


FCC Part 15C Measurement and Test Report

For

Shenzhen Ruisicong Technology CO. Ltd

FCC ID:2AP2I-WM01

FCC Rule(s):	<u>FCC Part 15.249</u>
Product Description:	<u>Headset wireless microphone</u>
Model:	<u>WM01,wm02,wm03,wm05,wm06,wm07,c02,c03,c05,c06</u>
Report No.:	<u>BSL18041028400001</u>
Tested Date:	<u>June 01-04, 2018</u>
Issued Date:	<u>June 04, 2018</u>
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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Shenzhen Ruisicong Technology CO. Ltd
 Address of applicant: No.2, 5th floor,building 61,baotian industrial zone,xixiang street,baotan,shenzhen,guangdong,china

Manufacturer: Shenzhen Ruisicong Technology CO. Ltd
 Address of manufacturer: No.2, 5th floor,building 61,baotian industrial zone,xixiang street,baotan,shenzhen,guangdong,china

General Description of EUT	
Product Name:	Headset wireless microphone
Trade Name:	ASING
Model No.:	WM01
Adding Model(s):	wm02,wm03,wm05,wm06,wm07,c02,c03,c05,c06
Rated Voltage:	DC 3.7V from battery
Power Adapter Model:	N/A
<i>Note: The test data is gathered from a production sample, provided by the manufacturer.</i>	

Technical Characteristics of EUT	
Frequency Range:	2402-2479MHz
Data Rate:	2Mbps
Modulation:	GFSK
Quantity of Channels:	16
Channel Separation:	1MHz
Antenna Type:	PIFA
Antenna Gain:	1dBi

1.2 Test Standards

The following report is prepared on behalf of the Underwater Audio LLC in accordance with FCC Part 15, Subpart B, Subpart C, and section 15.107, 15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.107,15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which results in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.4 Test Facility

BSL Testing Co.,LTD.

NO. 24, ZH Park, Nantou, Shenzhen, 518000 China

Designation Number : CN1217

Test Firm Registration Number: 866035

Tel: 86- 755-26508703

Fax: 86- 755-26508703

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	Low Channel	2402MHz
TM2	Middle Channel	2446MHz
TM3	High Channel	2479MHz

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Notebook	Lenovo	E23	EB12648265
USB	ESR	S01	19682904994

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	$\pm 0.42\text{dB}$
Occupied Bandwidth	Conducted	$\pm 1.5\%$
Conducted Spurious Emission	Conducted	$\pm 2.17\text{dB}$
Conducted Emissions	Conducted	$\pm 2.88\text{dB}$
Transmitter Spurious Emissions	Radiated	$\pm 5.1\text{dB}$

1.7 Test Equipment List and Details

Description	Manufacturer	Model	Serial No.	Cal Date	Due. Date
Communication Tester	Rohde & Schwarz	CMW500	100358	2017-10-21	2018-10-20
Spectrum Analyzer	R&S	FSP40	100550	2017-10-21	2018-10-20
Test Receiver	R&S	ESCI7	US47140102	2017-10-21	2018-10-20
Signal Generator	HP	83630B	3844A01028	2017-10-22	2018-10-21
Test Receiver	R&S	ESPI-3	100180	2017-10-21	2018-10-20
Amplifier	Agilent	8449B	4035A00116	2017-10-22	2018-10-21
Amplifier	HP	8447E	2945A02770	2017-10-22	2018-10-21
Signal Generator	IFR	2023A	202307/242	2017-10-22	2018-10-21
Broadband Antenna	SCHAFFNER	2774	2774	2017-10-17	2018-10-16
Biconical and log periodic antennas	ELECTRO-METRICS	EM-6917B-1	171	2017-10-17	2018-10-16
Horn Antenna	R&S	HF906	100253	2017-10-17	2018-10-16
Horn Antenna	EM	EM-6961	6462	2017-10-17	2018-10-16
LISN	R&S	ESH3-Z5	100196	2017-10-17	2018-10-16
LISN	COM-POWER	LI-115	02027	2017-10-17	2018-10-16
3m Semi-Anechoic Chamber	Chengyu Electron	9 (L)*6 (W)* 6 (H)	BSL086	2017-10-21	2018-10-20
Horn Antenna	A-INFOMW	LB-180400KF	BSL088	2017-10-21	2018-10-20

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 15.203	Antenna Requirement	PASS
§15.205	Restricted Band of Operation	PASS
§ 15.207(a)	Conducted Emission	PASS
§ 15.209(a)(f)	Radiated Spurious Emissions	PASS
§15.249(a)	Field Strength of Emissions	PASS
§15.249(d)	Out of Band Emission	PASS
§15.215 (c)	Emission Bandwidth	PASS

Note: PASS: applicable, N/A: not applicable.

3. Antenna Requirements

3.1 Standard Applicable

According to FCC Part 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.

3.2 Test Result

This product has a PIFA antenna, fulfill the requirement of this section.

