

# FCC Test Report

Product Name	Gaming Mouse
Model No	P704
FCC ID.	H4IMSP704

Applicant	Lite-on Technology Corp.
Address	16F,392,Ruey Kuang Road,Neihu ,Taipei

Date of Receipt	Aug. 22, 2019
Issue Date	Oct. 15, 2019
Report No.	1980348R-RFUSP15V00
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

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## Test Report

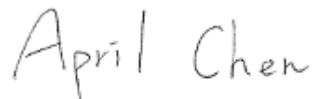
Issue Date: Oct. 15, 2019

Report No.: 1980348R-RFUSP15V00



Product Name	Gaming Mouse
Applicant	Lite-on Technology Corp.
Address	16F,392,Ruey Kuang Road,Neihu ,Taipei
Manufacturer	Lite-on Technology Corp.
Model No.	P704
EUT Rated Voltage	DC 3.7V (Power by battery)
EUT Test Voltage	DC 3.7V (Power by battery)
Trade Name	ASUS
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2018 ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By :



(Senior Adm. Specialist / April Chen)

Tested By :



( Engineer / Jason Tuan )

Approved By :



( Director / Vincent Lin )

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**Attachment 1: EUT Test Photographs**

**Attachment 2: EUT Detailed Photographs**

## 1. GENERAL INFORMATION

### 1.1. EUT Description

Product Name	Gaming Mouse
Trade Name	ASUS
Model No.	P704
FCC ID.	H4IMSP704
Frequency Range	2403-2480MHz
Number of Channels	78CH
Channel Separation	1MHz
Type of Modulation	GFSK
Antenna Type	MULTILAYER CERAMIC
Antenna Gain	Refer to the table “Antenna List”
Channel Control	Auto
USB to Type C Cable	MFR: YUE YANG, M/N: USB CABLE SM9380, Shielded, 1.88m

#### Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	PSA	RFANT3216120A5T	MULTILAYER CERAMIC	2.93 dBi for 2.4 GHz

Note: The antenna of EUT conforms to FCC 15.203.

## Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 01:	2403 MHz	Channel 21:	2423 MHz	Channel 41:	2443 MHz	Channel 61:	2463 MHz
Channel 02:	2404 MHz	Channel 22:	2424 MHz	Channel 42:	2444 MHz	Channel 62:	2464 MHz
Channel 03:	2405 MHz	Channel 23:	2425 MHz	Channel 43:	2445 MHz	Channel 63:	2465 MHz
Channel 04:	2406 MHz	Channel 24:	2426 MHz	Channel 44:	2446 MHz	Channel 64:	2466 MHz
Channel 05:	2407 MHz	Channel 25:	2427 MHz	Channel 45:	2447 MHz	Channel 65:	2467 MHz
Channel 06:	2408 MHz	Channel 26:	2428 MHz	Channel 46:	2448 MHz	Channel 66:	2468 MHz
Channel 07:	2409 MHz	Channel 27:	2429 MHz	Channel 47:	2449 MHz	Channel 67:	2469 MHz
Channel 08:	2410 MHz	Channel 28:	2430 MHz	Channel 48:	2450 MHz	Channel 68:	2470 MHz
Channel 09:	2411 MHz	Channel 29:	2431 MHz	Channel 49:	2451 MHz	Channel 69:	2471 MHz
Channel 10:	2412 MHz	Channel 30:	2432 MHz	Channel 50:	2452 MHz	Channel 70:	2472 MHz
Channel 11:	2413 MHz	Channel 31:	2433 MHz	Channel 51:	2453 MHz	Channel 71:	2473 MHz
Channel 12:	2414 MHz	Channel 32:	2434 MHz	Channel 52:	2454 MHz	Channel 72:	2474 MHz
Channel 13:	2415 MHz	Channel 33:	2435 MHz	Channel 53:	2455 MHz	Channel 73:	2475 MHz
Channel 14:	2416 MHz	Channel 34:	2436 MHz	Channel 54:	2456 MHz	Channel 74:	2476 MHz
Channel 15:	2417 MHz	Channel 35:	2437 MHz	Channel 55:	2457 MHz	Channel 75:	2477 MHz
Channel 16:	2418 MHz	Channel 36:	2438 MHz	Channel 56:	2458 MHz	Channel 76:	2478 MHz
Channel 17:	2419 MHz	Channel 37:	2439 MHz	Channel 57:	2459 MHz	Channel 77:	2479 MHz
Channel 18:	2420 MHz	Channel 38:	2440 MHz	Channel 58:	2460 MHz	Channel 78:	2480 MHz
Channel 19:	2421 MHz	Channel 39:	2441 MHz	Channel 59:	2461 MHz		
Channel 20:	2422 MHz	Channel 40:	2442 MHz	Channel 60:	2462 MHz		

## Note:

1. The EUT is a Gaming Mouse with a built-in Bluetooth V4.2 、2.4GHz GFSK transceiver and 104-205KHz Wireless Charger receiver , this report for 2.4GHz GFSK.
2. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
3. These tests are conducted on a sample for the purpose of demonstrating compliance of 2.4GHz transmitter with Part 15 Subpart C Paragraph 15.247 of spread spectrum devices

Test Mode:	Mode 1: Transmit
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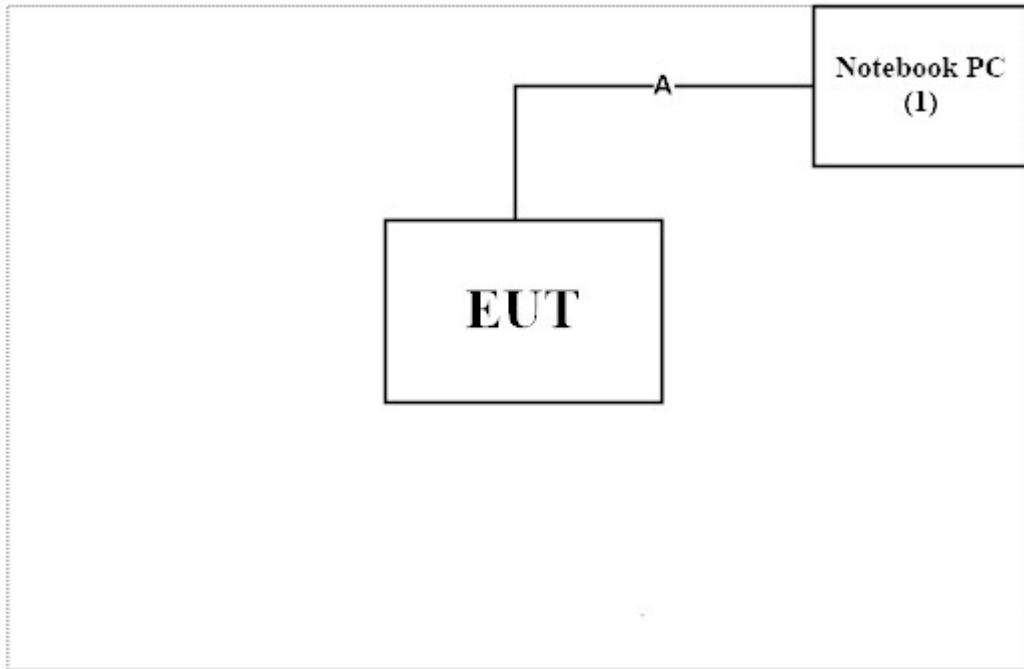
### 1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
1 Notebook PC	DELL	Latitude 5580	GDZN7H2	Non-Shielded, 0.8m

Signal Cable Type	Signal cable Description
A USB to Type C Cable	Shielded, 1.88m

### 1.4. Configuration of Tested System



### 1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Execute software “Cmd” on the EUT.
3. Configure the test mode, the test channel, and the data rate.
4. Press “OK” to start the continuous Transmit.
5. Verify that the EUT works properly.

## 1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

**USA : FCC Registration Number: TW3023**

**Canada : IC Registration Number: 4075A**

Site Description: Accredited by TAF  
Accredited Number: 3023

Test Laboratory: DEKRA Testing and Certification Co., Ltd

Address: No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451,  
Taiwan, R.O.C.

Phone number: 886-2-8601-3788

Fax number: 886-2-8601-3789

Email address: [info.tw@dekra.com](mailto:info.tw@dekra.com)

Website: <http://www.dekra.com.tw>

## 1.7. List of Test Equipment

### For Conducted measurements /CB3/SR8

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
	Temperature Chamber	WIT GROUP	TH-1S-B	EQ-201-00146	2019/02/26	2020/02/25
X	Spectrum Analyzer	Agilent	N9010A	MY52220597	2019/10/11	2020/10/10
X	Peak Power Analyzer	Keysight	8990B	MY51000410	2019/07/30	2020/07/29
X	Wideband Power Sensor	Keysight	N1923A	MY56080003	2019/07/30	2020/07/29
X	Wideband Power Sensor	Keysight	N1923A	MY56080004	2019/07/30	2020/07/29
X	EMI Test Receiver	R&S	ESCS 30	100369	2018/11/19	2019/11/18
X	LISN	R&S	ENV216	101105	2019/04/10	2020/04/09
X	LISN	R&S	ESH3-Z5	836679/014	2019/04/10	2020/04/09
X	Coaxial Cable	DEKRA	RG 400	LC018-RG	2019/06/21	2020/06/20

### For Radiated measurements /Site3/CB8

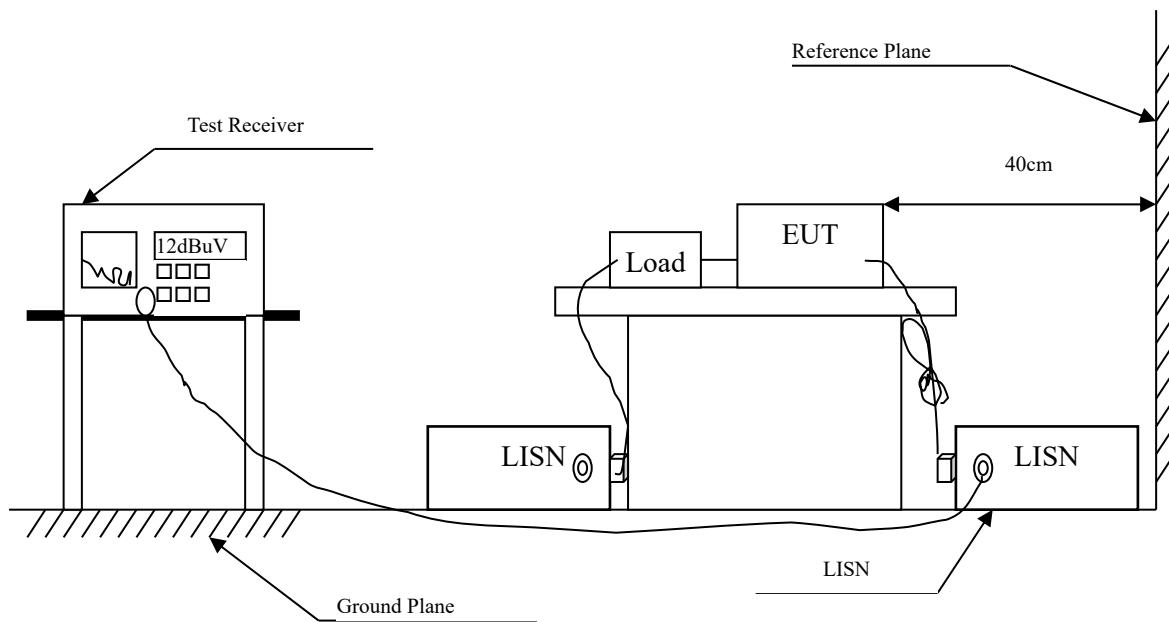
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
X	Spectrum Analyzer	R&S	FSP40	100170	2019/03/11	2020/03/10
X	Loop Antenna	Teseq	HLA6121	37133	2019/10/13	2020/10/12
X	Bilog Antenna	Schaffner Chase	CBL6112B	2707	2019/06/23	2020/06/22
X	Coaxial Cable	DEKRA	RG 214	LC003-RG	2019/06/13	2020/06/12
X	Pre-Amplifier	Jet-Power	JPA-10M1G33	170101000330010	2019/06/13	2020/06/12
X	Horn Antenna	ETS-Lindgren	3117	00135205	2019/04/30	2020/04/29
X	Horn Antenna	SCHWARZBECK	9120D	576	2018/12/18	2019/12/17
X	Pre-Amplifier	EMCI	EMC012630SE	980210	2019/04/16	2020/04/15
	Horn Antenna	Com-Power	AH-840	101043	2019/01/19	2020/01/18
	Amplifier + Cable	EMCI	EMC184045SE	980370	2019/03/27	2020/03/26
X	Filter	MICRO-TRONICS	BRM50702	G270	2019/08/08	2020/08/07
	Filter	MICRO-TRONICS	BRM50716	G196	2019/08/08	2020/08/07

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version :QuieTek EMI 2.0 V2.1.113.

