

# FCC Part 15C

## Measurement and Test Report

### For

### RUIMA INTERNATIONAL (HK) INDUSTRIAL CO., LIMITED

**FCC ID: 2AHSJ-MPD65APBZ**

<b>FCC Rule(s):</b>	<u>FCC Part 15.249</u>
<b>Product Description:</b>	<u>Portable Battery Speaker</u>
<b>Tested Model:</b>	<u>MPD65APBZ</u>
<b>Report No.:</b>	<u>BSL190712646801RF</u>
<b>Tested Date:</b>	<u>July 18-July 24, 2019</u>
<b>Issued Date:</b>	<u>July 24, 2019</u>
<b>Tested By:</b>	<u>Cindy Zheng / Engineer</u>
<b>Reviewed By:</b>	<u>Haley Wen / EMC Manager</u>
<b>Approved &amp; Authorized By:</b>	<u>Mike Mo / PSQ Manager</u>
<b>Prepared By:</b>	<p><b>BSL Testing Co.,LTD.</b> No. 24, ZH Park, Nantou Nanshan District, Shenzhen, Guangdong, China Tel: 400-882-9628                          Fax: 86- 755-26508703</p>

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## 1.2 Test Standards

The following report is prepared on behalf of the RUIMA INTERNATIONAL (HK) INDUSTRIAL CO., LIMITED 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



## 1.6 Measurement Uncertainty

<b>Measurement uncertainty</b>		
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	$\pm 5.1\text{dB}$



## 2. SUMMARY OF TEST RESULTS

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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**

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#### **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 PCB 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

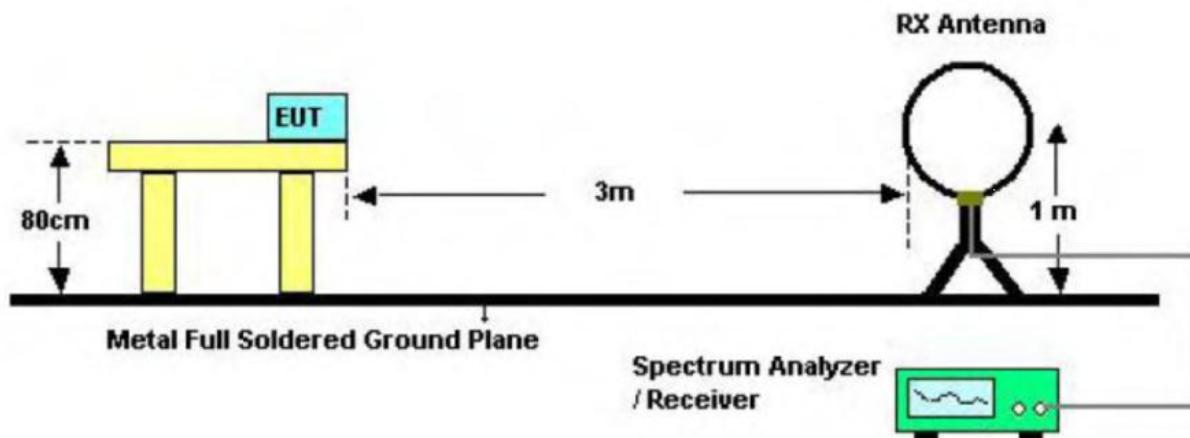
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

