TEST REPORT

Applicant Name :	Shenzhen Jiayz photo industrial ., Ltd
Address :	A16 Building,Intelligent Terminal Industrial Park of Silicon Valley Power, Guanlan, Longhua District, Shenzhen, China
Report Number :	RA230506-24365E-RF-00
FCC ID:	2ARN3-051811RX

Test Standard (s)

FCC PART 15.247

Sample Description

Product Type:	Microphone
Model No.:	Omic RXU
Multiple Model(s) No.:	Omic RXD
Trade Mark:	N/A
Date Received:	2023/05/06
Report Date:	2023/05/24

Test Result:	Pass*

* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Dave Liang

EMC Engineer

Approved By:

Candy Li

EMC Engineer

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RA230506-24365E-RF-00	Original Report	2023-05-24

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Microphone
Tested model	Omic RXU
Multiple Model(s)	Omic RXD (model difference see product declaration letter of similarity)
Frequency Range	2402-2480MHz
Maximum conducted peak output power	2.98dBm
Modulation Technique	GFSK
Antenna Specification*	-0.25dBi (provided by the applicant)
Voltage Range	DC 5V
Sample serial number	25HQ_6 for RF Conducted Test 25HQ_5for Conducted and Radiated Emissions (Assigned by ATC)
Sample/EUT Status	Good condition

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
RF Frequency		$0.082*10^{-7}$
RF output power, conducted		0.71dB
Unwanted Emission, conducted		1.6dB
AC Power Lines Conducted Emissions		2.72dB
Audio Frequency Response		0.1dB
Low Pass Filter Response		1.2dB
Modulation Limiting		1%
Emissions, Radiated	9kHz - 30MHz	2.06dB
	30MHz - 1GHz	5.08dB
	1GHz - 18GHz	4.96dB
	18GHz - 26.5GHz	5.16dB
	26.5GHz - 40GHz	4.64dB
Temperature		1℃
Humidity		6%
Supply voltages		0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the Floor 1, KuMaKe Building, Dongzhou Community, Guangming Street, Guangming District, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0016. The Registration Number is 30241.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode.

Channel list

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2402	21	2422	41	2442	61	2462
2	2403	22	2423	42	2443	62	2463
3	2404	23	2424	43	2444	63	2464
4	2405	24	2425	44	2445	64	2465
5	2406	25	2426	45	2446	65	2466
6	2407	26	2427	46	2447	66	2467
7	2408	27	2428	47	2448	67	2468
8	2409	28	2429	48	2449	68	2469
9	2410	29	2430	49	2450	69	2470
10	2411	30	2431	50	2451	70	2471
11	2412	31	2432	51	2452	71	2472
12	2413	32	2433	52	2453	72	2473
13	2414	33	2434	53	2454	73	2474
14	2415	34	2435	54	2455	74	2475
15	2416	35	2436	55	2456	75	2476
16	2417	36	2437	56	2457	76	2477
17	2418	37	2438	57	2458	77	2478
18	2419	38	2439	58	2459	78	2479
19	2420	39	2440	59	2460	79	2480
20	2421	40	2441	60	2461	/	/

Channel 1, 40, 79 was tested.

EUT Exercise Software

“FCC_assist_1.0.2.2.exe*” software was used and the power level is 10*. The software and power level was provided by the manufacturer.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

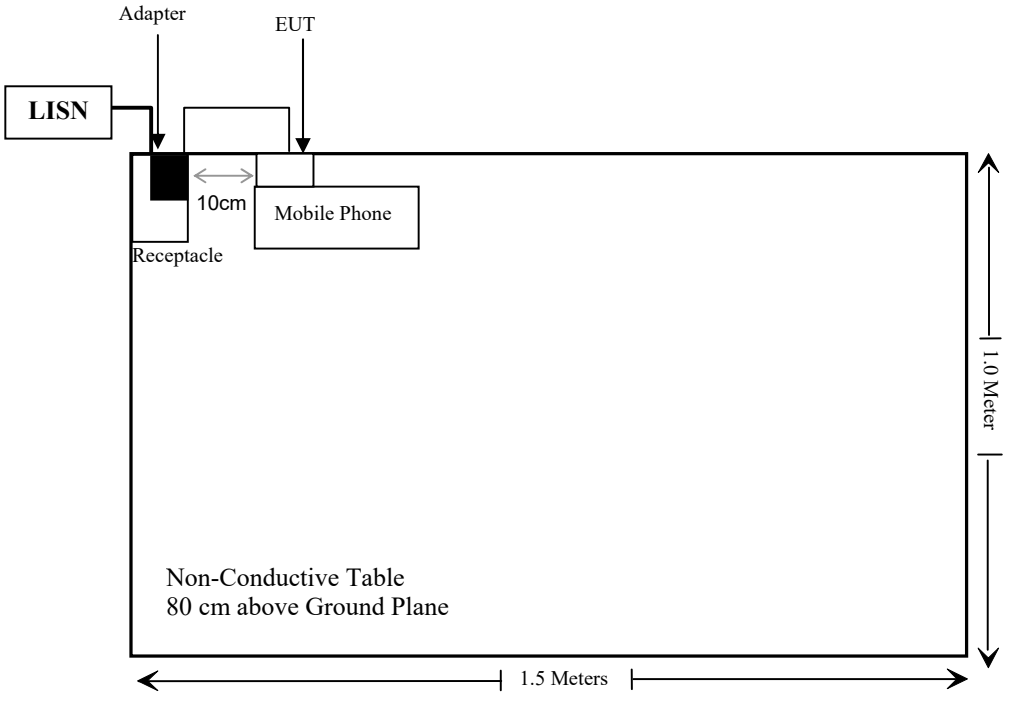
Manufacturer	Description	Model	Serial Number
Huawei	Adapter	HW-050450C00	Unknown
Bull	Receptacle	902#	Unknown
HONOR	Mobile Phone	TNA-AN00	A6BFUT1C09003495

External I/O Cable

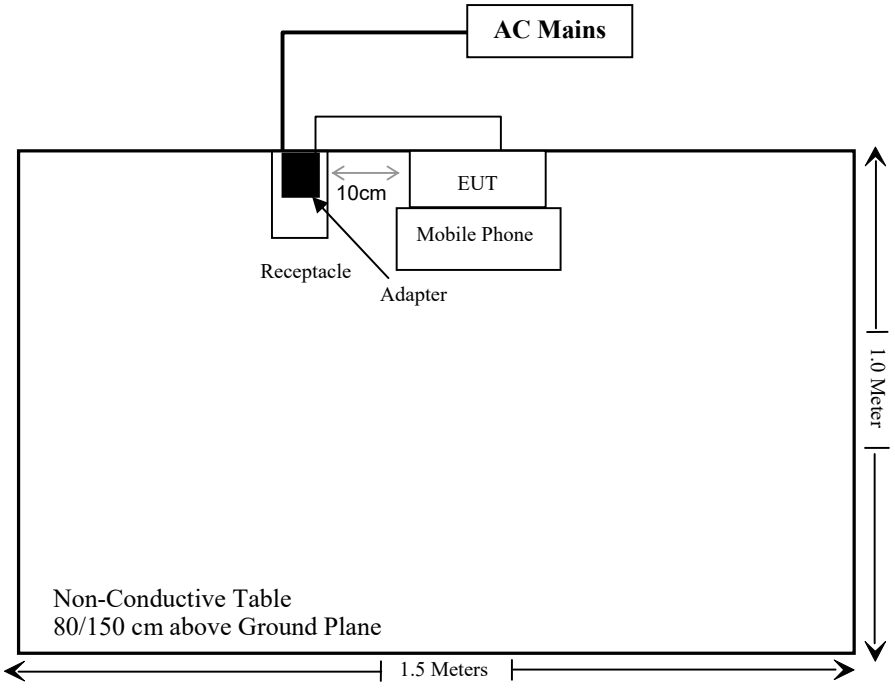
Cable Description	Length (m)	From/Port	To
Un-shielding Detachable USB Cable	0.2	Adapter	EUT
Unshielded Un-detachable Cable	1.2	Receptacle	LISN/AC Mains

Block Diagram of Test Setup

For conducted emission**:**



For Radiated Emissions:



Note: the support table edge was flush with the center of turntable

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC§15.247 (i), §1.1307 (b) (1) &§2.1093	RF EXPOSURE	Compliant
§15.203	Antenna Requirement	Compliant
§15.207(a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliant
§15.247(a)(1)	20 dB Emission Bandwidth & 99% Occupied Bandwidth	Compliant
§15.247(a)(1)	Channel Separation Test	Compliant
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliant
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliant
§15.247(b)(1)	Peak Output Power Measurement	Compliant
§15.247(d)	Band edges	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde& Schwarz	EMI Test Receiver	ESCI	100784	2022/11/25	2023/11/24
Rohde & Schwarz	L.I.S.N.	ENV216	101314	2022/11/25	2023/11/24
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2022/12/07	2023/12/06
Conducted Emission Test Software: e3 191218 (V9)					
Radiated Emissions Test					
Rohde& Schwarz	Test Receiver	ESR	102725	2022/11/25	2023/11/24
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2022/11/25	2023/11/24
SONOMA INSTRUMENT	Amplifier	310 N	186131	2022/11/08	2023/11/07
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2022/11/08	2023/11/07
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2022/11/08	2023/11/07
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
Schwarzbeck	Horn Antenna	BBHA9120D	837	2023/02/22	2026/02/21
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2022/12/26	2025/12/25
Radiated Emission Test Software:e3 191218 (V9)					
Unknown	RF Coaxial Cable	No.10	N050	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.11	N1000	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.12	N040	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.13	N300	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.14	N800	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.15	N600	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.16	N650	2022/11/25	2023/11/24
Wainwright	High Pass Filter	WHKX3.6/18 G-10SS	5	2022/11/25	2023/11/24
RF Conducted Test					
SPECTRUM ANALYZER	Rohde & Schwarz	FSU26	200982	2022/07/04	2023/07/03
WEINSCHEL	3dB Attenuator	Unknown	F-03-EM121	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.31	RF-01	Each time	

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.247 (i)& §1.1307 (b) & §2.1093 – RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

Measurement Result

Frequency (MHz)	Maximum Tune-up power		Calculated Distance (mm)	Calculated Value	Threshold (1-g SAR)	SAR Test Exclusion
	(dBm)	(mW)				
2402-2480	3.0	2.0	5	0.6	3.0	**Yes**

Note: the maximum tune up power was declared by the applicant.