## 2. Conducted Emission

### 2.1. Test Setup



## 2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AVG
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

## 2.3. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

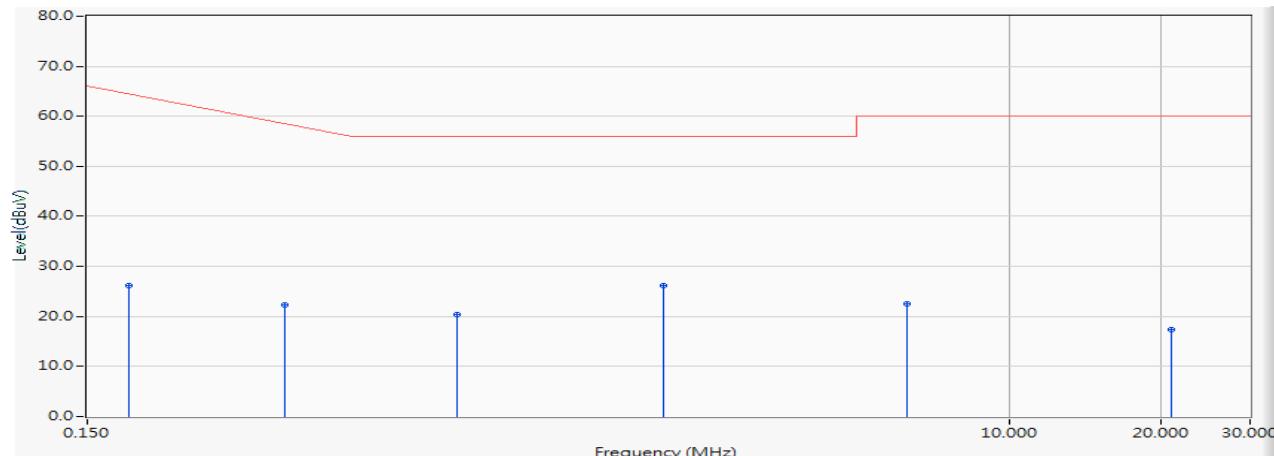
## 2.4. Uncertainty

± 2.26 dB

## 2.5. Test Result of Conducted Emission

Product : Gaming Mouse  
 Test Item : Conducted Emission Test  
 Power Line : Line (+)  
 Test Date : 2019/09/18  
 Test Mode : Mode 1: Transmit (2440MHz)

Line 1



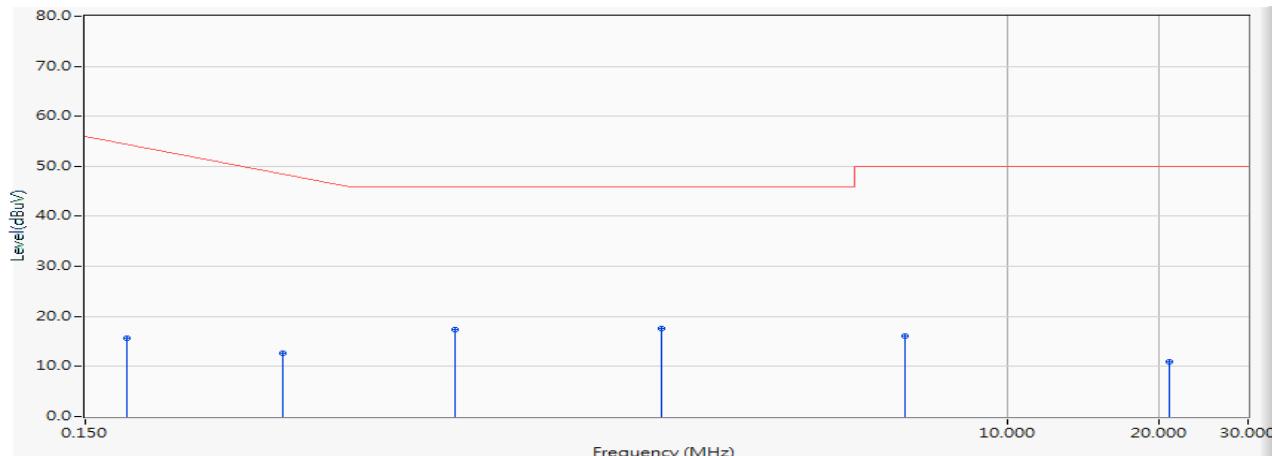
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	0.181	9.669	16.420	26.089	-39.025	65.114	QUASIPEAK
2	0.369	9.680	12.540	22.220	-37.523	59.743	QUASIPEAK
3	0.810	9.704	10.740	20.444	-35.556	56.000	QUASIPEAK
4	*	9.782	16.480	26.262	-29.738	56.000	QUASIPEAK
5	6.298	9.913	12.660	22.573	-37.427	60.000	QUASIPEAK
6	20.982	10.191	7.180	17.371	-42.629	60.000	QUASIPEAK

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “\*” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Gaming Mouse  
 Test Item : Conducted Emission Test  
 Power Line : Line (+)  
 Test Date : 2019/09/18  
 Test Mode : Mode 1: Transmit (2440MHz)

Line 1



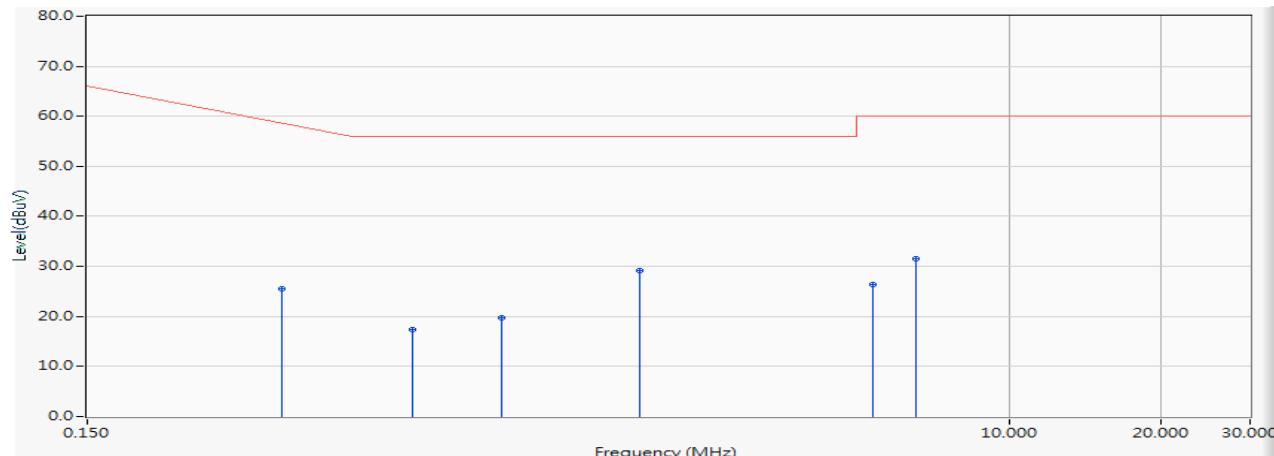
	<b>Frequency (MHz)</b>	<b>Correct Factor (dB)</b>	<b>Reading Level (dBuV)</b>	<b>Measure Level (dBuV)</b>	<b>Margin (dB)</b>	<b>Limit (dBuV)</b>	<b>Detector Type</b>
1	0.181	9.669	5.910	15.579	-39.535	55.114	AVERAGE
2	0.369	9.680	2.870	12.550	-37.193	49.743	AVERAGE
3	0.810	9.704	7.580	17.284	-28.716	46.000	AVERAGE
4	*	9.782	7.800	17.582	-28.418	46.000	AVERAGE
5	6.298	9.913	6.220	16.133	-33.867	50.000	AVERAGE
6	20.982	10.191	0.710	10.901	-39.099	50.000	AVERAGE

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “\*” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Gaming Mouse  
 Test Item : Conducted Emission Test  
 Power Line : Line (-)  
 Test Date : 2019/09/18  
 Test Mode : Mode 1: Transmit (2440MHz)

Line2



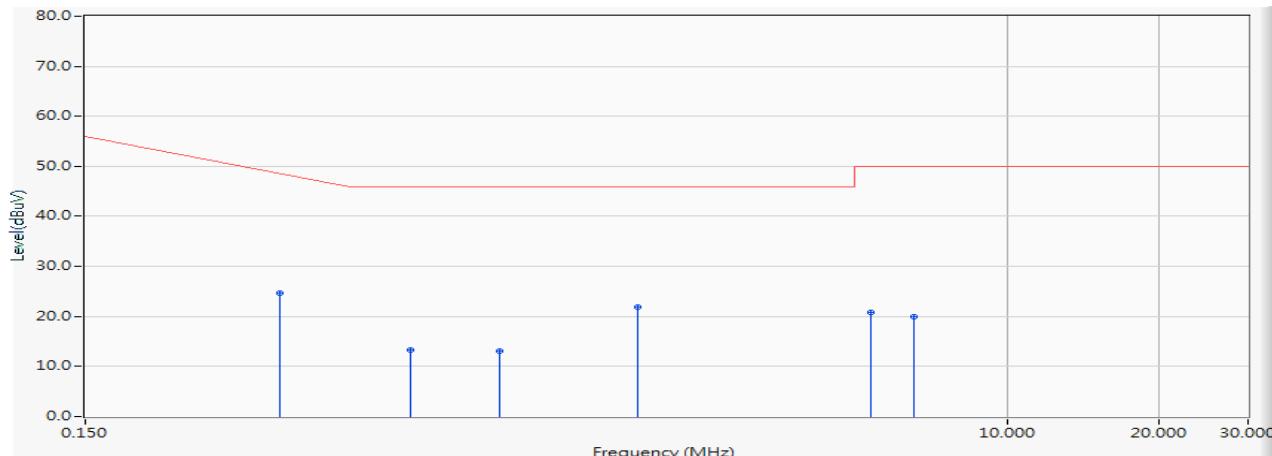
	<b>Frequency (MHz)</b>	<b>Correct Factor (dB)</b>	<b>Reading Level (dBuV)</b>	<b>Measure Level (dBuV)</b>	<b>Margin (dB)</b>	<b>Limit (dBuV)</b>	<b>Detector Type</b>
1	0.365	9.709	15.720	25.429	-34.428	59.857	QUASIPEAK
2	0.658	9.725	7.600	17.325	-38.675	56.000	QUASIPEAK
3	0.990	9.754	10.000	19.754	-36.246	56.000	QUASIPEAK
4	*	9.811	19.400	29.211	-26.789	56.000	QUASIPEAK
5	5.396	9.932	16.420	26.352	-33.648	60.000	QUASIPEAK
6	6.533	9.968	21.640	31.608	-28.392	60.000	QUASIPEAK

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “\*” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Gaming Mouse  
 Test Item : Conducted Emission Test  
 Power Line : Line (-)  
 Test Date : 2019/09/18  
 Test Mode : Mode 1: Transmit (2440MHz)

Line2



	<b>Frequency (MHz)</b>	<b>Correct Factor (dB)</b>	<b>Reading Level (dBuV)</b>	<b>Measure Level (dBuV)</b>	<b>Margin (dB)</b>	<b>Limit (dBuV)</b>	<b>Detector Type</b>
1	0.365	9.709	15.040	24.749	-25.108	49.857	AVERAGE
2	0.658	9.725	3.490	13.215	-32.785	46.000	AVERAGE
3	0.990	9.754	3.310	13.064	-32.936	46.000	AVERAGE
4	* 1.861	9.811	12.150	21.961	-24.039	46.000	AVERAGE
5	5.396	9.932	10.830	20.762	-29.238	50.000	AVERAGE
6	6.533	9.968	10.030	19.998	-30.002	50.000	AVERAGE

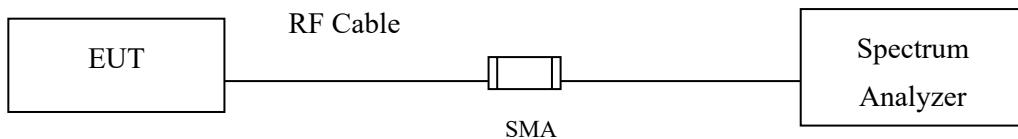
Note:

1. All Reading Levels are Quasi-Peak and average value.
2. “\*” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

### 3. Peak Power Output

#### 3.1. Test Setup

Conducted Measurement



#### 3.2. Limits

The maximum peak power shall be less 1 Watt.

#### 3.3. Test Procedure

The EUT was tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements. The maximum peak conducted output power using KDB 558074 D01 DTS Meas Guidance v04 section 9.1.3 PKPM1 Peak power meter method.

