FCC Test Report

Product Name	Gaming Mouse
Model No	P705
FCC ID.	XW3DKMSP705

Applicant	Dongguan Siliten Electronics CO.,LTD
Address	Sijia Yewu Industrial estate, Shijie Town, Dongguan, China

Date of Receipt	Sep. 16, 2019
Issue Date	Nov. 01, 2019
Report No.	1990207R-RFUSP23V00
Report Version	V1.0

Testing Laboratory
3023

Test Report

Issue Date: Nov. 01, 2019
Report No.: 1990207R-RFUSP23V00

Product Name	Gaming Mouse
Applicant	Dongguan Siliten Electronics CO.,LTD
Address	Sijia Yewu Industrial estate, Shijie Town, Dongguan, China
Manufacturer	Dongguan Siliten Electronics CO.,LTD
Model No.	P705
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 ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By : Genie Chang

(Senior Adm. Specialist / Genie Chang)

Tested By : Jason Tuan

(Engineer / Jason Tuan)

Approved By :

(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Gaming Mouse
Trade Name	ASUS
Model No.	P705
FCC ID.	XW3DKMSP705
Frequency Range	2403-2480MHz
Number of Channels	78CH
Channel Separation	1MHz
Type of Modulation	GFSK
Antenna Type	Printed on PCB
Antenna Gain	Refer to the table “Antenna List”
Channel Control	Auto
USB to Type C Cable	Shielded, 1.85m

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	ASUS	P705	Printed on PCB	-2.76dBi 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 and 2.4GHz GFSK transceiver , 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

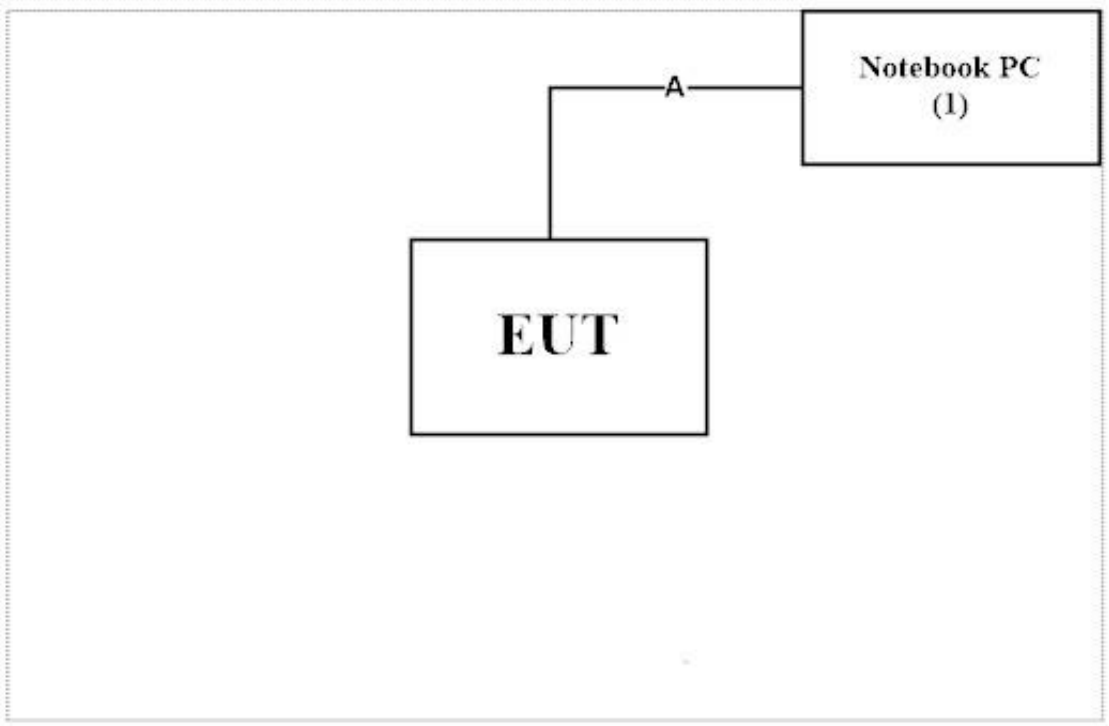
1.3. Tested System Details

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, 1.85m

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

1.7. List of Test Equipment

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	MY53470892	2019/09/25	2020/09/24
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

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 :DEKRA Conduction Test SystemV9.0.5.

For Radiated measurements /Site3/CB8

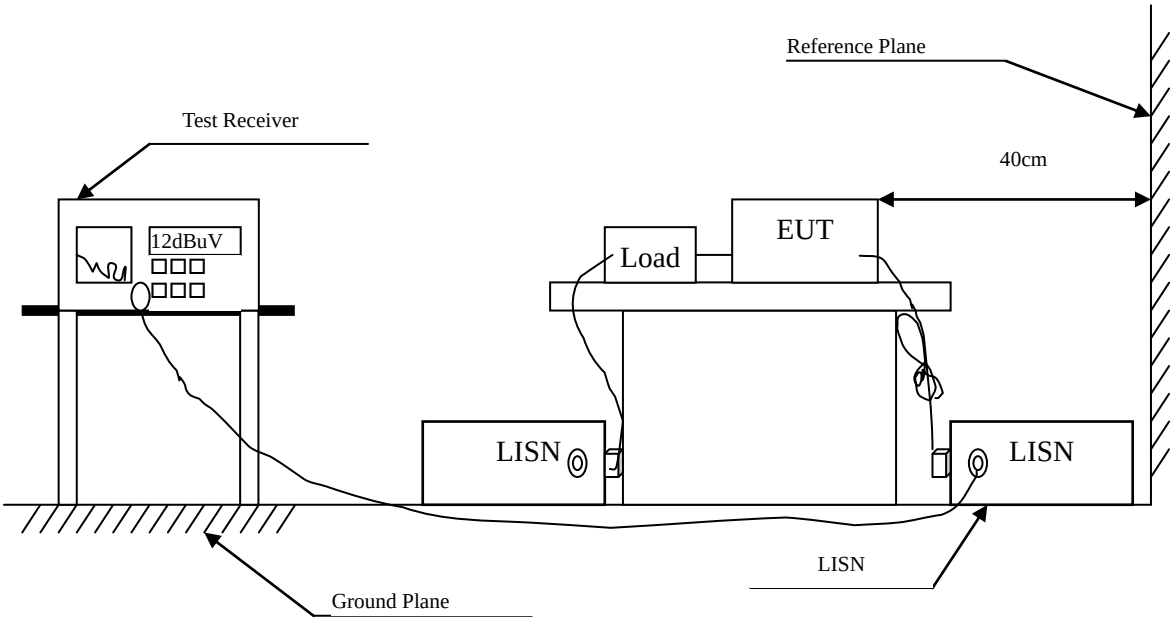
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
X	Spectrum Analyzer	R&S	FSP40	100170	2019/03/11	2020/03/10
X	Loop Antenna	Teseq	HLA6121	37133	2019/10/15	2021/10/14
X	Bilog Antenna	Schaffner Chase	CBL6112B	2794	2019/06/23	2020/06/22
X	Coaxial Cable	DEKRA	L1907-001C	280280.F141.1000D	2019/07/10	2020/07/09
X	Amplifier	EMCI	EMC001330	980254	2019/08/22	2020/08/21
X	Horn Antenna	ETS-LINDGREN	3117	00228113	2019/05/02	2020/05/01
X	Coaxial Cable	DEKRA	L1907-002C	280280.F141.1000D	2019/07/10	2020/07/09
X	Amplifier	EMCI	EMC05820SE	980362	2019/06/26	2020/06/25
X	Amplifier	EMCI	EMC051845SE	SN980632	2019/08/08	2020/08/07
	Horn Antenna	Com-Power	AH-1840	101101	2018/10/19	2019/10/18
	Amplifier + Cable	EMCI	EMC184045SE	980369	2019/04/16	2020/04/15
	Bilog Antenna	Schaffner Chase	CBL6112B	2916	2019/06/23	2020/06/22
	Coaxial Cable	DEKRA	L1907-003C	00100A1B3A120M	2019/07/10	2020/07/09
	Amplifier	EMCI	EMC001330	980255	2019/06/28	2020/06/27
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 System V2.1.134.

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.