4. Radiated Emissions

4.1 Standard Applicable

According to §15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of fundamental (milli-volts/meter)	Field strength of Harmonics (micro-volts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

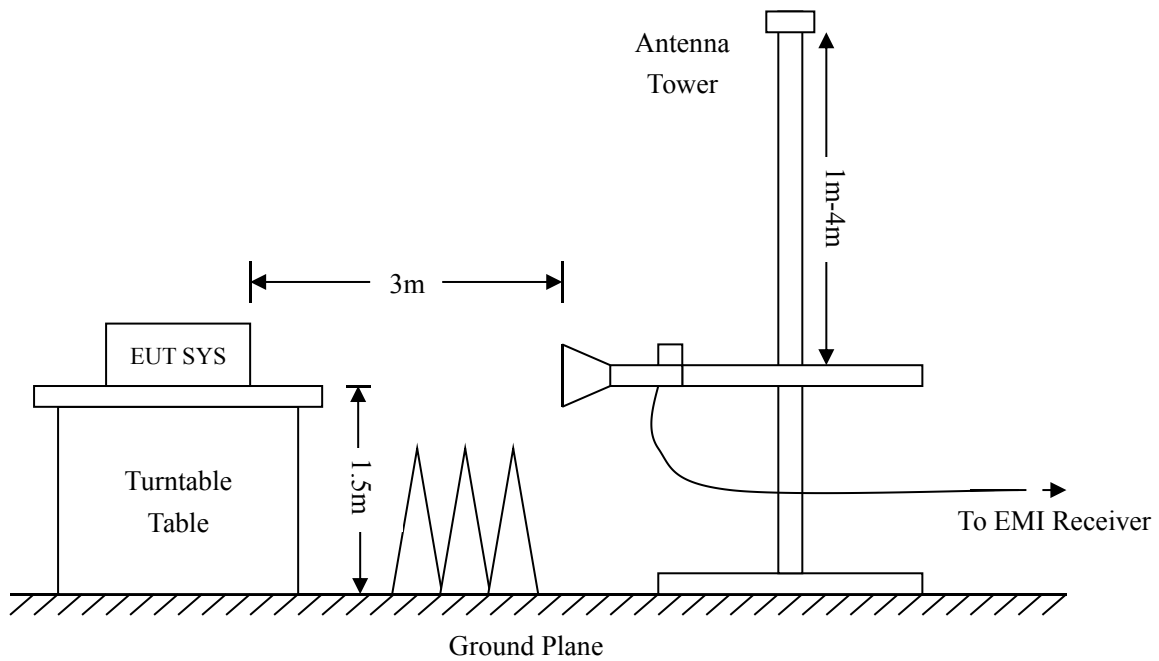
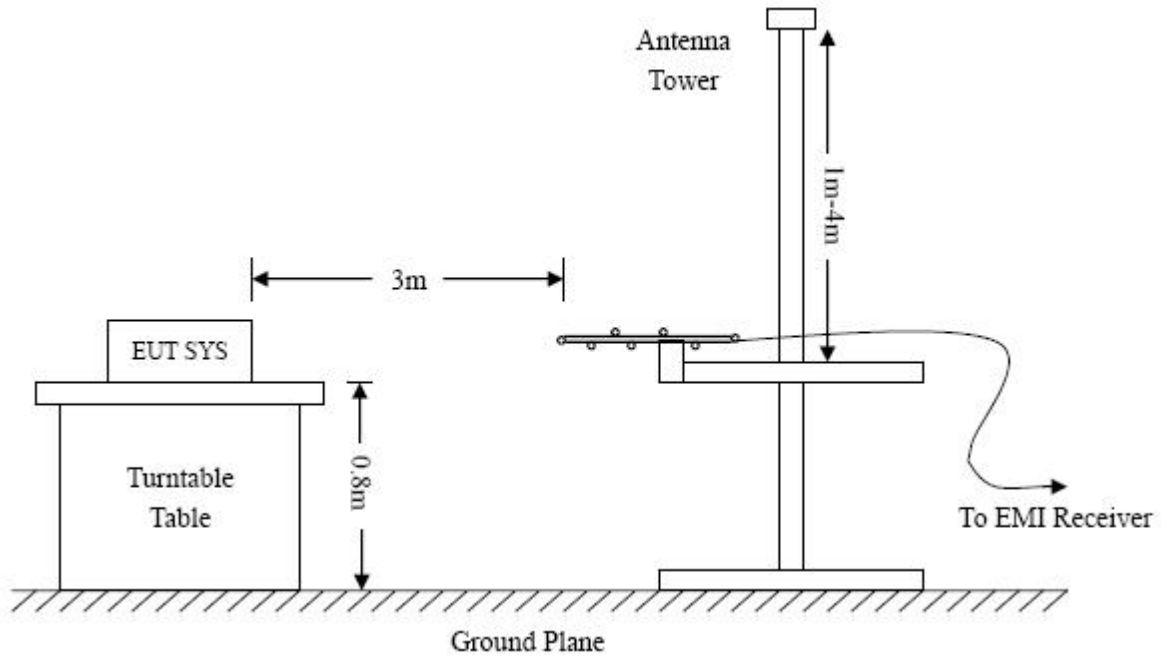
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

4.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.249(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.