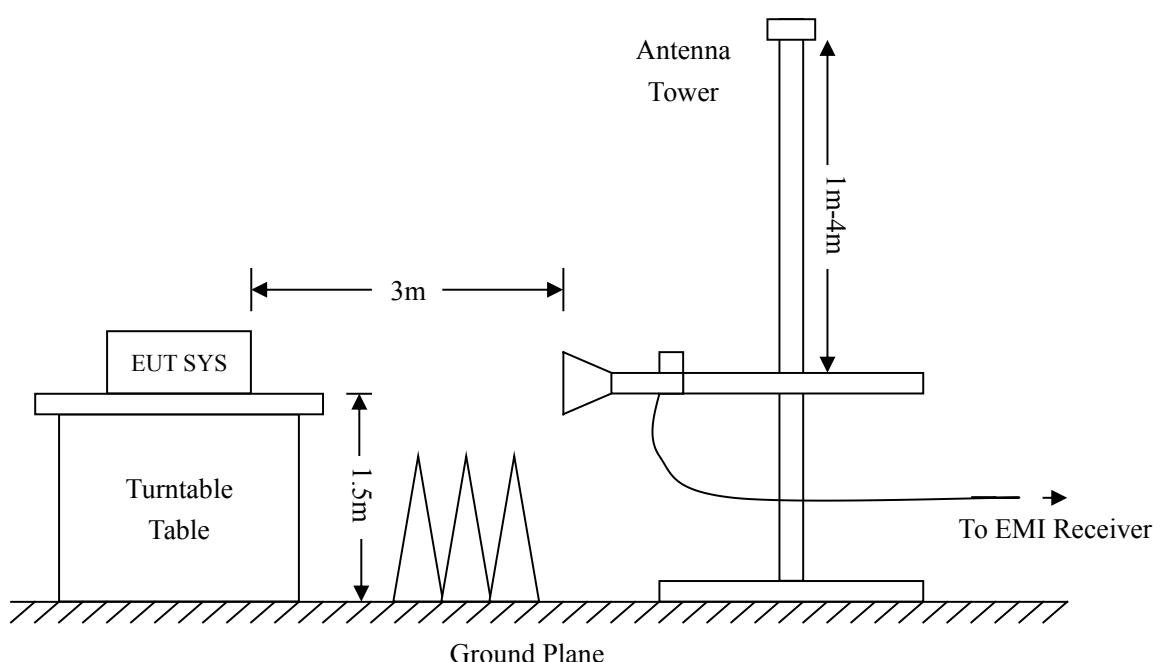
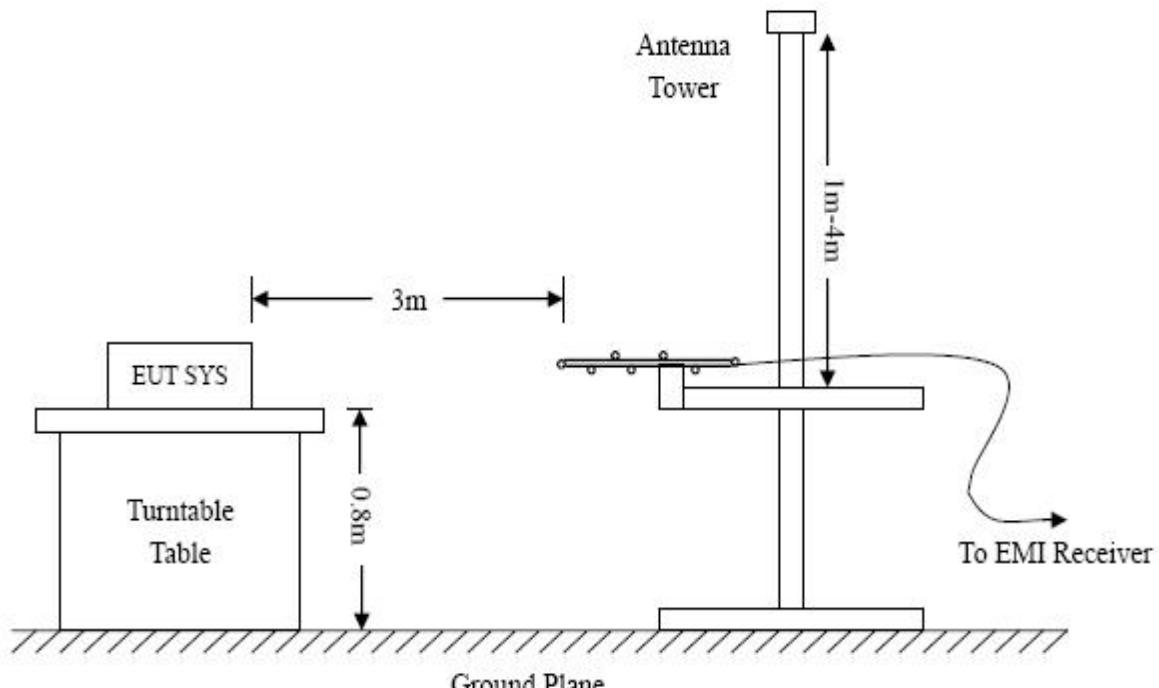
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

### 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 -6dB $\mu$ V means the emission is 6dB $\mu$ 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

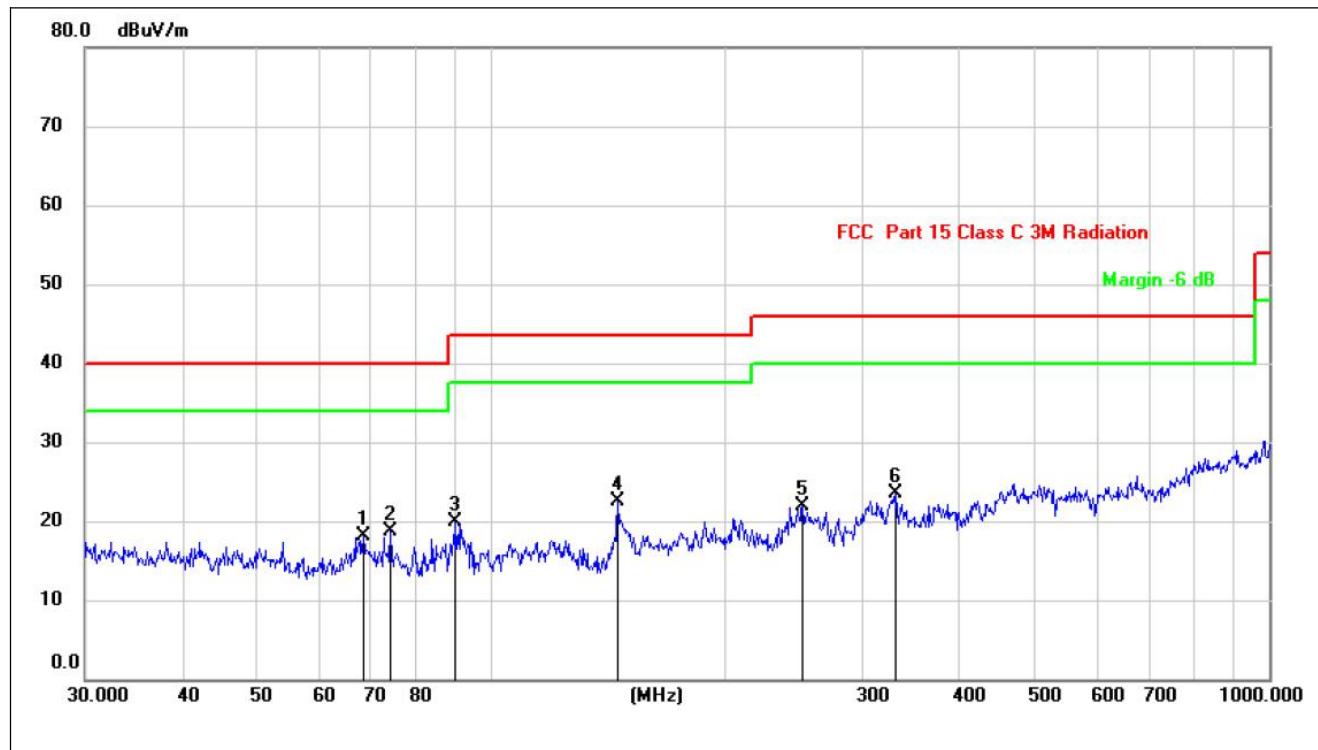
According to the data below, the FCC Part 15.205, 15.209 and 15.249 standards, and had the worst cases.