Result: Compliant.

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator 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.

Antenna Connector Construction

The EUT has one internal antenna arrangement which was permanently attached and the antenna gain is -0.25 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

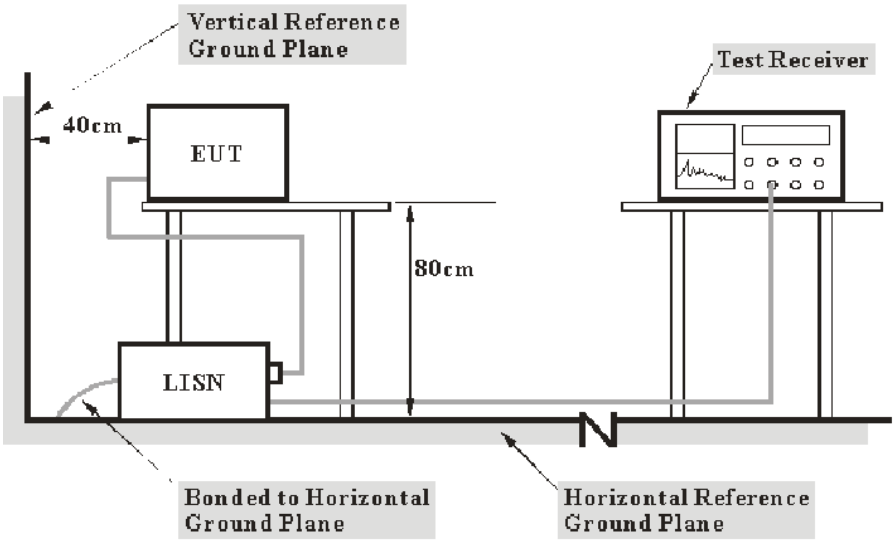
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

EUT Setup



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

The measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Factor & Over Limit Calculation

The factor is calculated by adding LISN VDF (Voltage Division Factor) and Cable Loss. The basic equation is as follows:

Factor = LISN VDF + Cable Loss

The "**Over Limit**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a over limit of -7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Over Limit = level – Limit
Level= reading level+ Factor

Test Data

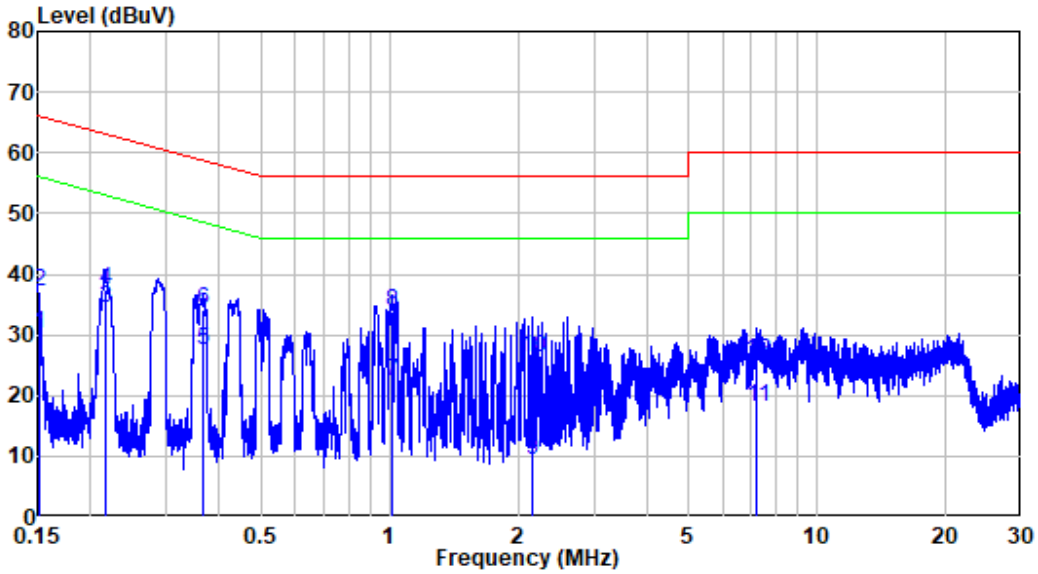
Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	49 %
ATM Pressure:	101.0 kPa

The testing was performed by Jerry on 2023-05-19.

EUT operation mode: Transmitting (the worst case is Middle channel)

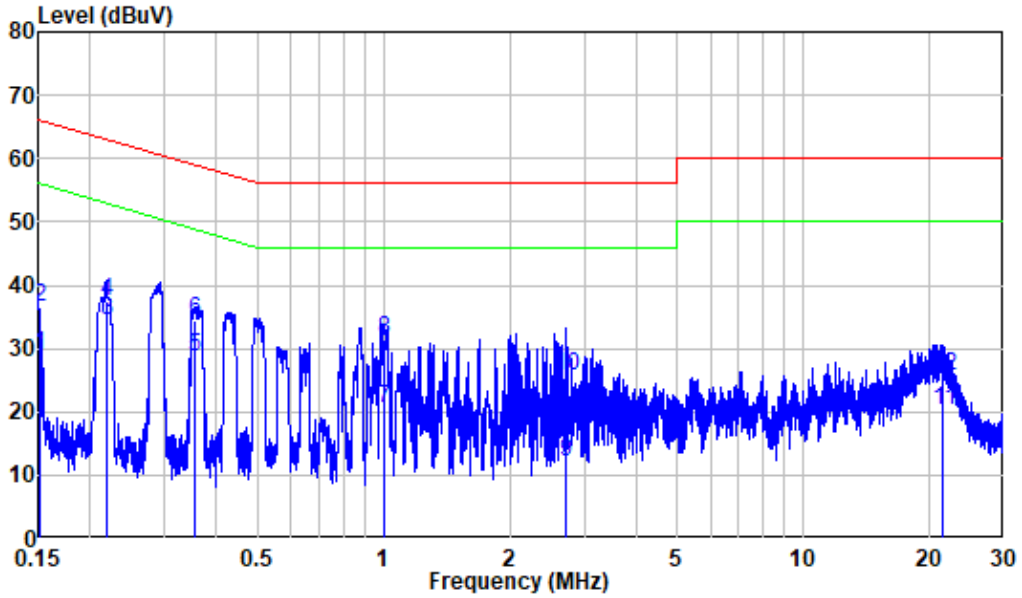
AC 120V/60 Hz, Line



Site : Shielding Room
Condition: Line
Job No. : RA230506-24365E-RF
Mode : Transmitting
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.151	10.37	19.78	30.15	55.94	-25.79	Average
2	0.151	10.37	26.91	37.28	65.94	-28.66	QP
3	0.216	10.31	24.17	34.48	52.97	-18.49	Average
4	0.216	10.31	27.22	37.53	62.97	-25.44	QP
5	0.366	10.46	17.09	27.55	48.60	-21.05	Average
6	0.366	10.46	23.79	34.25	58.60	-24.35	QP
7	1.014	10.46	12.03	22.49	46.00	-23.51	Average
8	1.014	10.46	23.26	33.72	56.00	-22.28	QP
9	2.161	10.41	-1.20	9.21	46.00	-36.79	Average
10	2.161	10.41	15.84	26.25	56.00	-29.75	QP
11	7.213	10.62	7.64	18.26	50.00	-31.74	Average
12	7.213	10.62	15.13	25.75	60.00	-34.25	QP

AC 120V/60 Hz, Neutral



Site : Shielding Room
Condition: Neutral
Job No. : RA230506-24365E-RF
Mode : Transmitting
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.151	10.27	18.85	29.12	55.94	-26.82	Average
2	0.151	10.27	26.11	36.38	65.94	-29.56	QP
3	0.218	10.30	23.98	34.28	52.89	-18.61	Average
4	0.218	10.30	27.07	37.37	62.89	-25.52	QP
5	0.354	10.39	18.44	28.83	48.88	-20.05	Average
6	0.354	10.39	24.07	34.46	58.88	-24.42	QP
7	0.999	10.36	10.10	20.46	46.00	-25.54	Average
8	0.999	10.36	21.18	31.54	56.00	-24.46	QP
9	2.703	10.52	1.41	11.93	46.00	-34.07	Average
10	2.703	10.52	15.11	25.63	56.00	-30.37	QP
11	21.500	10.23	9.95	20.18	50.00	-29.82	Average
12	21.500	10.23	15.54	25.77	60.00	-34.23	QP