Frequency :9kHz-30MHz
 RBW=10KHz,
 VBW =30KHz
 Sweep time= Auto
 Trace = max hold
 Detector function = peak

Frequency :30MHz-1GHz
 RBW=120KHz,
 VBW=300KHz
 Sweep time= Auto
 Trace = max hold
 Detector function = peak, QP

Frequency :Above 1GHz
 RBW=1MHz,
 VBW=3MHz(Peak), 10Hz(AV)
 Sweep time= Auto
 Trace = max hold
 Detector function = peak, AV

4.3 Corrected Amplitude & Margin Calculation

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

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of $-6\text{dB}\mu\text{V}$ means the emission is $6\text{dB}\mu\text{V}$ below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15C Limit}$$

4.4 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

4.5 Summary of Test Results/Plots

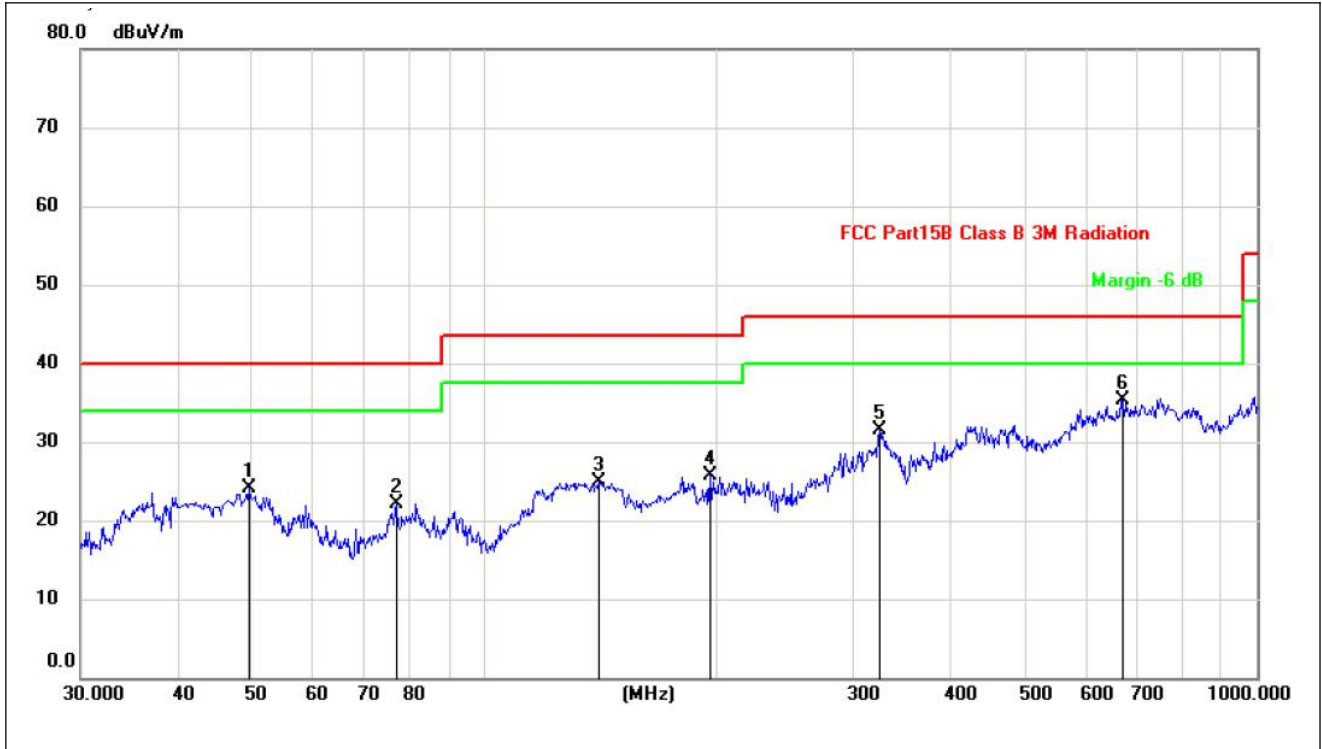
According to the data below, the FCC Part 15.205, 15.209 and 15.249 standards, and had the worst cases.

Note:

1. *Worst-case radiated emission below 1GHz is CH Low mode.*
2. *Worst-case radiated emission above 1GHz is CH Low, Middle, High mode.*

