Test Report

Product: AI Wireless Lavalier Microphone

Trade Mark: N/A

Model Number: WM650

FCC ID: 2AJJB-WM650

Prepared for

Shenzhen Maono Technology Co., Ltd.

No. 1307, 13th Floor, Building 4, Phase II of Tianan Yungu Industrial Park, Gangtou Community, Bantian Street, Longgang District, Shenzhen, China

Prepared by

Shenzhen HongBiao Certification& Testing Co., Ltd

Room 102, 201, Building 2, Yuanwanggu RFID Industrial Park, Tongguan Road, Tianliao Community, Yutang Street, Guangming District, Shenzhen, China

Tel.: +86-755-2998 9321 Fax.: +86-755-2998 5110

Website: http://www.sz-hongbiao.com

Table of Contents

TEST RESULT CERTIFICATION

Applicant's Name	:	Shenzhen Maono Technology Co., Ltd.
Address	:	No. 1307, 13th Floor, Building 4, Phase II of Tianan Yungu Industrial Park, Gangtou Community, Bantian Street, Longgang District, Shenzhen, China
Manufacturer's Name	:	Shenzhen Maono Technology Co., Ltd.
Address	:	No. 1307, 13th Floor, Building 4, Phase II of Tianan Yungu Industrial Park, Gangtou Community, Bantian Street, Longgang District, Shenzhen, China

Product description

Product name	:	AI Wireless Lavalier Microphone
Model Number	:	WM650
Standards	:	FCC Part 15.247
Test procedure	:	IEEE/ANSI C63.10-2020

This device described above has been tested by Shenzhen HongBiao Certification& Testing Co., Ltd and the test results show that the equipment under test (EUT) is in compliance with the EMC requirements. And it is applicable only to the tested sample identified in the report.

Date of Test

Date (s) of performance of tests	:	Nov. 20, 2024~ Dec. 03, 2024
Test Result	:	**Pass**

Testing Engineer : Zoe Su

(Z o e S u)

Technical Manager : Gary Lu

(G a r y L u)

Authorized Signatory : Leo Su

(L e o S u)

Revision History

Revised No.	Date of Issue	Description
01	Dec. 03, 2024	Original

1 General Description

1.1 Description of EUT

Product name:	AI Wireless Lavalier Microphone
Model name:	WM650
Series Model:	WM650A, WM650 PB1, WM650 PB2, WM650 PB3, WM650 PB4, WM650 PB5, WM650 B1, WM650 B2, WM650 B3, WM650 B4, WM650 B5, WM650 PC1, WM650 PC2, WM650 PC3, WM650 PC4, WM650 PC5, WM650 C1, WM650 C2, WM650 C3, WM650 C4, WM650 C5, WM650 PA1, WM650 PA2, WM650 PA3, WM650 PA4, WM650 PA5, WM650 PA6, WM650 PA7, Wave T5, Wave T5 A
Different of series model:	All models have the same RF circuit and module, except for the model and appearance color
Operation frequency:	2402-2480MHz
Modulation type:	GFSK
Bit Rate of transmitter:	1 Mbps, 2Mbps
Antenna type:	LDS Antenna
Antenna gain:	1dBi
Max. output power:	1.89dBm
Hardware version:	V1.3
Software version:	1.4.2
Battery:	Charging case: DC 3.8V, 750mAh, 2.85Wh Transmitter: DC 3.8V, 97mAh, 0.3686Wh
Power supply:	For Transmitter: Powered by internal battery For charging case Input: 5V⎓0.6A For charging case Output: 5V⎓1A Battery for Transmitter: DC 3.8V, 97mAh, 0.3686Wh Battery for charging case: DC 3.8V, 750mAh, 2.85Wh Mobile Version Receiver: DC 5V from USB supply
Adapter information:	N/A

1.2 Test Mode

Test Mode	Channel	Frequency (MHz)
1	00	2402
2	19	2440
3	39	2480

1.3 Operation Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

1.4 Test Setup

See photographs of the test setup in the report for the actual setup and connections between EUT and support equipment.

1.5 Power setting configuration parameters

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters.

Test software Version		2.4G FCC Tool V1.00	
Frequency	2402 MHz	2440 MHz	2480 MHz
Parameters	Default	Default	Default
RF cable			
Description	Connector	Length	Supplied by
Antenna Cable	SMA	10cm	Applicant

Note: Disclaimer: the loss of RF cable is too small and can be ignored.

1.6 Ancillary Equipment

Equipment	Model	S/N	Manufacturer
Laptop	BDR-WDH	A3RQPM2420004454	HONR

Note: The laptop is used to assist the RF test. In order to prevent the laptop from causing unnecessary impact on the test, the laptop will be removed from the test environment after the EUT successfully transmits at a fixed frequency using the laptop.

2 Summary of Test Result

No.	Standard Section	Test Item	Result	Remark
1	15.203	Antenna requirement	Pass	
2	15.207	Conducted emission	N/A	
3	15.247(d)	Band edge	Pass	
4	15.205/15.209	Spurious emission	Pass	
5	15.247(b)(1)	Peak output power	Pass	
6	15.247(a)(1)	20dB occupied bandwidth	Pass	
7	15.247(a)(1)	Carrier Frequencies Separation	Pass	
8	15.247(a)(1)	Hopping channel number	Pass	
9	15.247(a)(1)	Dwell time	Pass	
10	15.247(d)	Spurious RF Conducted Emissions	Pass	

3 Test Facilities and Accreditations

3.1 Test Laboratory

Test Site:	Shenzhen HongBiao Certification& Testing Co., Ltd
Test Site Location:	Room 102, 201, Building 2, Yuanwanggu RFID Industrial Park, Tongguan Road, Tianliao Community, Yutang Street, Guangming District, Shenzhen, China
Telephone:	(86-755) 2998 9321
Fax:	(86-755) 2998 5110
FCC Registration No.:	CN1341
A2LA Certificate No.:	6765.01

3.2 Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15ºC~35ºC
Relative Humidity:	20%~75%
Air Pressure:	98kPa~101kPa

3.3 Measurement Uncertainty

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.
The data and results quoted in this document are true and accurate values, and uncertainties are not involved in the calculations.
In addition, components and mass production processes that are similar to testing equipment may introduce additional deviations, and the manufacturer is solely responsible for the continued compliance of the equipment.

Measurement Frequency Range	U, (dB)	Note
RF frequency	2x 10^{-5}	
RF power, conducted	± 0.57 dB	
Conducted emission(150kHz~30MHz)	± 2.5 dB	
Radiated emission(9kHz-30MHz)	± 2.5 dB	
Radiated emission(30MHz~1GHz)	± 4.2 dB	
Radiated emission (above 1GHz)	± 4.7 dB	
Occupied Bandwidth	±3%	
Temperature	±1 degree	
Humidity	± 5 %	

3.4 Test Software

Software name	Manufacturer	Model	Version
Conducted Emission test Software	Farad	EZ-EMC	EMC-CON 3A1.1+
Radiated Emission test Software	Farad	EZ-EMC	FA-03A2
RF Test System	MWRF	MTS 8310	2.0.0.0

4 List of Test Equipment

Radiation emission							
Item	Equipment No.	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	HB-E001	Horn Antenna	Schwarzbeck	BBHA 9120D	02592	2024-05-18	2026-05-17
2	HB-E002	Biconical log-periodic composite antenna	Schwarzbeck	VULB 9168	01340	2024-05-18	2026-05-17
3	HB-E003	SHF-EHF Horn	Schwarzbeck	BBHA 91270	01193	2024-05-18	2026-05-17
4	HB-E005	Preamplifier	Noyetec	LAN-0118	NYCM1420102	2024-05-17	2025-05-16
5	HB-E006	Preamplifier	Noyetec	LAN-1840	NYCM1420103	2024-05-17	2025-05-16
6	HB-E007	EMI TEST RECEIVER	R&S	ESR7	102520	2024-05-17	2025-05-16
7	HB-E009	POSITINAL COTROLLER	Noyetec	N/A	N/A	/	/
8	HB-E013	RF switch	Noyetec	NY-RF4	NY0CM1420204	/	/
9	HB-E066	Illuminance Tester	TASI	TA8121	N/A	2024-05-21	2025-05-20
10	HB-E075	Active loop antenna	Schwarzbeck	FMZB 1519B	1519B-245	2024-05-18	2026-05-17
11	HB-E076	Preamplifier	Hewlett Packard	8447D	1937A02278	2024-05-17	2025-05-16
Conduction emission							
Item	Equipment No.	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	HB-E014	4 Path V-LISN	Schwarzbeck	NNLK 8121	00770	2024-05-17	2025-05-16
2	HB-E015	Pulse Limiter	Schwarzbeck	VTSD 9561-F	00949	2024-05-17	2025-05-16
3	HB-E016	ZN23201	Noyetec	ZN23201	N/A	2024-05-21	2025-05-20
4	HB-E059	Attenuator	Xianghua	TS2-6-1	220215166	2024-05-17	2025-05-16
5	HB-E069	EMI TEST RECEIVER	R&S	ESCI	N/A	2024-05-17	2025-05-16

RF							
Item	Equipment No.	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	HB-E041	MXG Anaiog Signal Generator	Agilent	N5181A	MY47070421	2024-05-17	2025-05-16
2	HB-E042	WIDEBAND RADIO COMMUNICA	R&S	CMW500	132108	2024-05-17	2025-05-16

		TION TESTER					
3	HB-E043	MXG Anaiog Signal Generator	Agilent	N5182A	US46240335	2024-05-17	2025-05-16
4	HB-E044	Signal& spectrum Analyzer	R&S	FSV3044	101264	2024-05-17	2025-05-16
5	HB-E045	RF Control Box	Noyetec	NY100-R FCB	N/A	/	/
6	HB-E058	Thermometer Clock Humidity Monitor	N/A	HTC-1	N/A	/	/

Note: the calibration interval of the above test instruments is 12&24 months and the calibrations are traceable to international system unit (SI).

5 Test Item And Results

5.1 Antenna Requirement

5.1.1 Standard Requirement

15.203 requirement: For intentional device, according to 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

5.1.2 Test Result

The EUT antenna is LDS Antenna. It comply with the standard requirement. In case of replacement of broken antenna the same antenna type must be used.

5.2 Conducted Emission

5.2.1 Limits

Limits – Class B		
Frequency (MHz)	Limit (dBμV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

Note:
1. the tighter limit applies at the band edges.
2. the limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

5.2.2 Test Procedures

a) EUT Operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

b) The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

c) 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 equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

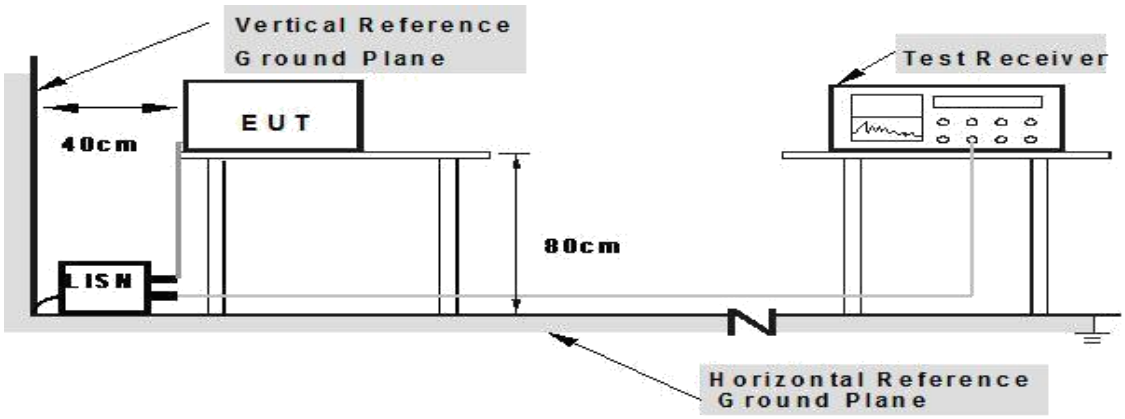
d) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

e) 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.

f) LISN is at least 80 cm from nearest part of EUT chassis.

g) For the actual test configuration, please refer to the related Item – photographs of the test setup.

