kHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

10.4 Test Data

Test worst mode

Modulation	Separation (MHz)	Limit(MHz)	Result
FSK	3.00	2.514	PASS



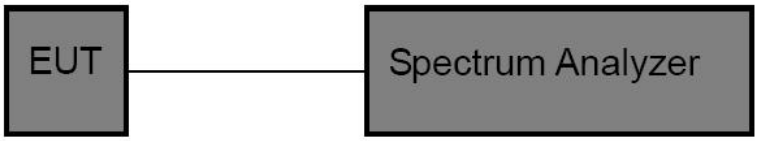
FSK

11 Number of Hopping Channel Test

11.1 Test Standard and Limit

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

11.2 Test Setup



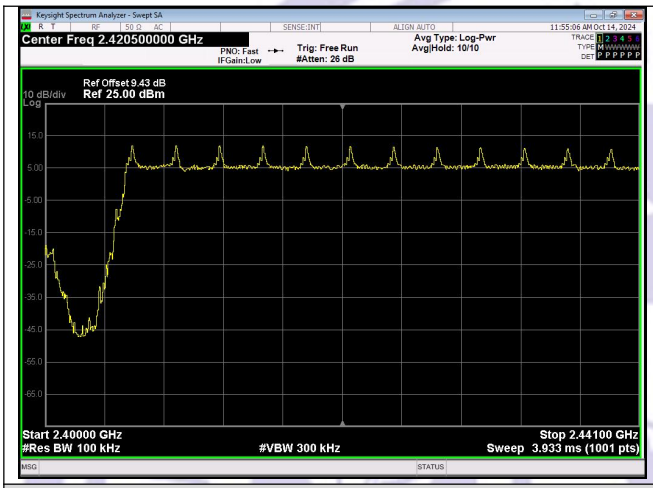
11.3 Test Procedure

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

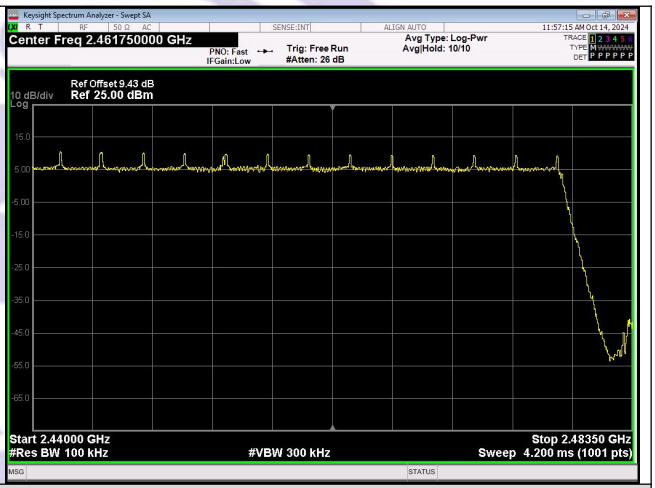
1. Span= the frequency band of operation
2. Set the RBW = 100kHz.
3. Set the VBW = 300kHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

11.4 Test Data

Mode	Frequency (MHz)	Num of Hopping Frequencies		Verdict
		ANT1	Limit	
FSK	HOPP	25	>=15	Pass



Low End Spectrum Channel Hopping Plot
FSK



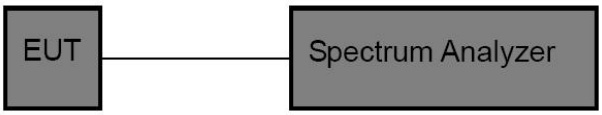
High End Spectrum Channel Hopping Plot
FSK

12 Dwell Time Test

12.1 Test Standard and Limit

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

12.2 Test Setup



12.3 Test Procedure

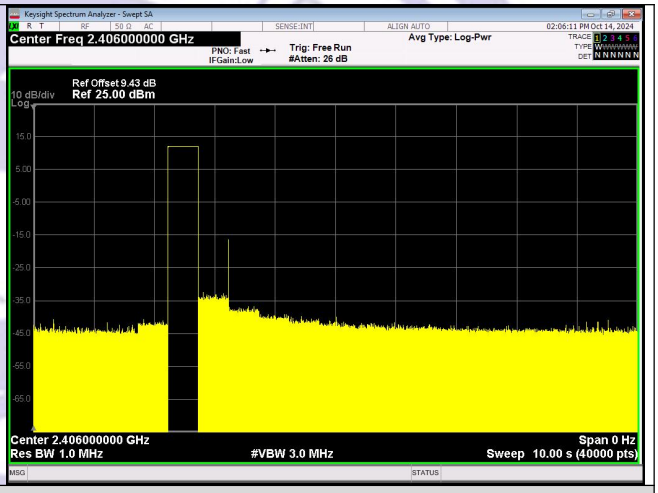
The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span= zero span, centered on a hopping channel
2. Set the RBW = 1 MHz.
3. Set the VBW = 3 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.