#### 3.4. Uncertainty

$\pm 1.19$  dB

### 3.5. Test Result of Peak Power Output

Product : Gaming Mouse  
Test Item : Peak Power Output Data  
Test Site : No.3 OATS  
Test Date : 2019/09/16  
Test Mode : Mode 1: Transmit

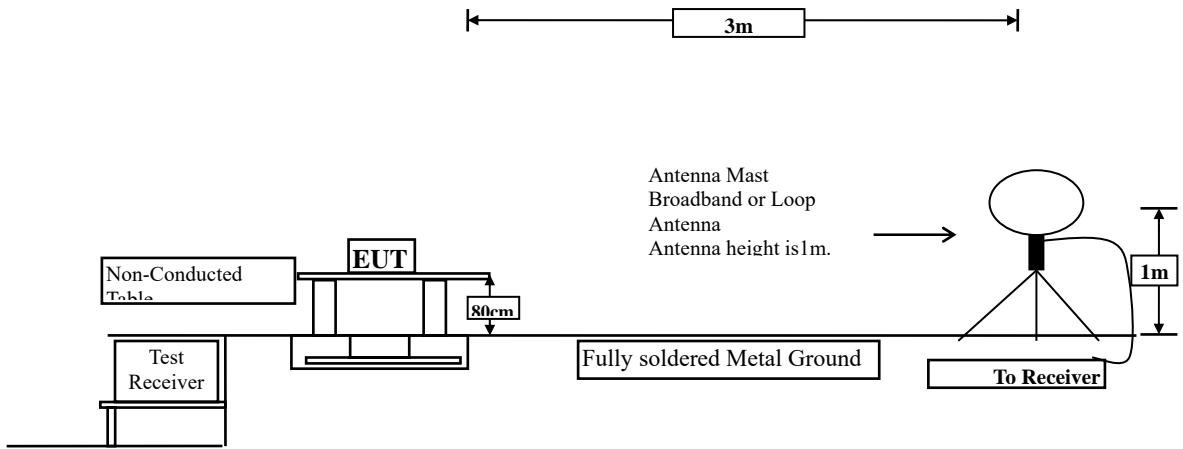
Channel No.	Frequency (MHz)	Average Power (dBm)	Peak Power (dBm)	Required Limit (dBm)	Result
01	2403	0.21	0.29	<30dBm	Pass
38	2440	-0.03	0.04	<30dBm	Pass
78	2480	-0.28	-0.19	<30dBm	Pass

Note: Peak Power Output Value =Reading value on peak power meter + cable loss

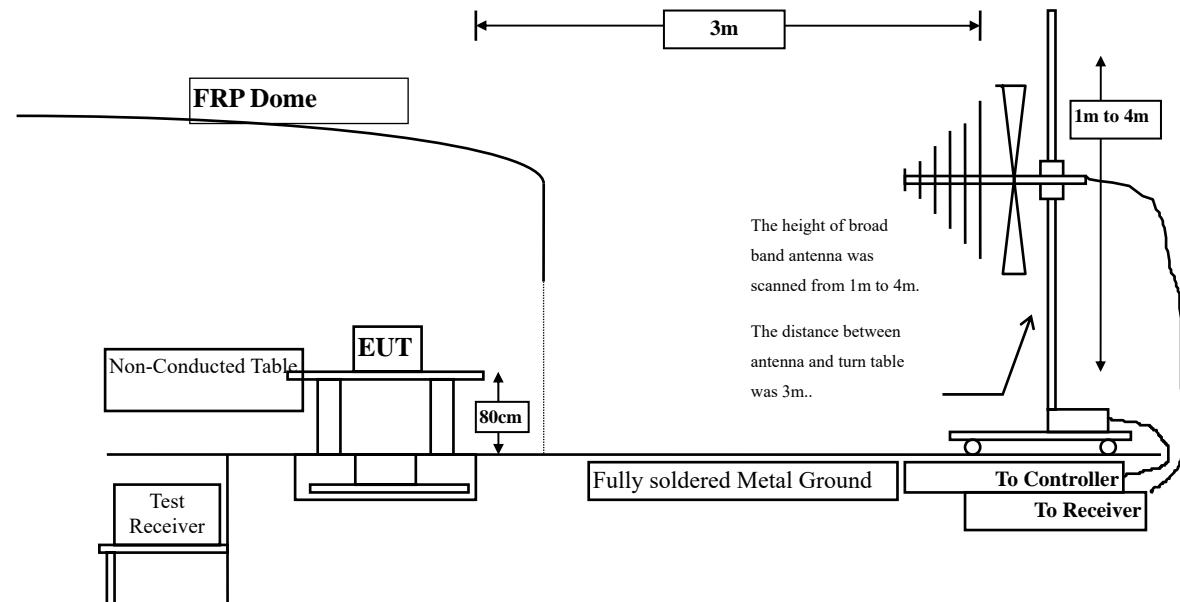
## 4. Radiated Emission

### 4.1. Test Setup

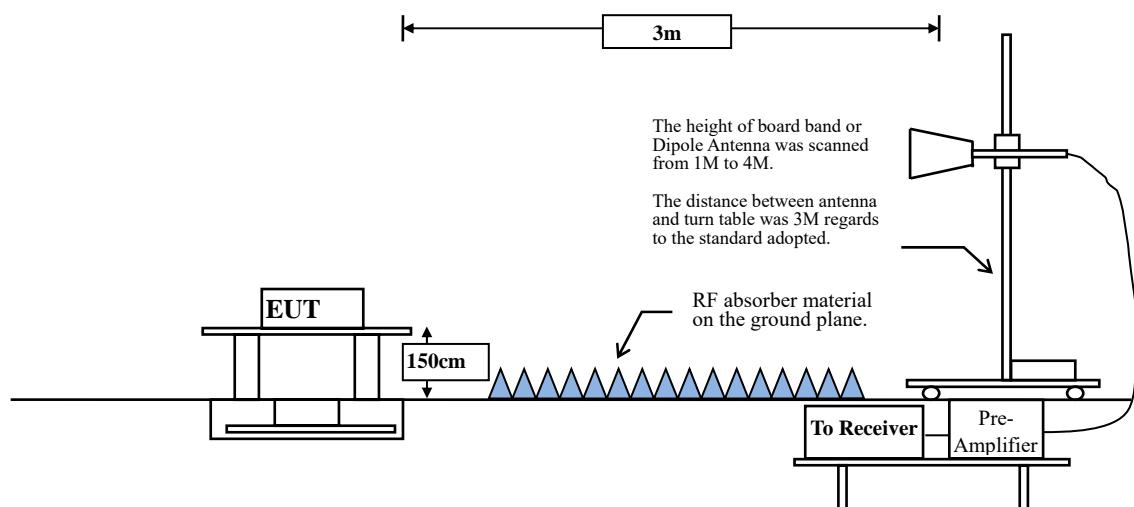
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



## Radiated Emission Above 1GHz



## 4.2. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209(a) Limits		
Frequency MHz	uV/m @3m	dBuV/m@3m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Remarks:E field strength (dBuV/m) = 20 log E field strength (uV/m)

## 4.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground, when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

**RBW and VBW Parameter setting:**

According to KDB 558074 section 12.2.4. Peak power measurement procedure

RBW = as specified in Table 1.

$VBW \geq 3 \times RBW$ .

**Table 1 —RBW as a function of frequency**

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

According to KDB 558074 section 12.2.5. Average power measurement procedure

RBW = 1MHz.

$VBW = 10\text{Hz}$ , when duty cycle  $\geq 98\%$

$VBW \geq 1/T$ , when duty cycle  $< 98\%$

( T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
GFSK	100	--	--	10

Note: Duty Cycle Refer to Section 9.

#### 4.4. Uncertainty

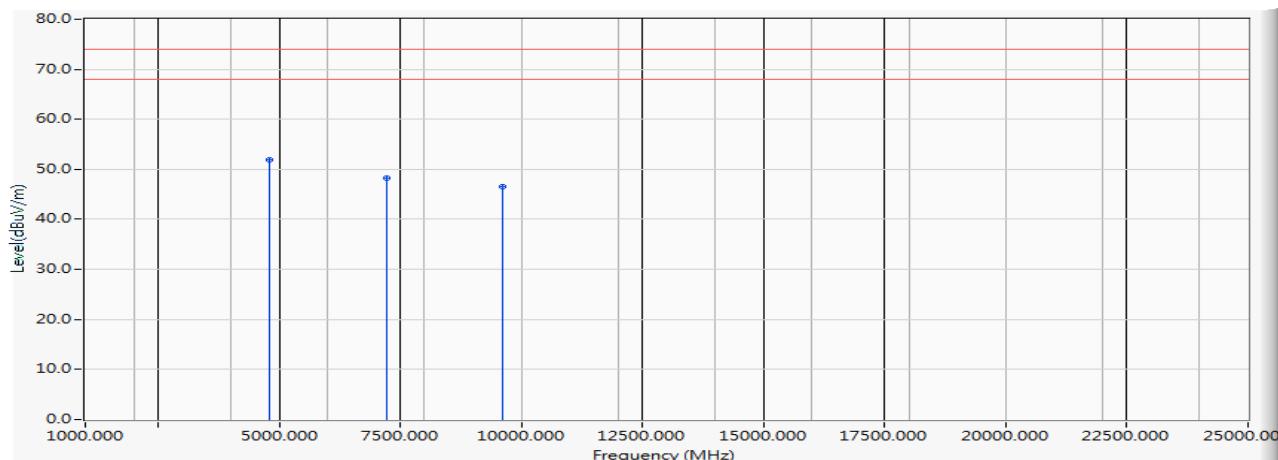
$\pm 4.08\text{ dB}$  above 1GHz

$\pm 4.22\text{ dB}$  below 1GHz

#### 4.5. Test Result of Radiated Emission

Product : Gaming Mouse  
 Test Item : Harmonic Radiated Emission Data  
 Test Date : 2019/09/24  
 Test Mode : Mode 1: Transmit (2403MHz)

Horizontal



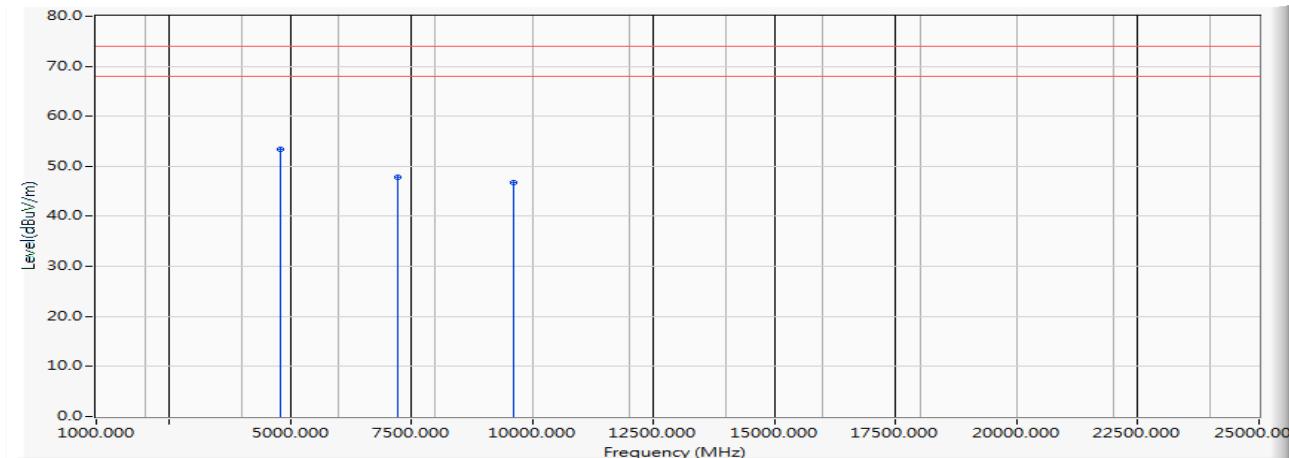
	<b>Frequency (MHz)</b>	<b>Correct Factor (dB)</b>	<b>Reading Level (dBuV)</b>	<b>Measure Level (dBuV/m)</b>	<b>Margin (dB)</b>	<b>Limit (dBuV/m)</b>	<b>Detector Type</b>	
1	*	4806.000	-15.214	67.090	51.876	-22.124	74.000	PEAK
2		7209.000	-12.037	60.280	48.243	-25.757	74.000	PEAK
3		9612.000	-11.709	58.290	46.580	-27.420	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Gaming Mouse  
 Test Item : Harmonic Radiated Emission Data  
 Test Date : 2019/09/24  
 Test Mode : Mode 1: Transmit (2403MHz)