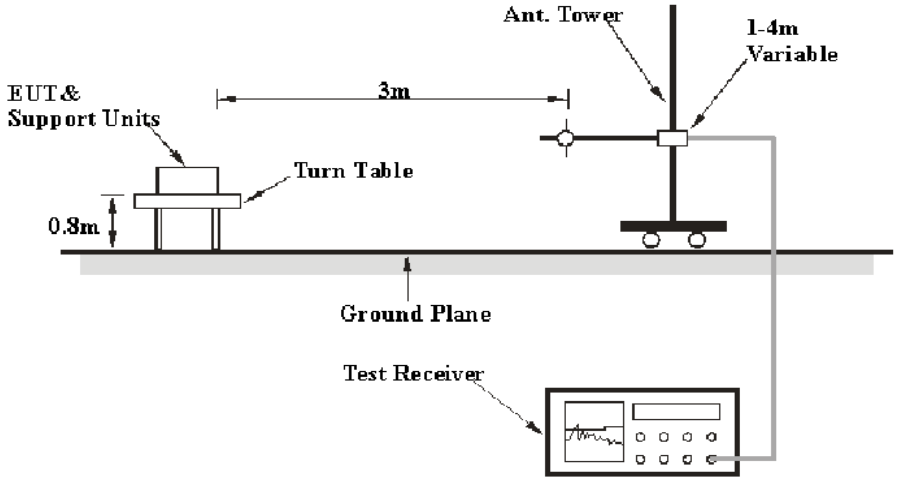
FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS

Applicable Standard

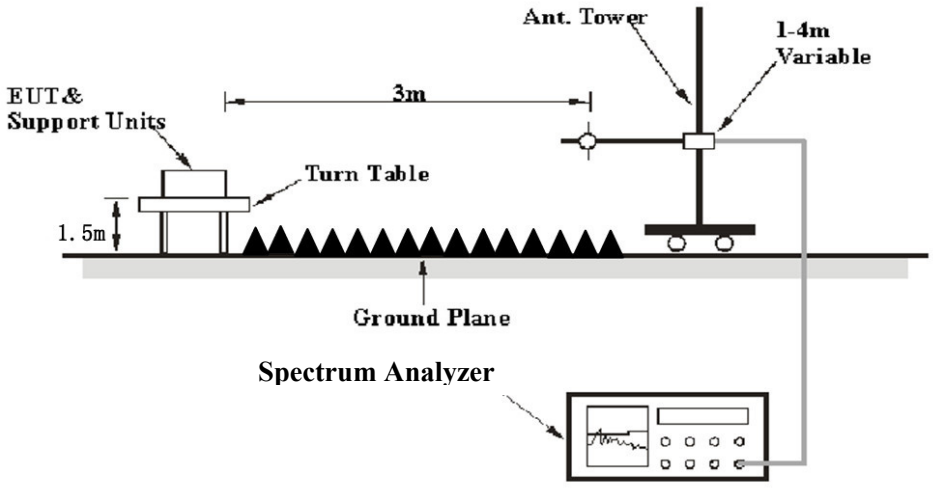
FCC §15.205; §15.209; §15.247(d)

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209 and FCC 15.247 limits.

EMI Test Receiver & Spectrum Analyzer Setup

The EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK

For average measurement:

Use the duty cycle factor correction factor method per 15.35(c).
Duty cycle=On time/100milliseconds, On time=N1*L1+N2*L2+…Nn-1*Ln-1+Nn*Ln,
Where N1 is number of type 1 pulses, L1 is length of type 1 pulse, etc.
Average Emission Level=Peak Emission Level+20*log(Duty cycle)

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data was recorded in Quasi-peak detection mode for frequency range of 30 MHz -1 GHz and peak and Average detection modes for frequencies above 1 GHz.

Factor & Over Limit/Margin Calculation

The Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain. The basic equation is as follows:

Factor = Antenna Factor + Cable Loss - Amplifier Gain

The "**Over Limit or Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a over limit/margin of -7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin/Over Limit = Corrected Amplitude/Level-Limit
Corrected Amplitude/Level = Reading + Factor

Test Data

Environmental Conditions

Temperature:	23~25.5 ℃
Relative Humidity:	50~55 %
ATM Pressure:	101.0 kPa

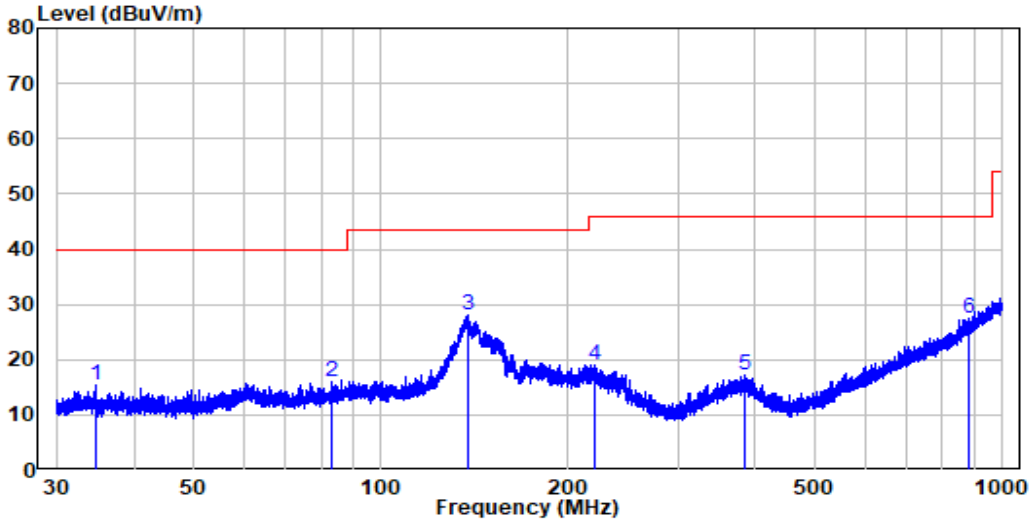
The testing was performed by Jason Liu on 2023-05-19 for below 1GHz and Jason Liu on 2023-05-14 for above 1GHz.

EUT operation mode: Transmitting (Pre-scan in the X,Y and Z axes of orientation, the worst case X-axes orientation was recorded)

30MHz-1GHz: *(worst case is middle channel)*

Note: When the test result of Peak was less than the limit of QP, just the peak value was recorded.

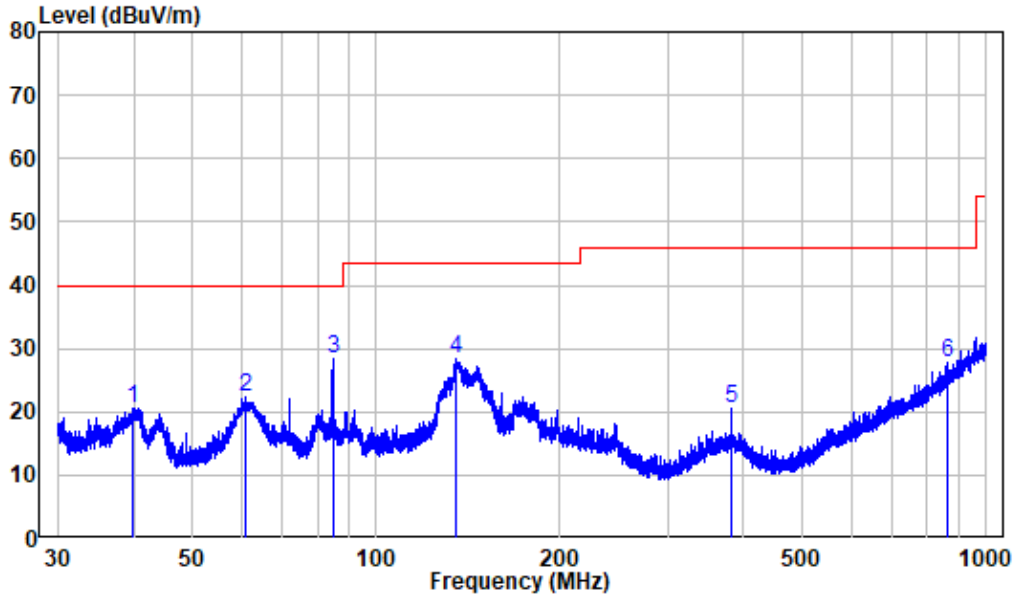
Horizontal:



Site : chamber
Condition: 3m HORIZONTAL
Job No. : RA230506-24365E-RF
Test Mode: 2.4G FHSS

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	34.745	-14.44	29.92	15.48	40.00	-24.52	Peak
2	83.193	-12.94	28.88	15.94	40.00	-24.06	Peak
3	137.722	-10.56	38.49	27.93	43.50	-15.57	Peak
4	221.392	-11.29	30.44	19.15	46.00	-26.85	Peak
5	383.932	-11.24	28.41	17.17	46.00	-28.83	Peak
6	882.180	-1.32	28.79	27.47	46.00	-18.53	Peak

Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : RA230506-24365E-RF
Test Mode: 2.4G FHSS