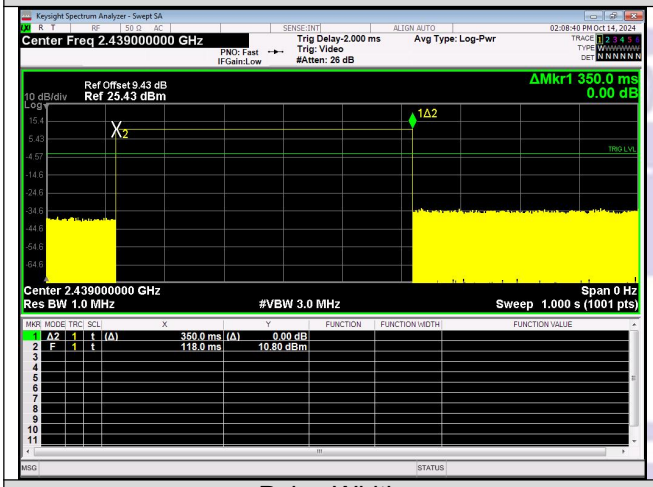
12.4 Test Data

Modulation	Channel	Pulse Width (ms)	Number of Pulses in 10 seconds	Dwell Time (ms)	Limit (ms)	Result
FSK	CH00 (2406MHz)	350.0	1	350.0	< 400	PASS
	CH11 (2439MHz)	350.0	1	350.0		PASS
	CH24 (2478MHz)	350.0	1	350.0		PASS