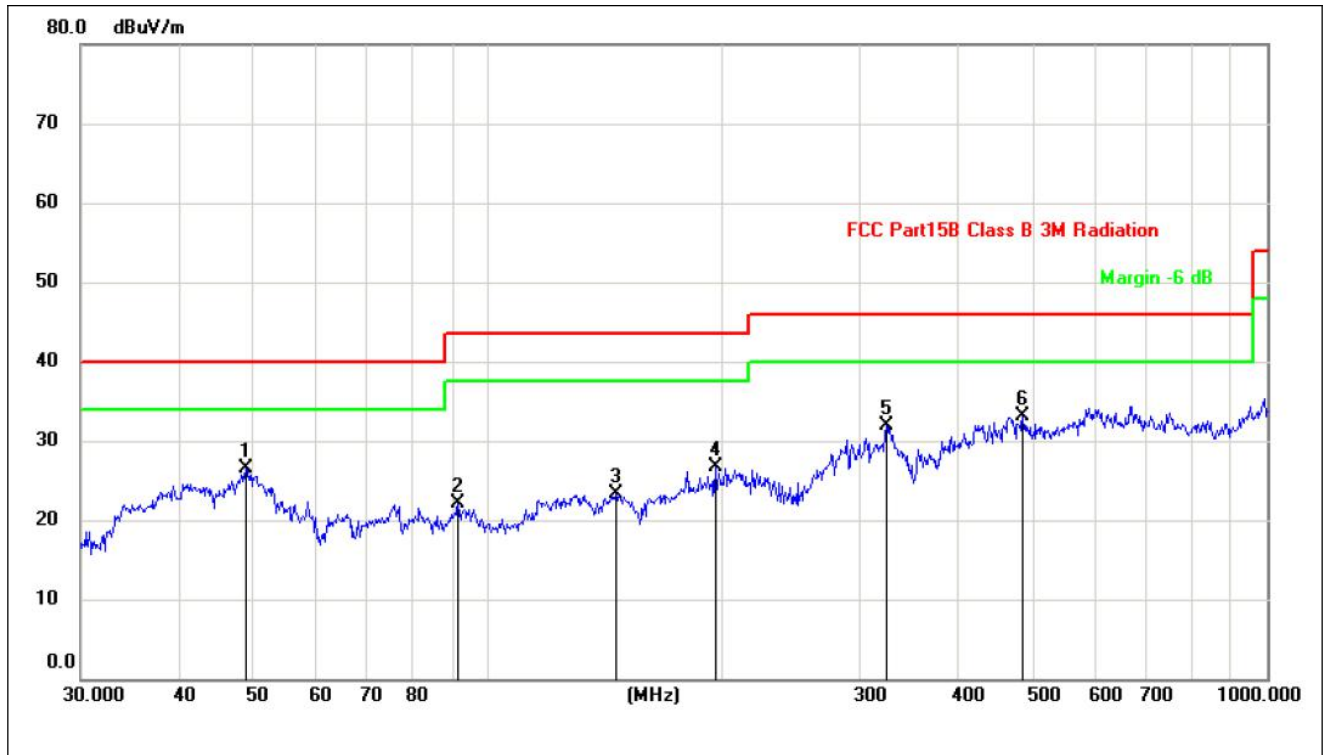
Plot of Radiated Emissions Test Data (30MHz to 1GHz): GFSK (CH Low) mode:

Test Specification: *Horizontal*



No.	Mk.	Freq.	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		49.5328	24.14	40.00	-15.86	QP		
2		76.7806	22.11	40.00	-17.89	QP		
3		140.3420	24.86	43.50	-18.64	QP		
4		195.8220	25.70	43.50	-17.80	QP		
5		324.4560	31.45	46.00	-14.55	QP		
6	*	670.4891	35.39	46.00	-10.61	QP		

Test Specification: Vertical



No.	Mk.	Freq.	Measurement	Limit	Over	Antenna	Table	
		MHz	dBuV/m	dBuV/m	dB	Height	Degree	Comment
						cm	degree	
1		48.8429	26.46	40.00	-13.54	QP		
2		91.4949	22.03	43.50	-21.47	QP		
3		145.8608	23.29	43.50	-20.21	QP		
4		195.8220	26.70	43.50	-16.80	QP		
5		324.4560	31.95	46.00	-14.05	QP		
6	*	485.6093	33.07	46.00	-12.93	QP		

Spurious Emissions Above 1GHz : (CH Low, Middle, High) mode.

Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel-2402MHz							
2402	92.86	-2.27	95.13	114	-18.87	H	PK
2402	79.87	-2.27	82.14	94	-11.86	H	AV
4804	61.18	-3.71	57.47	74	-16.53	H	PK
4804	49.98	-3.71	46.27	54	-7.73	H	AV
7206	59.01	-0.64	58.37	74	-15.63	H	PK
7206	44	-0.64	43.36	54	-10.64	H	AV
2402	91.8	-2.27	94.07	114	-19.93	V	PK
2402	78.86	-2.27	81.13	94	-12.87	V	AV
4804	58.91	-3.71	55.2	74	-18.8	V	PK
4804	47.88	-3.71	44.17	54	-9.83	V	AV
7206	59.86	-0.64	59.22	74	-14.78	V	PK
7206	43.9	-0.64	43.26	54	-10.74	V	AV
Middle Channel-2446MHz							
2446	91.43	-2.27	93.7	114	-20.3	H	PK
2446	77.49	-2.27	79.76	94	-14.24	H	AV
4892	58	-3.61	54.39	74	-19.61	H	PK
4892	46.9	-3.61	43.29	54	-10.71	H	AV
7338	58.01	-0.59	57.42	74	-16.58	H	PK
7338	42.9	-0.59	42.31	54	-11.69	H	AV
2446	91.53	-2.27	93.8	114	-20.2	V	PK
2446	77.51	-2.27	79.78	94	-14.22	V	AV
4892	60	-3.61	56.39	74	-17.61	V	PK
4892	48.89	-3.61	45.28	54	-8.72	V	AV
7338	59.88	-0.59	59.29	74	-14.71	V	PK
7338	44.91	-0.59	44.32	54	-9.68	V	AV

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2479MHz							
2479	91.22	-2.27	93.49	114	-20.51	H	PK
2479	78.7	-2.27	80.97	94	-13.03	H	AV
4958	64.03	-3.53	60.5	74	-13.5	H	PK
4958	49.31	-3.53	45.78	54	-8.22	H	AV
7437	53.21	-0.54	52.67	74	-21.33	H	PK
7437	43.92	-0.54	43.38	54	-10.62	H	AV
2479	89.54	-2.27	91.81	114	-22.19	V	PK
2479	76.48	-2.27	78.75	94	-15.25	V	AV
4958	57.44	-3.53	53.91	74	-20.09	V	PK
4958	44.28	-3.53	40.75	54	-13.25	V	AV
7437	58.87	-0.54	58.33	74	-15.67	V	PK
7437	43.7	-0.54	43.16	54	-10.84	V	AV

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 5th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

The measurements greater than 20dB below the limit from 9kHz to 30MHz..