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	39.802	-14.35	35.01	20.66	40.00	-19.34	Peak
2	61.185	-13.83	36.09	22.26	40.00	-17.74	Peak
3	84.813	-12.83	41.06	28.23	40.00	-11.77	Peak
4	134.914	-10.57	38.82	28.25	43.50	-15.25	Peak
5	381.583	-11.17	31.63	20.46	46.00	-25.54	Peak
6	861.922	-1.96	29.64	27.68	46.00	-18.32	Peak

Above 1GHz:

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Corrected Ampitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave		Height (m)	Polar (H/V)				
Low Channel(2402MHz)									
2385.92	68.59	PK	296	2.0	H	-10.71	57.88	74	-16.12
2386.73	68.43	PK	83	1.6	V	-10.71	57.72	74	-16.28
2390	66.31	PK	265	1.8	H	-10.70	55.61	74	-18.39
2390	66.19	PK	355	1.1	V	-10.70	55.49	74	-18.51
4804	61.39	PK	212	1.5	H	-6.11	55.28	74	-18.72
4804	61.16	PK	16	1.5	V	-6.11	55.05	74	-18.95
Middle Channel(2441MHz)									
4882	61.12	PK	337	1.1	H	-5.90	55.22	74	-18.78
4882	60.90	PK	295	1.1	V	-5.90	55.00	74	-19.00
High Channel(2480MHz)									
2483.5	68.29	PK	194	1.8	H	-10.55	57.74	74	-16.26
2483.5	68.17	PK	161	1.6	V	-10.55	57.62	74	-16.38
2483.89	69.86	PK	124	2.0	H	-10.55	59.31	74	-14.69
2484.28	69.64	PK	229	2.2	V	-10.54	59.10	74	-14.90
4960	60.49	PK	233	2.5	H	-5.47	55.02	74	-18.98
4960	60.28	PK	351	2.5	V	-5.47	54.81	74	-19.19

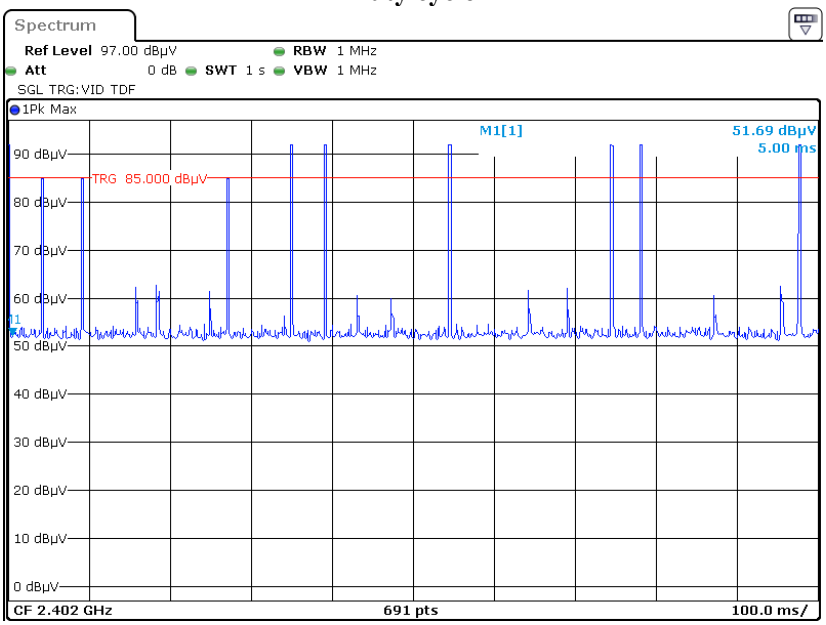
Field Strength of Average							
Frequency (MHz)	Peak Measurement @3m (dBμV/m)	Polar (H/V)	Duty Cycle Correction Factor (dB)	Corrected Ampitude (dBμV/m)	FCC Part 15.247		
					Limit (dBμV/m)	Margin (dB)	Comment
Low Channel(2402MHz)							
2385.92	57.88	H	-24.73	33.15	54	-20.85	Bandedge
2386.73	57.72	V	-24.73	32.99	54	-21.01	Bandedge
2390	55.61	H	-24.73	30.88	54	-23.12	Bandedge
2390	55.49	V	-24.73	30.76	54	-23.24	Bandedge
4804	55.28	H	-24.73	30.55	54	-23.45	Harmonic
4804	55.05	V	-24.73	30.32	54	-23.68	Harmonic
Middle Channel(2441MHz)							
4882	55.22	H	-24.73	30.49	54	-23.51	Harmonic
4882	55.00	V	-24.73	30.27	54	-23.73	Harmonic
High Channel(2480MHz)							
2483.5	57.74	H	-24.73	33.01	54	-20.99	Bandedge
2483.5	57.62	V	-24.73	32.89	54	-21.11	Bandedge
2483.89	59.31	H	-24.73	34.58	54	-19.42	Bandedge
2484.28	59.10	V	-24.73	34.37	54	-19.63	Bandedge
4960	55.02	H	-24.73	30.29	54	-23.71	Harmonic
4960	54.81	V	-24.73	30.08	54	-23.92	Harmonic

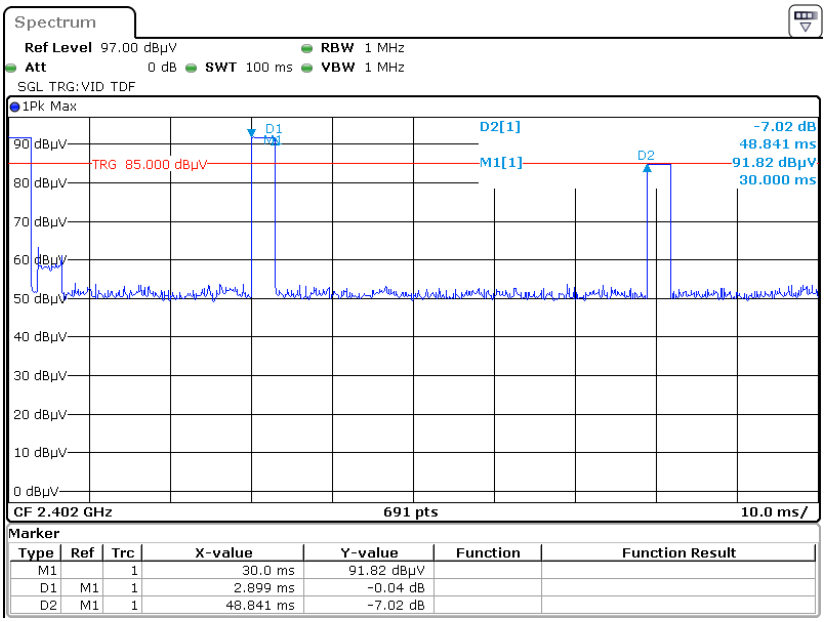
Note:

Absolute Level = Corrected Factor + Reading
Margin = Corrected. Amplitude - Limit
Average level= Peak level+ Duty Cycle Corrected Factor

Duty Cycle = Ton/100ms = 2.899*2/100=0.05798
Duty Cycle Corrected Factor = 20lg (Duty Cycle) = 20lg0.05798 = -24.73

Duty cycle





Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	30.0 ms	91.82 dBµV		
D1	M1	1	2.899 ms	-0.04 dB		
D2	M1	1	48.841 ms	-7.02 dB		