*Note:*

1. *Worst-case radiated emission below 1GHz is GFSK (CH High) mode.*
2. *Worst-case radiated emission above 1GHz is (Pi/4)DQPSK (CH Low, Middle, High) mode.*

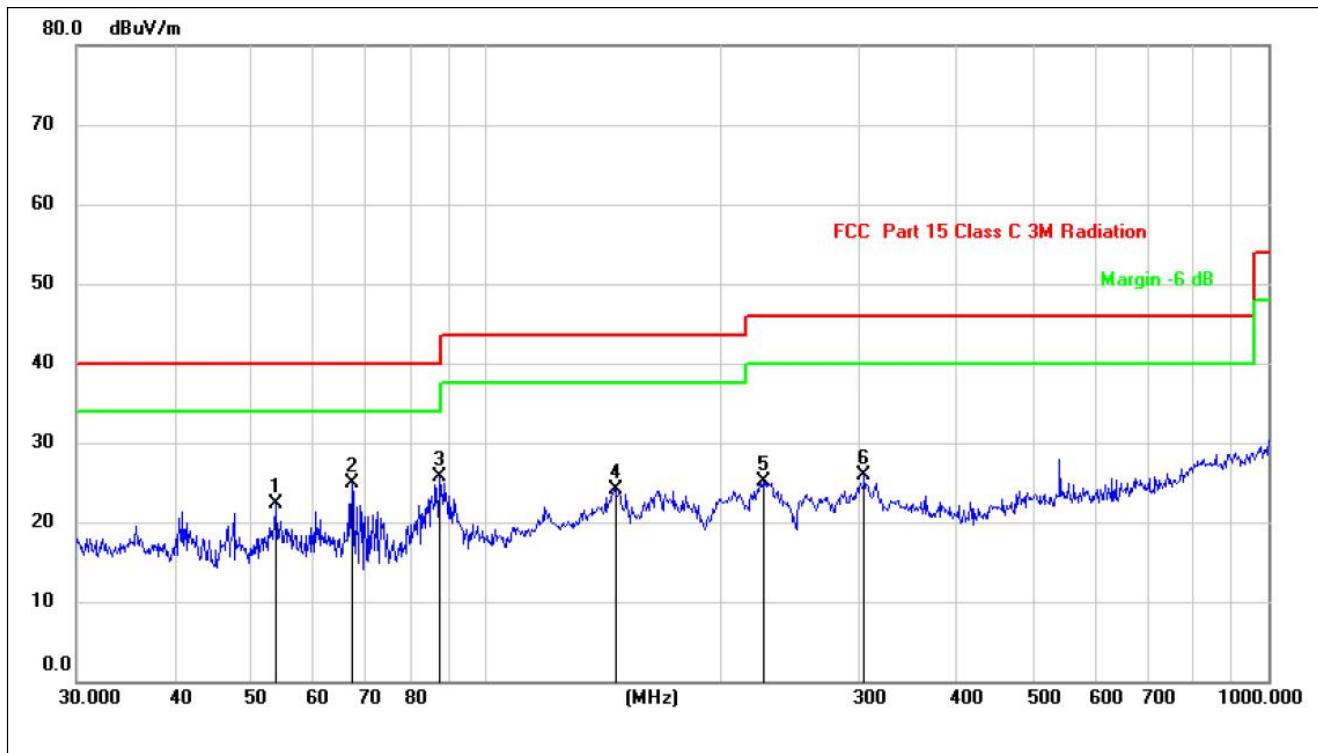
**Plot of Radiated Emissions Test Data (30MHz to 1GHz): GFSK (CH High) mode:**

*Test Specification: Horizontal*



No.	Mk.	Freq. MHz	Reading Level	Correct Factor	Measure- ment	Limit dBuV/m	Over	
			dBuV	dBuV/m	dBuV/m		dB	Detector
1		68.3906	18.18	-0.12	18.06	40.00	-21.94	QP
2		74.1350	18.91	-0.20	18.71	40.00	-21.29	QP
3		89.9047	20.40	-0.50	19.90	43.50	-23.60	QP
4	*	145.3505	21.11	1.39	22.50	43.50	-21.00	QP
5		251.1802	19.62	2.37	21.99	46.00	-24.01	QP
6		331.3546	18.28	5.18	23.46	46.00	-22.54	QP