5.2.3 Test Setup



5.2.4 Test Result

Note: This EUT is powered by a battery and does not transmit signals during charging.

5.3 Radiated Emission

5.3.1 Limits

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

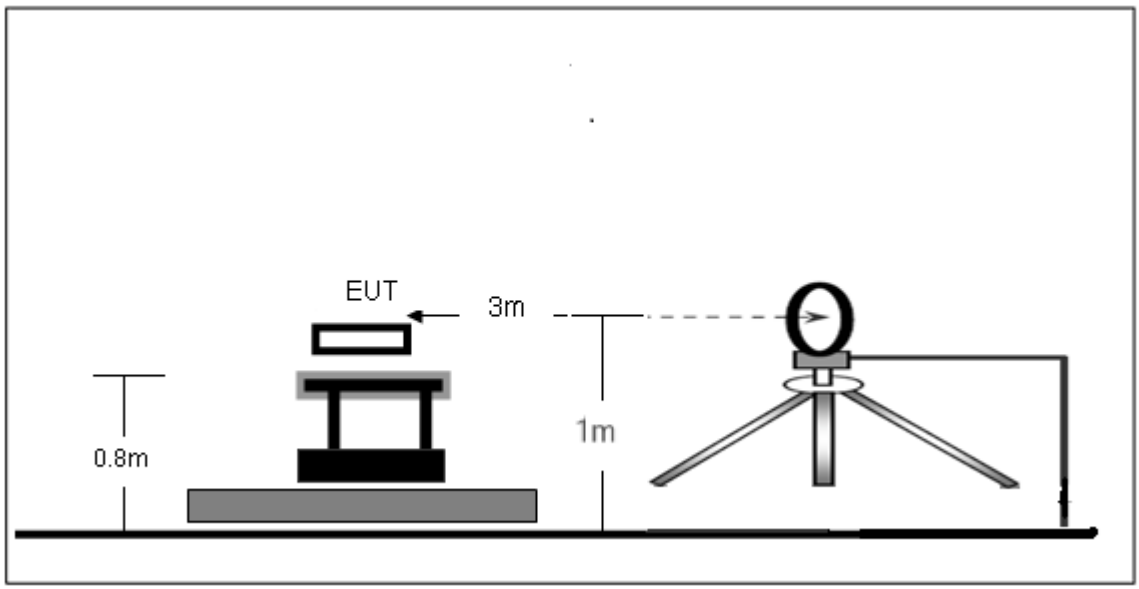
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

5.3.2 Test Procedures

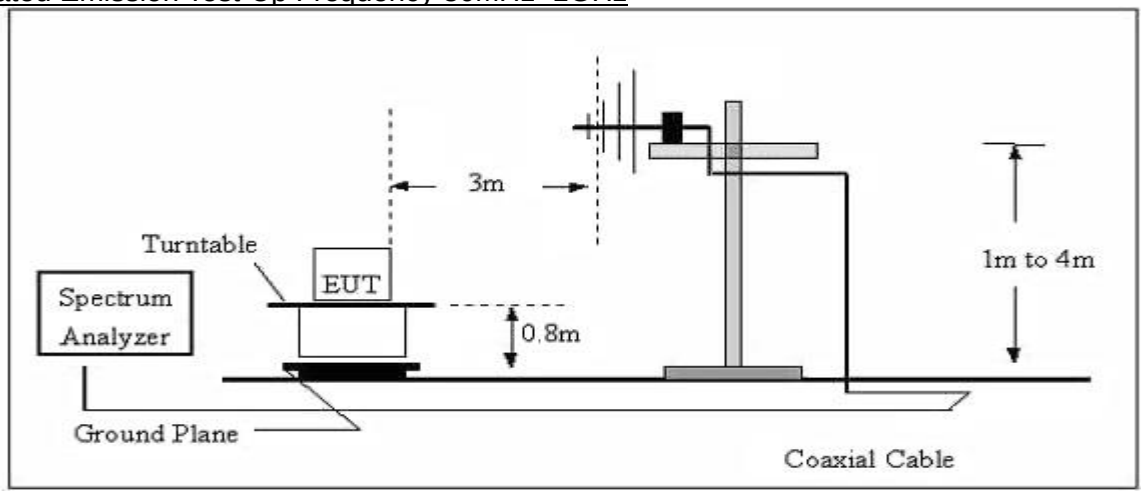
a) The radiated emission tests were performed in the 3 meters.
b) The EUT was placed on the top of a rotating table 0.8 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
c) The height of the test antenna shall vary between 1m to 4m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d) If the peak mode measured value compliance with and lower than quasi peak mode limit, the EUT shall be deemed to meet QP limits and then no additional QP mode measurement performed.
e) If the peak mode measured value compliance with and lower than average mode limit, the EUT shall be deemed to meet average limits and then no additional average mode measurement performed.
f) For the actual test configuration, please refer to the related item – EUT test photos.

5.3.3 Test Setup

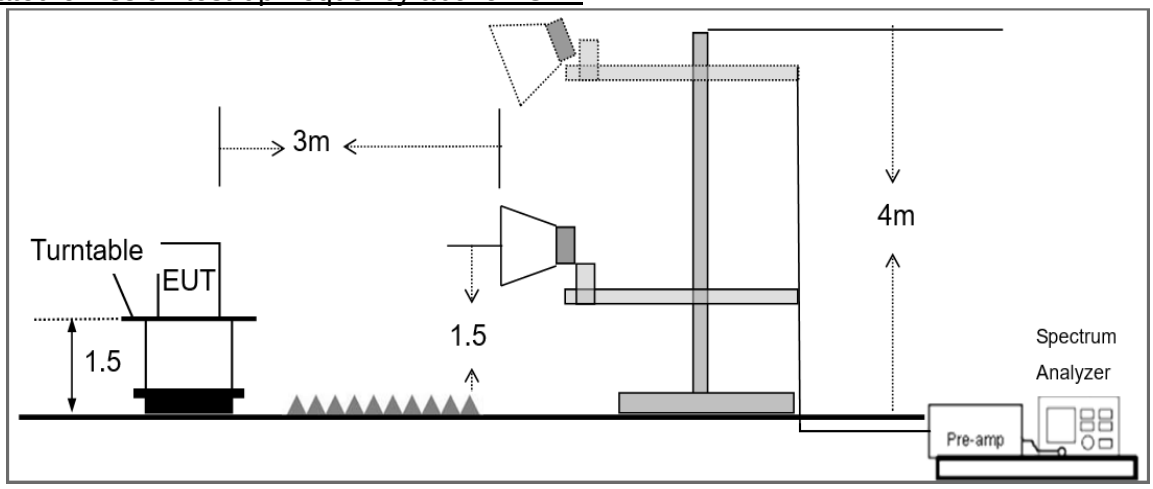
Radiated Emission Test-Up Frequency Below 30MHz



Radiated Emission Test-Up Frequency 30MHz~1GHz



Radiated emission test-up frequency above 1GHz



5.3.4 Test Result

Below 30MHz

EUT:	AI Wireless Lavalier Microphone	Model Name:	WM650
Pressure:	1010 hPa	Test Voltage:	DC 3.8V from battery
Test Mode:	TX	Polarization:	--

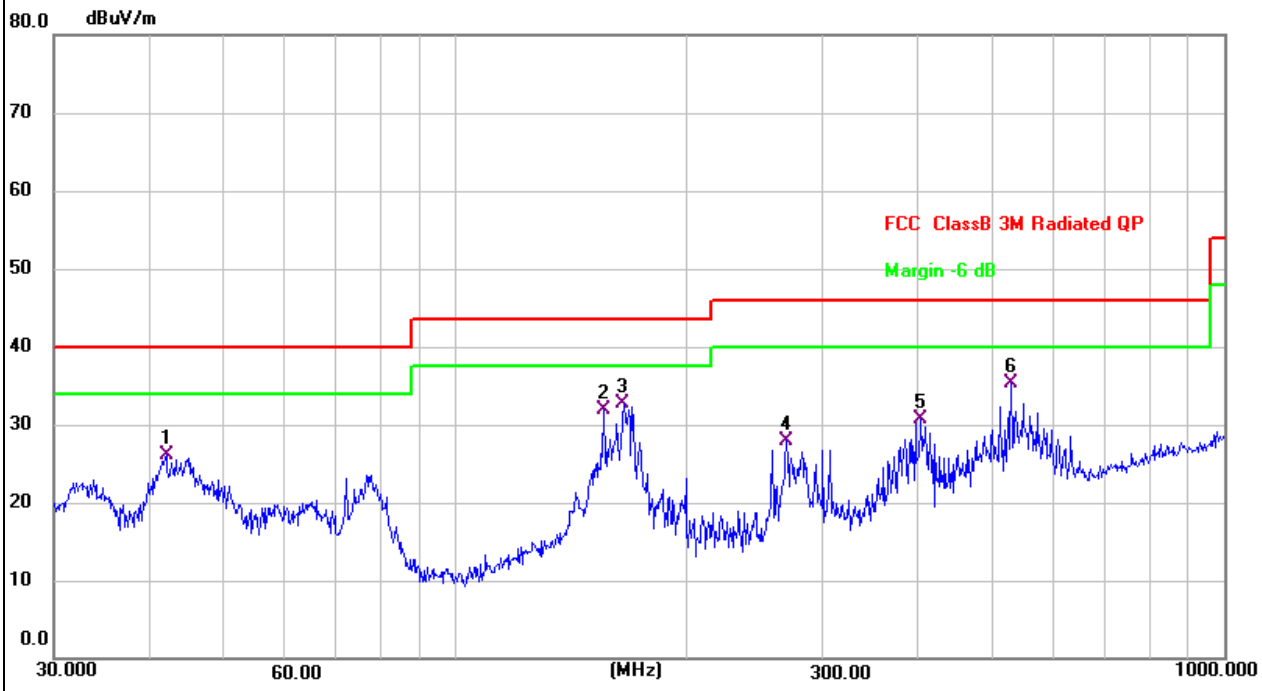
Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	Pass
--	--	--	--	Pass

Note:

1. For 9kHz-30MHz, the amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Distance extrapolation factor =40 log (specific distance/test distance)(dB);
3. Limit line = specific limits (dBuV) + distance extrapolation factor.