Vertical



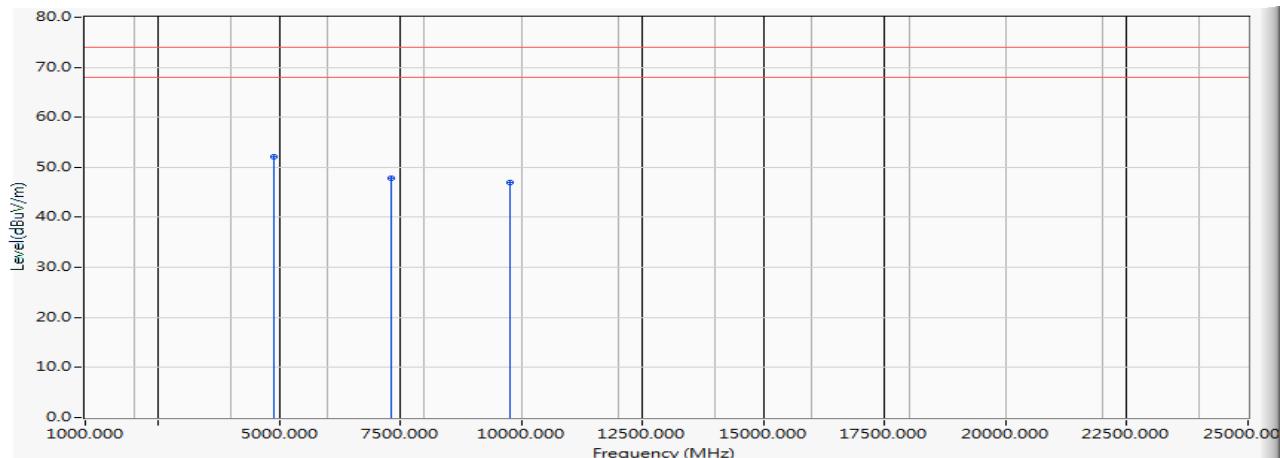
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4806.000	-15.214	68.610	53.396	-20.604	74.000	PEAK
2		7209.000	-12.037	59.800	47.763	-26.237	74.000	PEAK
3		9612.000	-11.709	58.380	46.670	-27.330	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Gaming Mouse  
 Test Item : Harmonic Radiated Emission Data  
 Test Date : 2019/09/24  
 Test Mode : Mode 1: Transmit (2440MHz)

## Horizontal



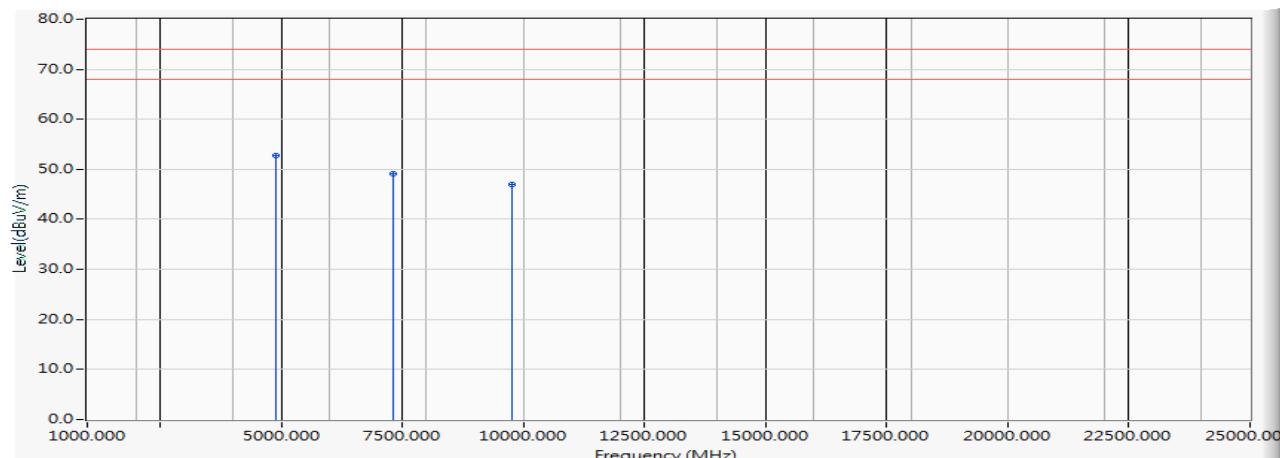
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type	
1	*	4880.000	-14.401	66.490	52.089	-21.911	74.000	PEAK
2		7320.000	-12.527	60.390	47.863	-26.137	74.000	PEAK
3		9760.000	-10.666	57.650	46.985	-27.015	74.000	PEAK

## Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Gaming Mouse  
 Test Item : Harmonic Radiated Emission Data  
 Test Date : 2019/09/24  
 Test Mode : Mode 1: Transmit (2440MHz)

Vertical



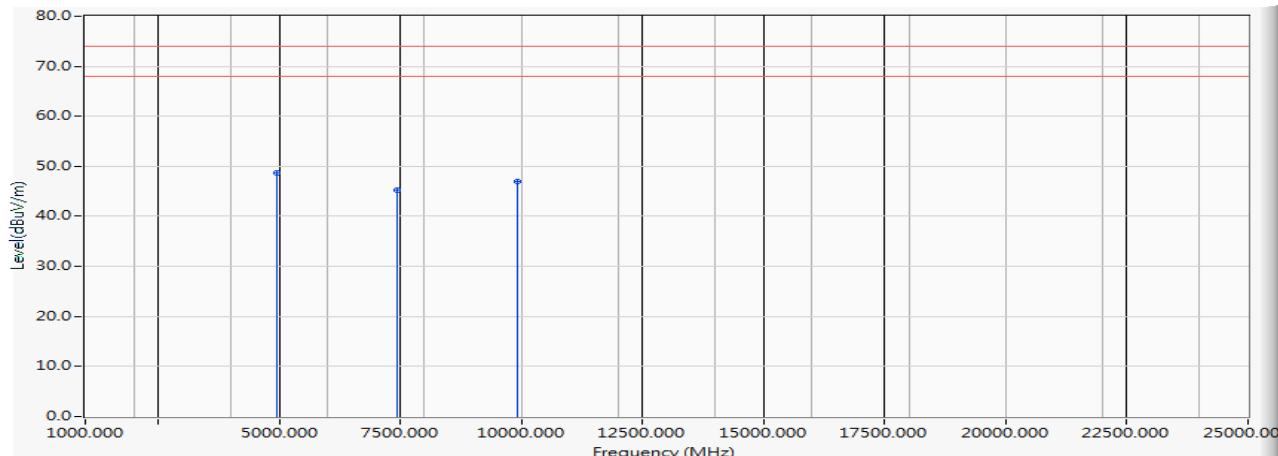
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type	
1	*	4880.000	-14.401	67.230	52.829	-21.171	74.000	PEAK
2		7320.000	-12.527	61.550	49.023	-24.977	74.000	PEAK
3		9760.000	-10.666	57.680	47.015	-26.985	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Gaming Mouse  
 Test Item : Harmonic Radiated Emission Data  
 Test Date : 2019/09/24  
 Test Mode : Mode 1: Transmit (2480MHz)

## Horizontal



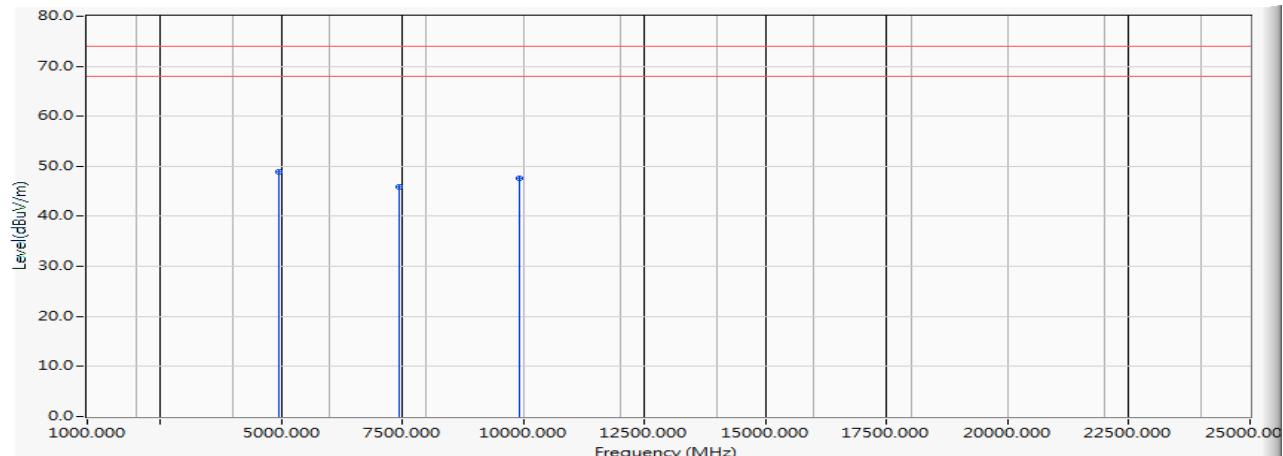
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4960.000	-13.462	62.190	48.728	-25.272	74.000	PEAK
2		7440.000	-13.842	59.200	45.358	-28.642	74.000	PEAK
3		9920.000	-12.531	59.580	47.049	-26.951	74.000	PEAK

## Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Gaming Mouse  
 Test Item : Harmonic Radiated Emission Data  
 Test Date : 2019/09/24  
 Test Mode : Mode 1: Transmit (2480MHz)

Vertical



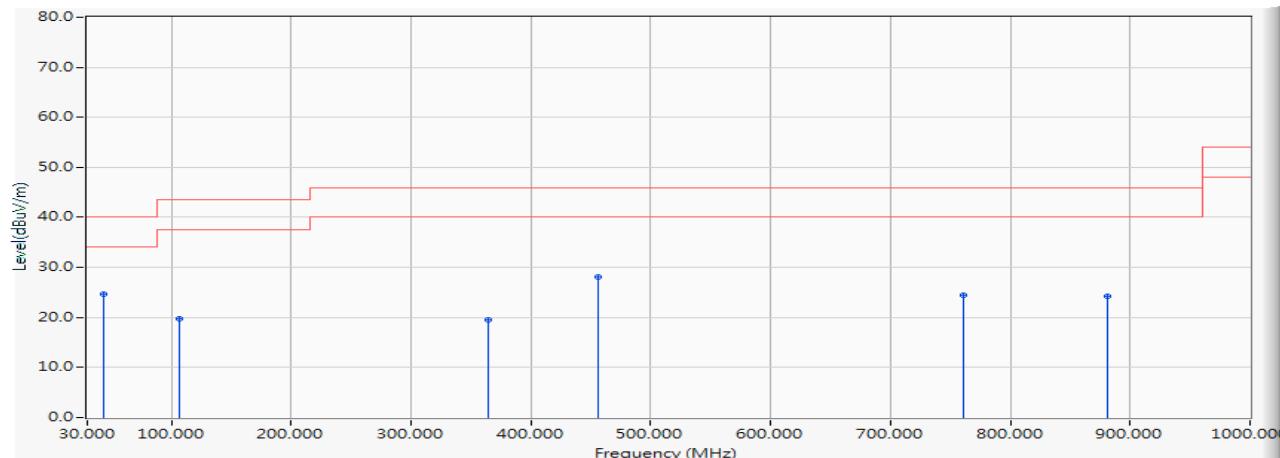
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4960.000	-13.462	62.310	48.848	-25.152	74.000	PEAK
2		7440.000	-13.842	59.640	45.798	-28.202	74.000	PEAK
3		9920.000	-12.531	60.110	47.579	-26.421	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Gaming Mouse  
 Test Item : General Radiated Emission Data  
 Test Date : 2019/09/06  
 Test Mode : Mode 1: Transmit (2440MHz)