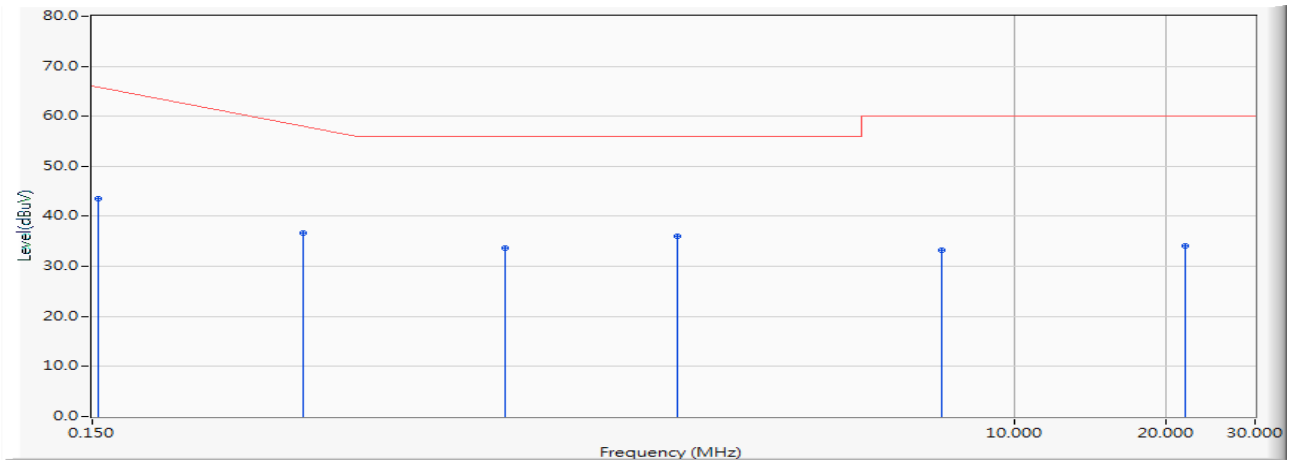
2.4. Uncertainty

± 2.26 dB

2.5. Test Result of Conducted Emission

Product : Gaming Mouse
Test Item : Conducted Emission Test
Power Line : Line (+)
Test Date : 2019/10/15
Test Mode : Mode 1: Transmit (2440MHz)

Line 1



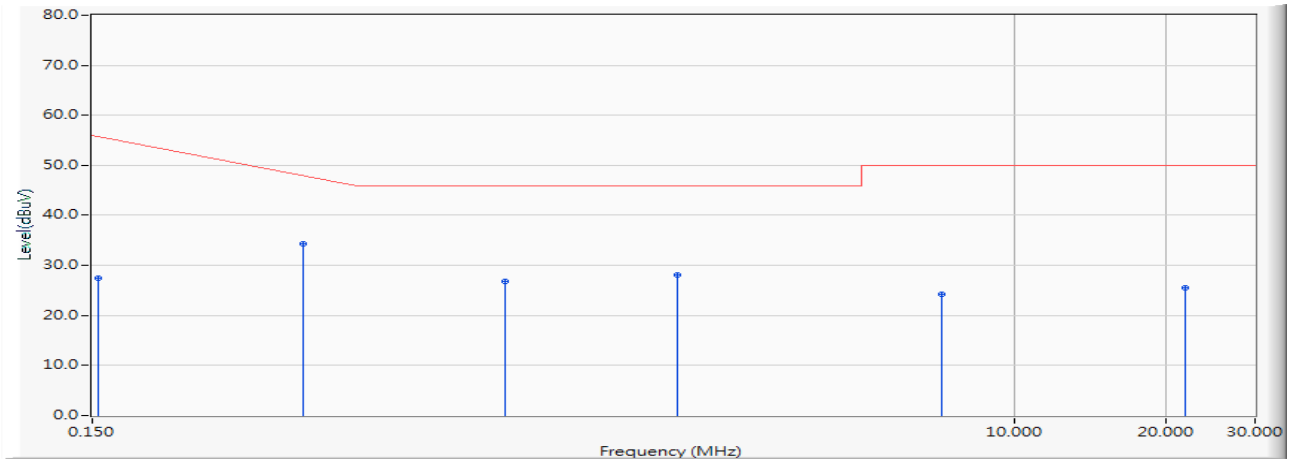
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.154	9.668	33.860	43.528	-22.358	65.886	QUASIPEAK
2		0.392	9.681	27.000	36.681	-22.405	59.086	QUASIPEAK
3		0.986	9.713	23.920	33.633	-22.367	56.000	QUASIPEAK
4	*	2.162	9.787	26.240	36.027	-19.973	56.000	QUASIPEAK
5		7.205	9.944	23.380	33.324	-26.676	60.000	QUASIPEAK
6		21.771	10.188	23.980	34.168	-25.832	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 : 2019/10/15
Test Mode : Mode 1: Transmit (2440MHz)

Line 1



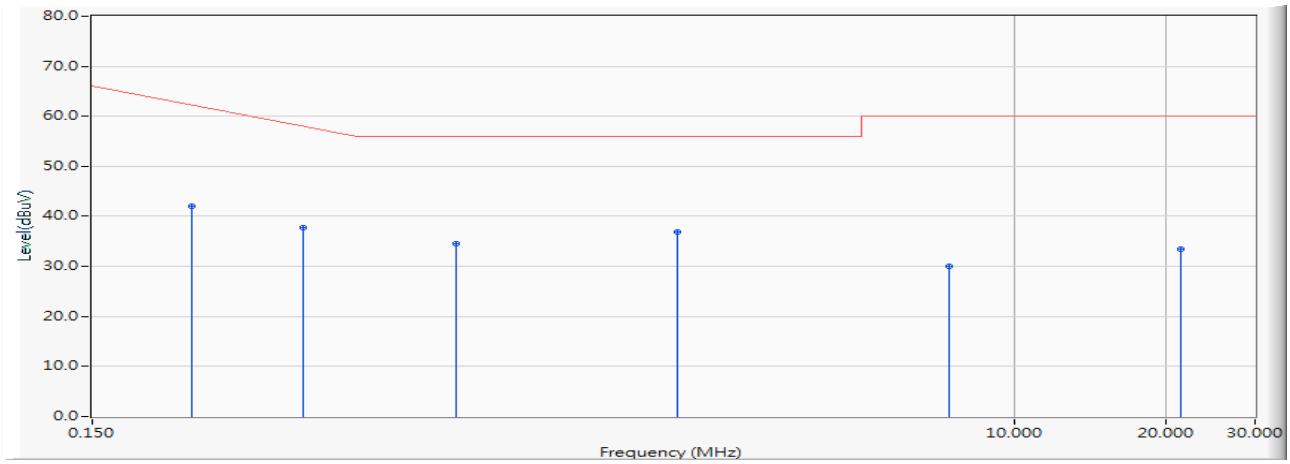
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.154	9.668	17.820	27.488	-28.398	55.886	AVERAGE
2		0.392	9.681	24.700	34.381	-14.705	49.086	AVERAGE
3		0.986	9.713	17.050	26.763	-19.237	46.000	AVERAGE
4	*	2.162	9.787	18.350	28.137	-17.863	46.000	AVERAGE
5		7.205	9.944	14.250	24.194	-25.806	50.000	AVERAGE
6		21.771	10.188	15.410	25.598	-24.402	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 : 2019/10/15
Test Mode : Mode 1: Transmit (2440MHz)

Line2



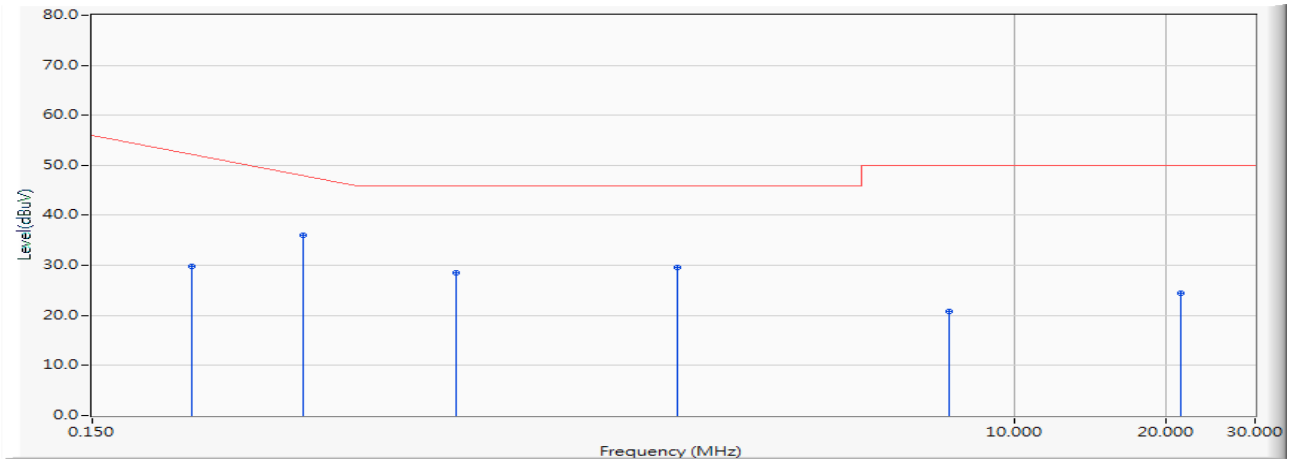
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.236	9.702	32.340	42.042	-21.501	63.543	QUASIPEAK
2		0.392	9.711	28.100	37.811	-21.275	59.086	QUASIPEAK
3		0.787	9.742	24.740	34.482	-21.518	56.000	QUASIPEAK
4	*	2.158	9.827	26.960	36.787	-19.213	56.000	QUASIPEAK
5		7.439	10.009	20.120	30.129	-29.871	60.000	QUASIPEAK
6		21.388	10.384	23.020	33.404	-26.596	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 : 2019/10/15
Test Mode : Mode 1: Transmit (2440MHz)

Line2



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.236	9.702	20.130	29.832	-23.711	53.543	AVERAGE
2		0.392	9.711	26.220	35.931	-13.155	49.086	AVERAGE
3		0.787	9.742	18.850	28.592	-17.408	46.000	AVERAGE
4	*	2.158	9.827	19.840	29.667	-16.333	46.000	AVERAGE
5		7.439	10.009	10.880	20.889	-29.111	50.000	AVERAGE
6		21.388	10.384	14.110	24.494	-25.506	50.000	AVERAGE

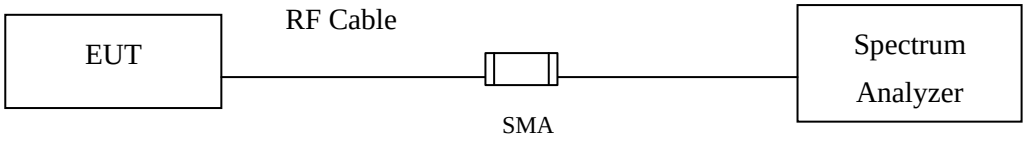
Note:

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 C63.10:2013 for compliance to FCC 47CFR 15.247 requirements. The maximum peak conducted output power using C63.10:2013 Section 11.9.1.3 PKPM1 Peak power meter method.