5. Out of Band Emissions

5.1 Standard Applicable

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

5.2 Test Procedure

As the radiation test, set the Lowest and Highest Transmitting Channel, observed the outside band of 2400MHz to 2483.5MHz, than mark the higher-level emission for comparing with the FCC rules.

5.3 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

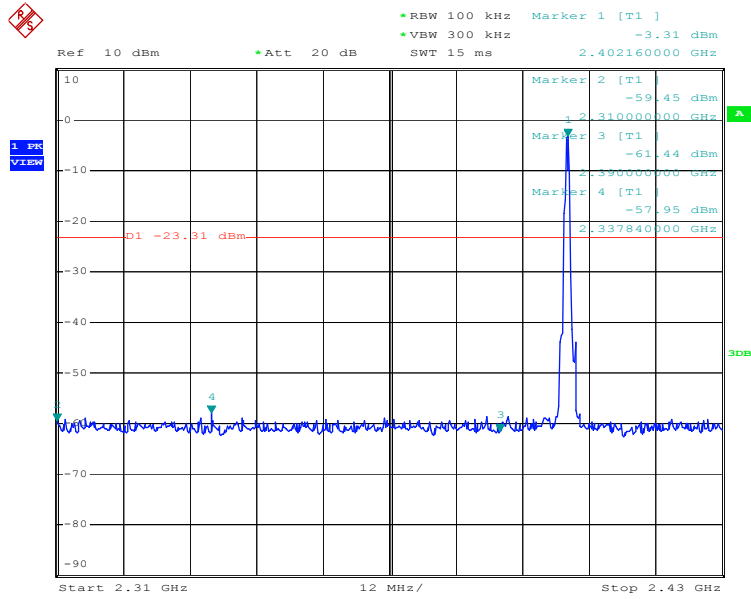
5.4 Summary of Test Results/Plots

Test mode	Frequency	Limit	Result
	MHz	dBc	
Lowest	2310.00	The measurements greater than 20dB below the limit from the restricted bands 2310~2390 MHz and 2483.5~2500 MHz	Pass
	2390.00		Pass
	2400.00		Pass
Highest	2483.50		Pass
	2500.00		Pass

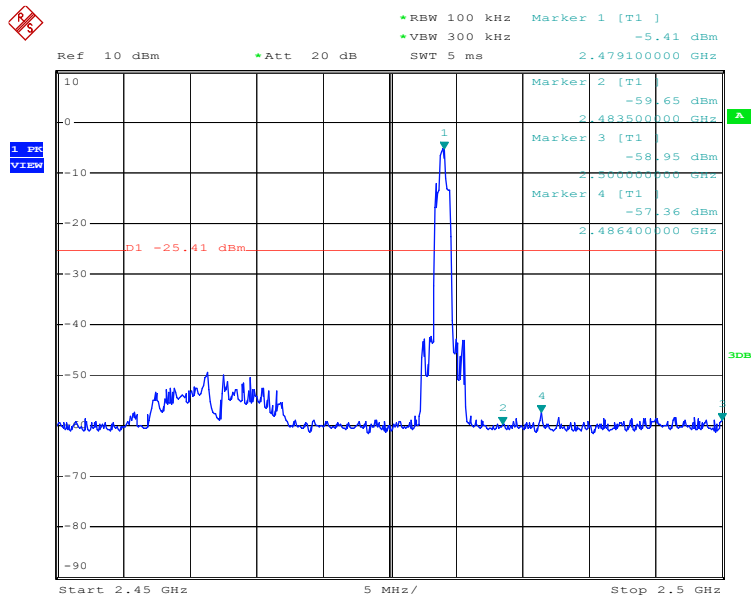
The edge emissions are below the FCC 15.209 Limits or complies with the 15.249 requirements.

Please refer to the test plots as below.

Lowest:



Highest:



6. Emission Bandwidth

6.1 Standard Applicable

According to 15.215 (c), intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

6.2 Test Procedure

According to the ANSI 63.10-2013, the emission bandwidth test method as follows.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Set span = 1MHz, centered on a transmitting channel

RBW \geq 1% 20dB Bandwidth, VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down and 99% bandwidth of the emission.