#### Horizontal

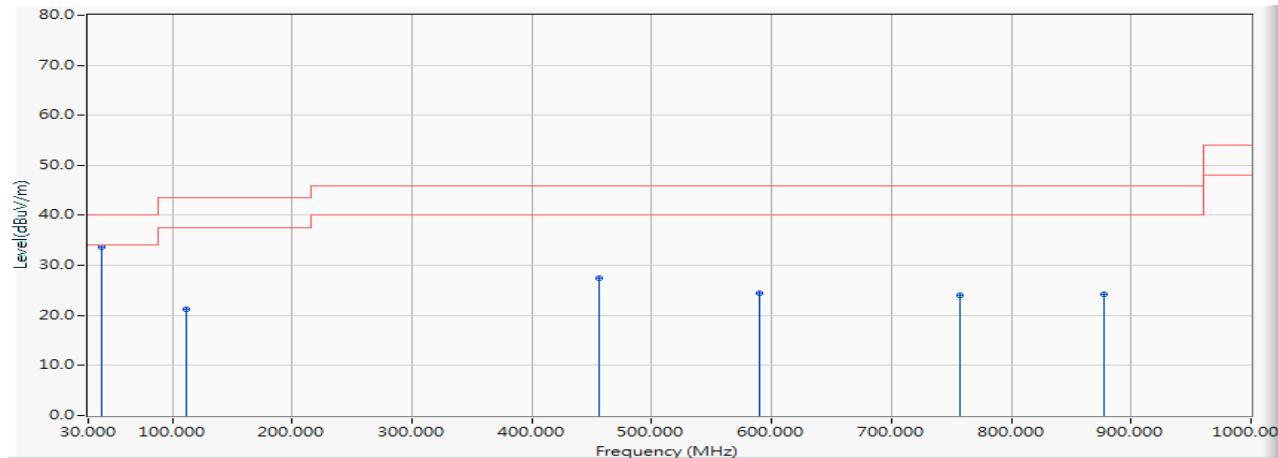


	<b>Frequency (MHz)</b>	<b>Correct Factor (dB)</b>	<b>Reading Level (dBuV)</b>	<b>Measure Level (dBuV/m)</b>	<b>Margin (dB)</b>	<b>Limit (dBuV/m)</b>	<b>Detector Type</b>	
1	*	44.058	-16.658	41.248	24.590	-15.410	40.000	QUASIPEAK
2		107.319	-16.039	35.847	19.808	-23.692	43.500	QUASIPEAK
3		364.580	-10.120	29.622	19.503	-26.497	46.000	QUASIPEAK
4		455.957	-8.361	36.452	28.091	-17.909	46.000	QUASIPEAK
5		761.014	-5.587	30.000	24.413	-21.587	46.000	QUASIPEAK
6		880.507	-6.286	30.541	24.255	-21.745	46.000	QUASIPEAK

#### Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Gaming Mouse  
 Test Item : General Radiated Emission Data  
 Test Date : 2019/09/06  
 Test Mode : Mode 1: Transmit (2440MHz)

**Vertical**


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	41.246	-16.998	50.586	33.588	-6.412	40.000	QUASIPEAK
2		111.536	-15.949	37.079	21.130	-22.370	43.500	QUASIPEAK
3		455.957	-8.361	35.777	27.416	-18.584	46.000	QUASIPEAK
4		589.507	-6.056	30.575	24.519	-21.481	46.000	QUASIPEAK
5		756.797	-5.868	29.811	23.943	-22.057	46.000	QUASIPEAK
6		877.696	-6.358	30.610	24.252	-21.748	46.000	QUASIPEAK

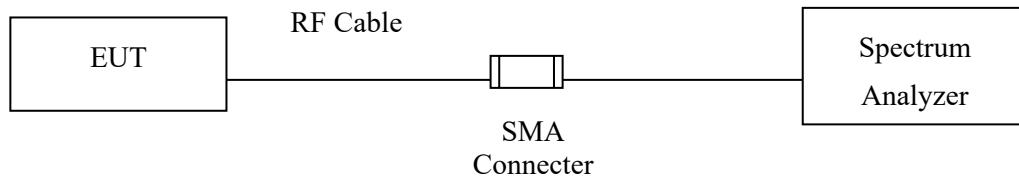
**Note:**

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

## 5. RF antenna conducted test

### 5.1. Test Setup

#### RF antenna Conducted Measurement:



### 5.2. Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

### 5.3. Test Procedure

The EUT was tested according to DTS test procedure of Jan. 2012 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 100 kHz, Set VBW > RBW, scan up through 10th harmonic.

### 5.4. Uncertainty

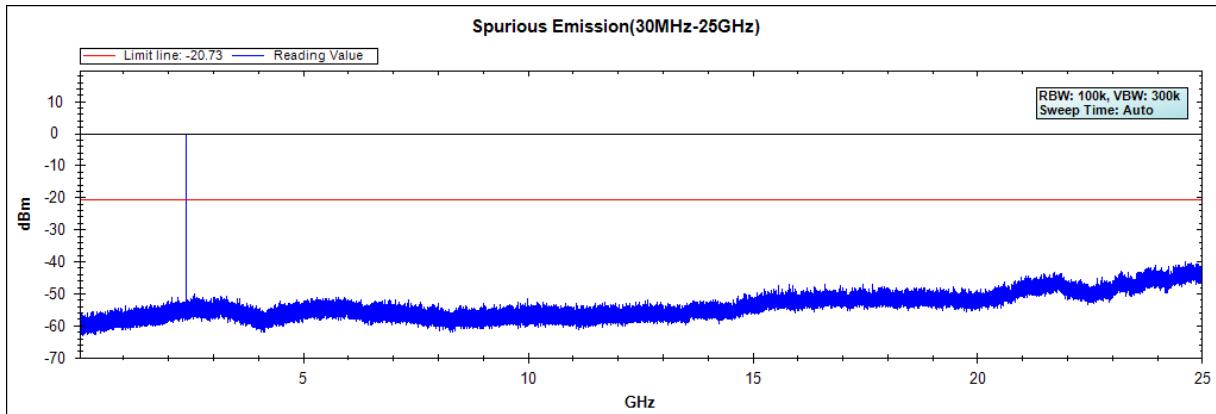
The measurement uncertainty

Conducted is defined as  $\pm 1.20\text{dB}$

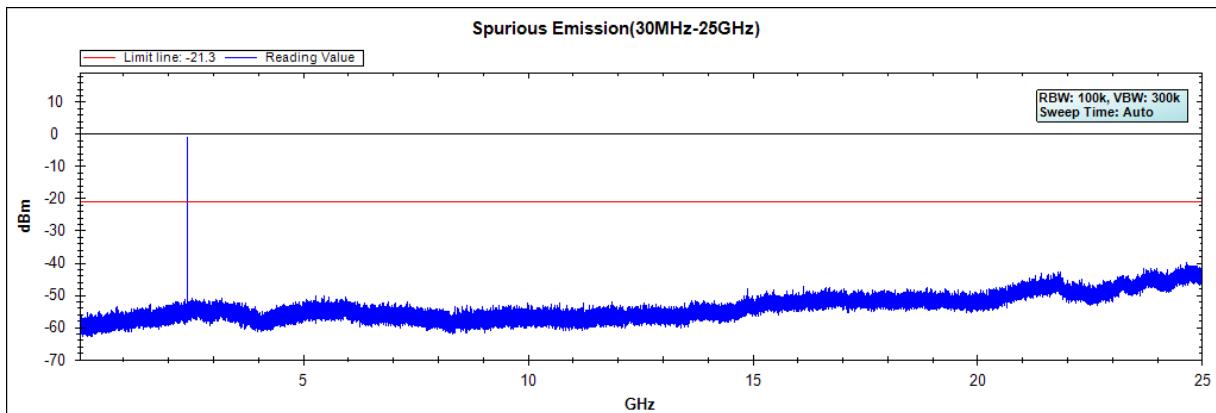
## 5.5. Test Result of RF antenna conducted test

Product : Gaming Mouse  
Test Item : RF antenna conducted test  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit

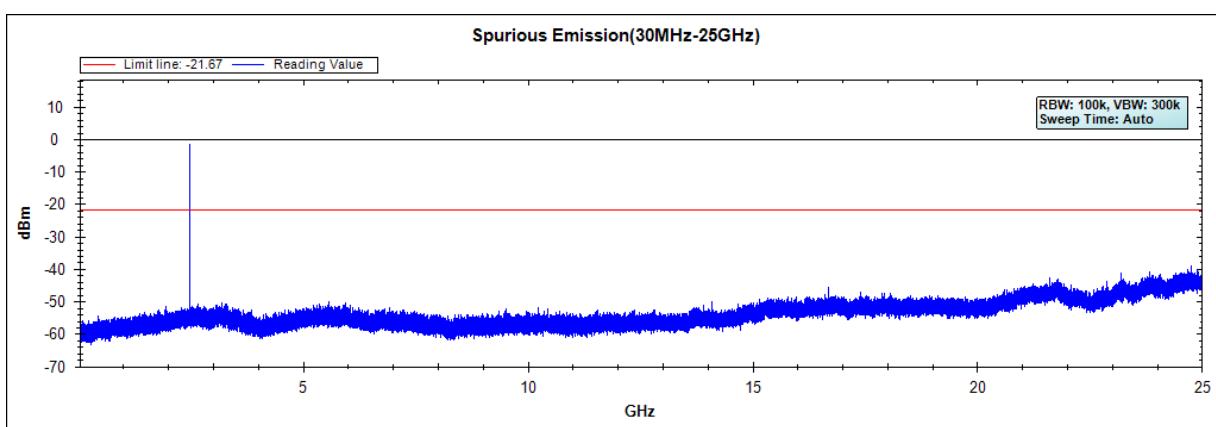
### (2403MHz) 30M-25GHz



### (2440MHz) 30M-25GHz



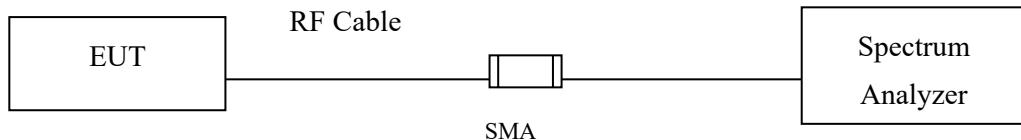
### (2480MHz) 30M-25GHz



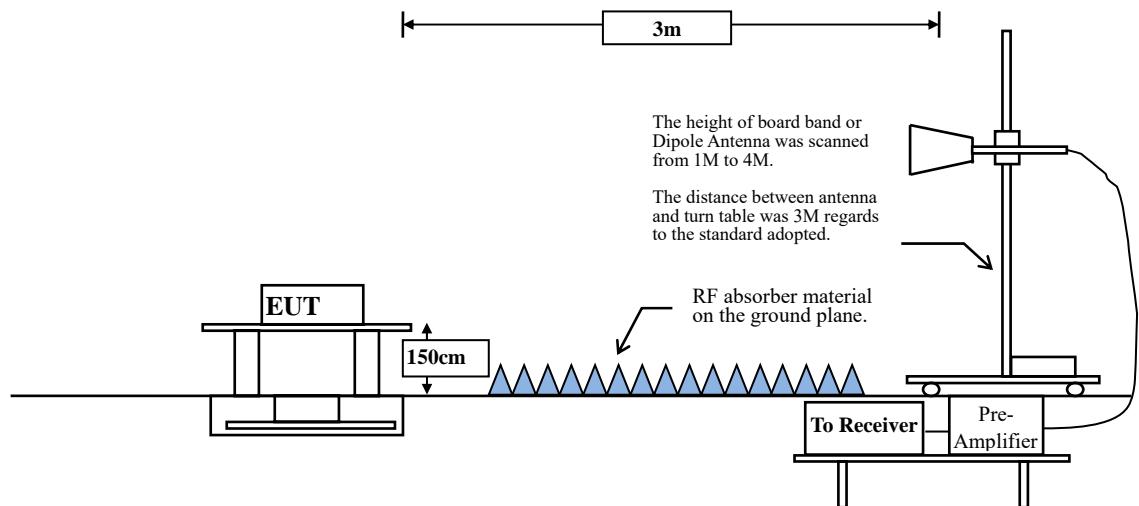
## 6. Band Edge

### 6.1. Test Setup

#### RF Conducted Measurement



#### RF Radiated Measurement:



### 6.2. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

### 6.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.

#### RBW and VBW Parameter setting:

According to KDB 558074 section 12.2.4. Peak power measurement procedure

RBW = as specified in Table 1.

$VBW \geq 3 \times RBW$ .

**Table 1 —RBW as a function of frequency**

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

According to KDB 558074 section 12.2.5. Average power measurement procedure

$RBW = 1\text{MHz}$ .

$VBW = 10\text{Hz}$ , when duty cycle  $\geq 98\%$

$VBW \geq 1/T$ , when duty cycle  $< 98\%$

( T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
GFSK	100	--	--	10

Note: Duty Cycle Refer to Section 9.