3.4. Uncertainty

± 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 : 2019/10/22
Test Mode : Mode 1: Transmit

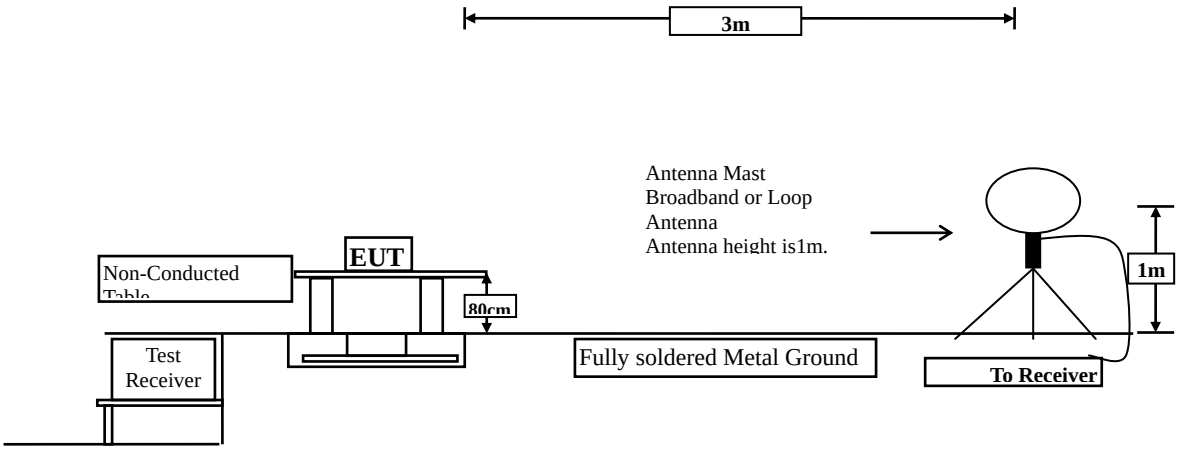
Channel No.	Frequency (MHz)	Average Power (dBm)	Peak Power (dBm)	Required Limit (dBm)	Result
01	2403	-0.24	-0.19	<30dBm	Pass
38	2440	-0.68	-0.61	<30dBm	Pass
78	2480	-1.30	-1.16	<30dBm	Pass

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

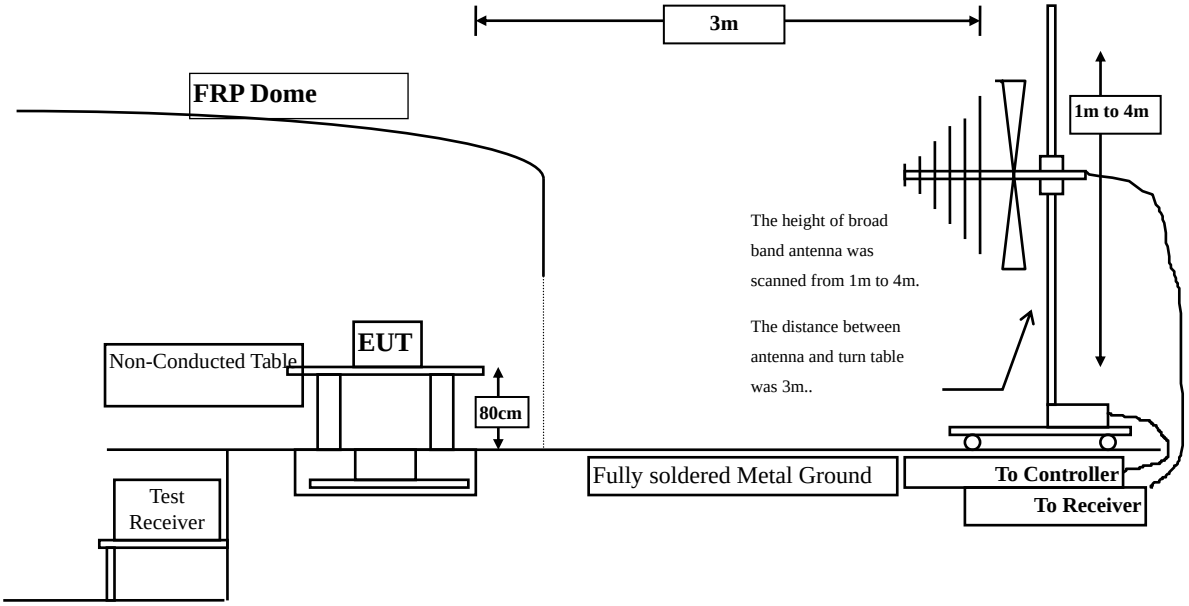
4. Radiated Emission

4.1. Test Setup

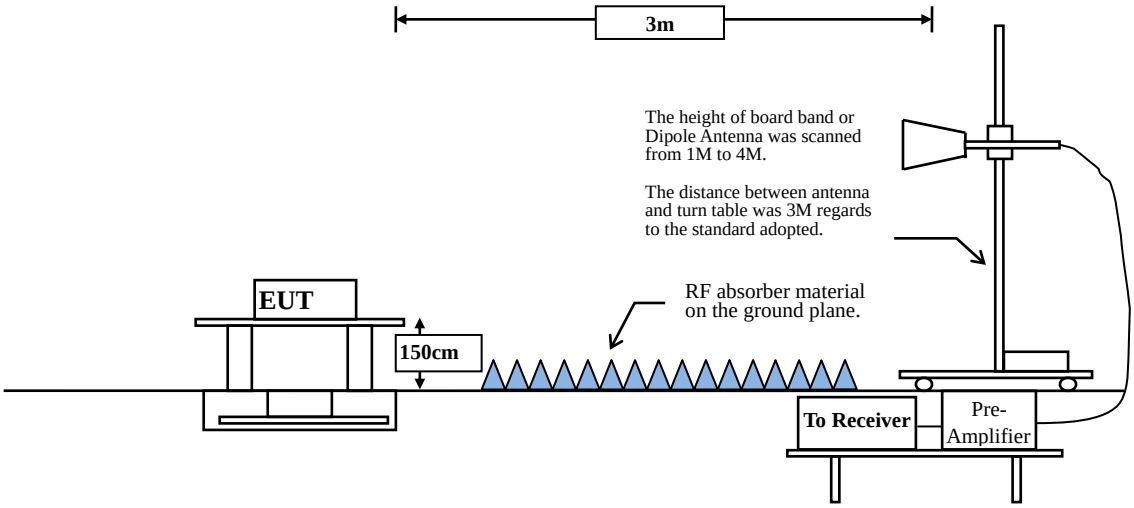
Radiated Emission Under 30MHz



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 C63.10:2013 Section 11.12.1 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 form 9kHz - 10th Harmonic of fundamental was investigated.

RBW and VBW Parameter setting:

According to C63.10 Section 11.12.2.4 Peak measurement procedure

RBW = as specified in Table 1.

VBW ≥ 3 x 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 C63.10 Section 11.12.2.5 Average measurement procedure

RBW = 1MHz.

VBW = 10Hz, when duty cycle ≥ 98 %

VBW ≥ 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.

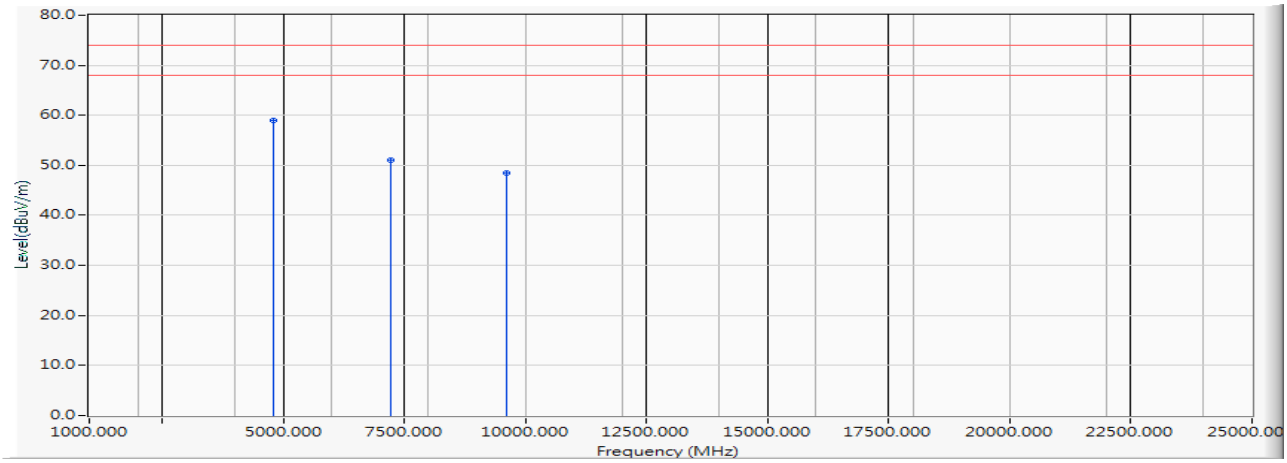
4.4. Uncertainty

± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

4.5. Test Result of Radiated Emission

Product : Gaming Mouse
Test Item : Harmonic Radiated Emission Data
Test Date : 2019/10/21
Test Mode : Mode 1: Transmit (2403MHz)