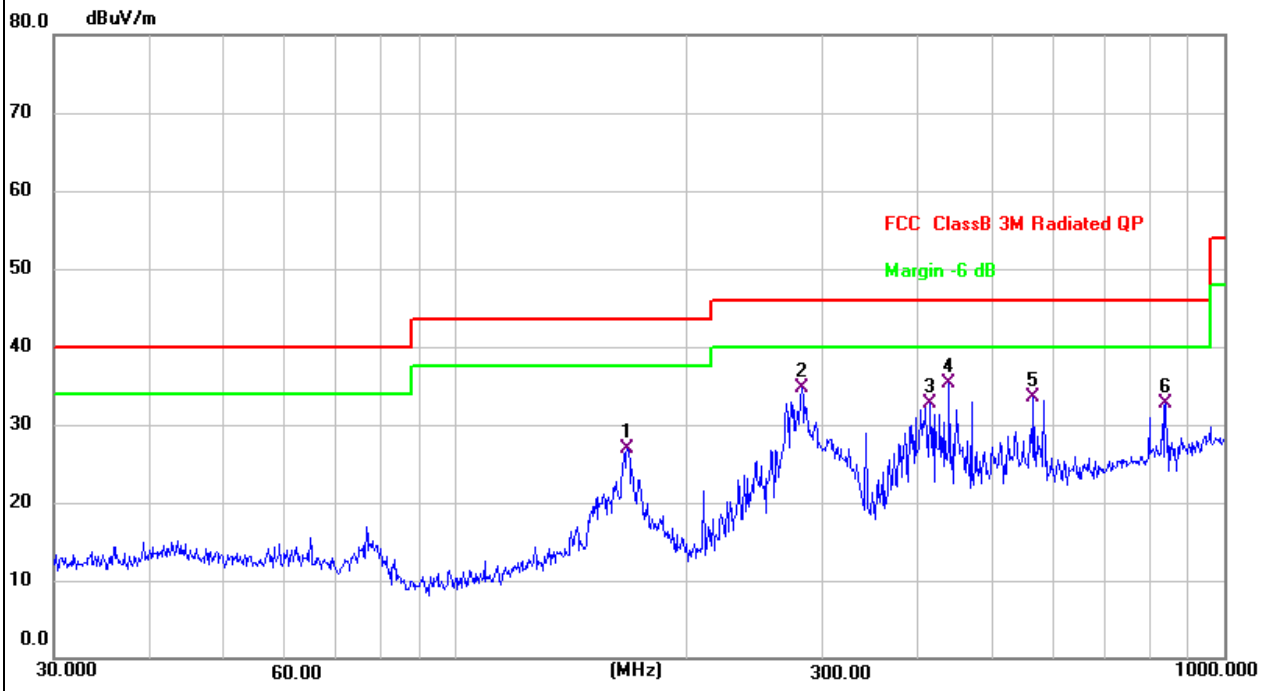
30MHz – 1GHz

EUT:	AI Wireless Lavalier Microphone	Model Name:	WM650
Test Mode:	TX	Phase:	Vertical
Test Voltage:	DC 3.8V from battery		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	42.0066	40.12	-14.08	26.04	40.00	-13.96	QP
2	155.9101	45.11	-13.13	31.98	43.50	-11.52	QP
3	165.4866	46.34	-13.60	32.74	43.50	-10.76	QP
4	269.4284	41.86	-13.93	27.93	46.00	-18.07	QP
5	403.2500	40.12	-9.46	30.66	46.00	-15.34	QP
6 *	528.2458	42.03	-6.74	35.29	46.00	-10.71	QP

EUT:	AI Wireless Lavalier Microphone	Model Name:	WM650
Test Mode:	TX	Phase:	Horizontal
Test Voltage:	DC 3.8V from battery		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	167.2368	40.33	-13.50	26.83	43.50	-16.67	QP
2	281.9946	47.93	-13.19	34.74	46.00	-11.26	QP
3	414.7223	41.82	-9.09	32.73	46.00	-13.27	QP
4 *	438.6554	43.87	-8.59	35.28	46.00	-10.72	QP
5	564.6389	39.81	-6.32	33.49	46.00	-12.51	QP
6	839.1818	32.71	0.06	32.77	46.00	-13.23	QP

1GHz-25GHz

Frequency	Read Level	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Remark	Comment
(MHz)	(dBμV)	(dB)	dB/m	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
Low Channel (2402 MHz)(GFSK)--Above 1G									
4804.103	42.79	4.83	33.5	30.80	50.32	74.00	-23.68	Pk	Vertical
4804.103	31.80	4.83	33.5	30.80	39.33	54.00	-14.67	AV	Vertical
7206.214	42.87	5.83	37.79	31.40	55.09	74.00	-18.91	Pk	Vertical
7206.214	32.13	5.83	37.79	31.40	44.35	54.00	-9.65	AV	Vertical
4804.142	42.89	4.83	33.5	30.80	50.42	74.00	-23.58	Pk	Horizontal
4804.142	31.85	4.83	33.5	30.80	39.38	54.00	-14.62	AV	Horizontal
7206.227	42.61	5.83	37.79	31.40	54.83	74.00	-19.17	Pk	Horizontal
7206.227	31.97	5.83	37.79	31.40	44.19	54.00	-9.81	AV	Horizontal
Mid Channel (2440 MHz)(GFSK)--Above 1G									
4880.142	43.96	4.89	33.76	30.80	51.81	74.00	-22.19	Pk	Vertical
4880.142	31.90	4.89	33.76	30.80	39.75	54.00	-14.25	AV	Vertical
7320.226	44.53	5.95	38.25	31.70	57.03	74.00	-16.97	Pk	Vertical
7320.226	32.87	5.95	38.25	31.70	45.37	54.00	-8.63	AV	Vertical
4880.166	43.67	4.89	33.76	30.80	51.52	74.00	-22.48	Pk	Horizontal
4880.166	31.96	4.89	33.76	30.80	39.81	54.00	-14.19	AV	Horizontal
7320.234	43.83	5.95	38.25	31.70	56.33	74.00	-17.67	Pk	Horizontal
7320.234	32.91	5.95	38.25	31.70	45.41	54.00	-8.59	AV	Horizontal
High Channel (2480 MHz)(GFSK)-- Above 1G									
4960.185	42.64	4.95	34.33	30.80	51.12	74.00	-22.88	Pk	Vertical
4960.185	31.93	4.95	34.33	30.80	40.41	54.00	-13.59	AV	Vertical
7440.131	43.51	6.11	37.60	31.74	55.48	74.00	-18.52	Pk	Vertical
7440.131	32.39	6.11	37.60	31.74	44.36	54.00	-9.64	AV	Vertical
4960.254	42.72	4.95	34.33	30.80	51.20	74.00	-22.80	Pk	Horizontal
4960.254	31.99	4.95	34.33	30.80	40.47	54.00	-13.53	AV	Horizontal
7440.299	43.00	6.11	37.60	31.74	54.97	74.00	-19.03	Pk	Horizontal
7440.299	32.40	6.11	37.60	31.74	44.37	54.00	-9.63	AV	Horizontal

Note:

1. All Readings are Peak Value (VBW=3MHz) and AV Value (VBW=10Hz).
2. Emission Level= Antenna Factor + Cable Loss + Read Level - Preamp Factor.
3. All the modulation modes have been tested, and only the worst results are reflected in the report.

5.3.5 Radiated Band Edge

Frequency	Meter Reading	Cable Loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Detector	Comment
(MHz)	(dBμV)	(dB)	dB/m	(dB)	(dBμV/m)	(dBμV/m)	(dB)	Type	
1Mbps(GFSK)- Non-hopping									
2310.00	46.17	3.40	27.80	32.41	44.96	74	-29.04	Pk	Horizontal
2310.00	33.46	3.40	27.80	32.41	32.25	54	-21.75	AV	Horizontal
2310.00	44.81	3.40	27.80	32.41	43.60	74	-30.40	Pk	Vertical
2310.00	33.63	3.40	27.80	32.41	32.42	54	-21.58	AV	Vertical
2390.00	45.54	3.45	27.70	32.49	44.20	74	-29.80	Pk	Vertical
2390.00	34.63	3.45	27.70	32.49	33.29	54	-20.71	AV	Vertical
2390.00	46.39	3.45	27.70	32.49	45.05	74	-28.95	Pk	Horizontal
2390.00	34.57	3.45	27.70	32.49	33.23	54	-20.77	AV	Horizontal
2400.00	46.67	3.46	27.80	32.54	45.39	74	-28.61	Pk	Vertical
2400.00	34.58	3.46	27.80	32.54	33.30	54	-20.70	AV	Vertical
2400.00	45.86	3.46	27.80	32.54	44.58	74	-29.42	Pk	Horizontal
2400.00	34.33	3.46	27.80	32.54	33.05	54	-20.95	AV	Horizontal
2483.50	47.06	3.48	28.53	32.55	46.52	74	-27.48	Pk	Vertical
2483.50	33.82	3.48	28.53	32.55	33.28	54	-20.72	AV	Vertical
2483.50	46.37	3.48	28.53	32.55	45.83	74	-28.17	Pk	Horizontal
2483.50	33.90	3.48	28.53	32.55	33.36	54	-20.64	AV	Horizontal
2500.00	45.51	3.49	29.20	32.66	45.54	74	-28.46	Pk	Vertical
2500.00	33.85	3.49	29.20	32.66	33.88	54	-20.12	AV	Vertical
2500.00	45.40	3.49	29.20	32.66	45.43	74	-28.57	Pk	Horizontal
2500.00	33.84	3.49	29.20	32.66	33.87	54	-20.13	AV	Horizontal
1Mbps (GFSK)- hopping									
2400.00	47.07	3.46	27.80	32.54	45.79	74	-28.21	Pk	Vertical
2400.00	34.58	3.46	27.80	32.54	33.30	54	-20.70	AV	Vertical
2400.00	45.78	3.46	27.80	32.54	44.50	74	-29.50	Pk	Horizontal
2400.00	34.72	3.46	27.80	32.54	33.44	54	-20.56	AV	Horizontal
2483.50	47.39	3.48	28.53	32.55	46.85	74	-27.15	Pk	Vertical
2483.50	34.20	3.48	28.53	32.55	33.66	54	-20.34	AV	Vertical
2483.50	46.60	3.48	28.53	32.55	46.06	74	-27.94	Pk	Horizontal
2483.50	34.01	3.48	28.53	32.55	33.47	54	-20.53	AV	Horizontal

Note:

1. All Readings are Peak Value (VBW=3MHz) and AV Value (VBW=10Hz).
2. Emission Level= Antenna Factor + Cable Loss + Read Level - Preamp Factor.
3. All the modulation modes have been tested, and only the worst results are reflected in the report.

5.4 Peak Output Power

5.4.1 Limit

FCC Part15 Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
15.247(b)(1)	Peak output power	Power<1W(30dBm)	2400-2483.5

5.4.2 Test Procedure

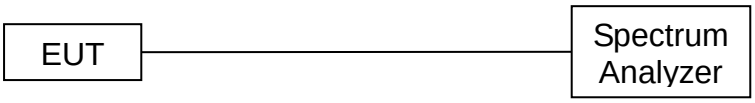
(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

(2) Spectrum Setting:

RBW=2MHz, VBW=10MHz, Detector=Peak

(3) The EUT was set to continuously transmitting in the max power during the test.