### 6.4. Uncertainty

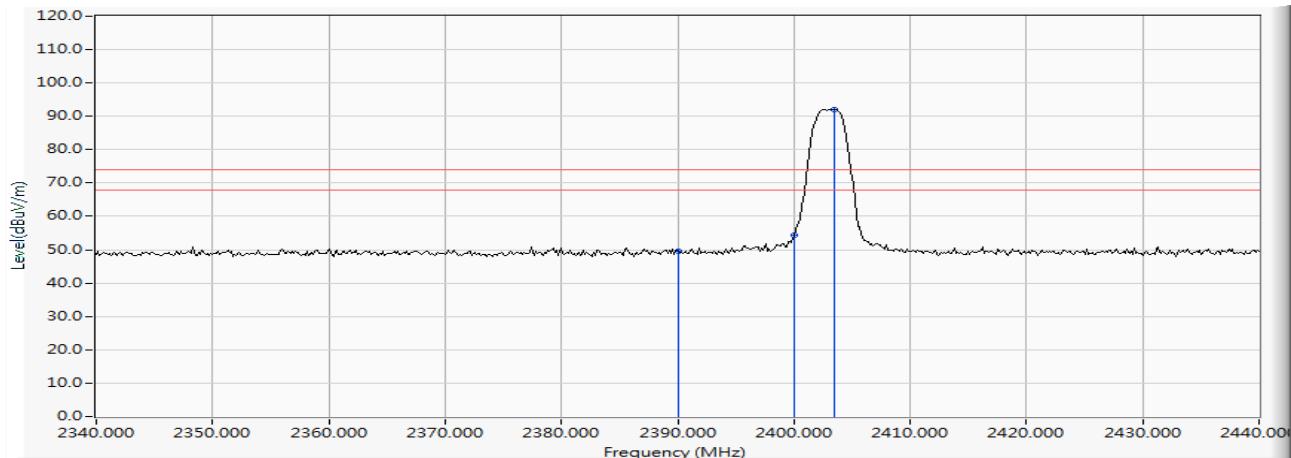
$\pm 4.08\text{ dB}$  above 1GHz

$\pm 4.22\text{ dB}$  below 1GHz

## 6.5. Test Result of Band Edge

Product : Gaming Mouse  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2403MHz)

### Horizontal



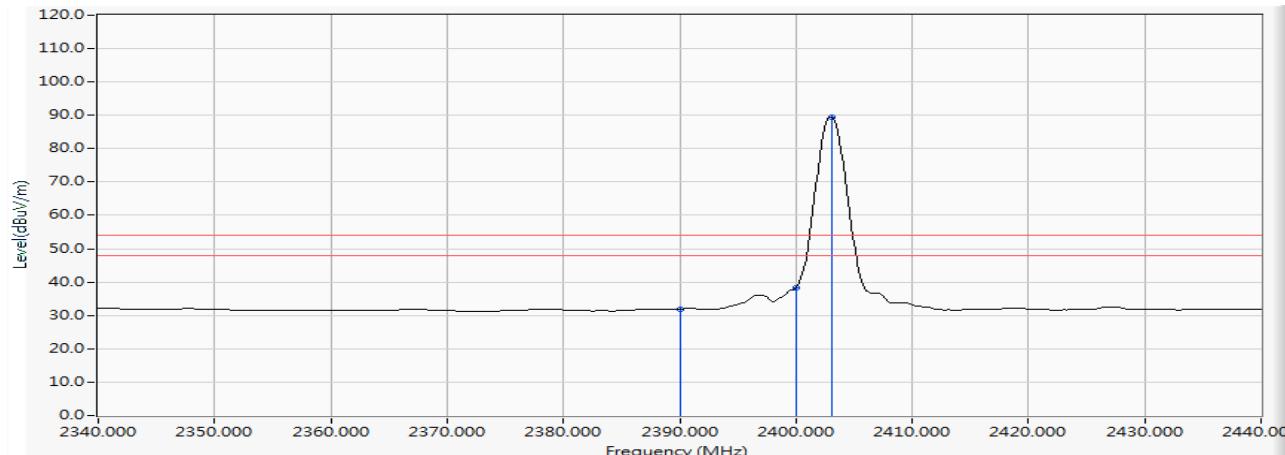
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2390.000	8.763	40.795	49.558	-24.442	74.000	PEAK
2	2400.000	8.799	45.691	54.490	--	--	PEAK
3 *	2403.478	8.811	83.196	92.008	--	--	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Gaming Mouse  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2403MHz)

### Horizontal

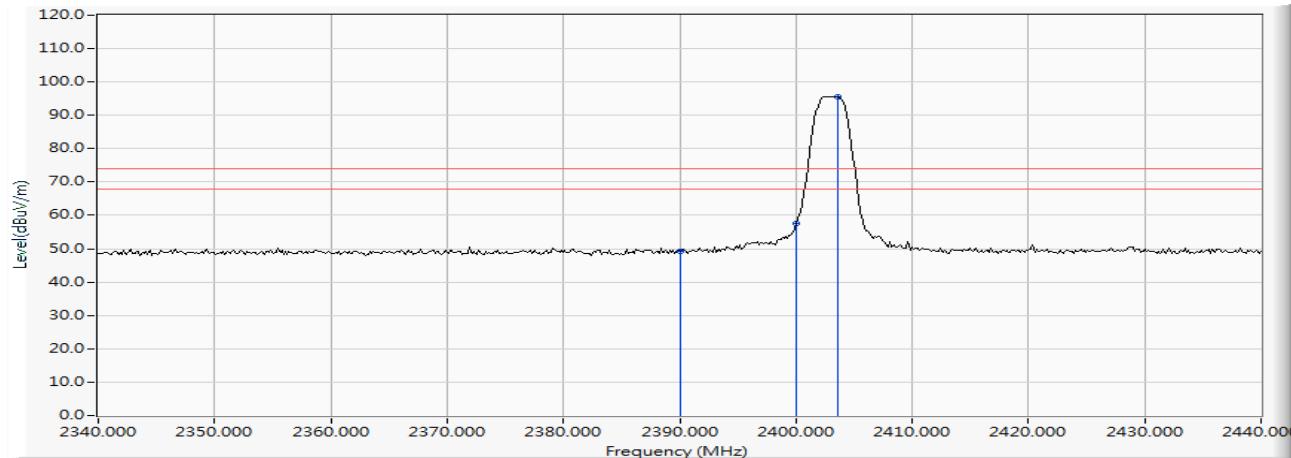


	<b>Frequency (MHz)</b>	<b>Correct Factor (dB)</b>	<b>Reading Level (dBuV)</b>	<b>Measure Level (dBuV/m)</b>	<b>Margin (dB)</b>	<b>Limit (dBuV/m)</b>	<b>Detector Type</b>
1	2390.000	8.763	23.171	31.934	-22.066	54.000	AVERAGE
2	2400.000	8.799	29.571	38.370	--	--	AVERAGE
3	*	2403.043	80.568	89.378	--	--	AVERAGE

### Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Gaming Mouse  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2403MHz)

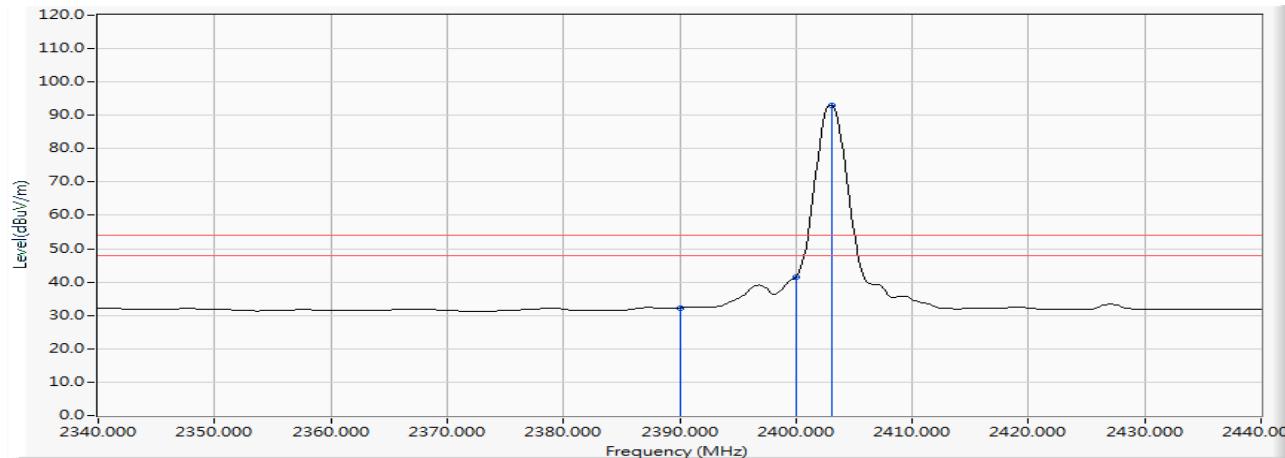
**Vertical**


	<b>Frequency (MHz)</b>	<b>Correct Factor (dB)</b>	<b>Reading Level (dBuV)</b>	<b>Measure Level (dBuV/m)</b>	<b>Margin (dB)</b>	<b>Limit (dBuV/m)</b>	<b>Detector Type</b>
1	2390.000	8.763	40.300	49.063	-24.937	74.000	PEAK
2	2400.000	8.799	48.685	57.484	--	--	PEAK
3	*	2403.623	8.813	86.837	95.649	--	--

**Note:**

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Gaming Mouse  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2403MHz)

**Vertical**


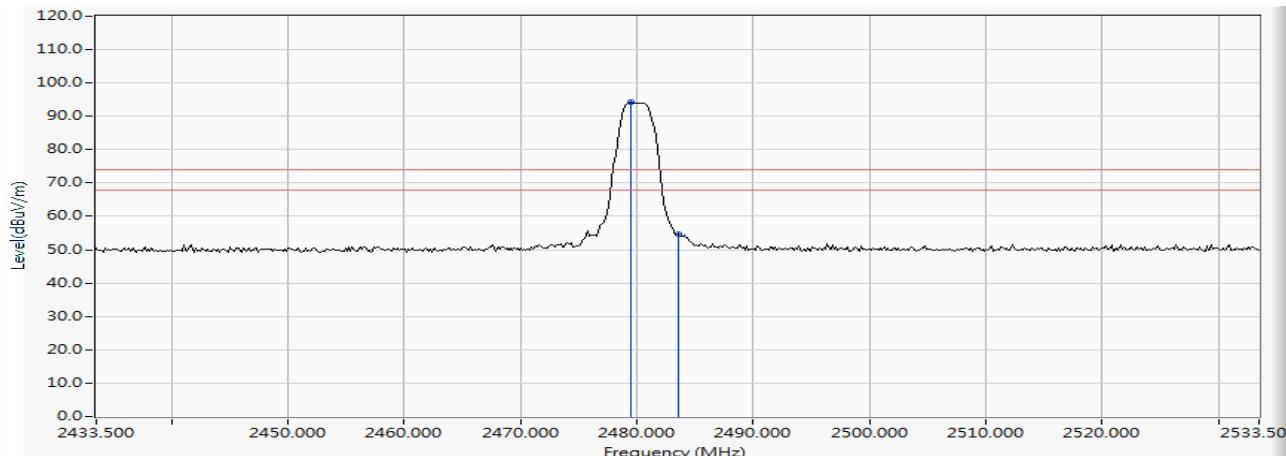
	<b>Frequency (MHz)</b>	<b>Correct Factor (dB)</b>	<b>Reading Level (dBuV)</b>	<b>Measure Level (dBuV/m)</b>	<b>Margin (dB)</b>	<b>Limit (dBuV/m)</b>	<b>Detector Type</b>
1	2390.000	8.763	23.538	32.301	-21.699	54.000	AVERAGE
2	2400.000	8.799	32.549	41.348	--	--	AVERAGE
3	*	2403.043	84.245	93.055	--	--	AVERAGE

**Note:**

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Gaming Mouse  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2480MHz)

### Horizontal

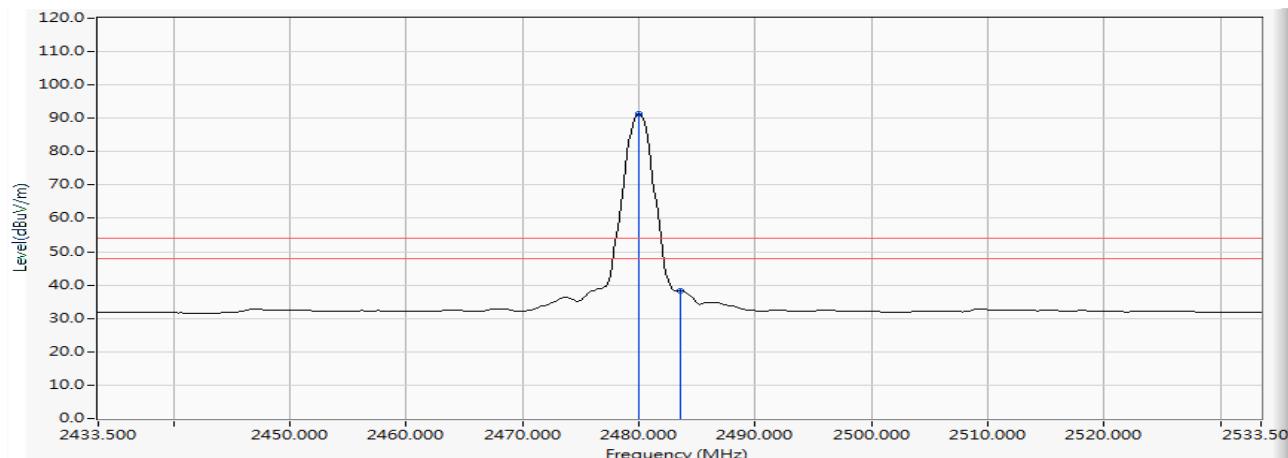


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2479.442	9.084	85.026	94.110	--	--	PEAK
2		2483.500	9.100	45.635	54.734	-19.266	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Gaming Mouse  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2480MHz)