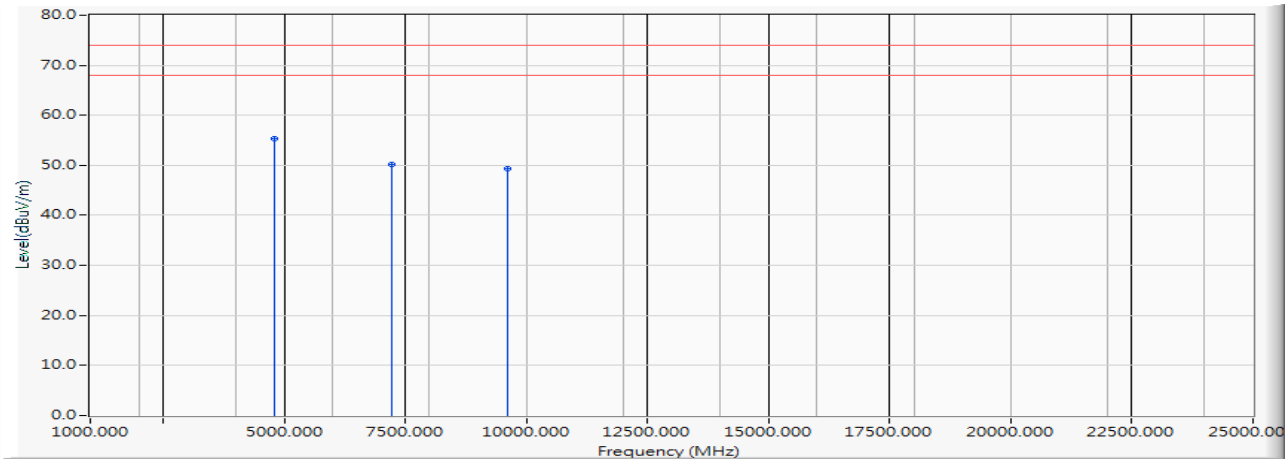


Frequency MHz	Correct Factor dB	Reading Level dBµV	Measurement Level dBµV/m	Margin dB	Peak Limit dBµV/m	Average Limit dBµV/m
Horizontal						
Peak Detector						
4806.000	4.623	54.320	58.943	-15.057	74.000	54.00
7209.000	11.700	39.390	51.090	-22.910	74.000	54.00
9612.000	11.906	36.610	48.516	-25.484	74.000	54.00
Average Detector						
4806.000	4.623	44.050	48.673	-25.327	74.000	54.00

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	:	2019/10/21
Test Mode	:	Mode 1: Transmit (2403MHz)

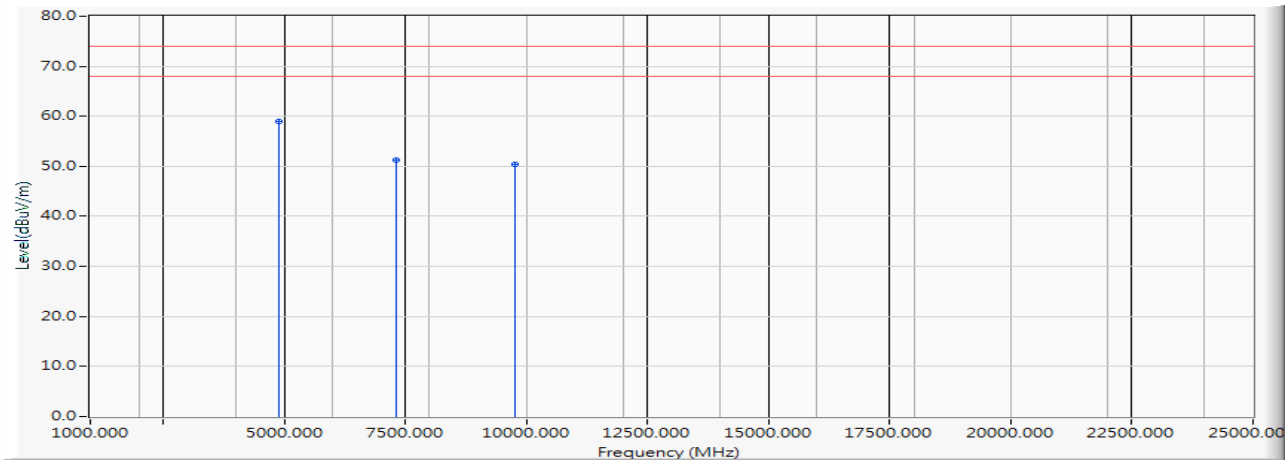


Frequency MHz	Correct Factor dB	Reading Level dBµV	Measurement Level dBµV/m	Margin dB	Peak Limit dBµV/m	Average Limit dBµV/m
Vertical						
Peak Detector						
4806.000	4.623	50.680	55.303	-18.697	74.000	54.00
7209.000	11.700	38.480	50.180	-23.820	74.000	54.00
9612.000	11.906	37.360	49.266	-24.734	74.000	54.00
Average Detector						
4806.000	4.623	39.900	44.523	-9.477	74.000	54.00

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 : 2019/10/21
Test Mode : Mode 1: Transmit (2440MHz)

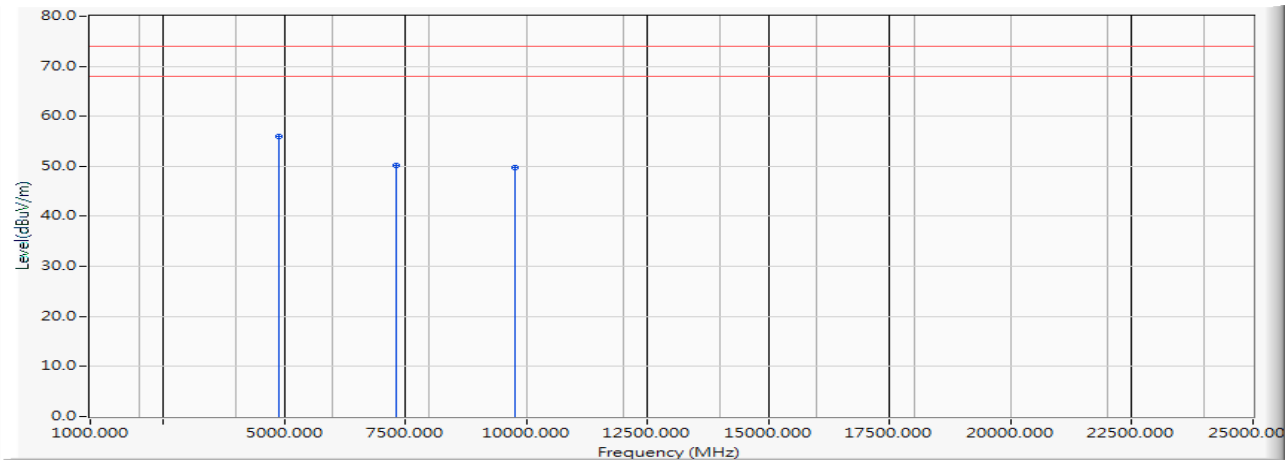


Frequency MHz	Correct Factor dB	Reading Level dBµV	Measurement Level dBµV/m	Margin dB	Peak Limit dBµV/m	Average Limit dBµV/m
Horizontal						
Peak Detector						
4880.000	5.302	53.730	59.032	-14.968	74.000	54.00
7320.000	11.795	39.390	51.185	-22.815	74.000	54.00
9760.000	11.929	38.410	50.340	-23.660	74.000	54.00
Average Detector						
4880.000	5.302	43.130	48.432	-5.568	74.000	54.00

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 : 2019/10/21
Test Mode : Mode 1: Transmit (2440MHz)