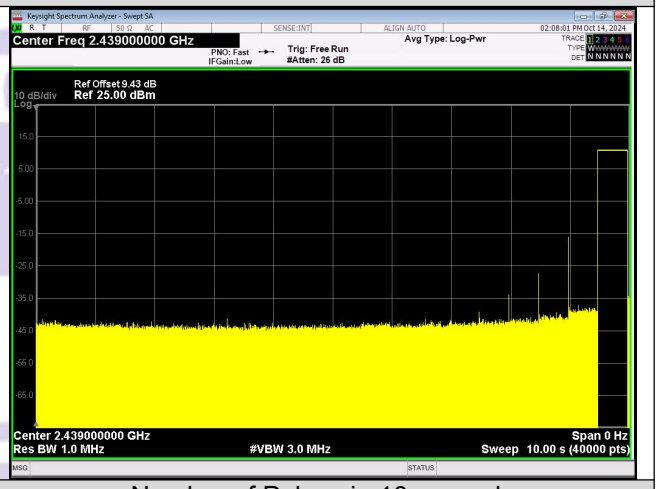
Pulse Width



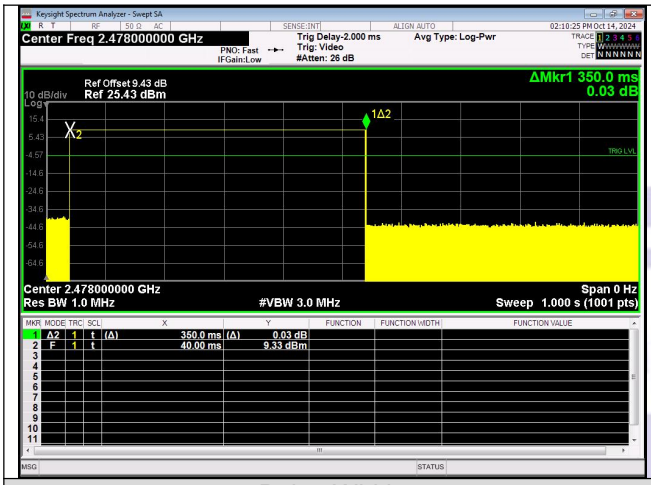
Number of Pulses in 10 seconds



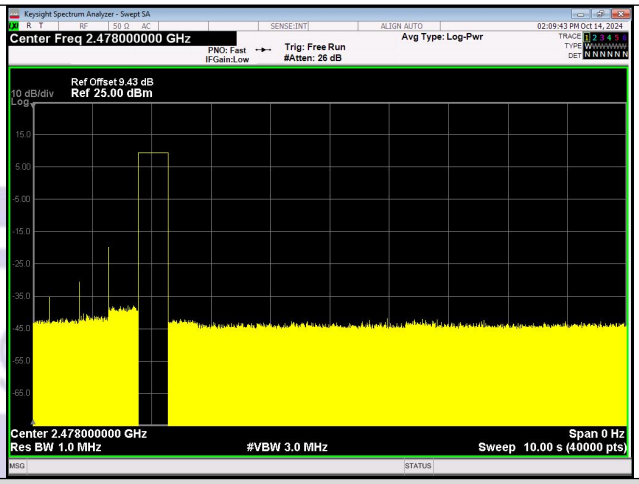
Pulse Width



Number of Pulses in 10 seconds



Pulse Width



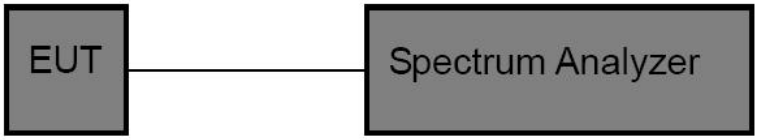
Number of Pulses in 10 seconds

13 100kHz Bandwidth of Frequency Band Edge Requirement

13.1 Test Standard and 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 in 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).

13.2 Test Setup



13.3 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.

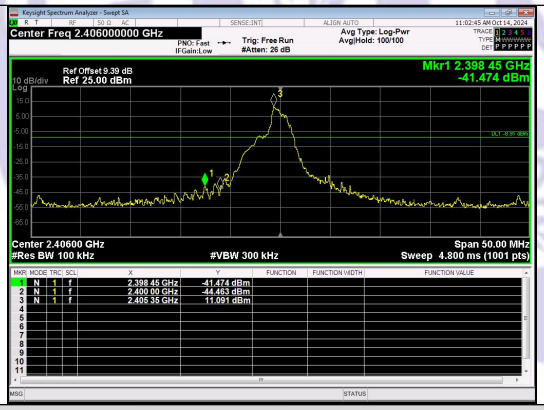
13.4 Test Data

Non-Hopping

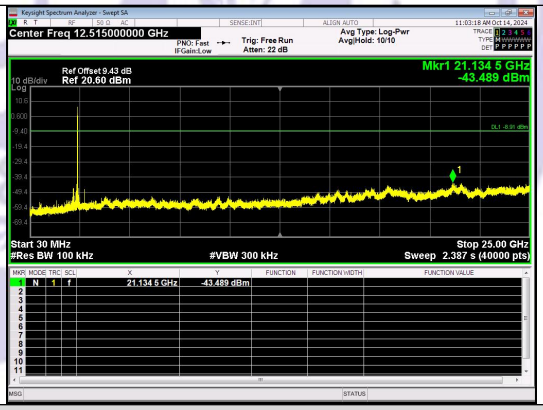
Modulation	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
FSK	0	2398.45	-41.474	-8.91	-32.564	PASS
		2400.00	-44.463	-8.91	-35.553	PASS
		21134.5	-43.489	-8.91	-34.579	PASS
	11	2781.76	-38.738	-9.63	-29.108	PASS
	24	2483.50	-44.456	-9.54	-34.916	PASS
		21542.8	-43.191	-9.54	-33.651	PASS

Hopping

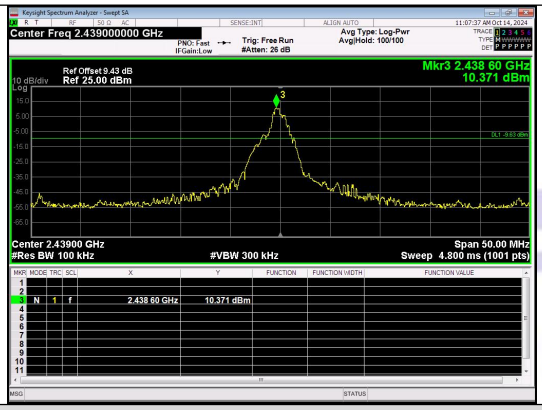
Modulation	Channel	OOB Emission Frequency (MHz)	OOB Emission Level (dBm)	Limit (dBm)	Over Limit (dB)	Result
FSK	Hopping	2388.50	-33.794	-6.27	-27.524	PASS
		2400.00	-38.862	-6.27	-32.592	PASS
		2483.50	-43.352	-6.44	-36.912	PASS