5.4.3 Test Setup

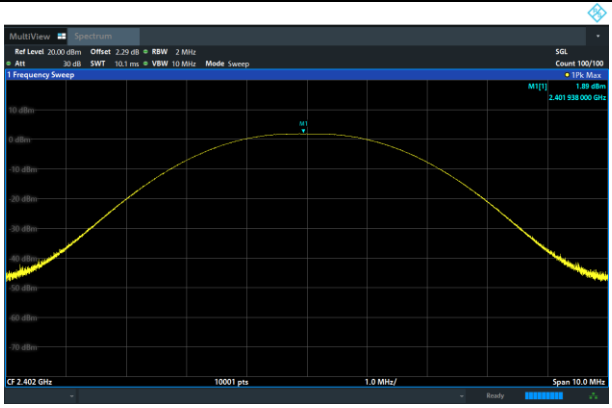
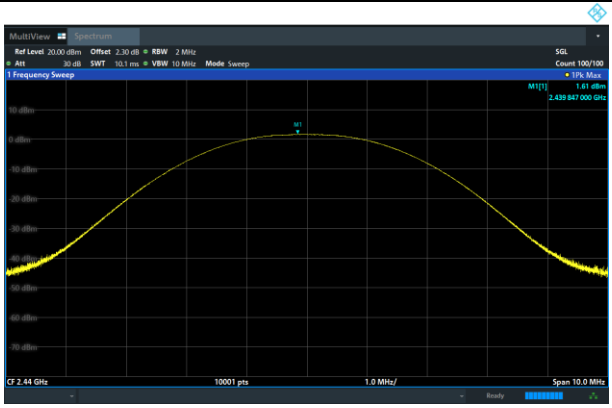
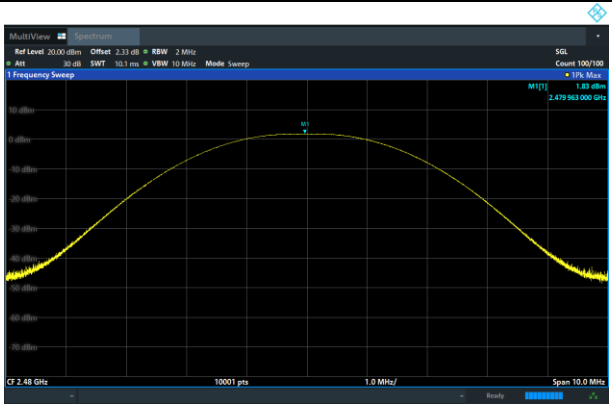


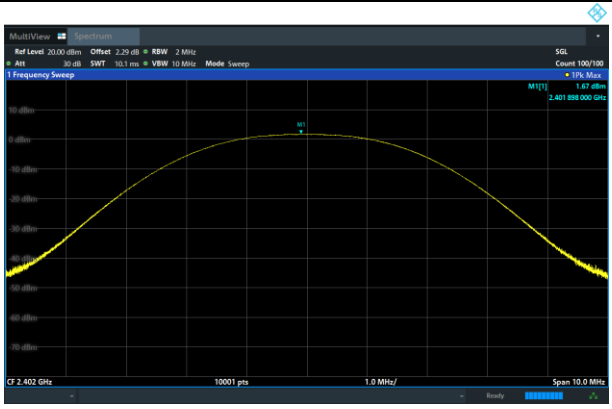
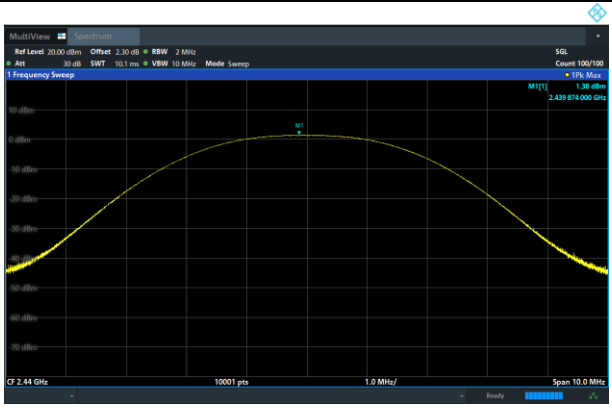
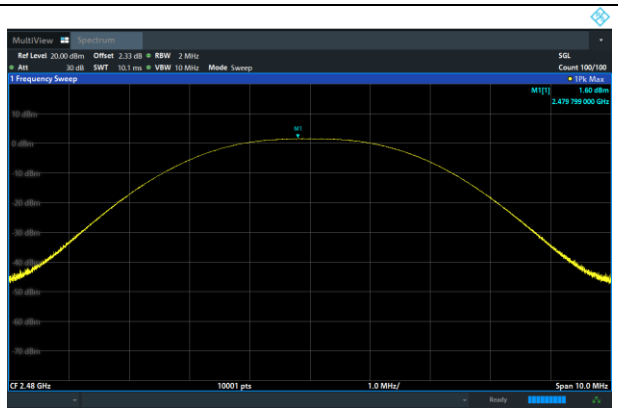
5.4.4 Test Results

EUT:	AI Wireless Lavalier Microphone	Model Name:	WM650
Test Mode:	GFSK/CH00, CH19, CH39	Test Voltage:	DC 3.8V from battery

2.4GHz 1M			
Test Channel	Frequency (MHz)	Maximum Peak Output Power(dBm)	Limit (dBm)
CH00	2402	1.89	21
CH19	2440	1.61	21
CH39	2480	1.83	21

2.4GHz 2M			
Test Channel	Frequency (MHz)	Maximum Peak Output Power(dBm)	Limit (dBm)
CH00	2402	1.67	21
CH19	2440	1.38	21
CH39	2480	1.60	21

2.4GHz 1M	
GFSK on Channel 00	GFSK on Channel 19
	
GFSK on Channel 39	/
	/

2.4GHz 2M	
GFSK on Channel 00	GFSK on Channel 19
	
GFSK on Channel 39	/
	/

5.5 20dB Occupied Channel Bandwidth

5.5.1 Limit

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
15.247a(1)	20dB bandwidth	N/A	2400-2483.5

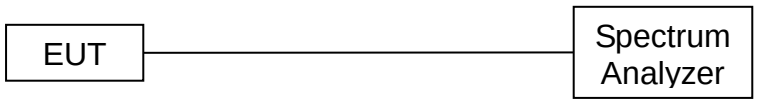
5.5.2 Test Procedure

(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

(2) Spectrum Setting:

Bandwidth: RBW=30 kHz, VBW=100 kHz, detector= Peak

5.5.3 Test Setup



5.5.4 Test results

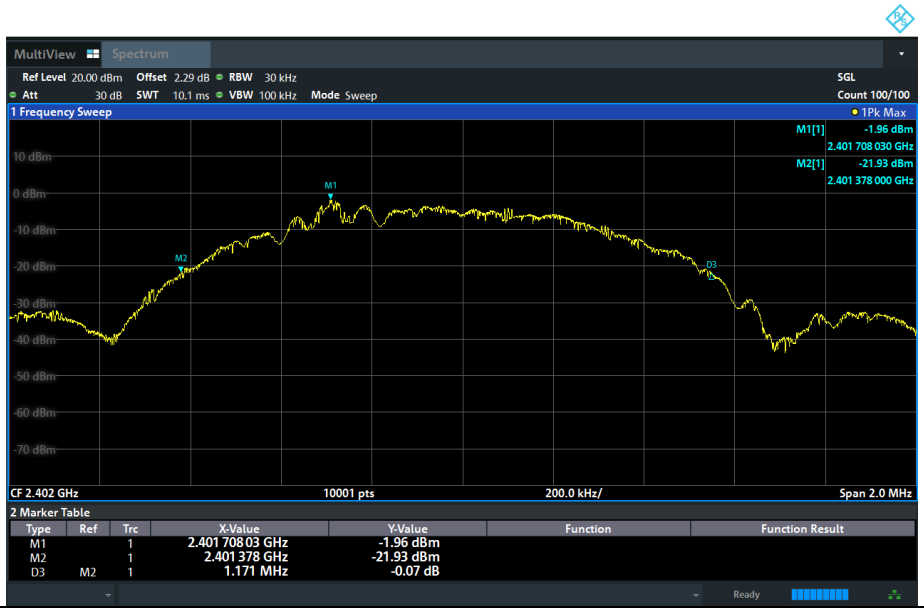
EUT:	AI Wireless Lavalier Microphone	Model Name:	WM650
Test Mode:	GFSK/CH00, CH19, CH39	Test Voltage:	DC 3.8V from battery

Mode	Frequency (MHz)	20dB Bandwidth (MHz)	Limit (kHz)	Result
2.4GHz 1M	2402	1.171	N/A	Pass
	2440	1.169	N/A	Pass
	2480	1.168	N/A	Pass
2.4GHz 2M	2402	2.053	N/A	Pass
	2440	2.043	N/A	Pass
	2480	2.049	N/A	Pass