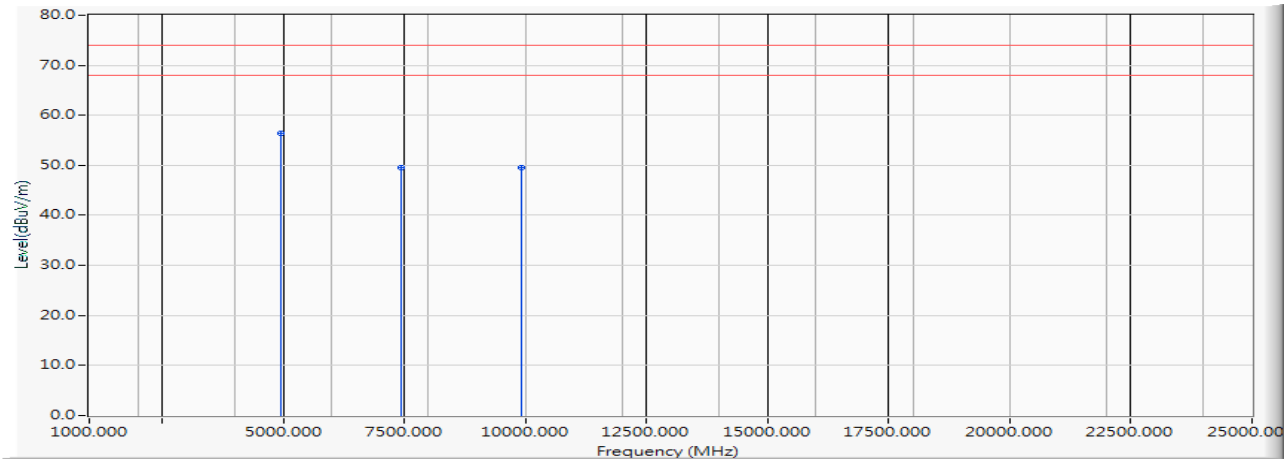


Frequency MHz	Correct Factor dB	Reading Level dBµV	Measurement Level dBµV/m	Margin dB	Peak Limit dBµV/m	Average Limit dBµV/m
Vertical						
Peak Detector						
4880.000	5.302	50.700	56.002	-17.998	74.000	54.00
7320.000	11.795	38.320	50.115	-23.885	74.000	54.00
9760.000	11.929	37.930	49.860	-24.140	74.000	54.00
Average Detector						
4880.000	5.302	39.800	45.102	-8.898	74.000	54.00

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 : 2019/10/21
Test Mode : Mode 1: Transmit (2480MHz)

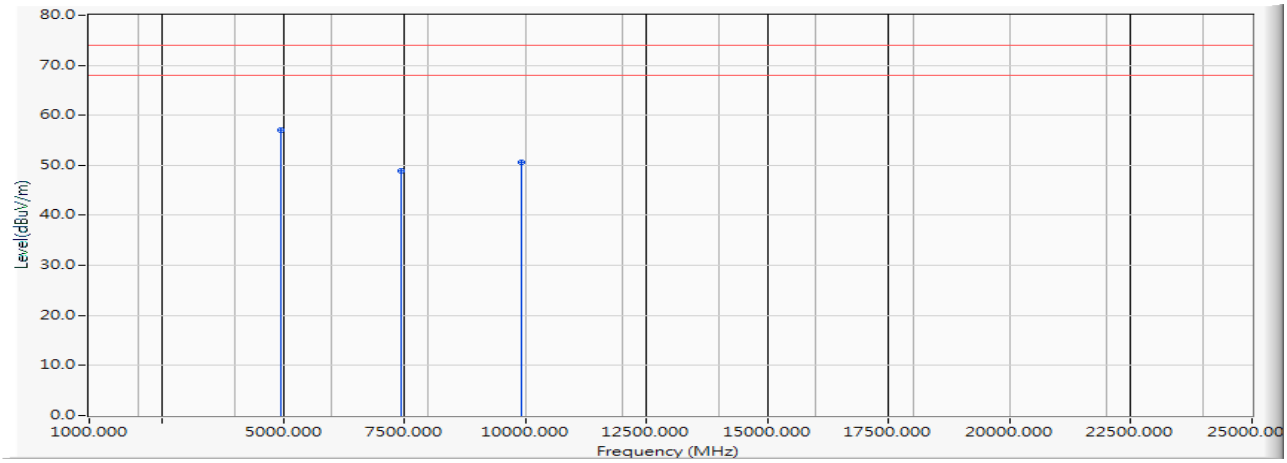


Frequency MHz	Correct Factor dB	Reading Level dBµV	Measurement Level dBµV/m	Margin dB	Peak Limit dBµV/m	Average Limit dBµV/m
Horizontal						
Peak Detector						
4960.000	6.035	50.360	56.395	-17.605	74.000	54.00
7440.000	10.977	38.570	49.547	-24.453	74.000	54.00
9920.000	12.758	36.880	49.637	-24.363	74.000	54.00
Average Detector						
4960.000	40.422	38.380	44.415	-9.585	74.000	54.00

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 : 2019/10/21
Test Mode : Mode 1: Transmit (2480MHz)



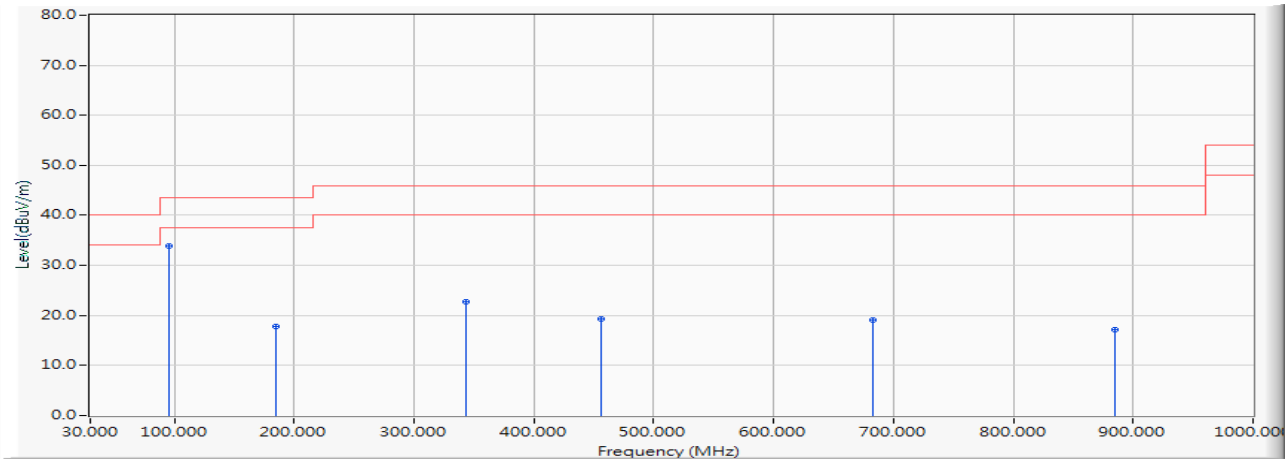
Frequency MHz	Correct Factor dB	Reading Level dBµV	Measurement Level dBµV/m	Margin dB	Peak Limit dBµV/m	Average Limit dBµV/m
Vertical						
Peak Detector						
4960.000	6.035	51.060	57.095	-16.905	74.000	54.00
7440.000	10.977	38.000	48.977	-25.023	74.000	54.00
9920.000	12.758	37.890	50.647	-23.353	74.000	54.00
Average Detector						
4960.000	6.035	39.370	45.405	-8.595	74.000	54.00

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 : 2019/10/28
Test Mode : Mode 1: Transmit (2440MHz)

Horizontal



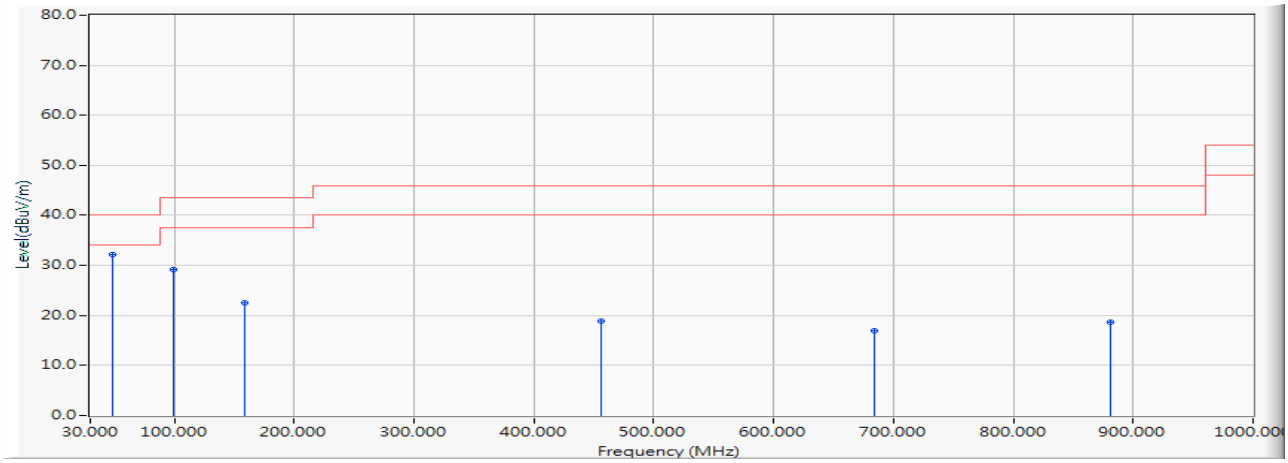
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	96.072	-16.250	50.143	33.893	-9.607	43.500	QUASIPEAK
2		184.638	-17.739	35.617	17.878	-25.622	43.500	QUASIPEAK
3		343.493	-11.381	34.218	22.837	-23.163	46.000	QUASIPEAK
4		455.957	-8.349	27.630	19.281	-26.719	46.000	QUASIPEAK
5		682.290	-7.779	26.768	18.989	-27.011	46.000	QUASIPEAK
6		884.725	-6.554	23.747	17.193	-28.807	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 : 2019/10/28
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	*	48.275	-16.986	49.070	32.084	-7.916	40.000	QUASIPEAK
2		98.884	-15.868	44.970	29.102	-14.398	43.500	QUASIPEAK
3		159.333	-18.561	41.171	22.609	-20.891	43.500	QUASIPEAK
4		455.957	-8.349	27.322	18.973	-27.027	46.000	QUASIPEAK
5		683.696	-7.898	24.746	16.848	-29.152	46.000	QUASIPEAK
6		880.507	-6.256	24.842	18.586	-27.414	46.000	QUASIPEAK

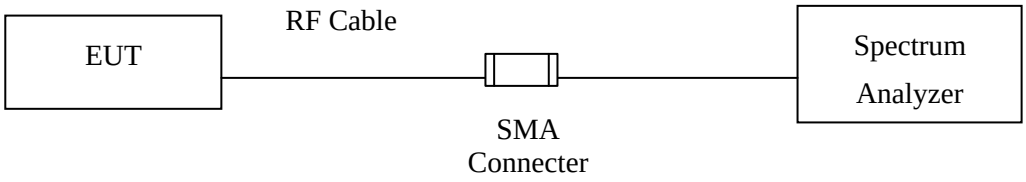
Note:

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 C63.10:2013 Section 11.11 for compliance to FCC 47CFR 15.247 requirements.
Set RBW = 100 kHz, Set VBW> RBW, scan up through 10th harmonic.