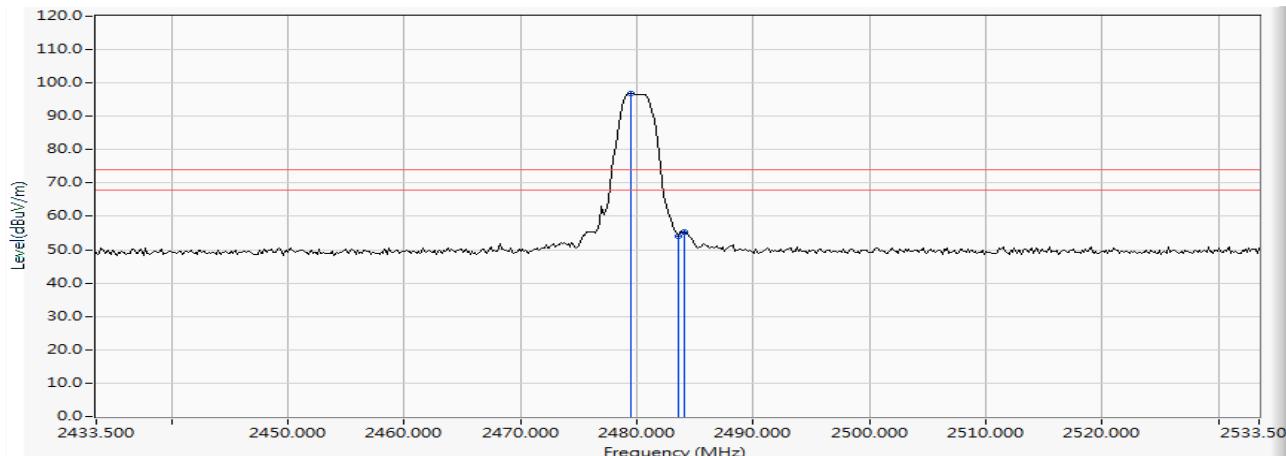
**Horizontal**


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	9.086	82.152	91.239	--	--	AVERAGE
2		2483.500	9.100	29.143	38.242	-15.758	54.000	AVERAGE

**Note:**

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Gaming Mouse  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2480MHz)

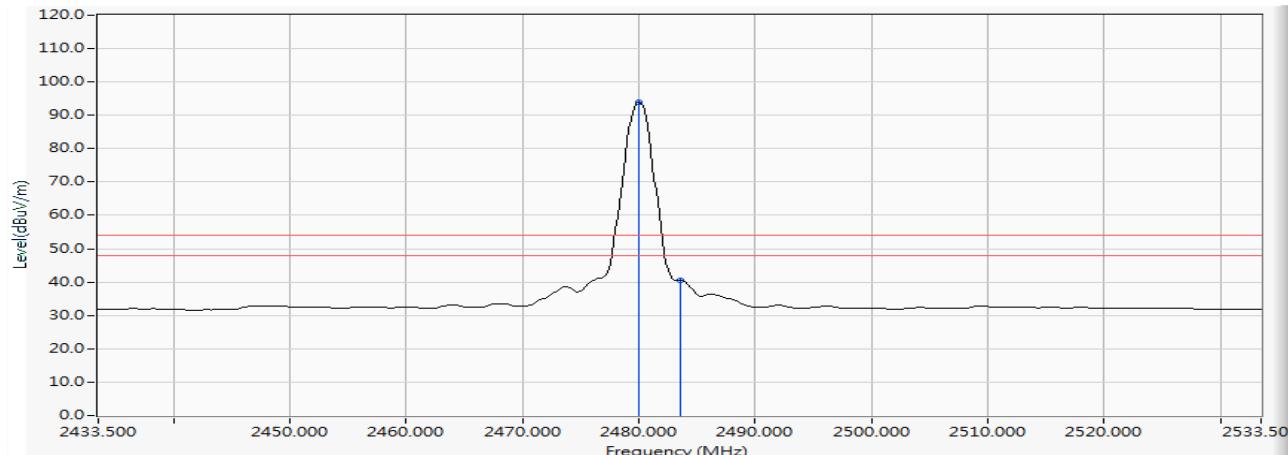
**Vertical**


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2479.442	9.084	87.713	96.797	--	--	PEAK
2		2483.500	9.100	44.931	54.030	-19.970	74.000	PEAK
3		2484.080	9.102	46.129	55.230	-18.770	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Gaming Mouse  
 Test Item : Band Edge Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2480MHz)

**Vertical**


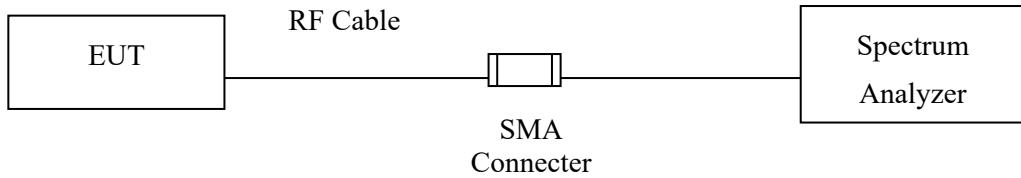
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	9.086	84.877	93.964	--	--	AVERAGE
2		2483.500	9.100	31.363	40.462	-13.538	54.000	AVERAGE

**Note:**

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

## 7. 6dB Bandwidth

### 7.1. Test Setup



### 7.2. Limits

The minimum bandwidth shall be at least 500 kHz.

### 7.3. Test Procedure

The EUT was setup according to ANSI C63.4, 2014; tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

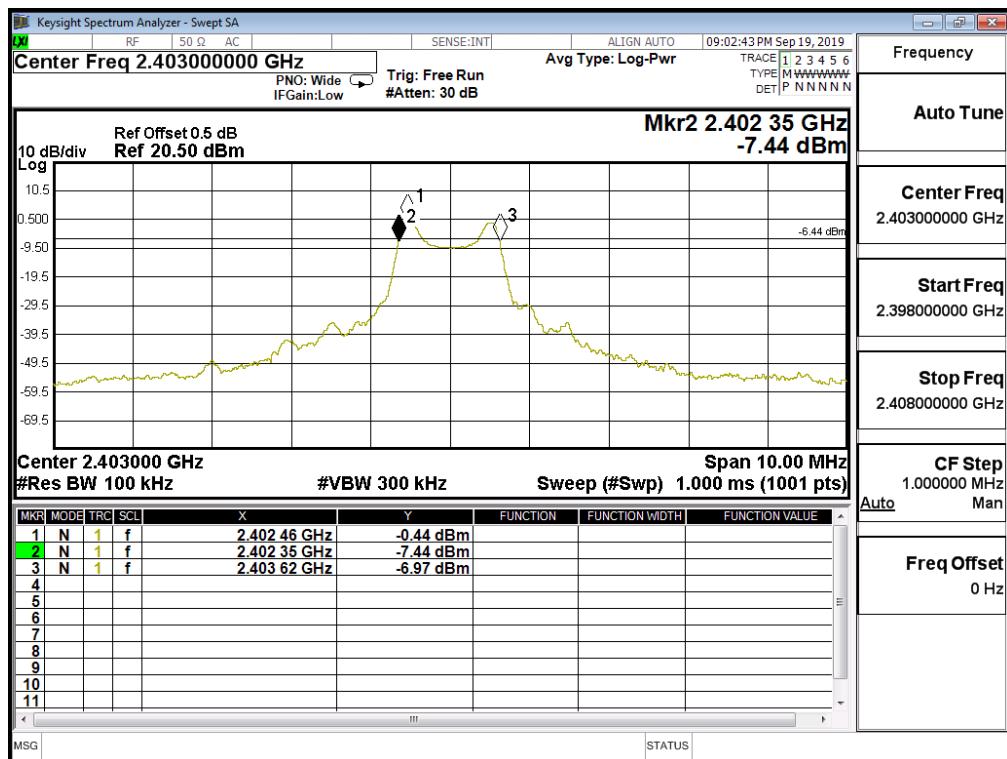
### 7.4. Uncertainty

± 283Hz

## 7.5. Test Result of 6dB Bandwidth

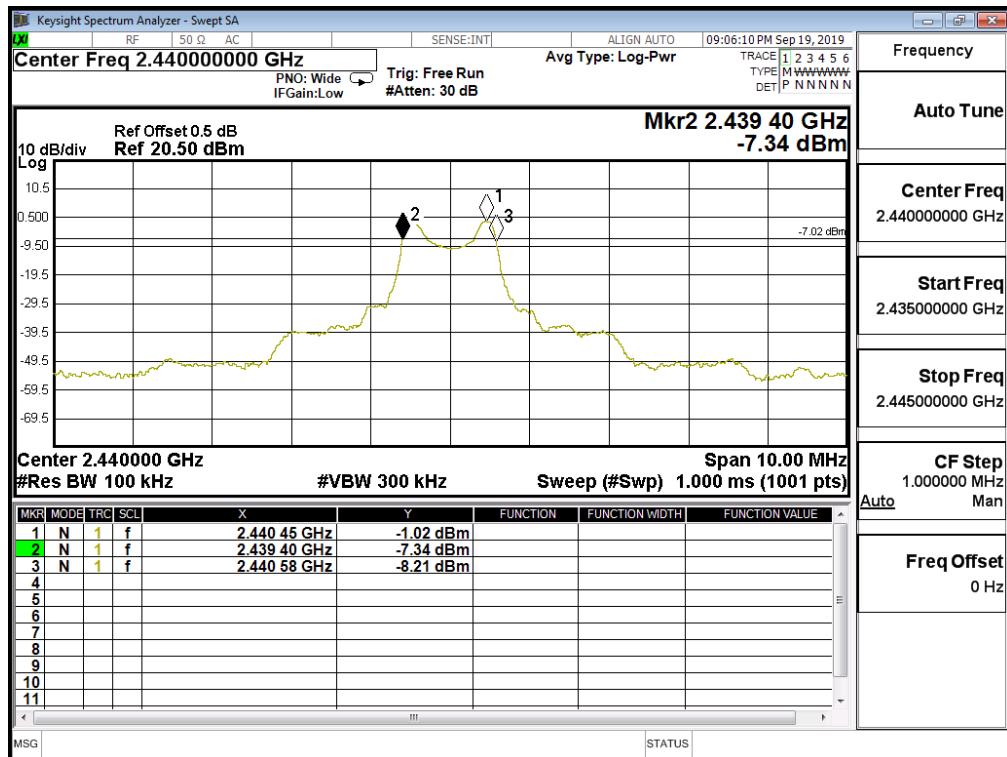
Product : Gaming Mouse  
 Test Item : 6dB Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2403MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
01	2403.00	1270	>500	Pass



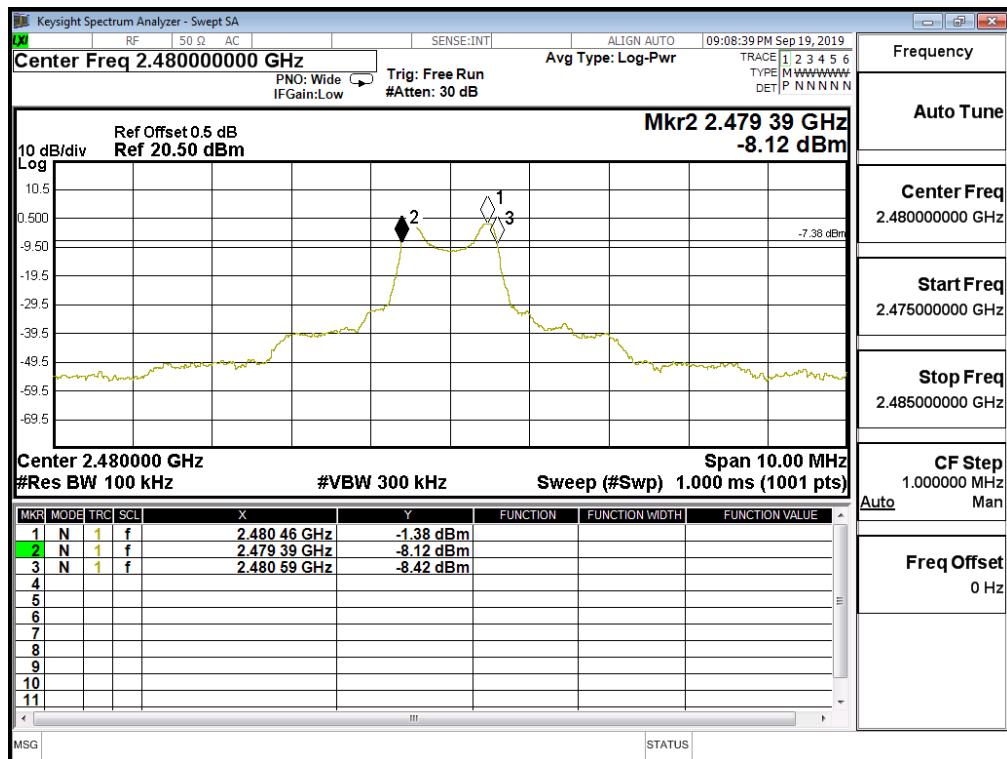
Product : Gaming Mouse  
 Test Item : 6dB Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
38	2440.00	1180	>500	Pass



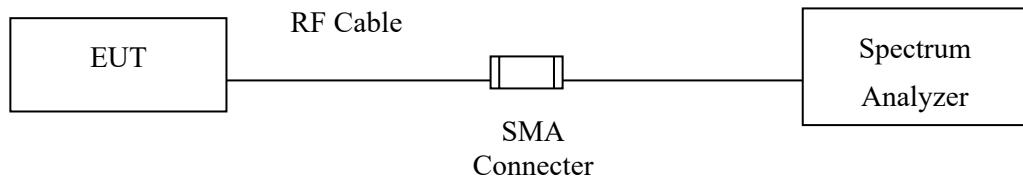
Product : Gaming Mouse  
 Test Item : 6dB Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2480MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
78	2480.00	1200	>500	Pass



## 8. Power Density

### 8.1. Test Setup



### 8.2. Limits

The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

### 8.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013; tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

The maximum power spectral density using KDB 558074 section 10.2 PKPSD (peak PSD) method.