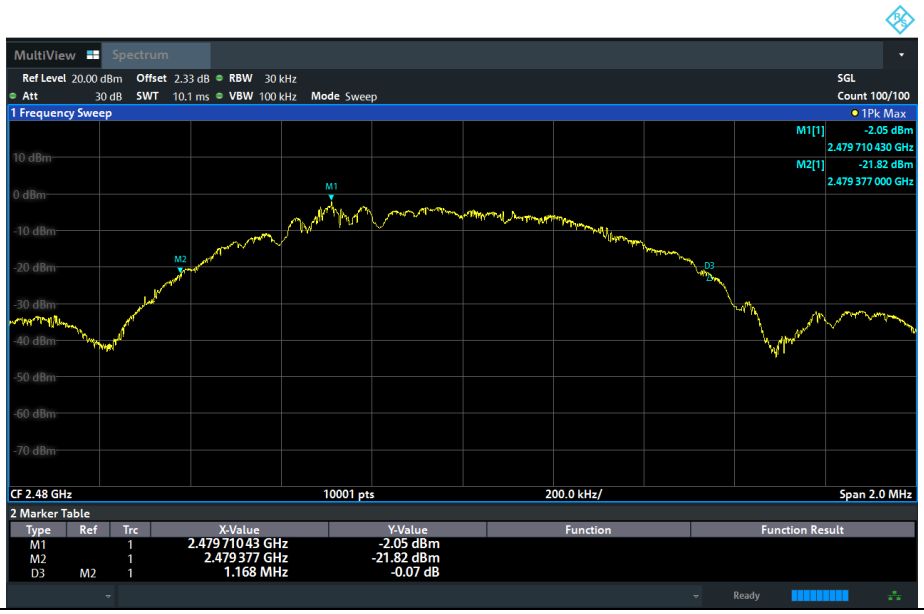
Test plots

2.4GHz 1M mode

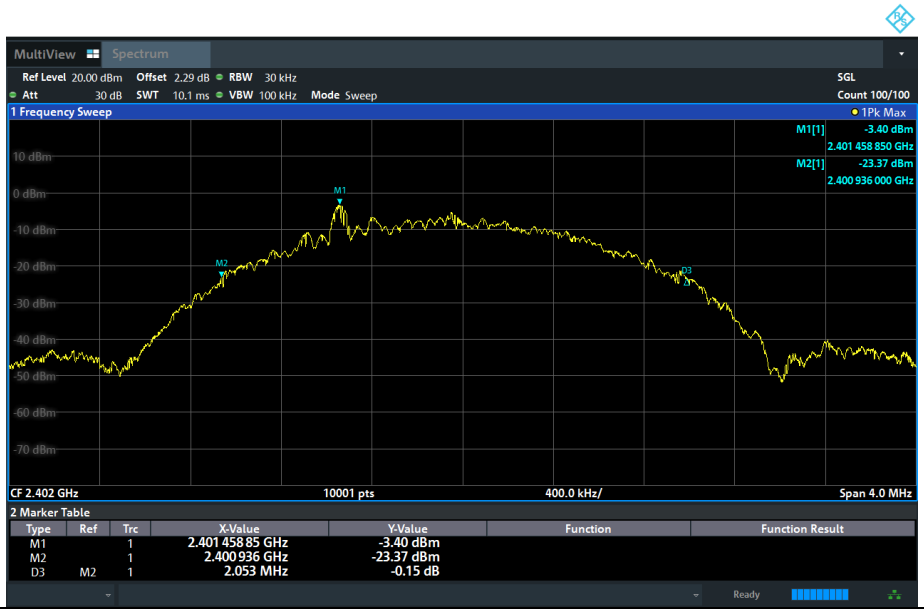
TX CH00



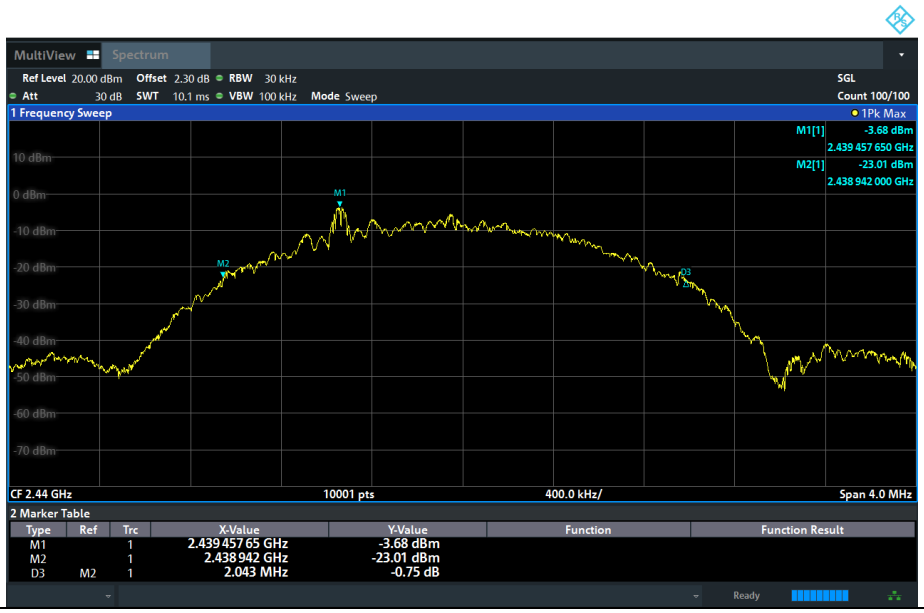
TX CH19

TX CH39


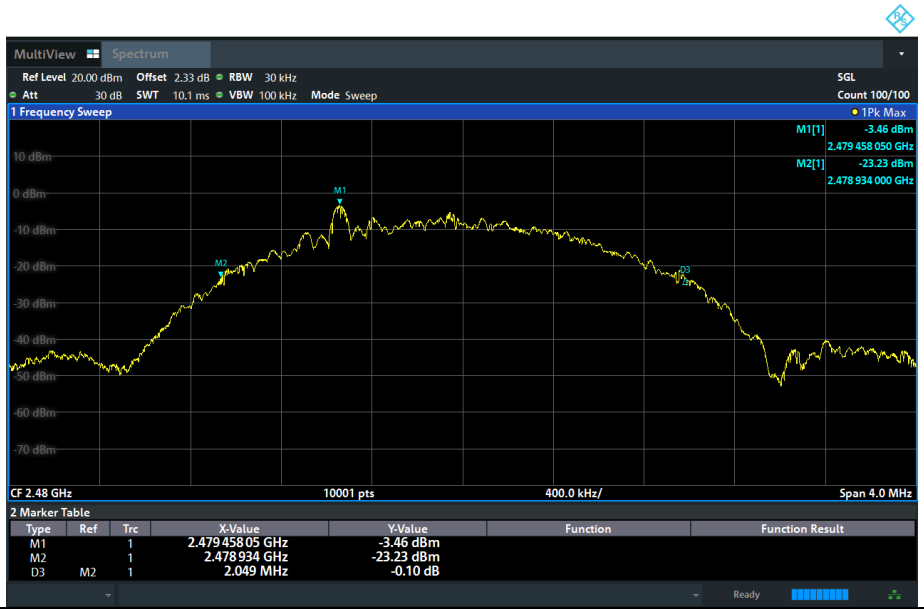
2.4GHz 2M mode

TX CH00


TX CH19



TX CH39



5.6 Carrier Frequency Separation

5.6.1 Limit

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
15.247(a)(1)	Channel Separation	>25kHz or >two-thirds of the 20 dB bandwidth (Which is greater)	2400-2483.5

5.6.2 Test Procedure

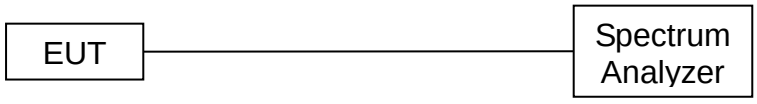
(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

(2) Spectrum Setting:

RBW=30 kHz, VBW=100 kHz, detector= Peak, Sweep Time =auto.

(3) The EUT was set to the Hopping Mode for Channel Separation Test and continuously transmitting for the Test.

5.6.3 Test Setup



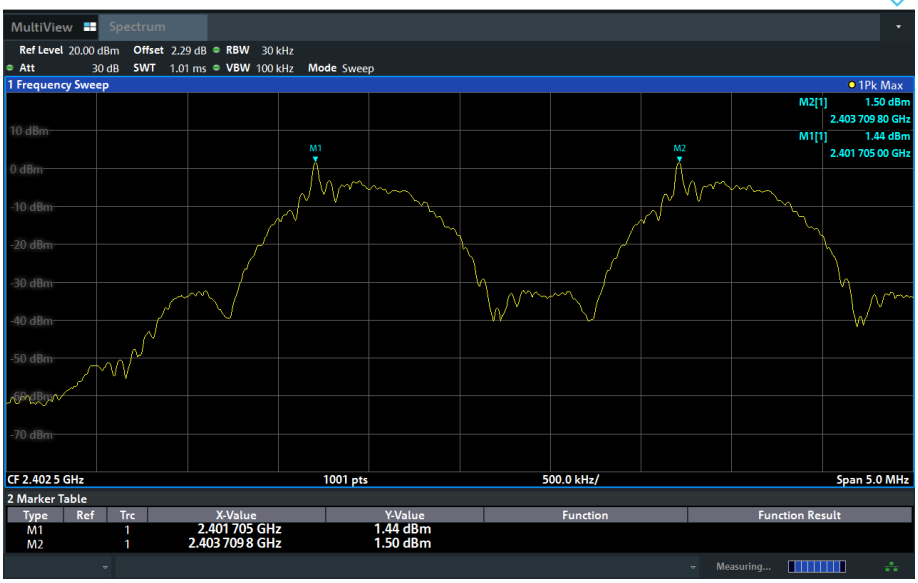
5.6.4 Test Results

EUT:	AI Wireless Lavalier Microphone	Model Name:	WM650
Pressure:	1012 hPa	Test Voltage:	DC 3.8V from battery
Test Mode:	GFSK/CH00, CH19, CH39		

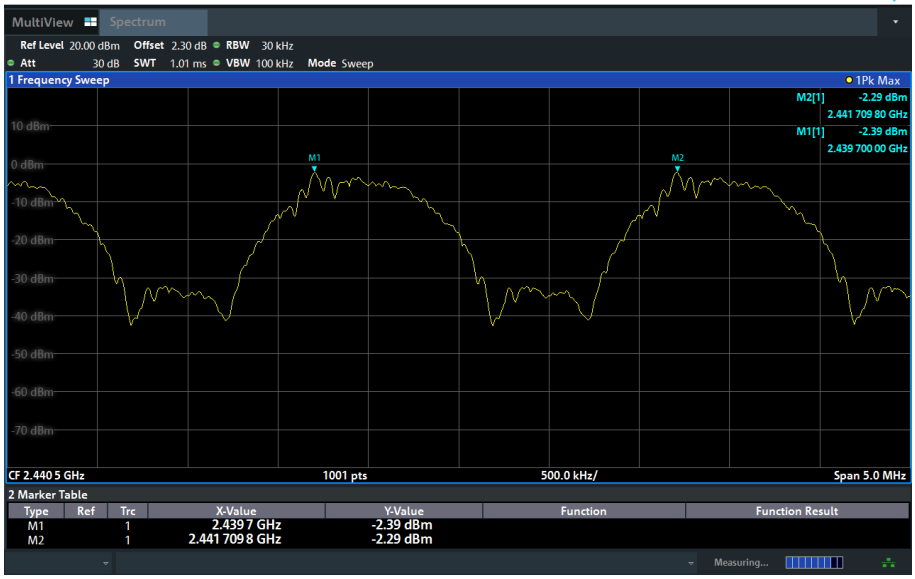
Mode	Channel	Frequency (MHz)	Test Result (kHz)	Limit (kHz)		Result
2.4GHz 1M	Low	2402	2004	0.781	2/3 of 20dB BW	Pass
	Middle	2440	2009	0.779	2/3 of 20dB BW	Pass
	High	2480	1999	0.779	2/3 of 20dB BW	Pass
2.4GHz 2M	Low	2402	2004	1.369	2/3 of 20dB BW	Pass
	Middle	2440	2004	1.362	2/3 of 20dB BW	Pass
	High	2480	2003	1.366	2/3 of 20dB BW	Pass