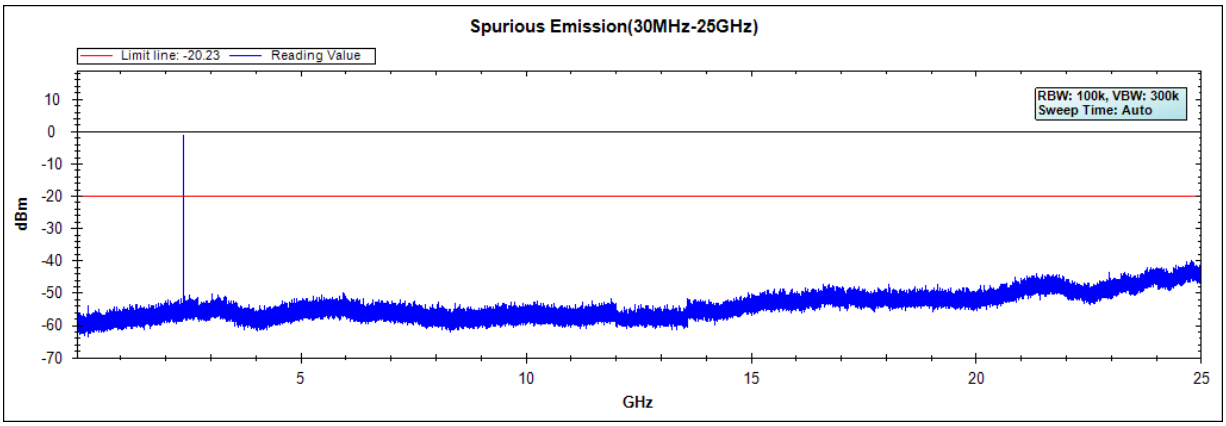
5.4. Uncertainty

The measurement uncertainty
Conducted is defined as ± 1.20dB

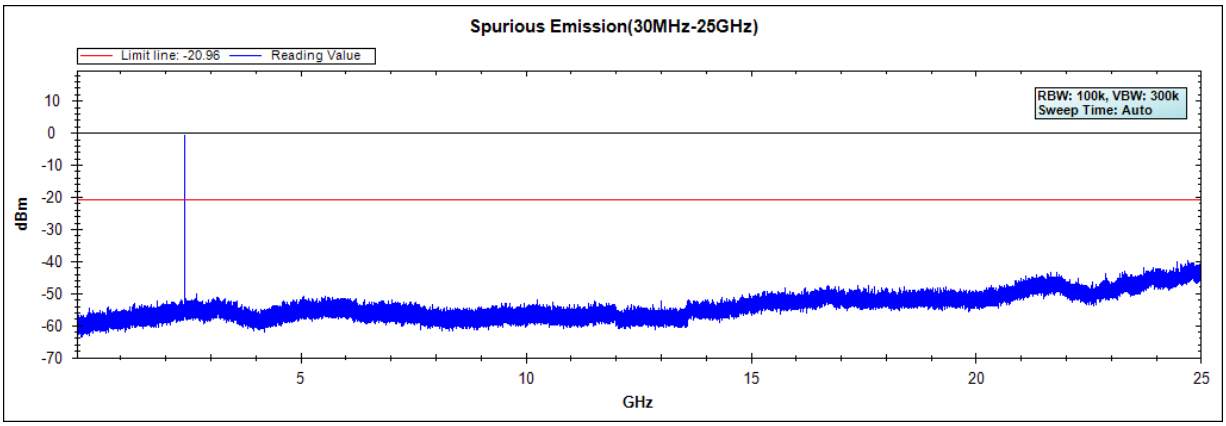
5.5. Test Result of RF antenna conducted test

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

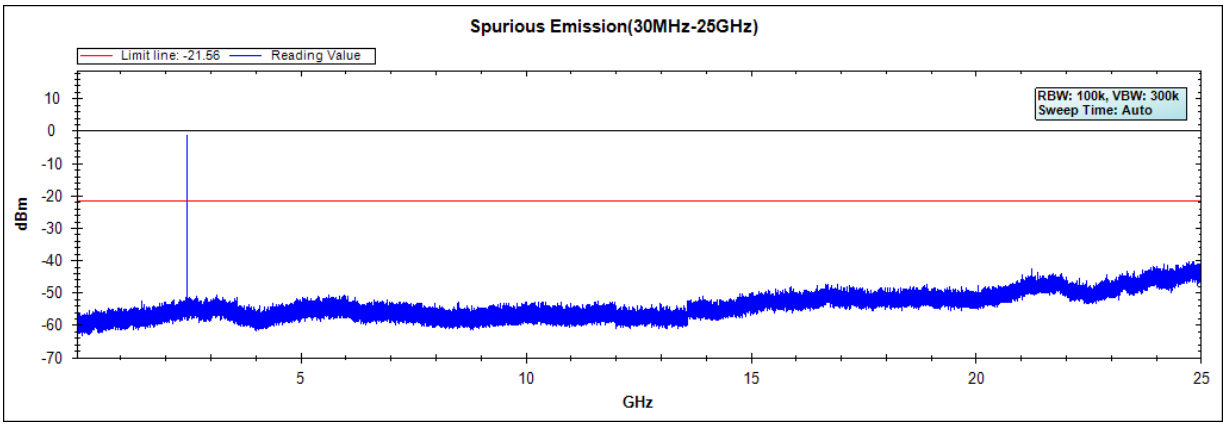
(2403MHz) 30M-25GHz



(2440MHz) 30M-25GHz



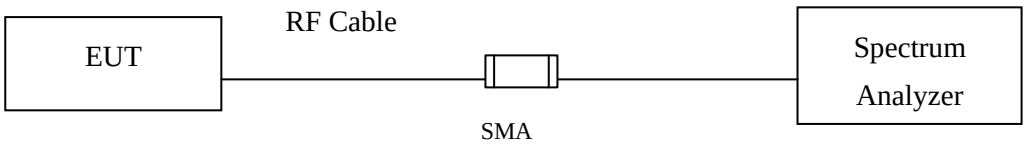
(2480MHz) 30M-25GHz



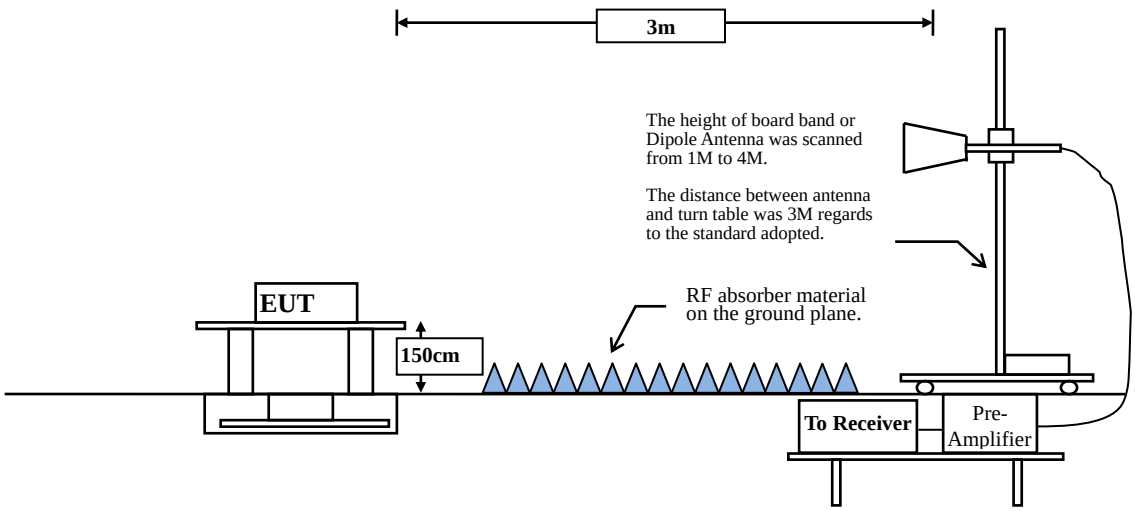
6. Band Edge

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 ANSI C63.10, 2013 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 C63.10 Section 11.12.2.4 Peak measurement procedure

RBW = as specified in Table 1.