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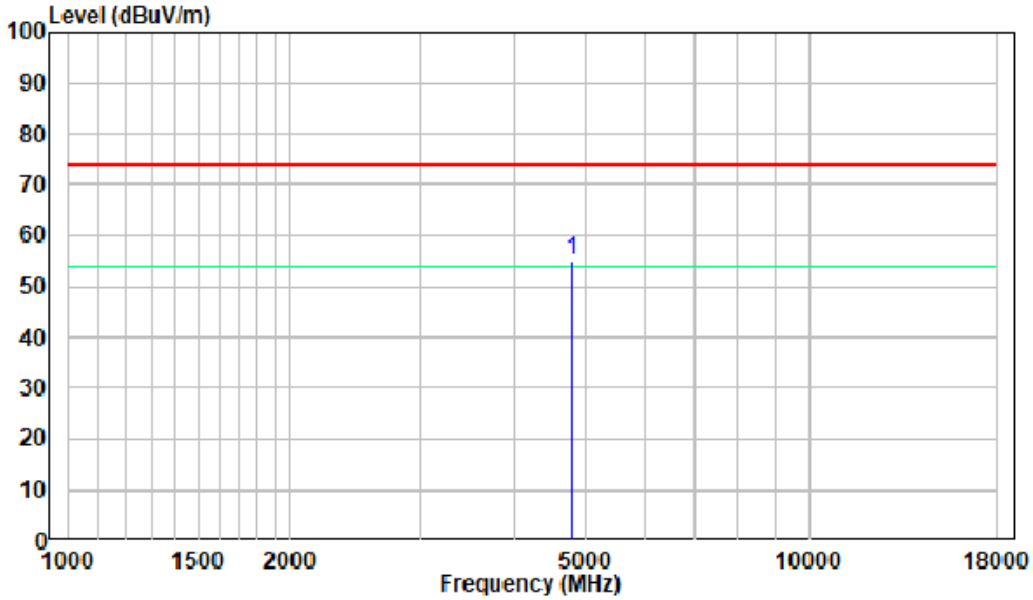
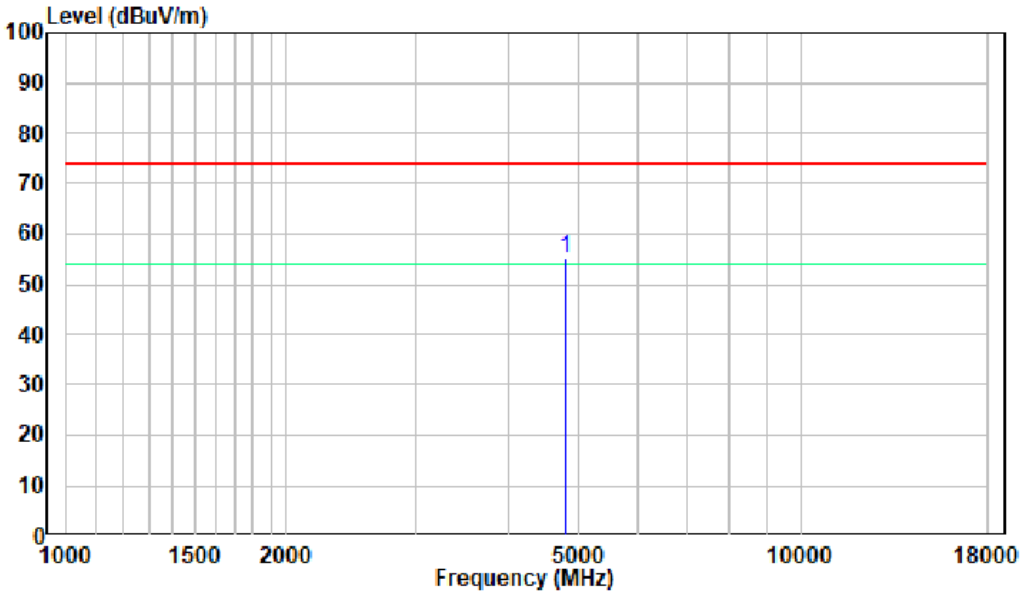
1-18GHz

Pre-scan for Low Channel

Horizontal:



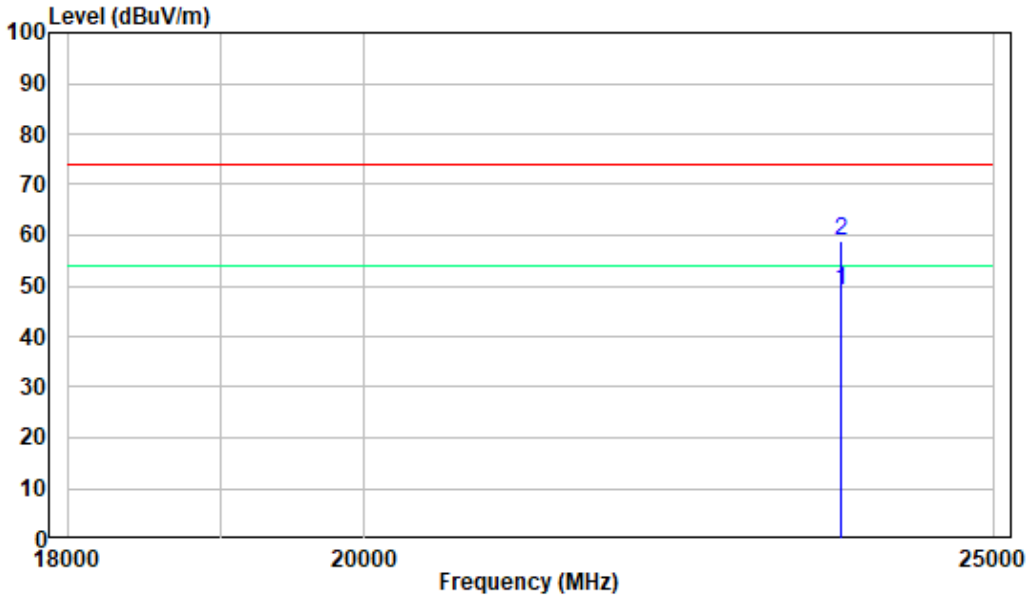
Vertical:



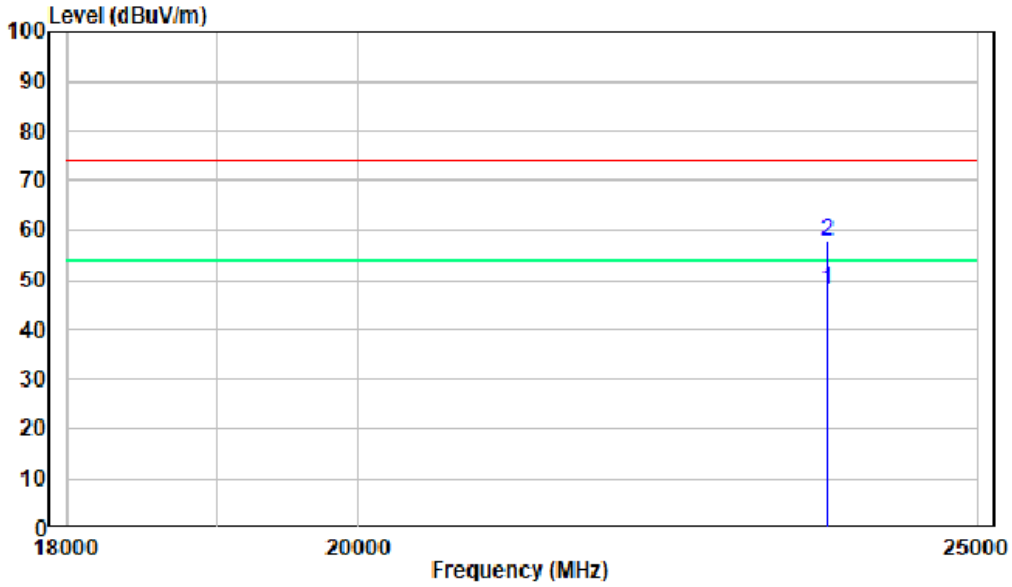
18-25GHz

Pre-scan for Low Channel

Horizontal:



Vertical:



FCC §15.247(a) (1)-CHANNEL SEPARATION TEST

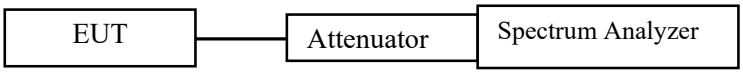
Applicable Standard

Frequency hopping systems shall have hoping 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 provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.2

1. Set the EUT in transmitting mode, maxhold the channel.
2. Set the adjacent channel of the EUT and maxhold another trace.
3. Measure the channel separation.



Test Data

Environmental Conditions

Temperature:	27.2℃
Relative Humidity:	42 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Huang on 2023-05-15.

EUT operation mode: Transmitting

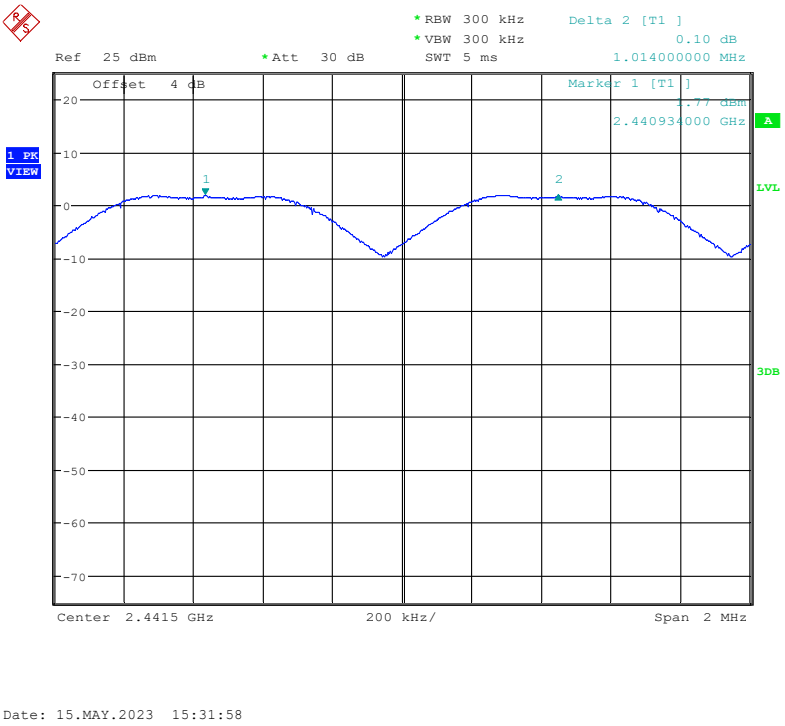
Test Result: Compliant.

Test Mode	Channel Separation (MHz)	20 dBc BW (MHz)	Two-thirds of the 20 dB bandwidth (MHz)	Channel Separation Limit	Result
GFSK					
Hopping	1.014	0.957	0.638	> two-thirds of the 20 dB bandwidth	Compliance

Note: The limit > two-thirds of the 20 dB bandwidth

Please refer to the below plots:

GFSK_Hop



FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH & 99% OCCUPIED BANDWIDTH

Applicable Standard

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, provided the systems operate with an output power no greater than 125 mW.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.7 & Clause 6.9.2

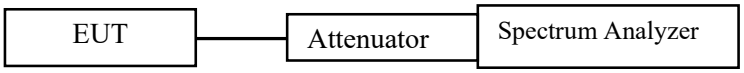
The following conditions shall be observed for measuring the occupied bandwidth and 20 dB bandwidth:
• The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

• The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.