2.4GHz 1M

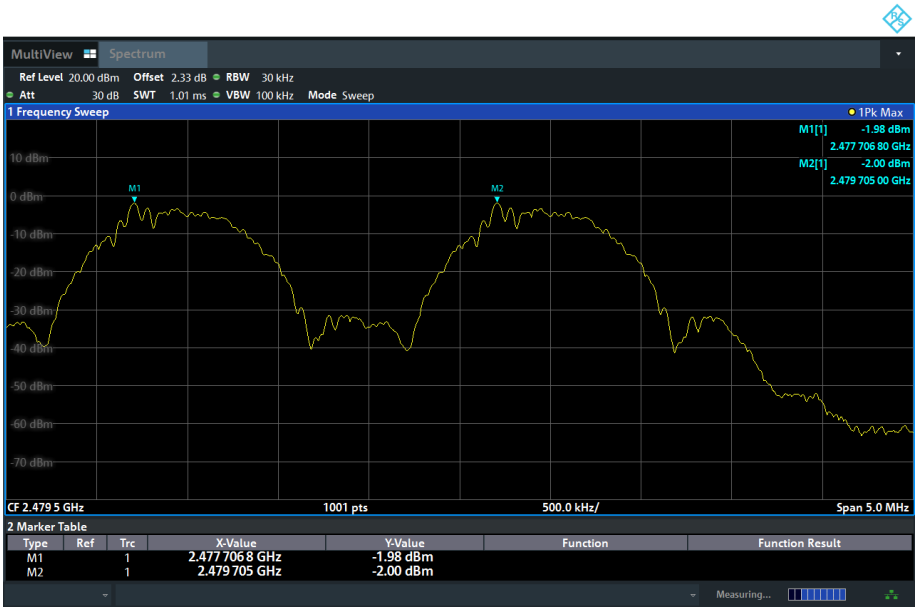
CH00

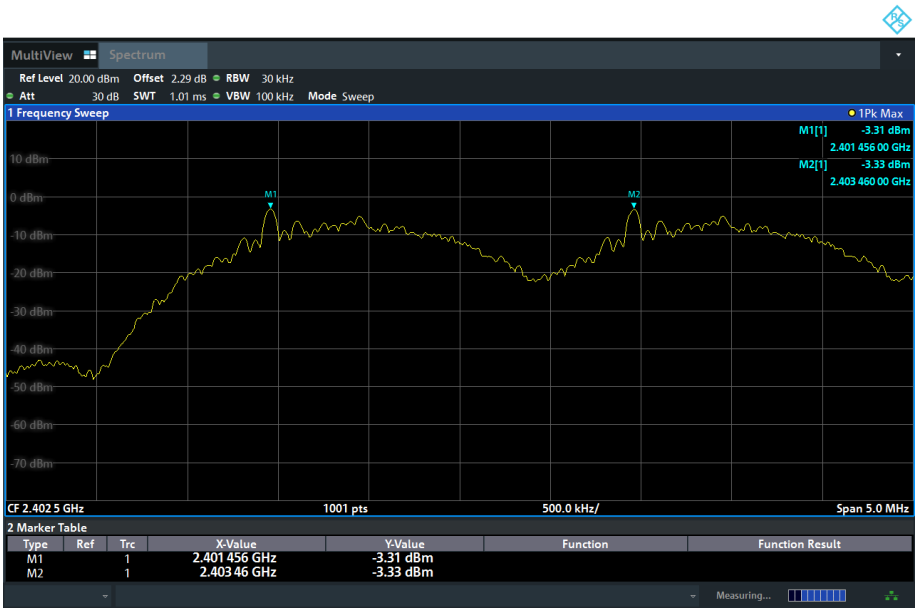
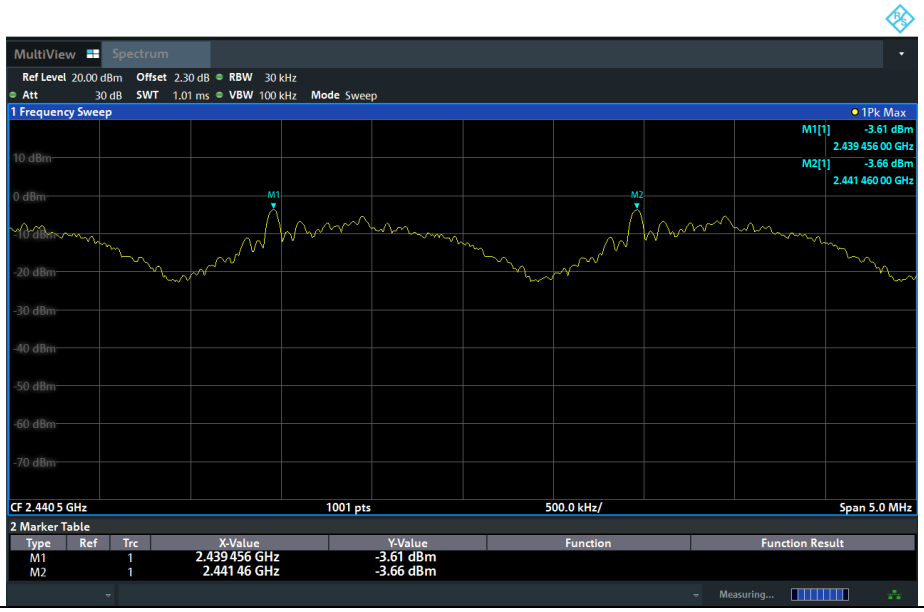


CH19


MultiView
Spectrum
Ref Level 20.00 dBm Offset 2.30 dB RBW 30 kHz
Att 30 dB SWT 1.01 ms VBW 100 kHz Mode Sweep
1 Frequency Sweep
1Pk Max
M2[1] -2.29 dBm
2.441 709 80 GHz
M1[1] -2.39 dBm
2.439 700 00 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
M2
CF 2.440 5 GHz
1001 pts
500.0 kHz/
Span 5.0 MHz
2 Marker Table
Type Ref Trc X-Value Y-Value Function Function Result
M1 1 2.439 7 GHz -2.39 dBm
M2 1 2.441 709 8 GHz -2.29 dBm
Measuring...

CH39


MultiView
Spectrum
Ref Level 20.00 dBm Offset 2.33 dB RBW 30 kHz
Att 30 dB SWT 1.01 ms VBW 100 kHz Mode Sweep
1 Frequency Sweep
1Pk Max
M1[1] -1.98 dBm
2.477 706 80 GHz
M2[1] -2.00 dBm
2.479 705 00 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
M2
CF 2.479 5 GHz
1001 pts
500.0 kHz/
Span 5.0 MHz
2 Marker Table
Type Ref Trc X-Value Y-Value Function Function Result
M1 1 2.477 706 8 GHz -1.98 dBm
M2 1 2.479 705 GHz -2.00 dBm
Measuring...

2.4GHz 2M
CH00

CH19


CH39


MultiView
Spectrum
Ref Level 20.00 dBm Offset 2.33 dB RBW 30 kHz
Att 30 dB SWT 1.01 ms VBW 100 kHz Mode Sweep
1 Frequency Sweep
1Pk Max
M1[1] -3.39 dBm
2.477 457 00 GHz
M2[1] -3.43 dBm
2.479 460 00 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
M2
CF 2.479 5 GHz
1001 pts
500.0 kHz/
Span 5.0 MHz
2 Marker Table
Type Ref Trc X-Value Y-Value Function Function Result
M1 1 2.477 457 GHz -3.39 dBm
M2 1 2.479 46 GHz -3.43 dBm
Measuring...

5.7 Hopping Channel Number

5.7.1 Limit

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

5.7.2 Test Procedure

The testing follows IEEE / ANSI C63.10-2020 clause 7.8.3

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.

The path loss was compensated to the results for each measurement.

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

The EUT must have its hopping function enabled.

Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW : To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.

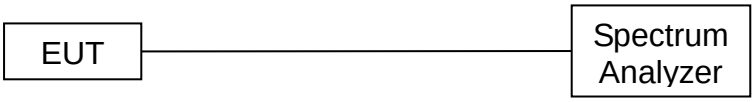
VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

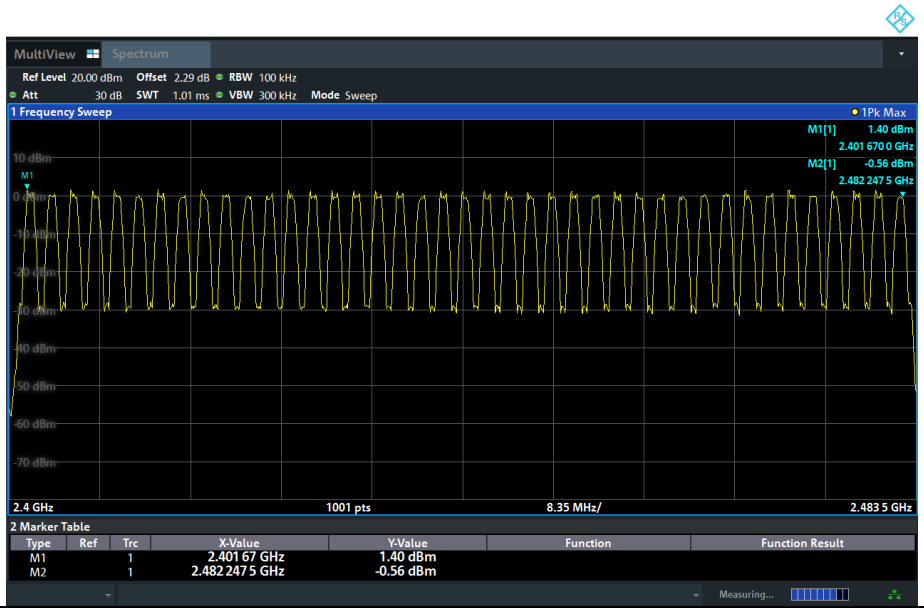
5.7.3 Test Setup



5.7.4 Test Results

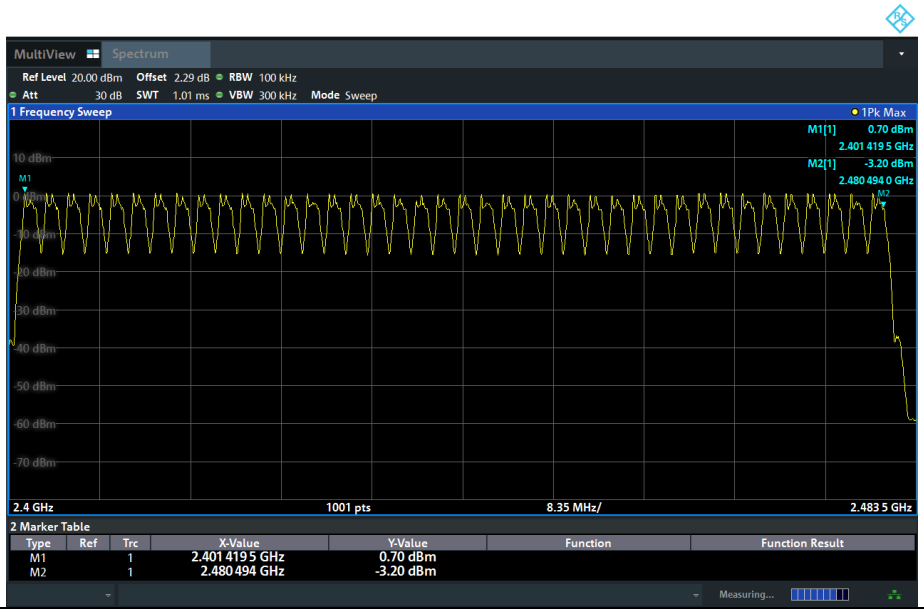
Mode	Quantity of Hopping Channel	Limit	Results
2.4GHz 1M	40	>15	Pass

2.4GHz 1M



Mode	Quantity of Hopping Channel	Limit	Results
2.4GHz 2M	40	>15	Pass

2.4GHz 2M



5.8 Dwell Time

5.8.1 Limit

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
15.247(a)(1)	Dwell time	0.4 sec	2400-2483.5

5.8.2 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=1MHz, VBW=3MHz, Span=0Hz, Detector=Peak

(3) Use video trigger with the trigger level set to enable triggering only on full pulses.

(4) Sweep Time is more than once pulse time.

(5) Set the center frequency on any frequency would be measure and set the frequency span to zero span.

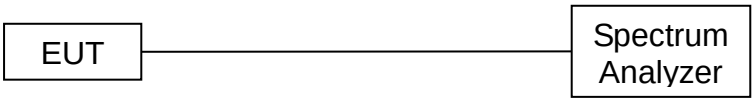
(6) Measure the maximum time duration of one single pulse.

(7) Set the EUT for packet transmitting.

(8) Measure the maximum time duration of one single pulse.

(9) The EUT was set to the Hopping Mode for Dwell Time Test.