Test Specification: *Vertical*



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
			Level	Factor	ment		dB	Detector
		MHz	dBuV	dBuV/m	dBuV/m			
1		53.8817	21.46	0.91	22.37	40.00	-17.63	QP
2		67.4381	25.03	-0.07	24.96	40.00	-15.04	QP
3	*	87.4176	26.09	-0.42	25.67	40.00	-14.33	QP
4		146.3735	22.85	1.34	24.19	43.50	-19.31	QP
5		226.0994	23.59	1.54	25.13	46.00	-20.87	QP
6		304.6099	21.31	4.53	25.84	46.00	-20.16	QP





## 5. Out of Band Emissions

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### 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

Note: We pre-scan all mode, the worst data is DH1, 2DH1, 3DH1.



## 6. Emission Bandwidth

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### 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 = 3MHz, 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

Worst mode: GFSK (DH1)

<b>Channel</b>	<b>Frequency</b> MHz	<b>20dB Bandwidth</b> kHz
Low Channel	2402	822
Middle Channel	2442	828
High Channel	2480	828

Worst mode: Pi/4 QDPSK (2DH1)

<b>Channel</b>	<b>Frequency</b> MHz	<b>20dB Bandwidth</b> kHz
Low Channel	2402	1122
Middle Channel	2442	1122
High Channel	2480	1122

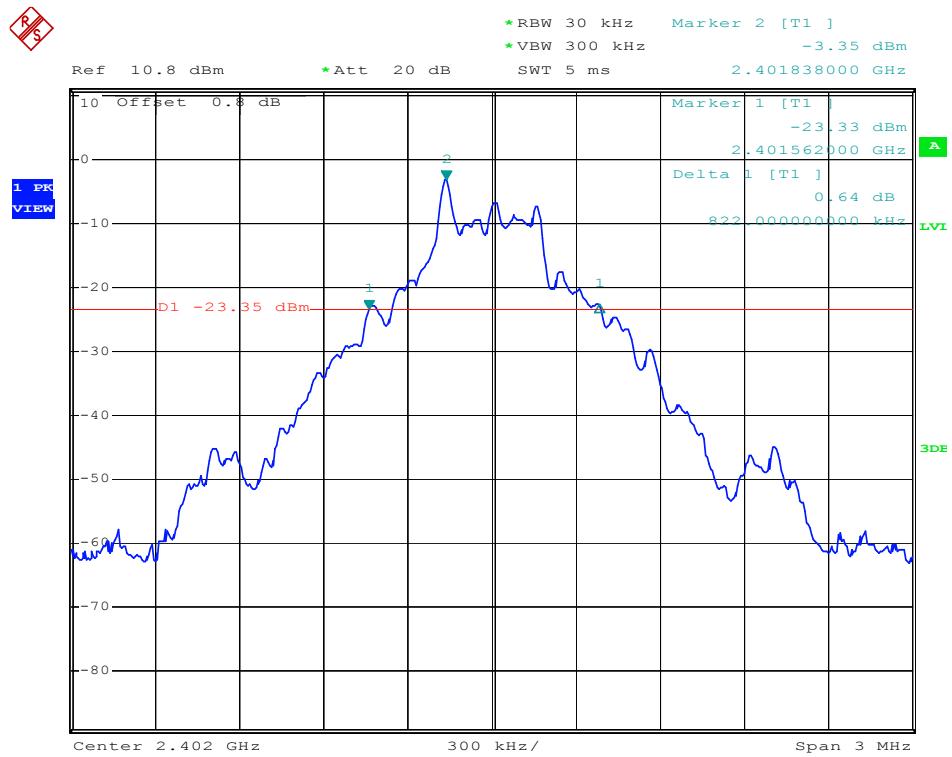
Worst mode: 8DPSK (3DH1)

<b>Channel</b>	<b>Frequency</b> MHz	<b>20dB Bandwidth</b> kHz
Low Channel	2402	1170
Middle Channel	2442	1170
High Channel	2480	1170