• The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max Hold”) may be necessary to determine the occupied / 20 dB bandwidth if the device is not transmitting continuously.

• The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / 20 dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.
For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).



Test Data

Environmental Conditions

Temperature:	27.2℃
Relative Humidity:	42 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Huang on 2023-05-15.

EUT operation mode: Transmitting

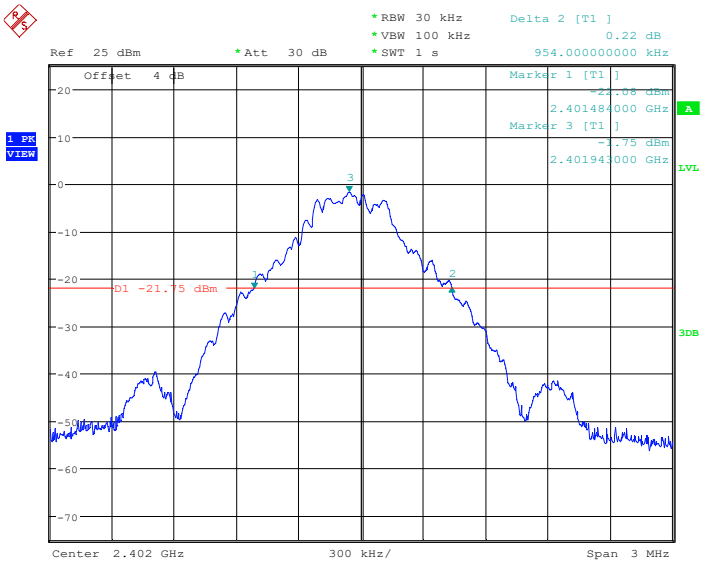
Test Result: Compliant.

Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	20 dB Emission Bandwidth (MHz)
GFSK	Low	2402	0.861	0.954
	Middle	2441	0.861	0.957
	High	2480	0.864	0.957

Please refer to the below plots:

20 dB Emission Bandwidth:

2402MHz



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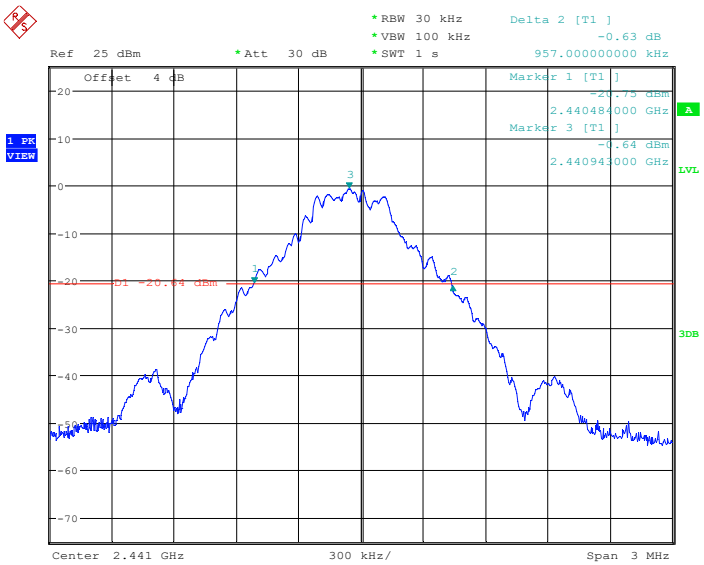
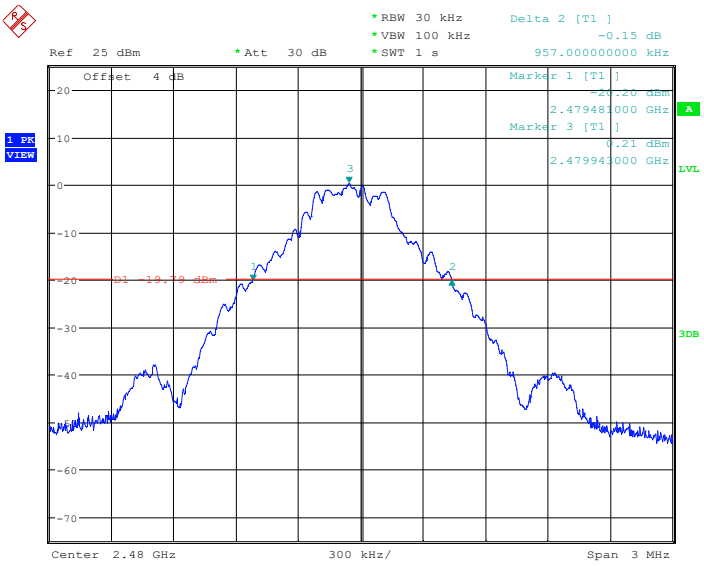
2441MHz



Date: 15.MAY.2023 15:15:48

2480MHz



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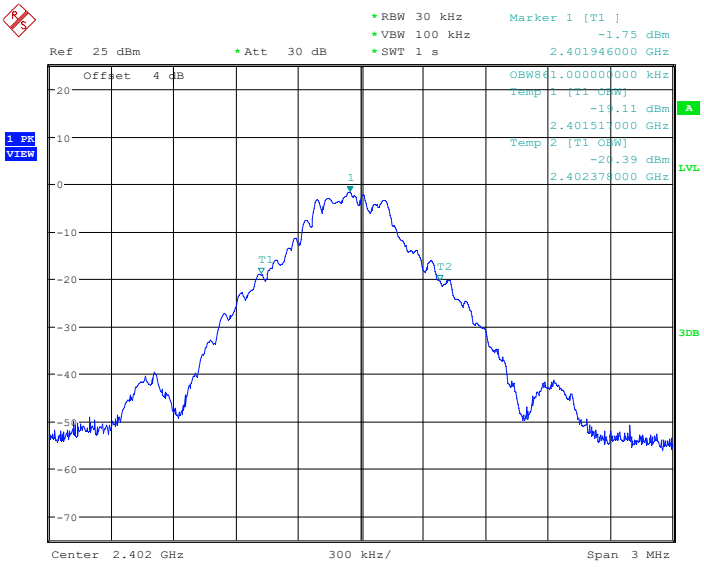
99% Emission Bandwidth:

2402MHz



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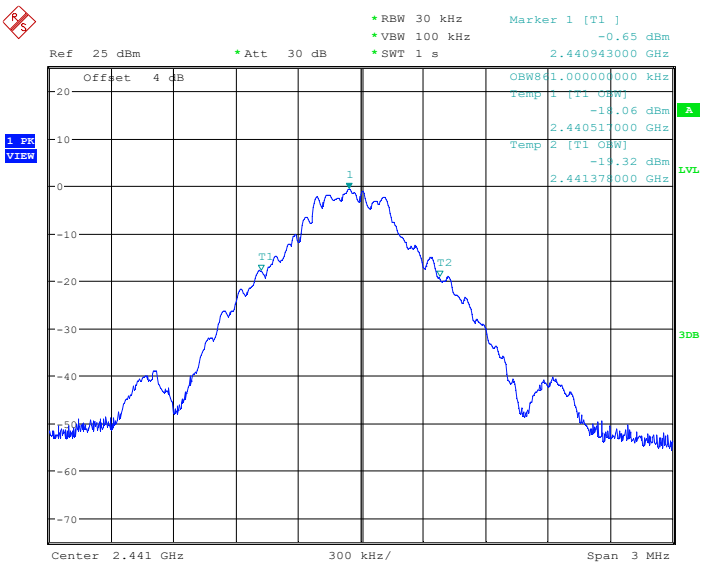
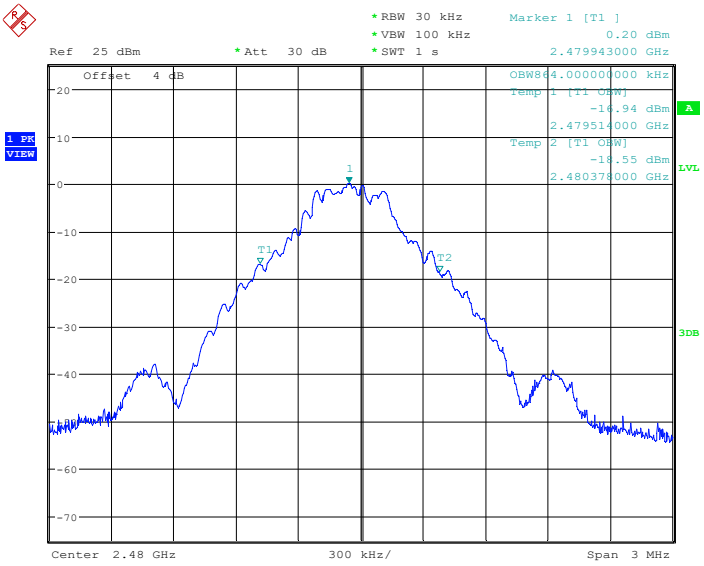
2441MHz