5.8.3 Test Setup



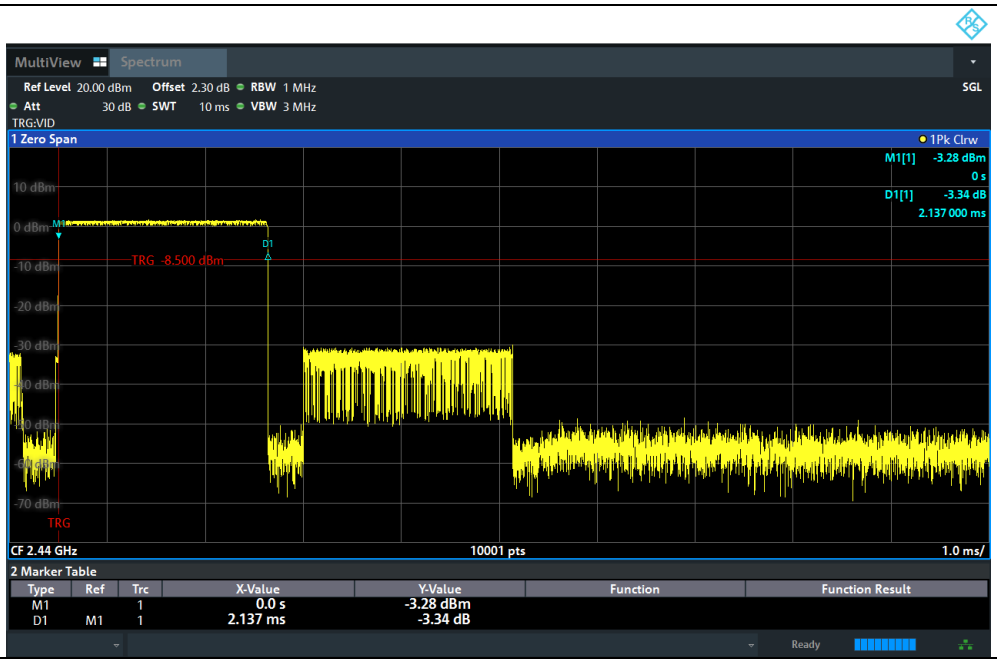
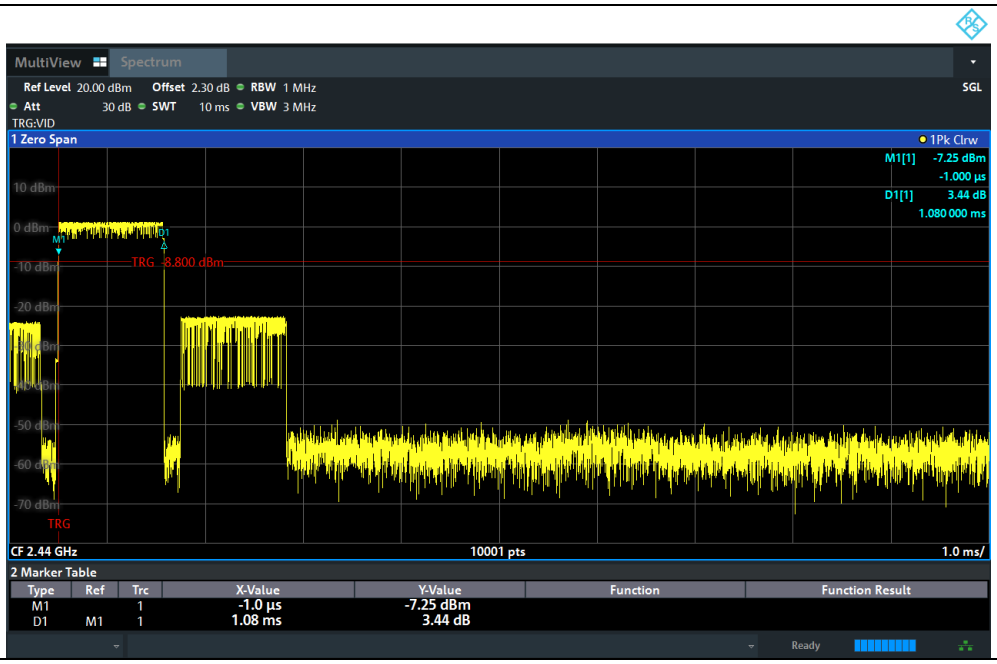
5.8.4 Test Results

EUT:	AI Wireless Lavalier Microphone	Model Name:	WM650
Pressure:	1012 hPa	Test Voltage:	DC 3.8V from battery
Test Mode:	GFSK		

Mode	Frequency (MHz)	Pulse Duration (ms)	Burst Count	Dwell Time (ms)	Limit(s)	Conclusion
2.4GHz 1M	2440	2.137	2	4.274	<0.4	Pass
2.4GHz 2M	2440	1.080	3	3.240	<0.4	Pass

Note:
1. A period time = 0.4 (s) * 40 = 16(s)
2. 2.4GHz 1M Dwell Time = Pulse Duration * Burst Count
   2.4GHz 2M Dwell Time = Pulse Duration * Burst Count

Test plots

2.4GHz 1M

2.4GHz 2M


5.9 Conducted Band Edge

5.9.1 Limit

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

5.9.2 Test Procedure

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

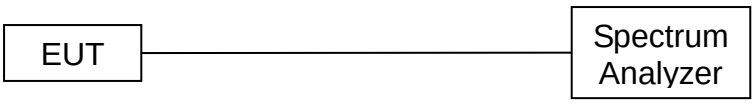
b) Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.

c) Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.

d) 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.

e) Repeat above procedures until all measured frequencies were complete.

5.9.3 Test Setup



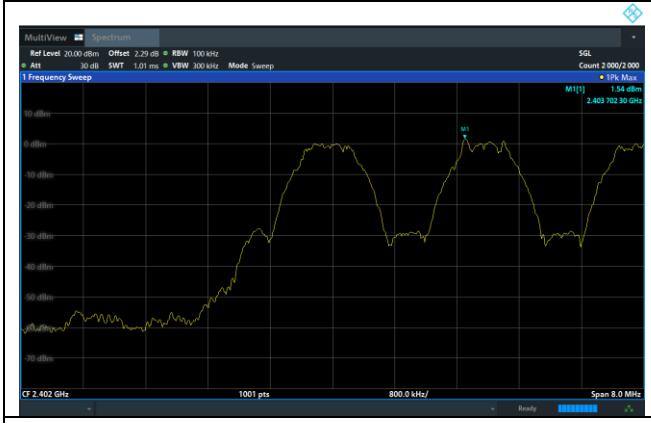
5.9.4 Test Results

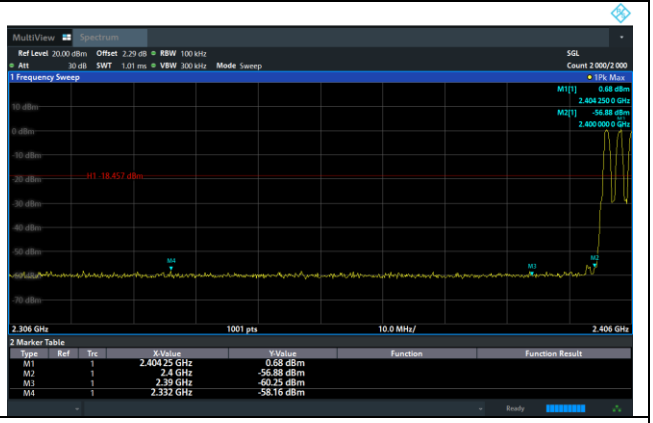
EUT:	AI Wireless Lavalier Microphone	Model Name:	WM650
Pressure:	1012 hPa	Test Voltage:	DC 3.8V from battery

Test plots

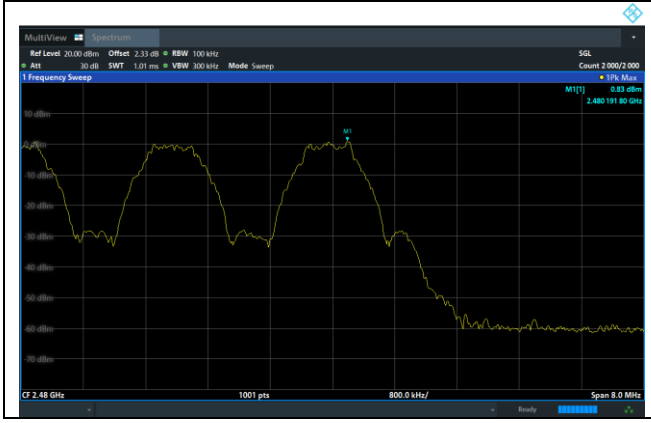
2.4GHz 1M

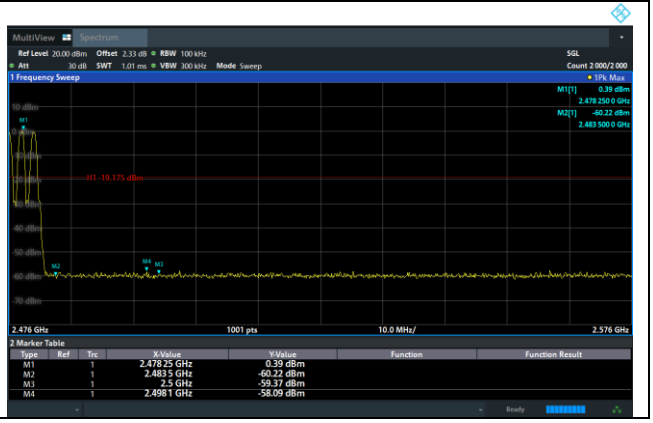
GFSK: Band Edge, Left Side



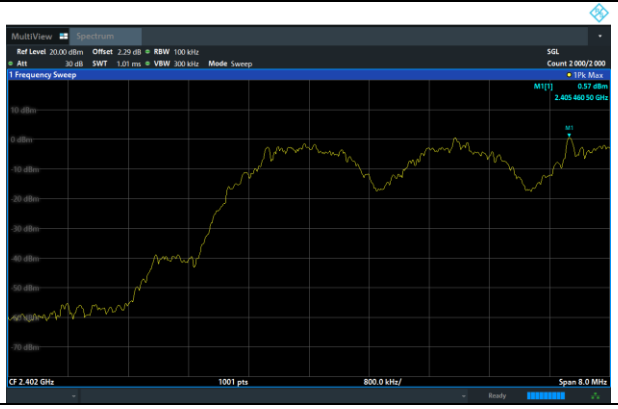
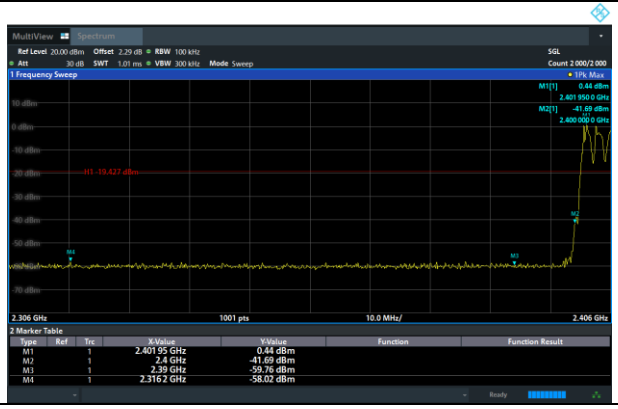
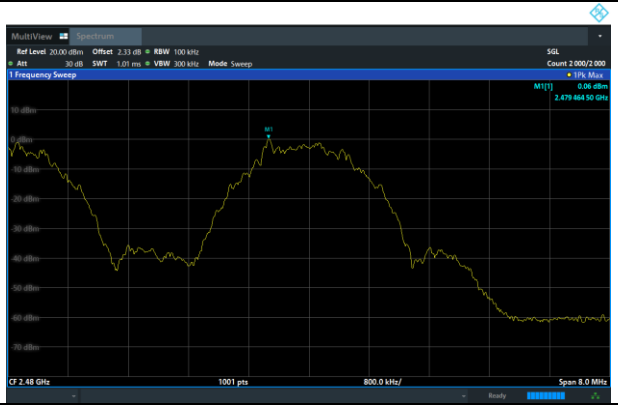
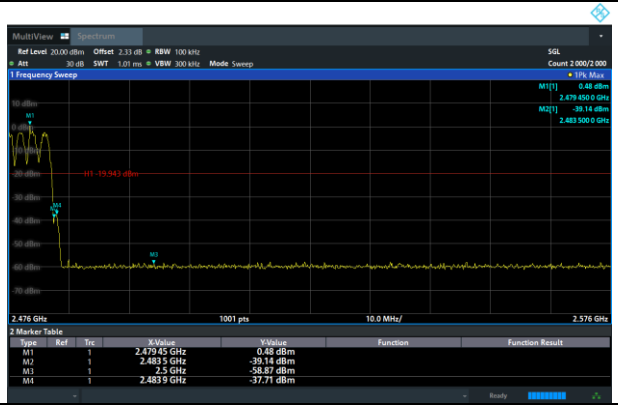


GFSK: Band Edge, Right Side





Test plots

2.4GHz 2M	
GFSK: Band Edge, Left Side	
	
GFSK: Band Edge, Right Side	
	

5.10 Spurious RF Conducted Emissions

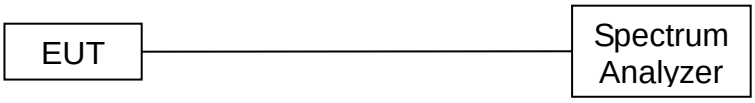
5.10.1 Limit

Below -20dB of the highest emission level in operating band.

5.10.2 Test Procedure

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2020 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBW= 300kHz to measure the peak field strength, and measure frequency range from 9kHz to 26.5GHz.