VBW ≥ 3 x 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 C63.10 Section 11.12.2.5 Average measurement procedure

RBW = 1MHz.

VBW = 10Hz, when duty cycle ≥ 98 %

VBW ≥ 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

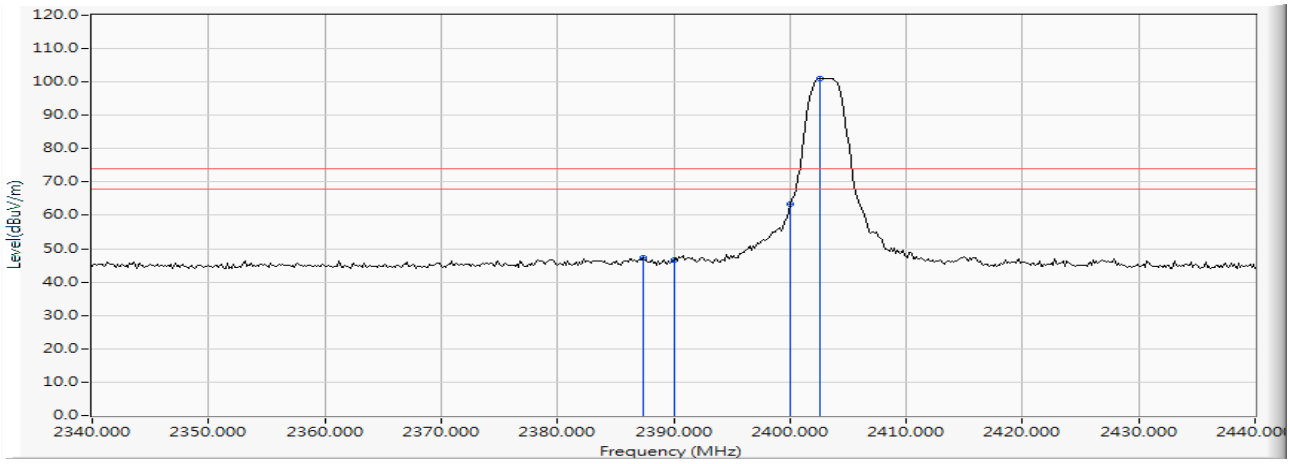
± 4.08 dB above 1GHz

± 4.22 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



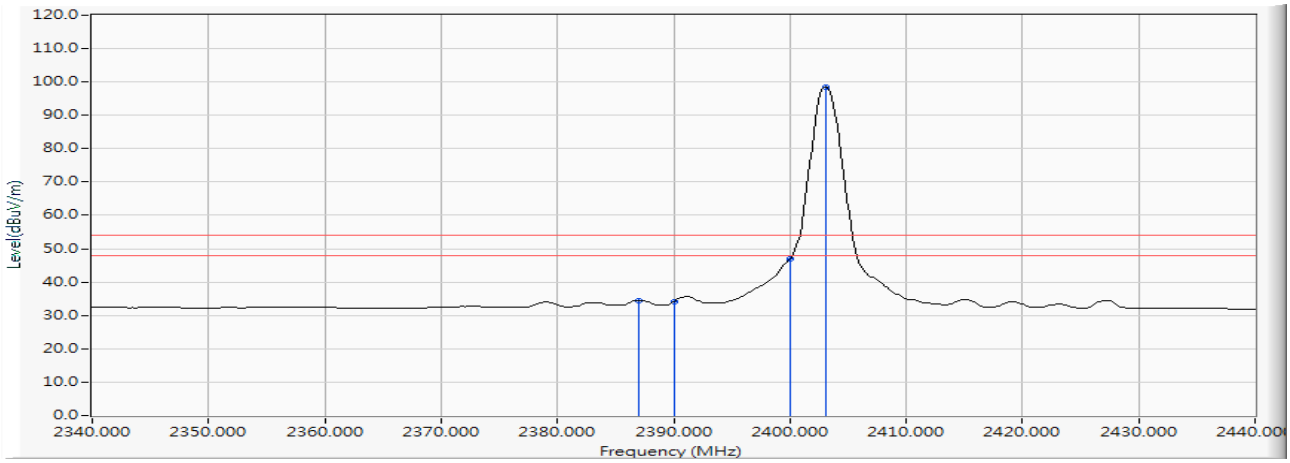
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2387.391	-1.534	48.727	47.193	-26.807	74.000	PEAK
2		2390.000	-1.550	48.103	46.553	-27.447	74.000	PEAK
3		2400.000	-1.612	64.849	63.237	--	--	PEAK
4	*	2402.609	-1.627	102.636	101.008	--	--	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



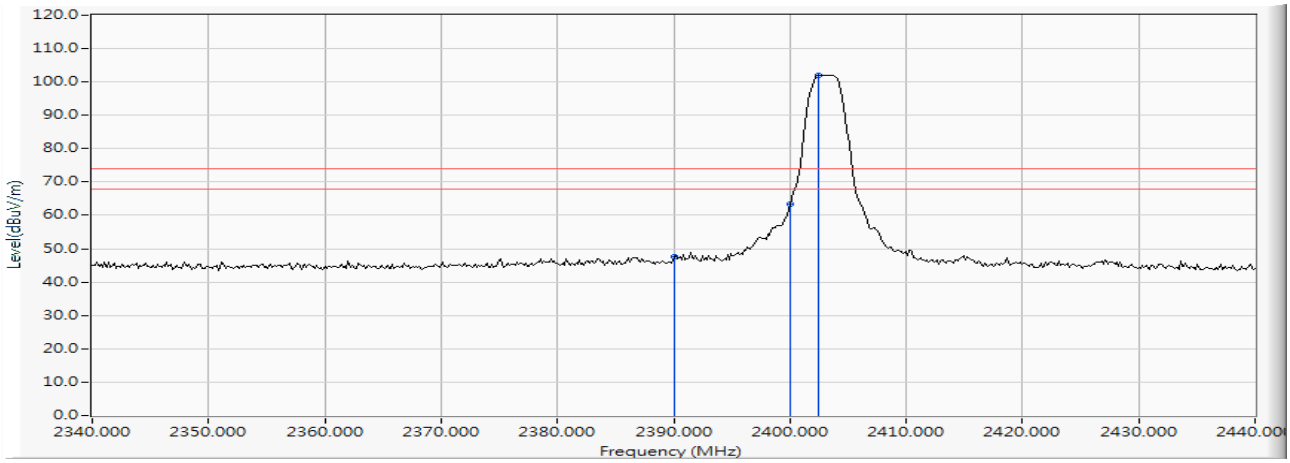
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2386.957	-1.531	35.997	34.465	-19.535	54.000	AVERAGE
2		2390.000	-1.550	35.673	34.123	-19.877	54.000	AVERAGE
3		2400.000	-1.612	48.433	46.821	--	--	AVERAGE
4	*	2403.043	-1.630	100.056	98.426	--	--	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



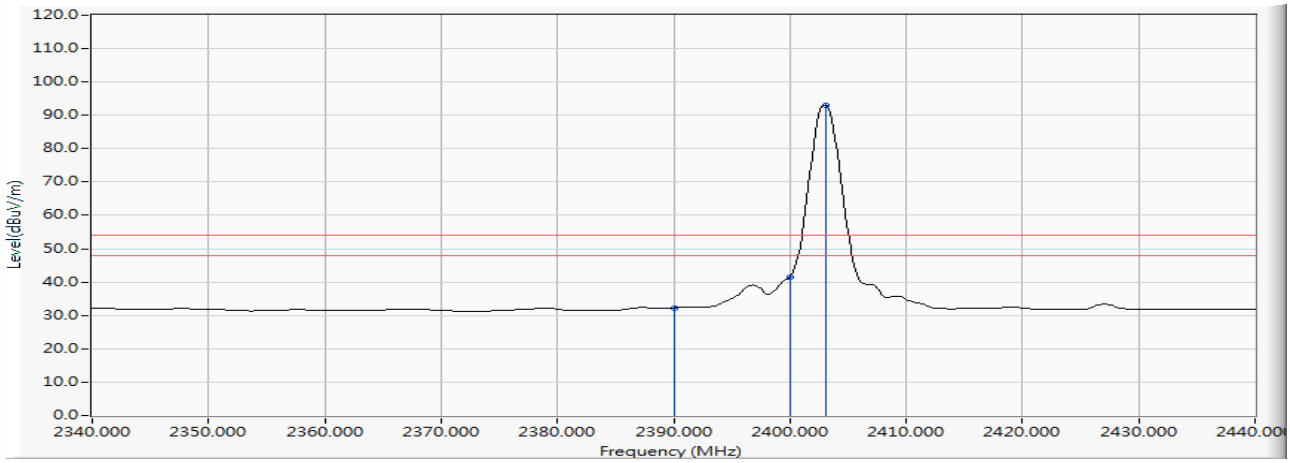
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	-1.550	49.162	47.612	-26.388	74.000	PEAK
2		2400.000	-1.612	64.967	63.355	--	--	PEAK
3	*	2402.464	-1.627	103.758	102.131	--	--	PEAK

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)