2480MHz



FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST

Applicable Standard

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

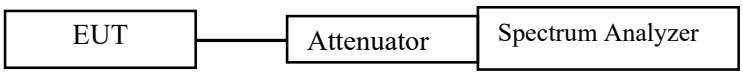
Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.3

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

2. Set the EUT in hopping mode from first channel to last.

3. By using the max-hold function record the quantity of the channel.



Test Data

Environmental Conditions

Temperature:	27.2℃
Relative Humidity:	42 %
ATM Pressure:	101.0 kPa

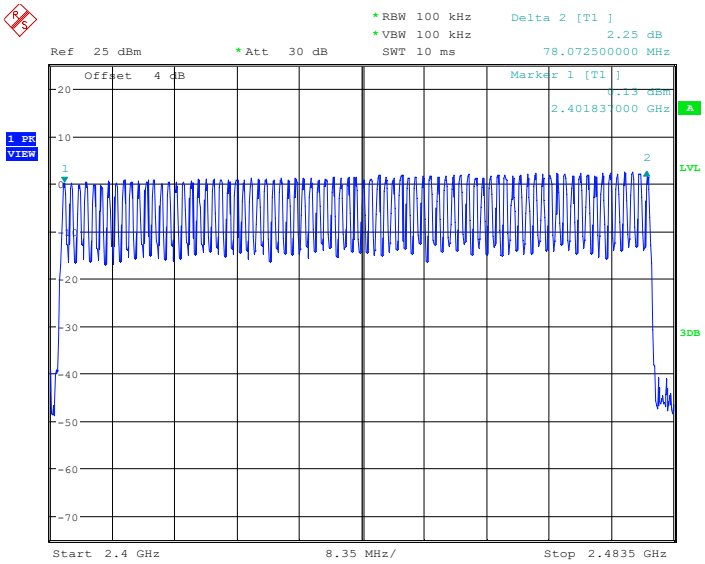
The testing was performed by Jacob Huang on 2023-05-15.

EUT operation mode: Transmitting

Test Result: Compliant.

Mode	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)
GFSK	2400-2483.5	79	≥15

GFSK_Hop



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FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)

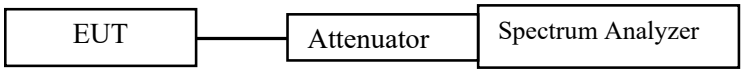
Applicable Standard

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.4

1. The EUT was worked in channel hopping.
2. Set the RBW to: 1MHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 0Hz.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Recorded the time of single pulses



Test Data

Environmental Conditions

Temperature:	27.2℃
Relative Humidity:	42 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Huang on 2023-05-15.

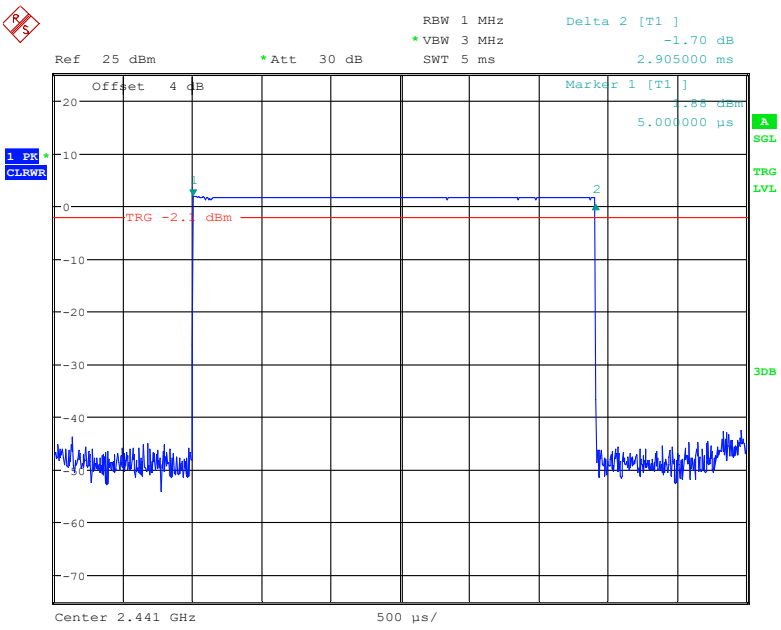
EUT operation mode: Transmitting

Test Result: Compliant.

Test Mode	Channel	Pulse Time [ms]	Total Hops [Num]	Result[s]	Limit[s]	Verdict
GFSK	Hop	2.905	80	0.232	≤0.4	PASS

Note 1: A period time=0.4*79=31.6(S), Result= Pulse Time *Total hops
Note 2: Total hops=Hopping Number in 3.16s*10
Note 3: Hopping Number in 3.16s=Total of highest signals in 3.16s (Second high signals were other channel)

Hop



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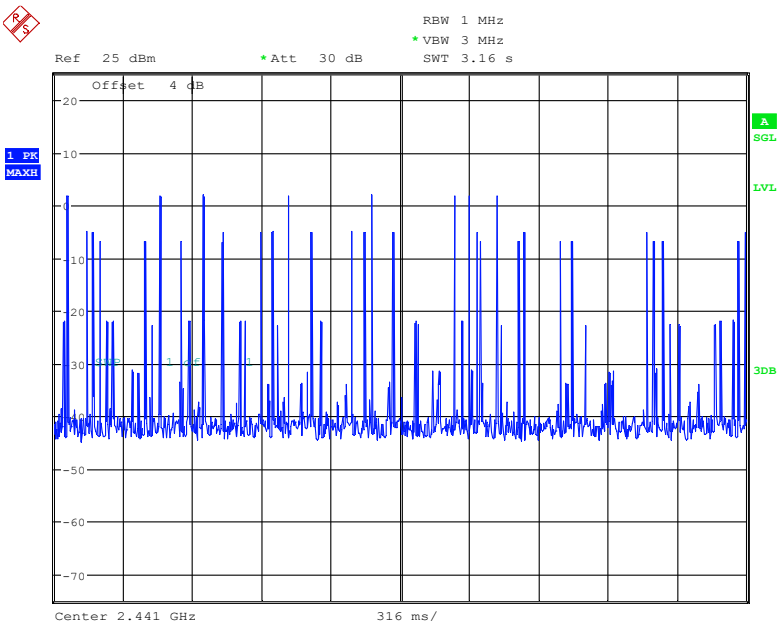

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FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

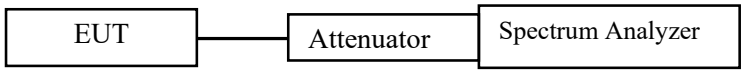
Applicable Standard

According to §15.247(b) (1), 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. And for all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.5

1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



Test Data

Environmental Conditions

Temperature:	27.2℃
Relative Humidity:	42 %
ATM Pressure:	101.0 kPa

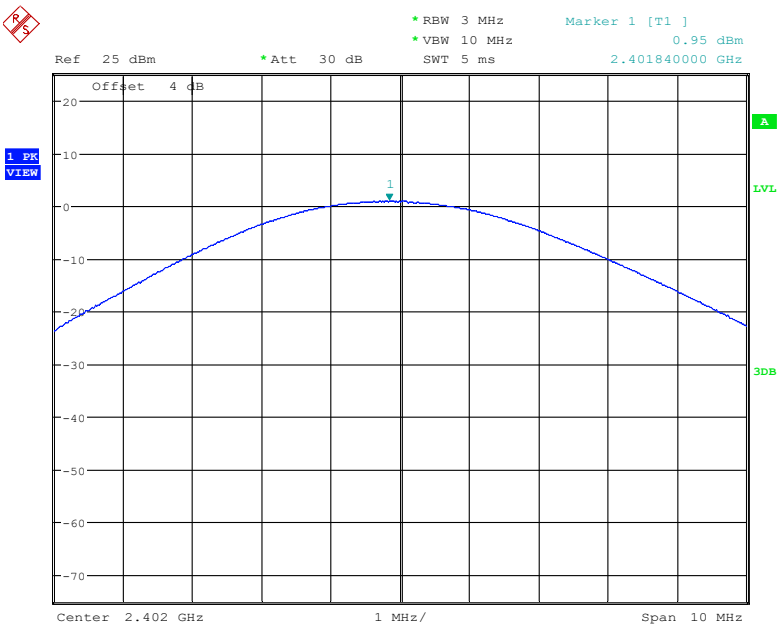
The testing was performed by Jacob Huang on 2023-05-15.

EUT operation mode: Transmitting

Test Result: Compliant.