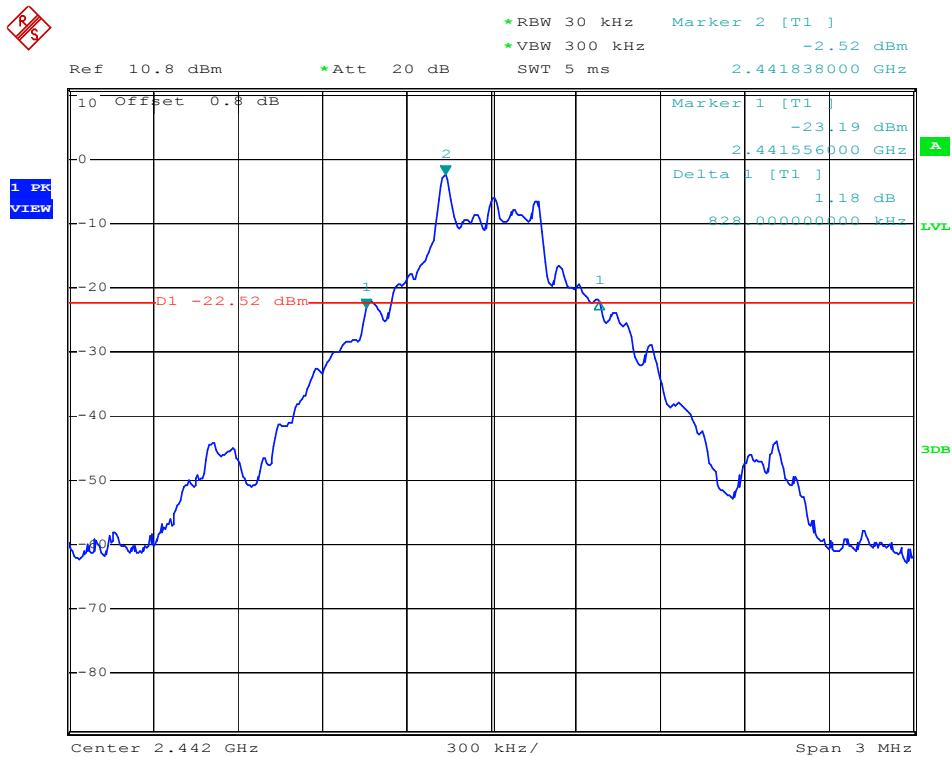
Please refer to the following test plots

Worst mode: GFSK (DH1)

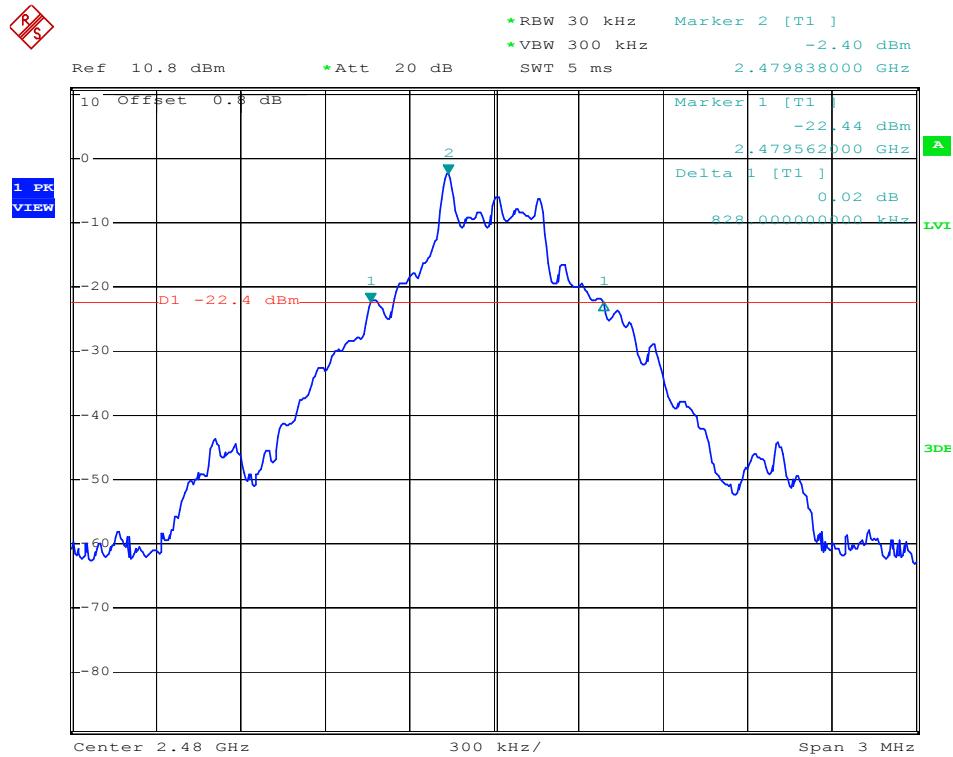
Low Channel:



Middle Channel:

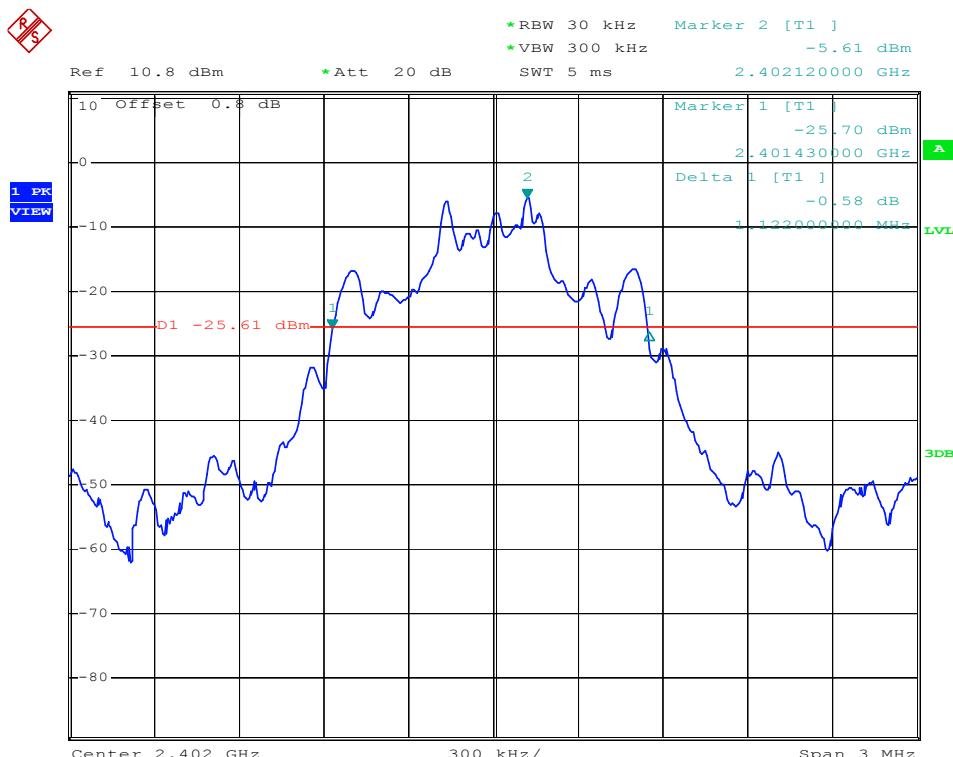


High Channel:

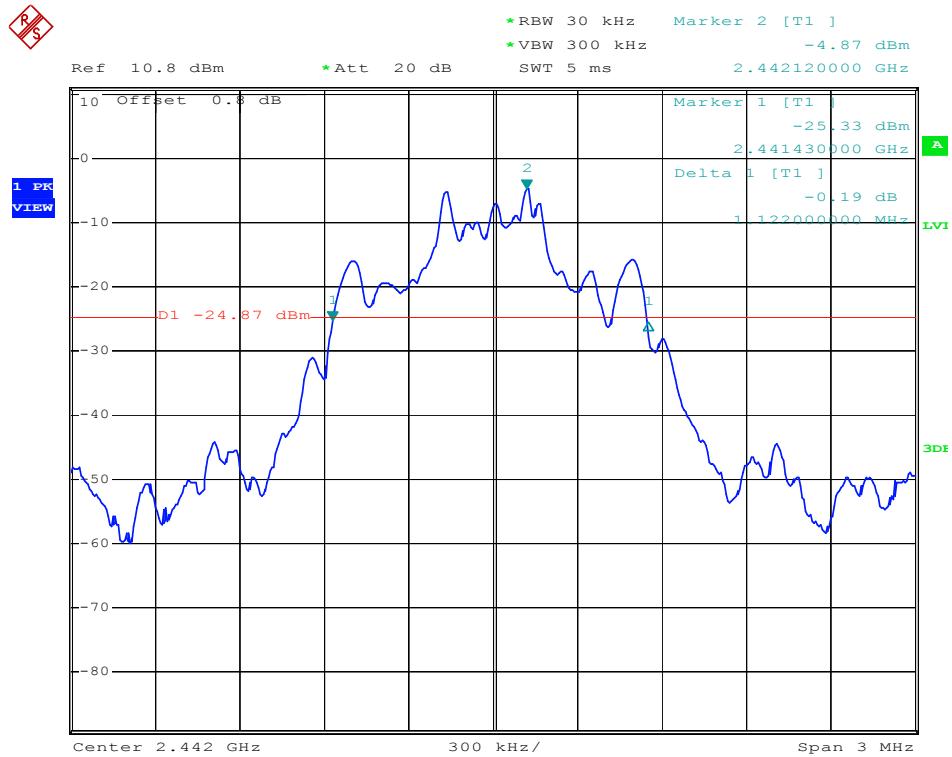


Worst mode: Pi/4 QDPSK (2DH1)

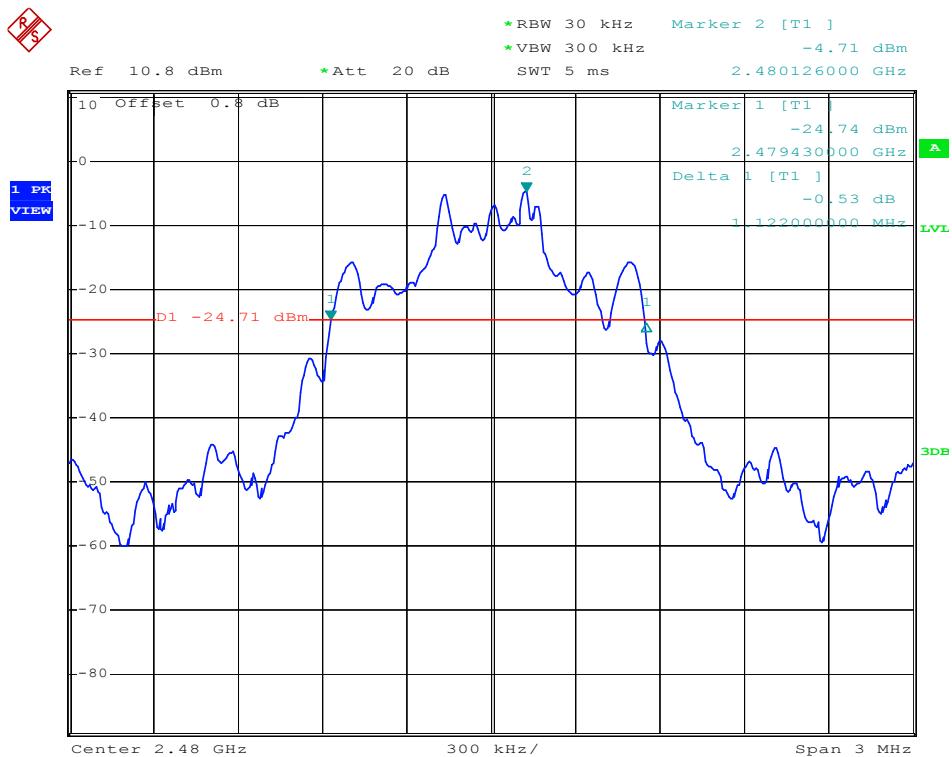
Low Channel:



## Middle Channel:

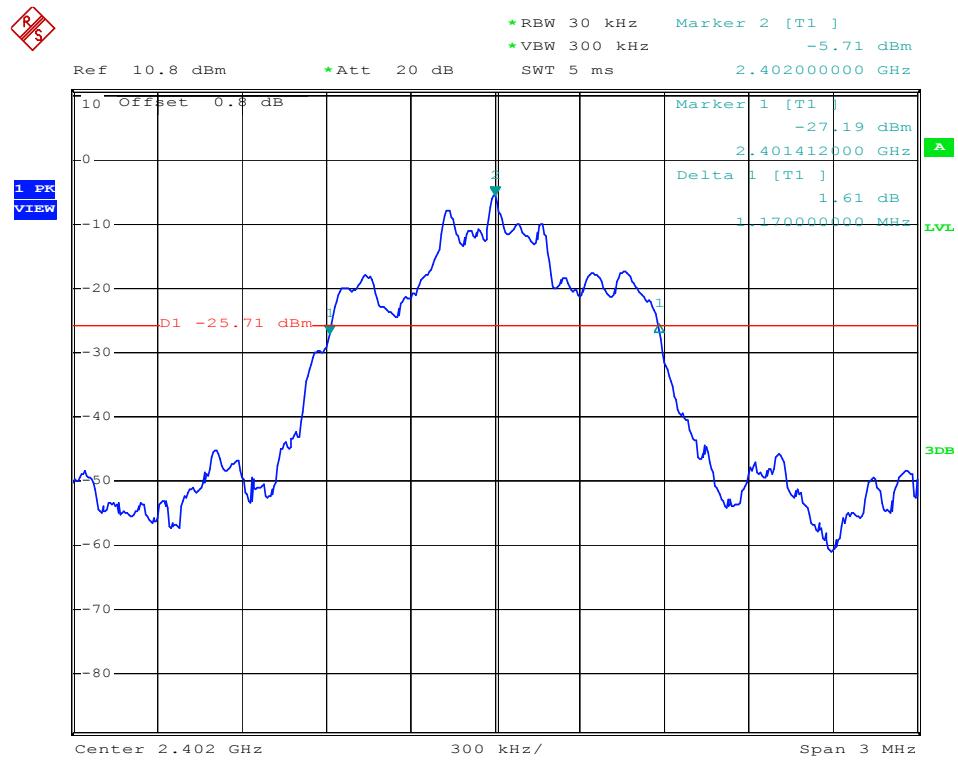


## High Channel:

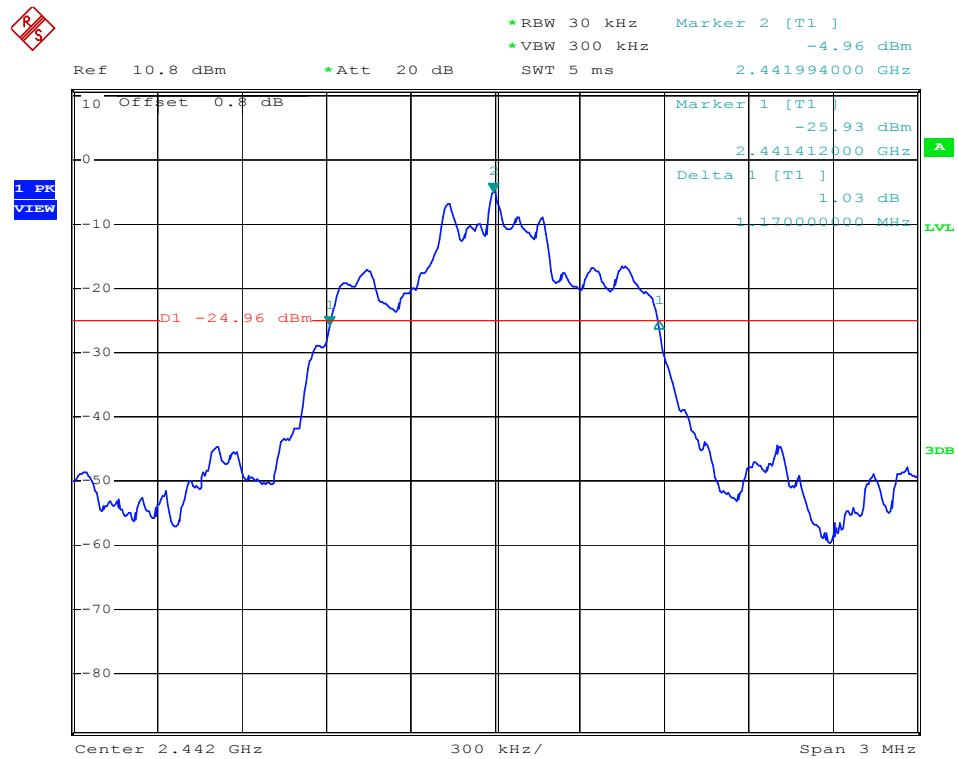


Worst mode: 8DPSK (3DH1)