5.10.3 Test Setup

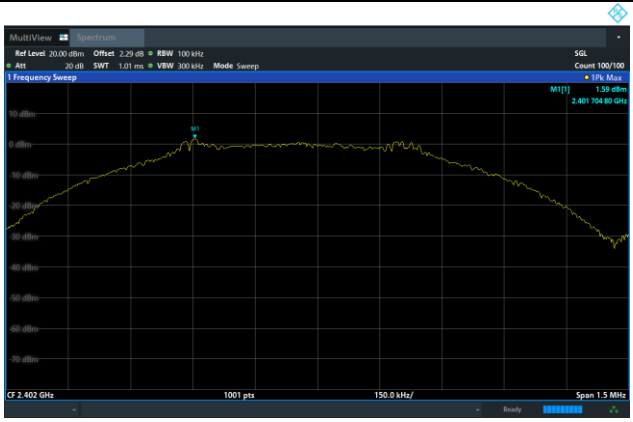
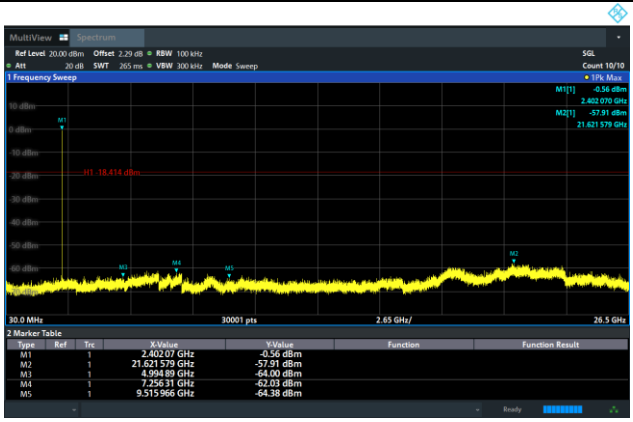
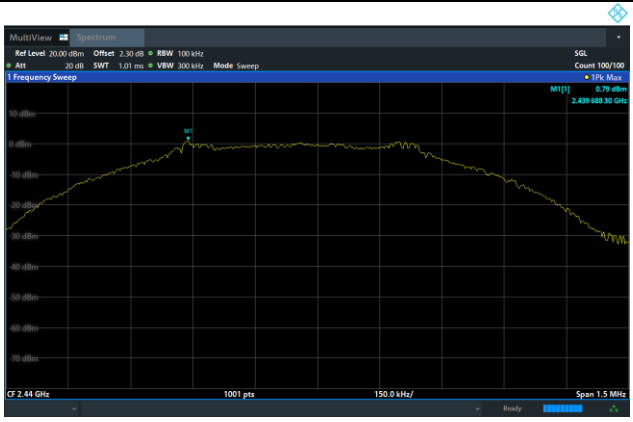
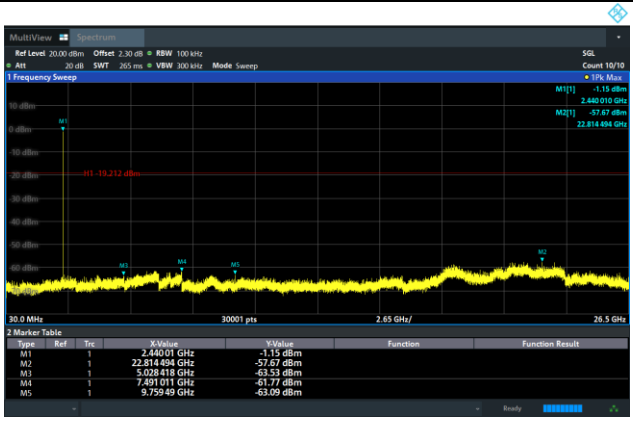
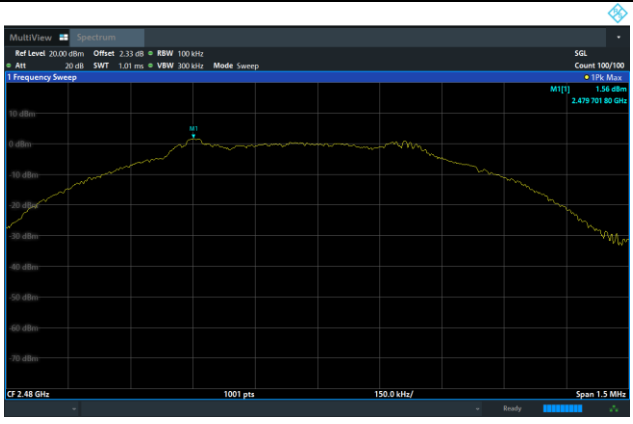
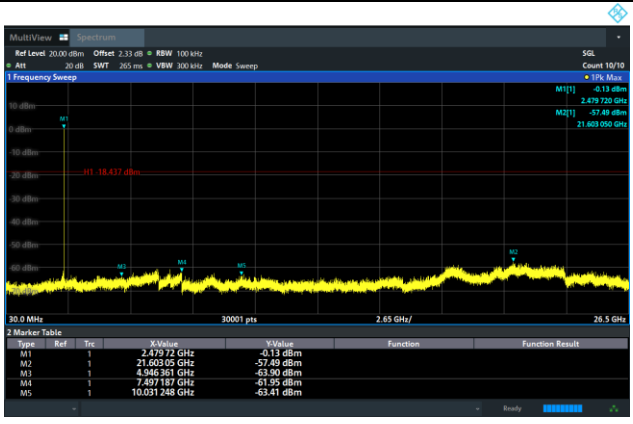


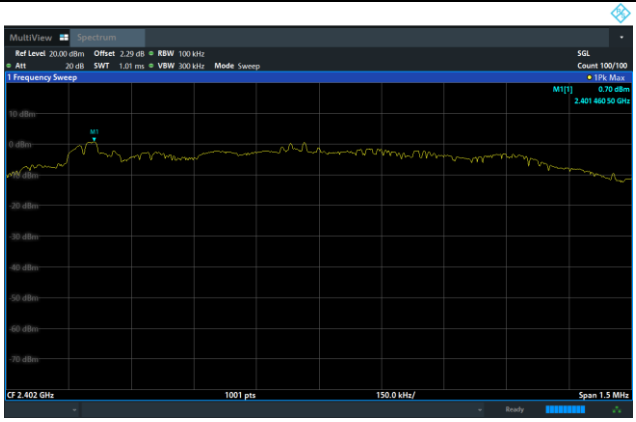
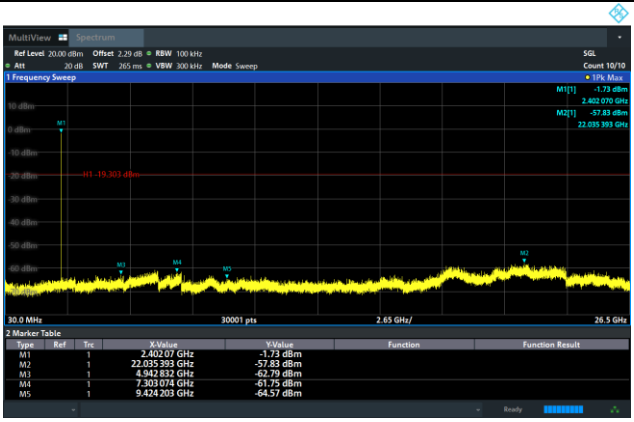
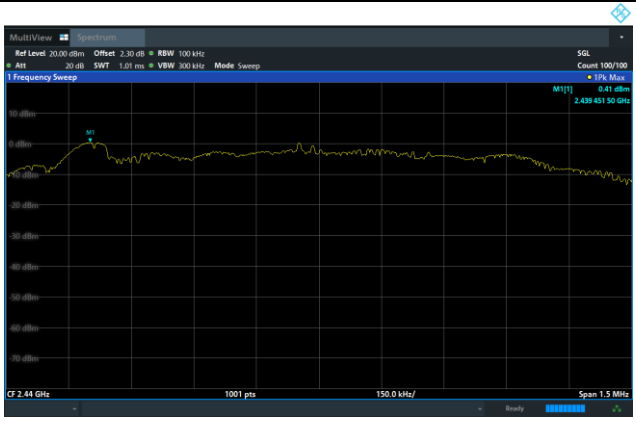
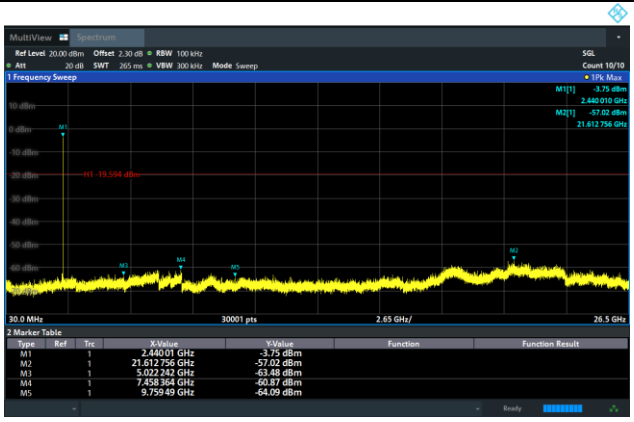
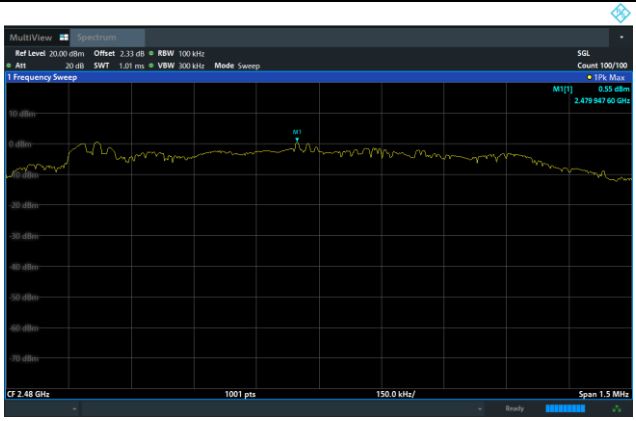
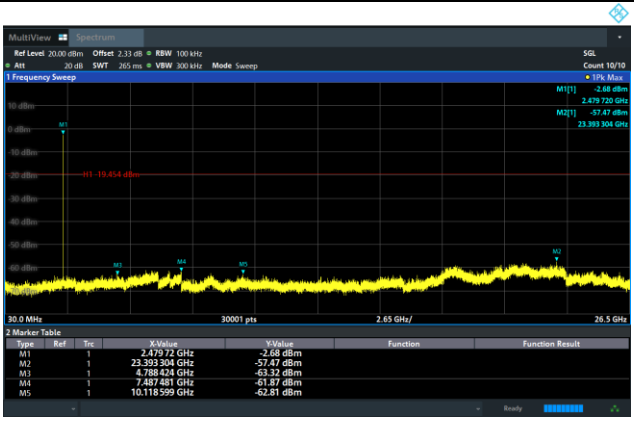
5.10.4 Test Results

Note:

1: The measurement frequency range is from 9kHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and band edge measurement data.

2: The worst mode is GFSK mode, and the report only show the worst mode data.

2.4GHz 1M	
GFSK on Channel 00	GFSK on Channel 00
	
GFSK on Channel 19	GFSK on Channel 19
	
GFSK on Channel 39	GFSK on Channel 39
	

2.4GHz 2M	
GFSK on Channel 00	GFSK on Channel 00
	
GFSK on Channel 19	GFSK on Channel 19
	
GFSK on Channel 39	GFSK on Channel 39
	

6 Photographs of the Test Setup

See the Appendix – Test Setup Photos.

7 Photographs of the EUT

See the Appendix - EUT Photos.

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