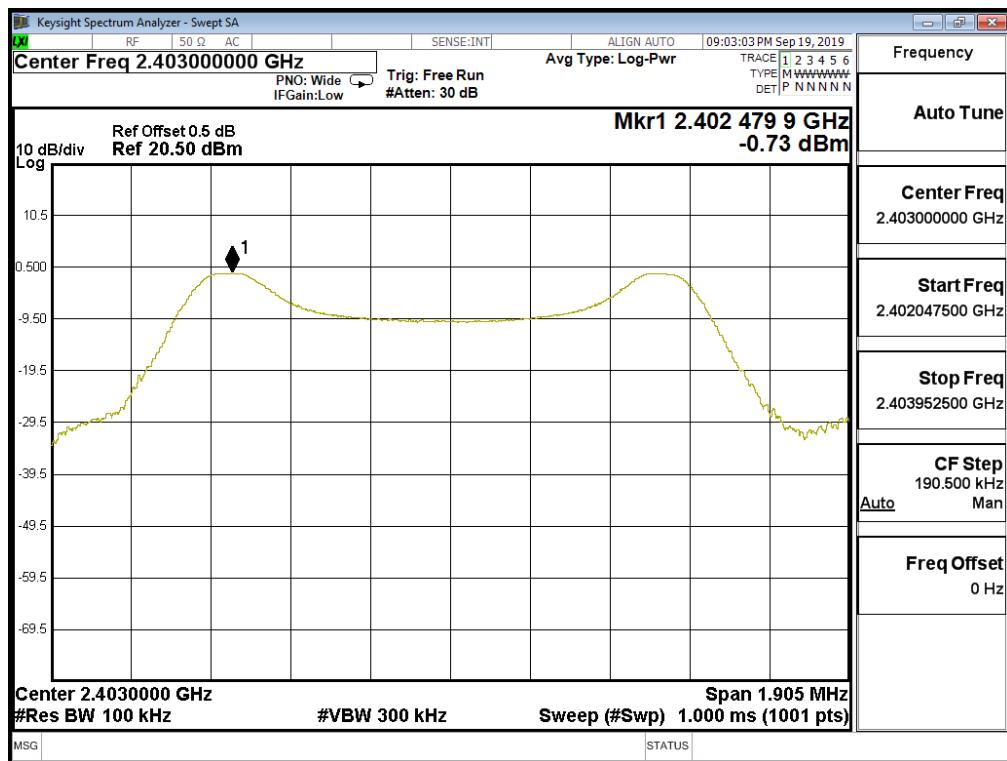
### 8.4. Uncertainty

± 1.20 dB

## 8.5. Test Result of Power Density

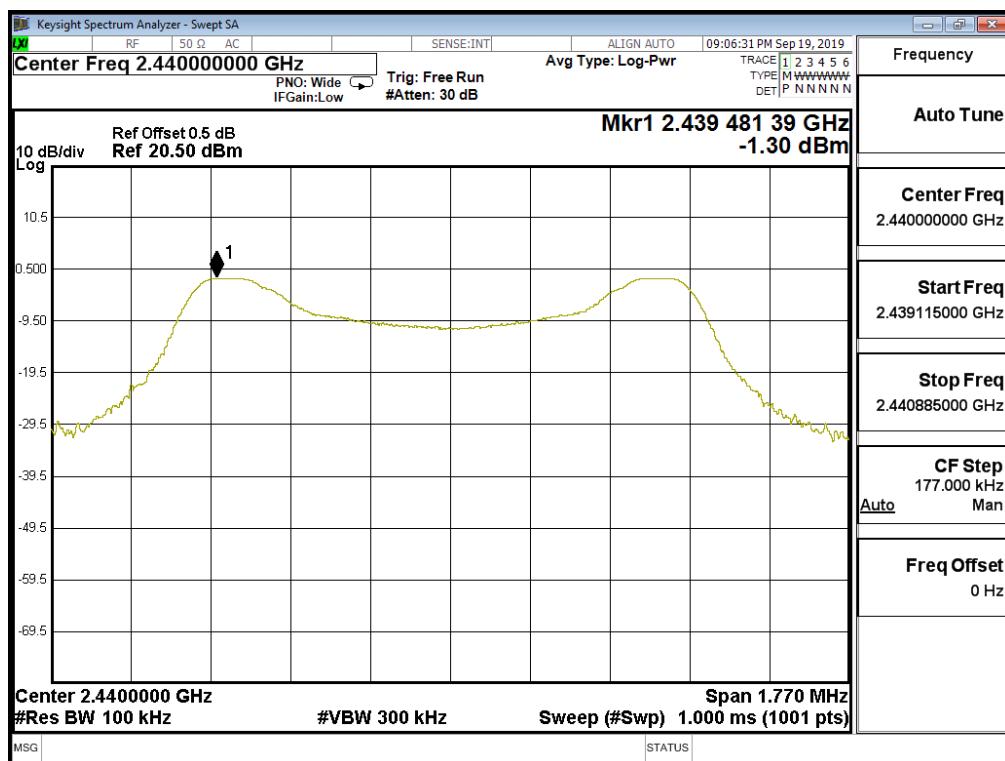
Product : Gaming Mouse  
 Test Item : Power Density Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit(2403MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
01	2403.00	-0.730	≤8dBm	Pass



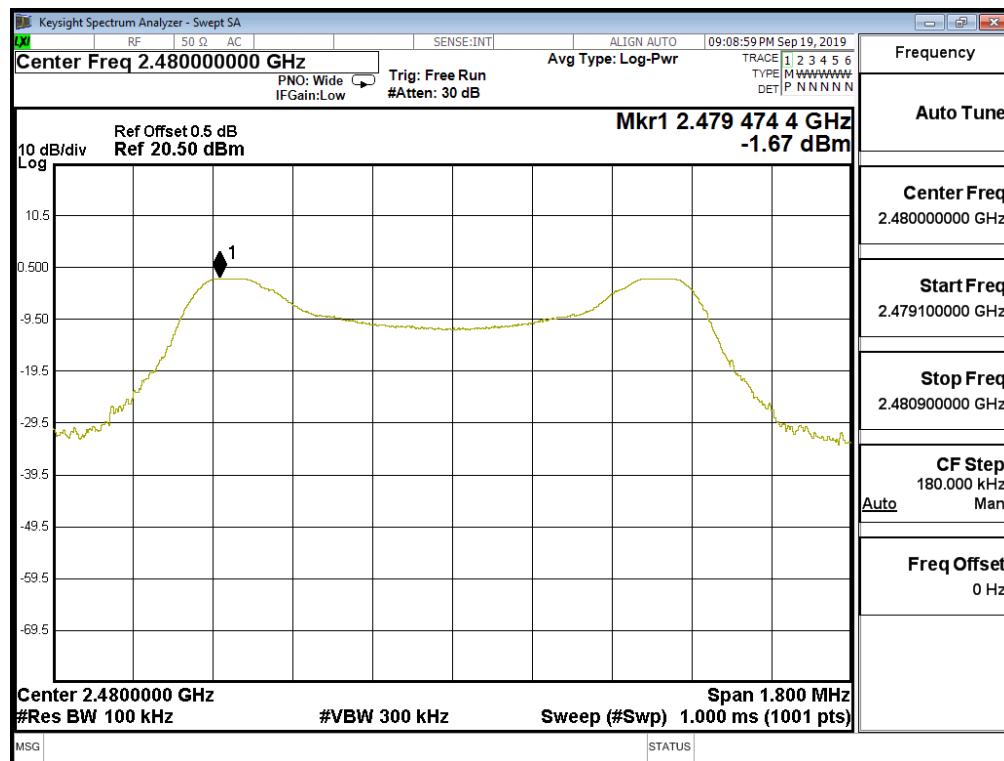
Product : Gaming Mouse  
 Test Item : Power Density Data  
 Test Site : No.3OATS  
 Test Mode : Mode 1: Transmit (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
38	2440	-1.300	≤8dBm	Pass



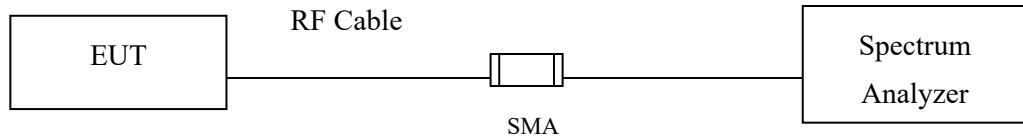
Product : Gaming Mouse  
 Test Item : Power Density Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit (2480MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
78	2480.00	-1.670	≤8dBm	Pass



## 9. Duty Cycle

### 9.1. Test Setup



### 9.2. Test Procedure

The EUT was setup according to ANSI C63.10 2013; tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

### 9.3. Uncertainty

± 2.31msec

#### 9.4. Test Result of Duty Cycle

Product : Gaming Mouse  
 Test Item : Duty Cycle  
 Test Mode : Mode 1: Transmit

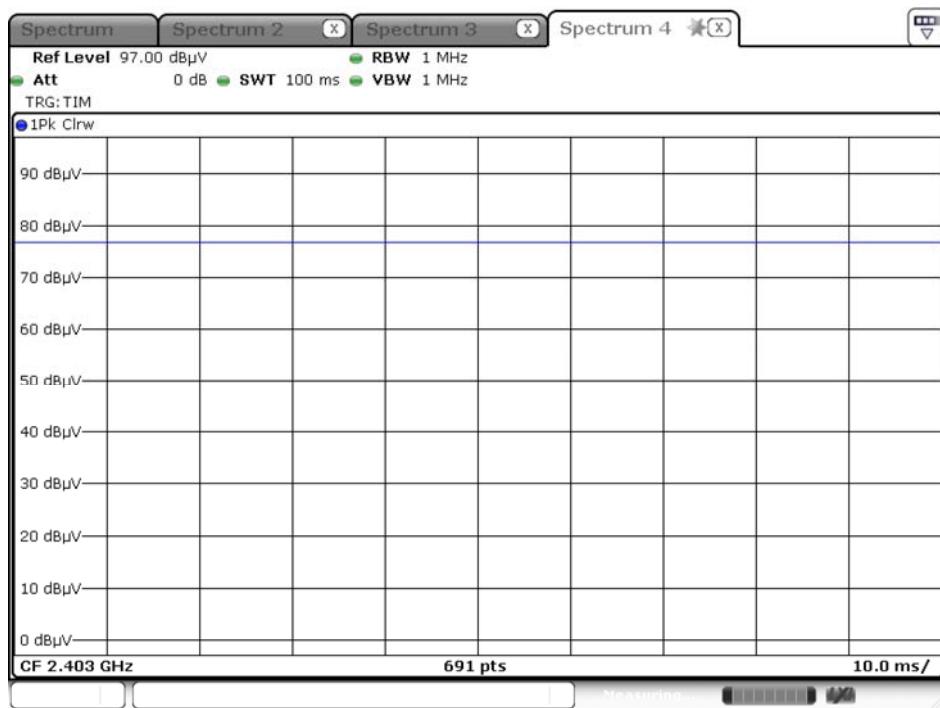
Duty Cycle Formula:

$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff})$$

$$\text{Duty Factor} = 10 \log (1/\text{Duty Cycle})$$

Results:

2.4GHz band	Ton (ms)	Ton + Toff (ms)	Duty Cycle (%)	Duty Factor (dB)
GFSK	--	--	100	--



**10. EMI Reduction Method During Compliance Testing**

No modification was made during testing.