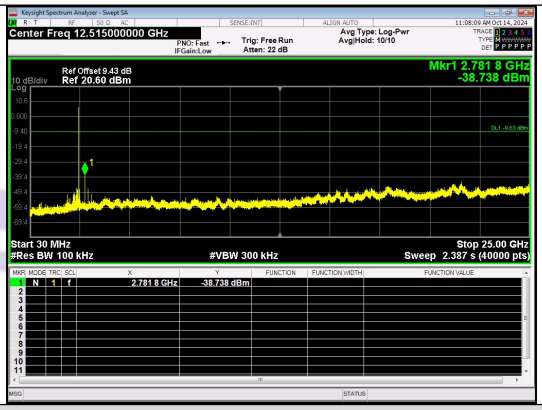
Out Of Band Emission
FSK_Channel 0



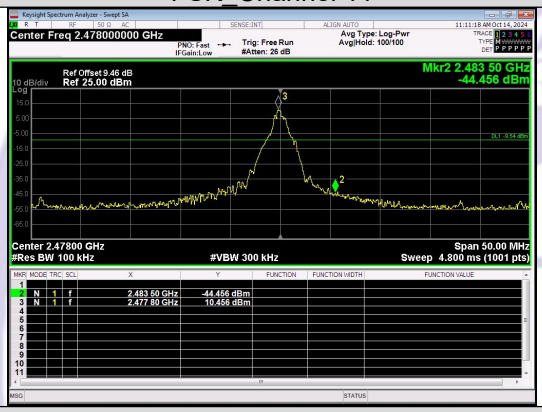
Spurious Emission
FSK_Channel 0



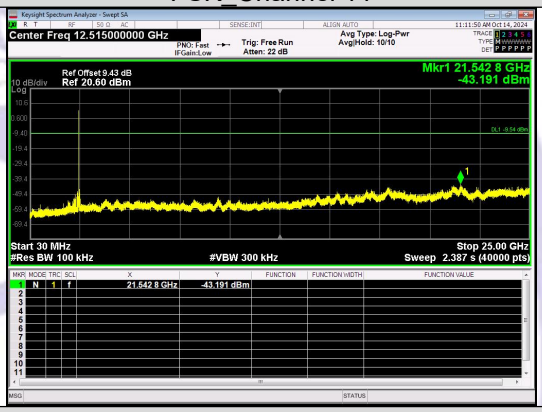
Out Of Band Emission
FSK_Channel 11



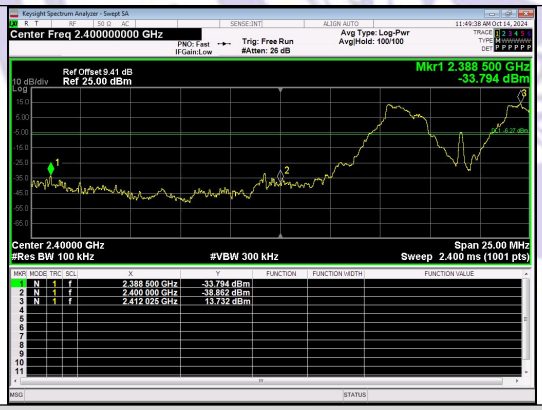
Spurious Emissions
FSK_Channel 11



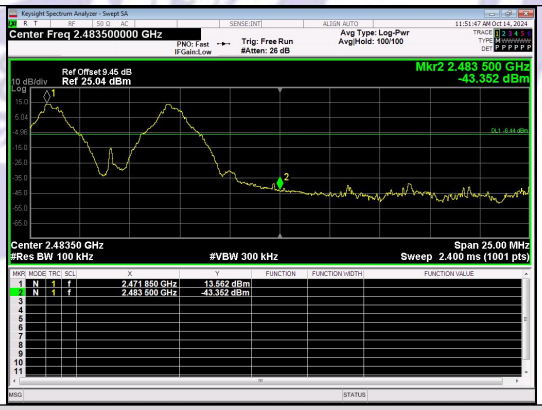
Out Of Band Emission
FSK_Channel 24



Spurious Emission
FSK_Channel 24



Out Of Band Emission(Left)
FSK_Channel Hopping



Out Of Band Emission(Right)
FSK_Channel Hopping

14 Antenna Requirement

14.1 Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203 /247(c)
Requirement	1) 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, 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. 2) 15.247(c) (1)(i) requirement: 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 6 dBi.

14.2 Antenna Connected Construction

The antenna is PCB Antenna which permanently attached, and the best case gain of the antenna is 3.54dBi. It complies with the standard requirement.

15 APPENDIX I -- TEST SETUP PHOTOGRAPH

Please see the attachment for details.

Shenzhen NCT Testing Technology Co., Ltd.
2008

16 APPENDIX II -- EUT PHOTOGRAPH

Please see the attachment for details.

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