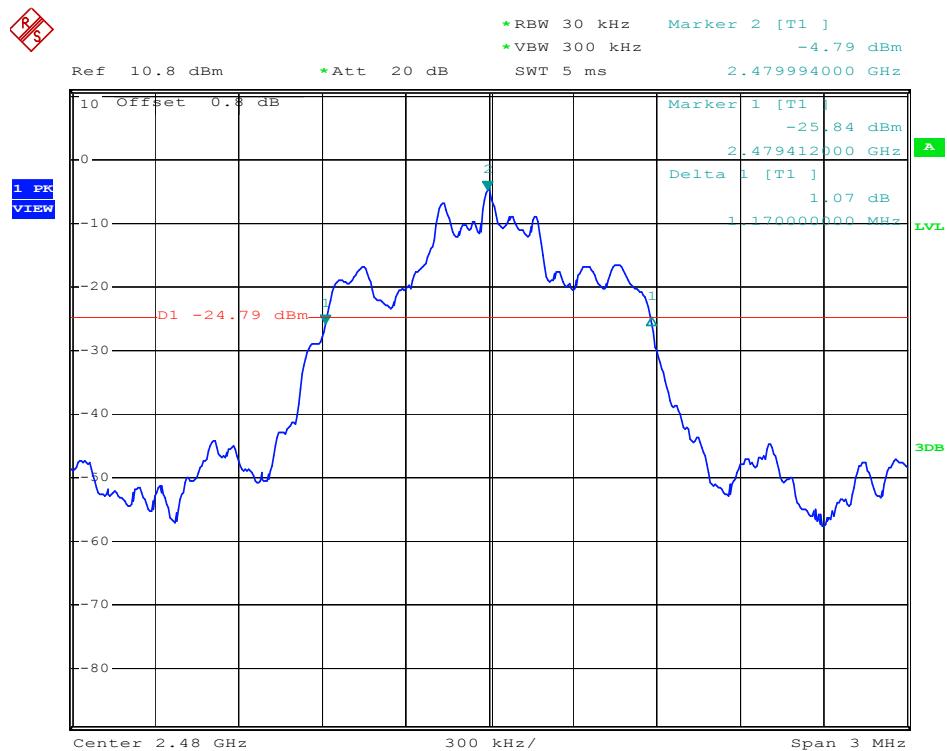
Low Channel:



Middle Channel:



High Channel:



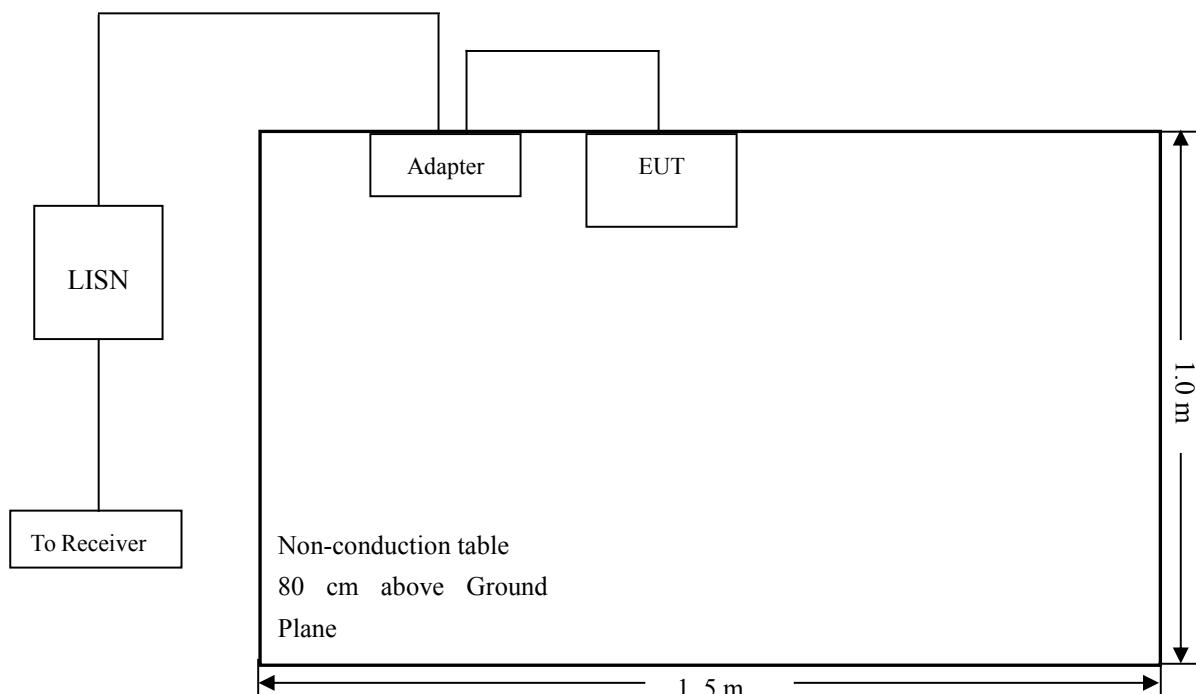
## 7. Conducted Emissions

### 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

Note: We pre-scan all mode, the worst data is GFSK (Low channel).