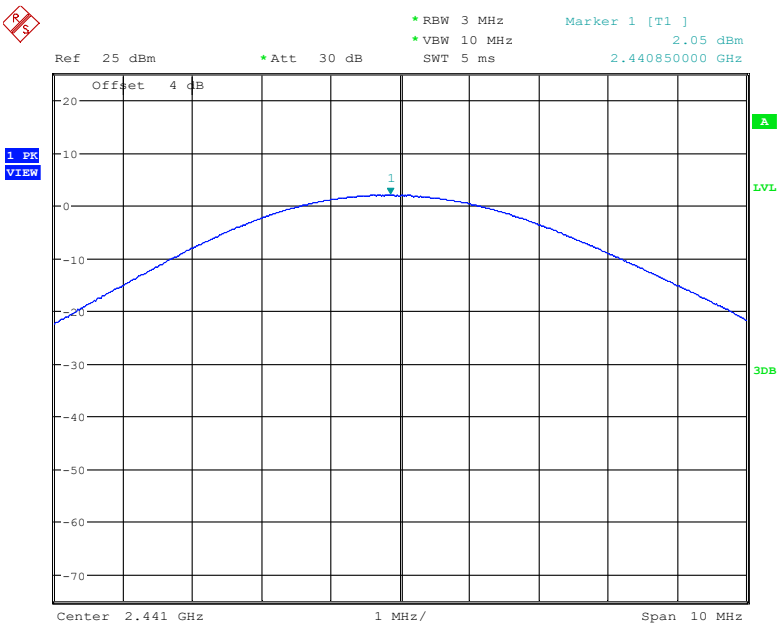
Mode	Channel	Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)
GFSK	Low	2402	0.95	21
	Middle	2441	2.05	21
	High	2480	2.98	21

GFSK_2402



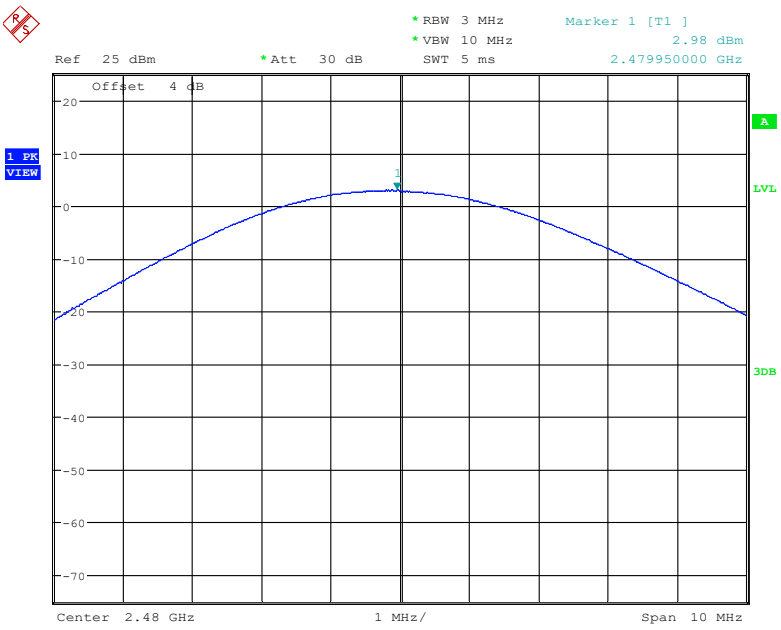
Date: 15.MAY.2023 15:10:48

GFSK_2441



Date: 15.MAY.2023 15:14:37

GFSK_2480


RBW 3 MHz
VBW 10 MHz
SWT 5 ms
Marker 1 [T1]
2.98 dBm
2.479950000 GHz
Ref 25 dBm
Att 30 dB
Offset 4 dB
1 PK
VIEW
A
LVL
3DB
Center 2.48 GHz
1 MHz/
Span 10 MHz
Date: 15.MAY.2023 15:18:36

FCC §15.247(d) - BAND EDGES TESTING

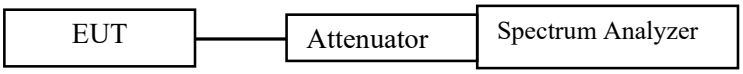
Applicable Standard

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)).

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.6 & Clause 6.10

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.



Test Data

Environmental Conditions

Temperature:	27.2℃
Relative Humidity:	42 %
ATM Pressure:	101.0 kPa

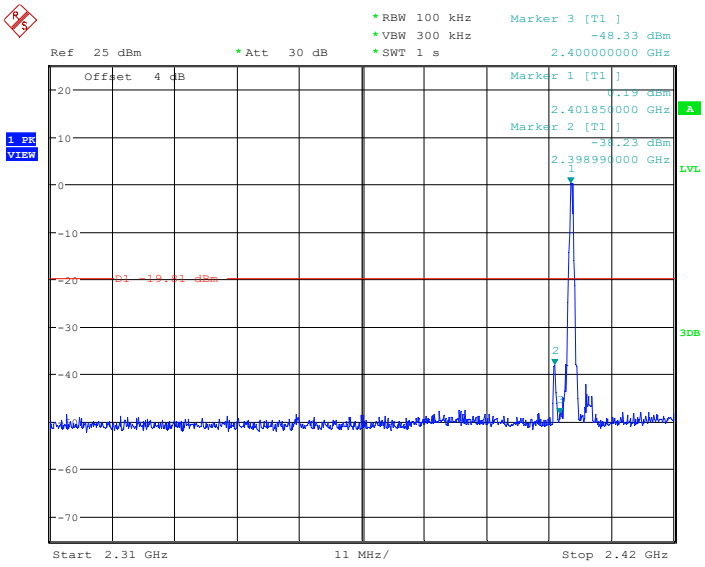
The testing was performed by Jacob Huang on 2023-05-15.

EUT operation mode: Transmitting

Test Result: Compliant.

Conducted Band Edge Result:

Low_2402MHz



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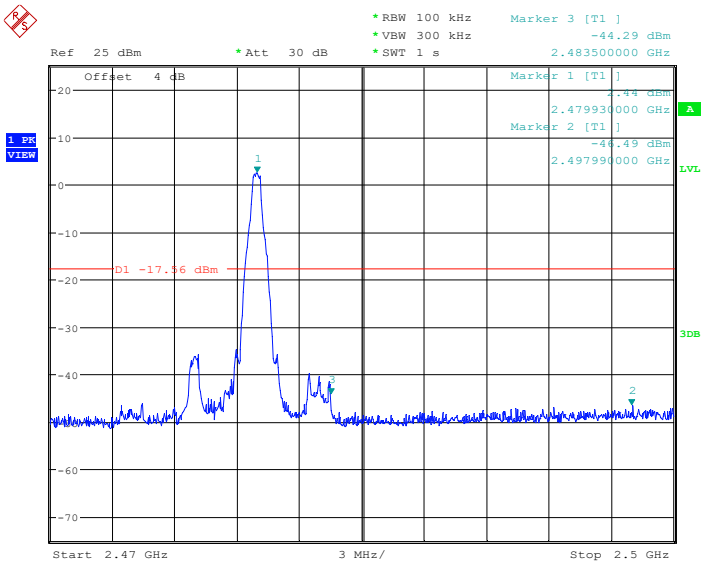
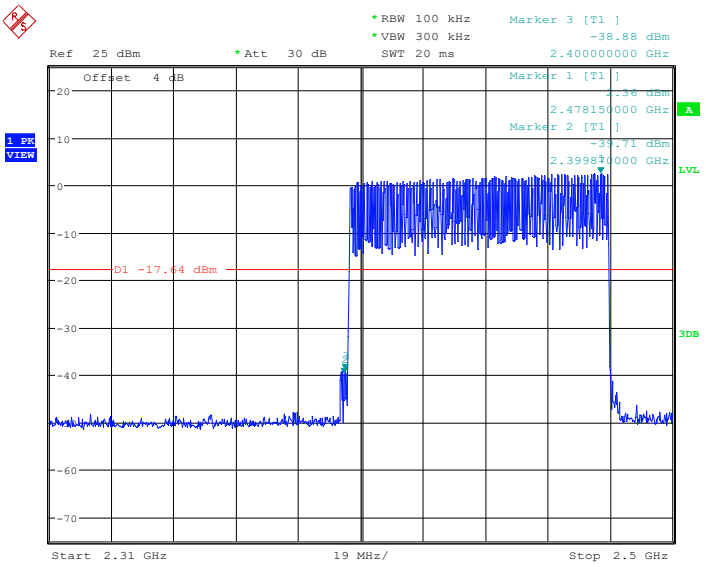
High_2480MHz



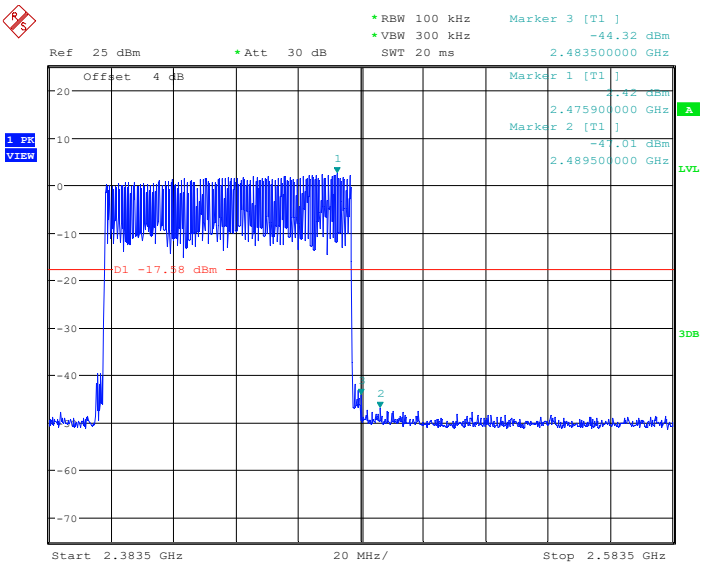
Date: 15.MAY.2023 15:20:11

Low_Hop



Date: 15.MAY.2023 15:34:17

High_Hop



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