6.3 Environmental Conditions

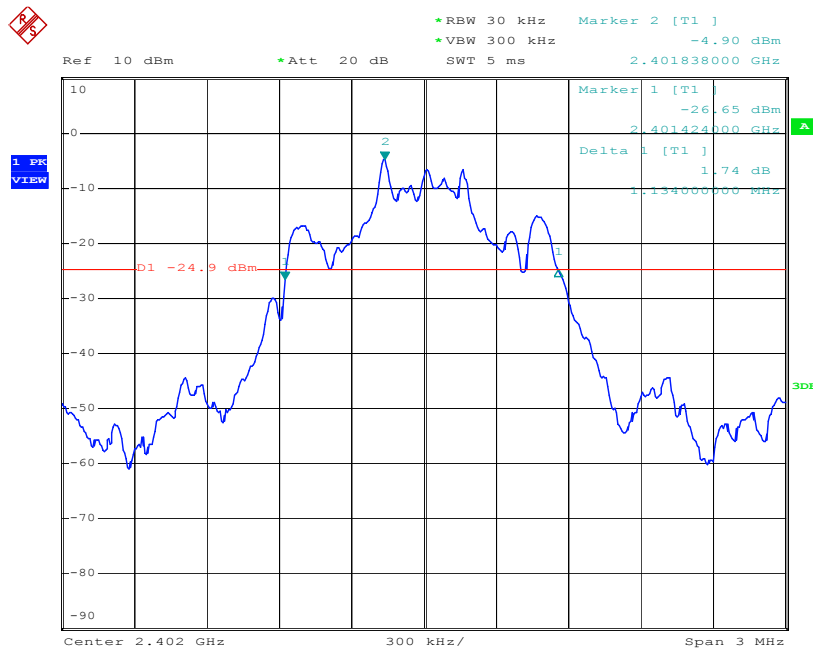
Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.4 Summary of Test Results/Plots

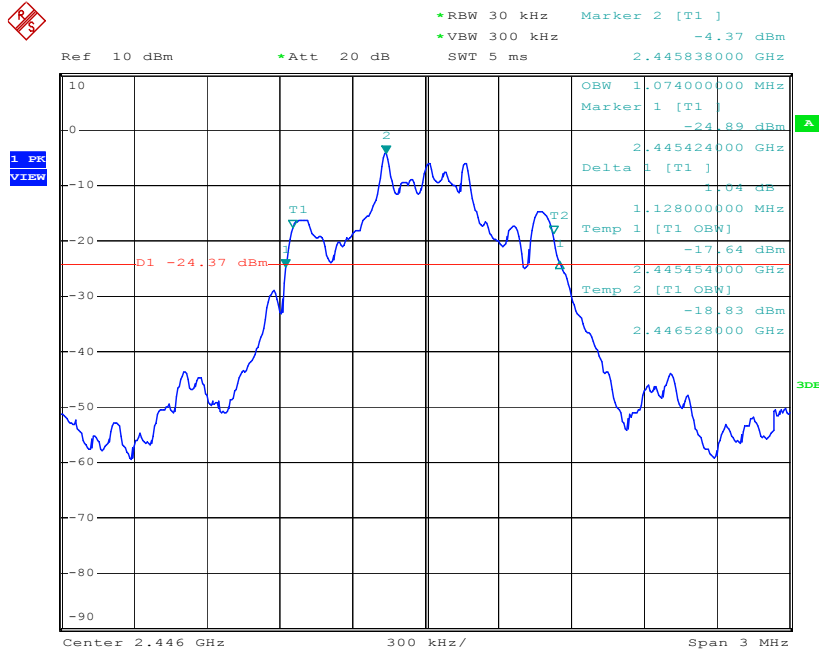
Channel	Frequency MHz	20dB Bandwidth kHz
Low Channel	2402	1.134
Middle Channel	2446	1.128
High Channel	2479	1.128

Please refer to the following test plots

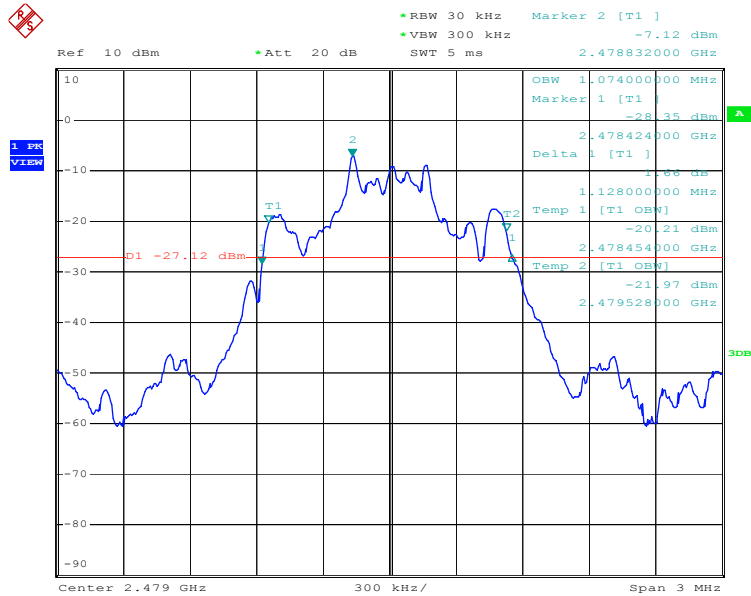
Low Channel:



Middle Channel:



High Channel:



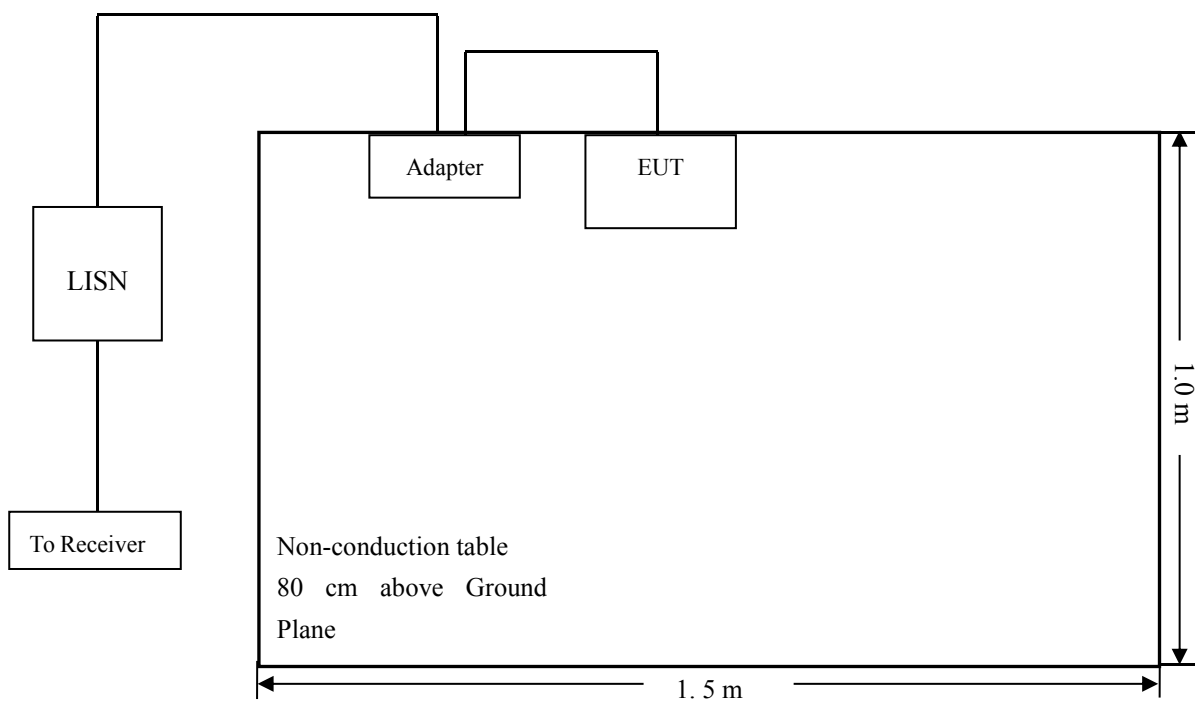
7. Conducted Emissions

7.1 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.

7.2 Basic Test Setup Block Diagram



7.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

7.4 Test Receiver Setup

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

Start Frequency.....	150 kHz
Stop Frequency.....	30 MHz
Sweep Speed.....	Auto
IF Bandwidth.....	10 kHz
Quasi-Peak Adapter Bandwidth.....	9 kHz
Quasi-Peak Adapter Mode.....	Normal

7.5 Summary of Test Results/Plots

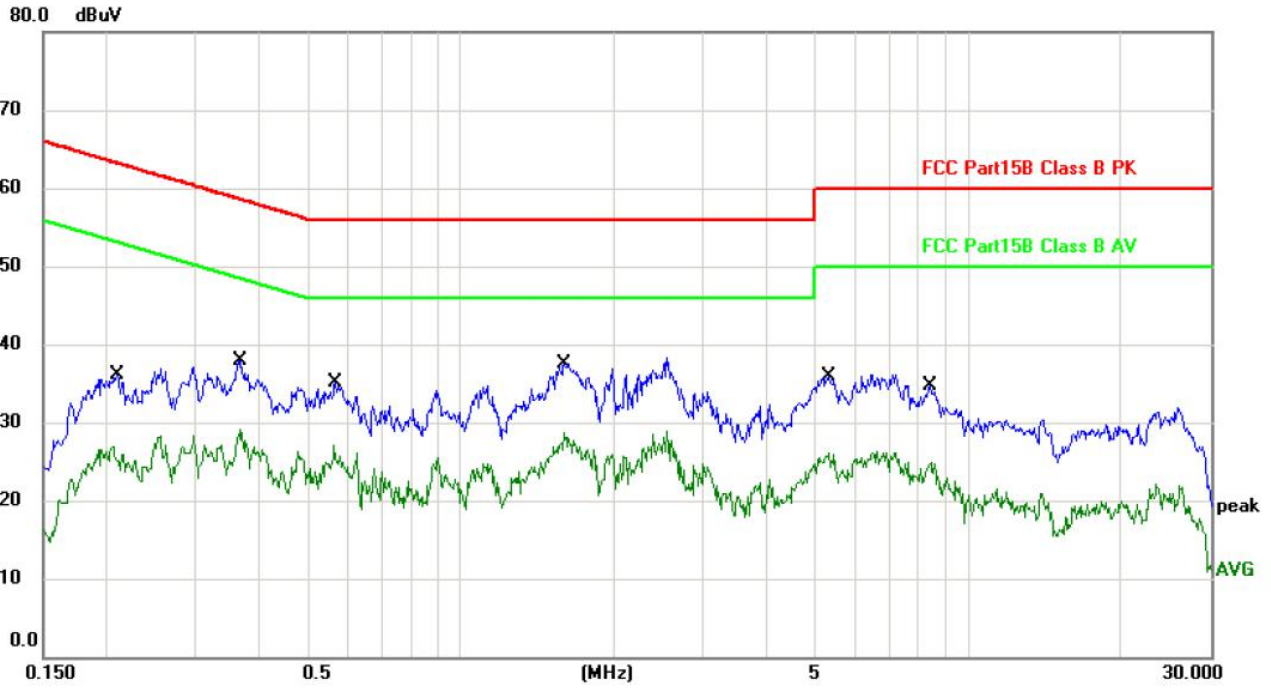
According to the data in section 7.7, the EUT complied with the FCC Part 15.207 Conducted margin for this device.

7.6 Conducted Emissions Test Data

PASS

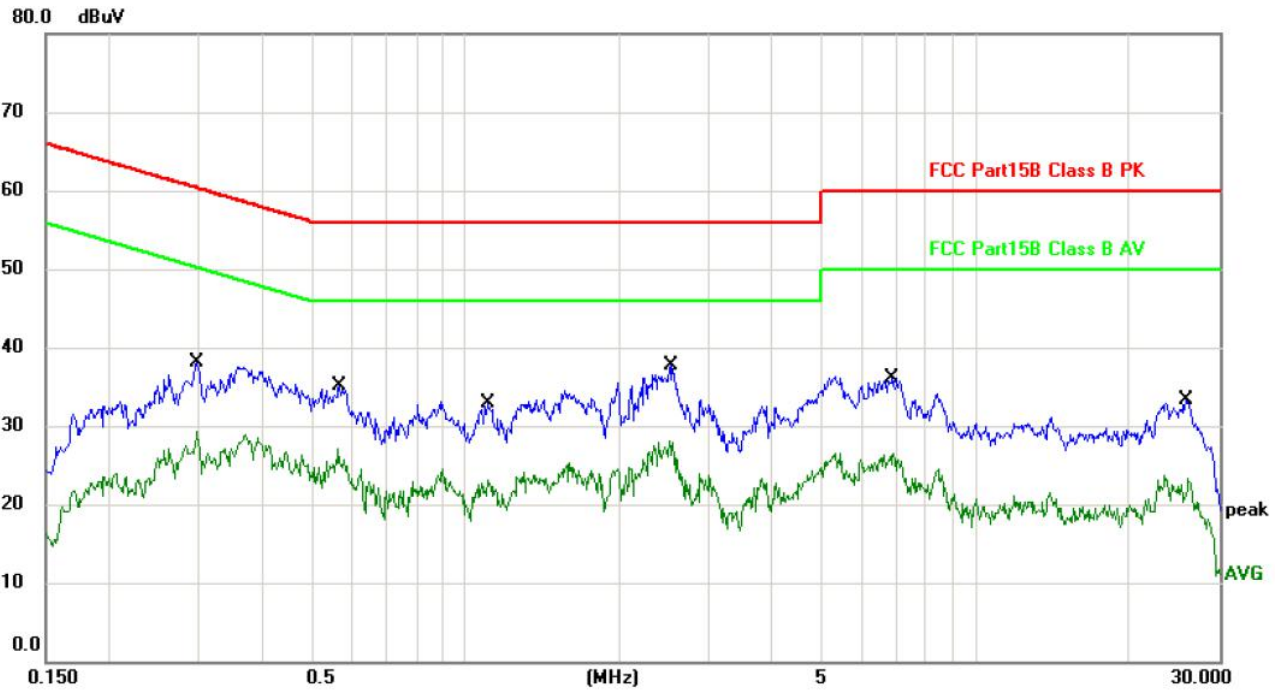
Plot of Conducted Emissions Test Data

Test Specification: Neutral



No. Mk.	Freq. MHz	Measurement dBuV	Limit dBuV	Over dB	Detector	Comment
1	0.2099	36.16	63.21	-27.05	QP	
2	0.2099	23.62	53.21	-29.59	AVG	
3	0.3673	37.89	58.56	-20.67	QP	
4	0.3673	23.86	48.56	-24.70	AVG	
5	0.5655	35.00	56.00	-21.00	QP	
6	0.5655	19.47	46.00	-26.53	AVG	
7 *	1.5940	37.52	56.00	-18.48	QP	
8	1.5940	25.39	46.00	-20.61	AVG	
9	5.2899	35.89	60.00	-24.11	QP	
10	5.2899	23.09	50.00	-26.91	AVG	
11	8.3978	34.67	60.00	-25.33	QP	
12	8.3978	20.78	50.00	-29.22	AVG	

Test Specification: Line



No.	Mk.	Freq.	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dBuV	dB		
1		0.2977	38.12	60.30	-22.18	QP	
2		0.2977	24.83	50.30	-25.47	AVG	
3		0.5655	35.00	56.00	-21.00	QP	
4		0.5655	21.40	46.00	-24.60	AVG	
5		1.1100	32.98	56.00	-23.02	QP	
6		1.1100	23.24	46.00	-22.76	AVG	
7	*	2.5219	37.76	56.00	-18.24	QP	
8		2.5219	20.24	46.00	-25.76	AVG	
9		6.8658	36.07	60.00	-23.93	QP	
10		6.8658	23.98	50.00	-26.02	AVG	
11		25.8580	33.31	60.00	-26.69	QP	
12		25.8580	18.56	50.00	-31.44	AVG	

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