Vertical



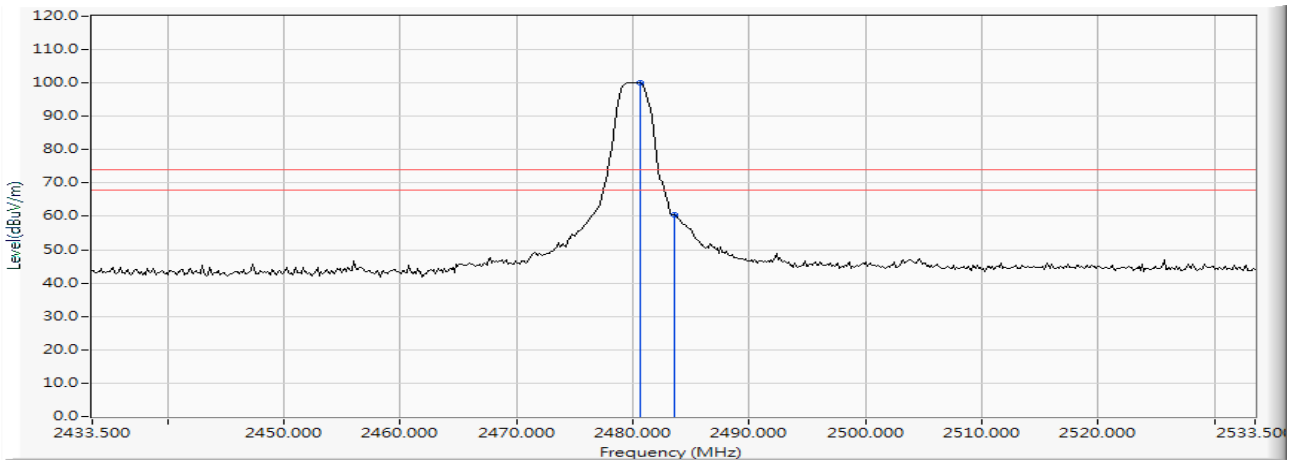
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2386.522	-1.528	36.355	34.826	-19.174	54.000	AVERAGE
2		2390.000	-1.550	36.159	34.609	-19.391	54.000	AVERAGE
3		2400.000	-1.612	49.386	47.774	--	--	AVERAGE
4	*	2403.043	-1.630	101.147	99.517	--	--	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



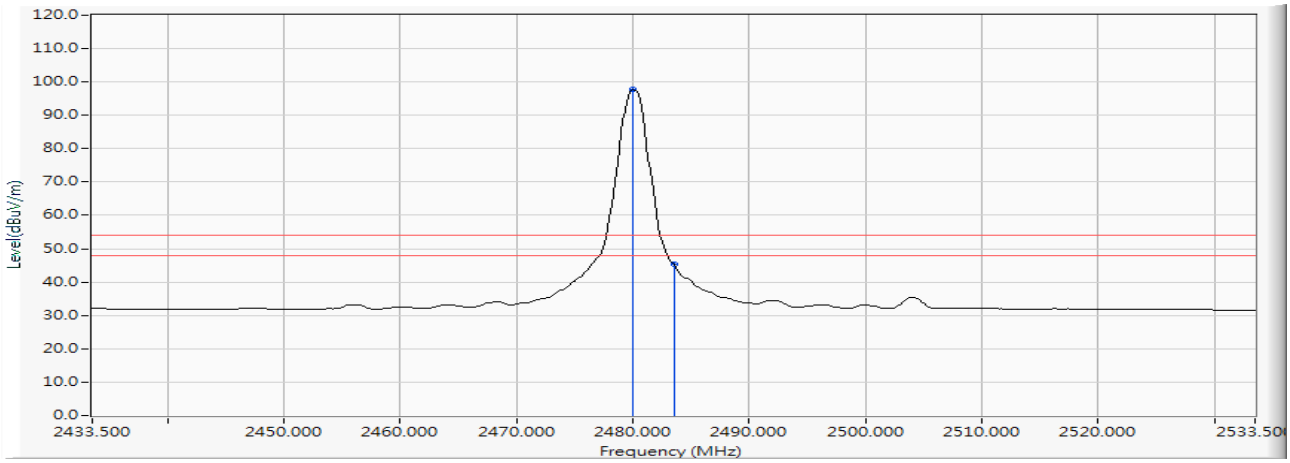
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.601	-2.109	102.087	99.978	--	--	PEAK
2		2483.500	-2.127	62.663	60.536	-13.464	74.000	PEAK

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



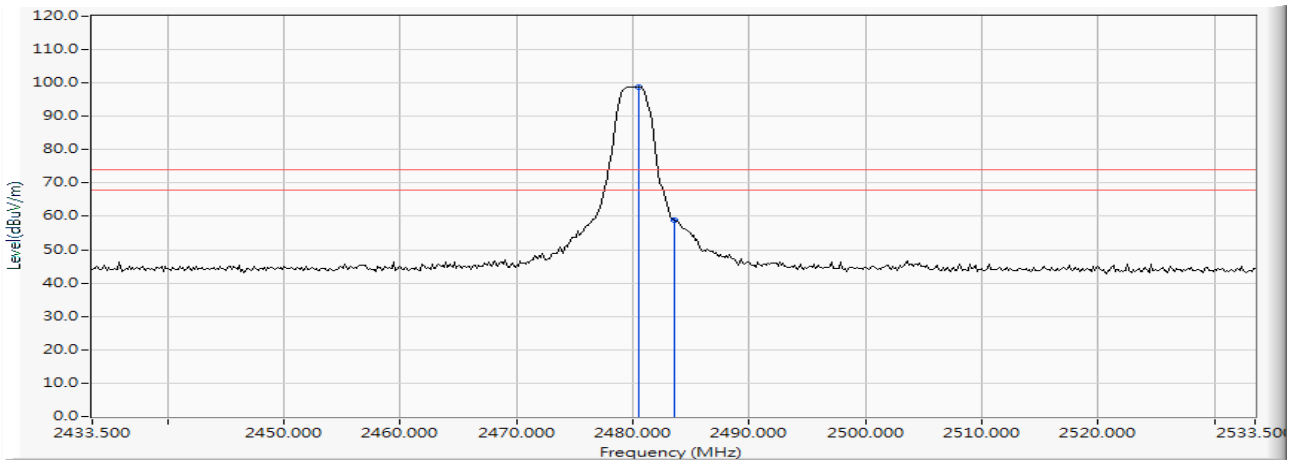
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	-2.105	99.804	97.699	--	--	AVERAGE
2		2483.500	-2.127	47.366	45.239	-8.761	54.000	AVERAGE

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



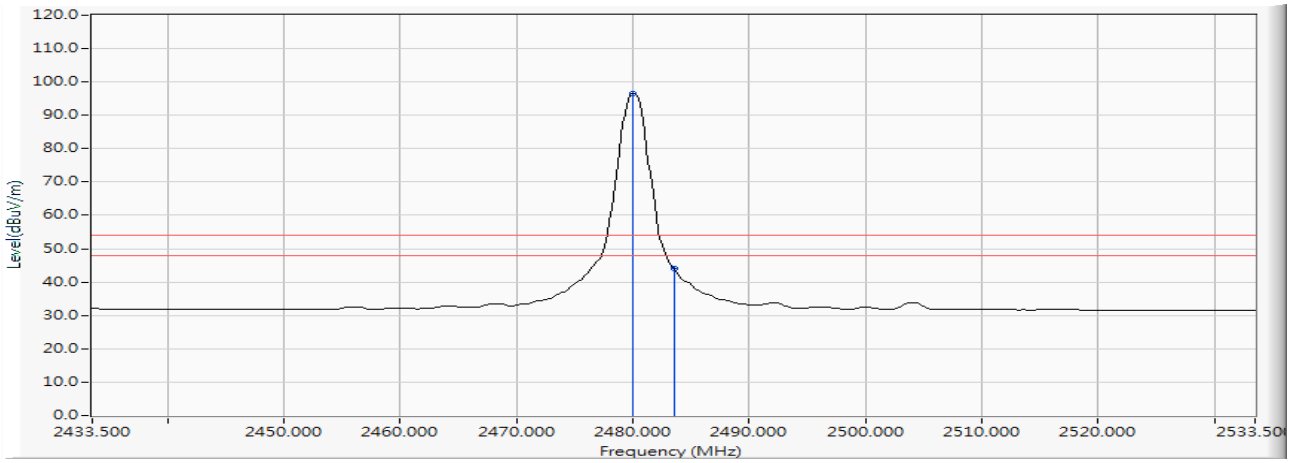
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.457	-2.108	100.977	98.869	--	--	PEAK
2		2483.500	-2.127	61.091	58.964	-15.036	74.000	PEAK

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



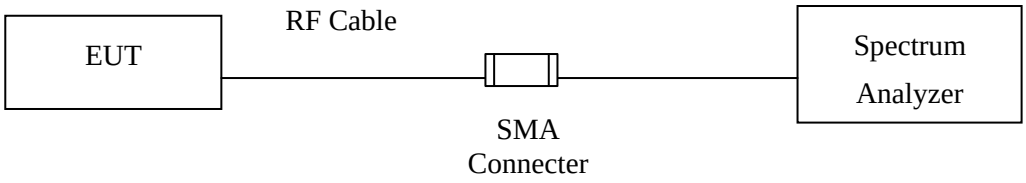
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	-2.105	98.716	96.611	--	--	AVERAGE
2		2483.500	-2.127	46.304	44.177	-9.823	54.000	AVERAGE

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 ANSI C63.10 Section 11.8 for compliance to FCC 47CFR 15.247 requirements.

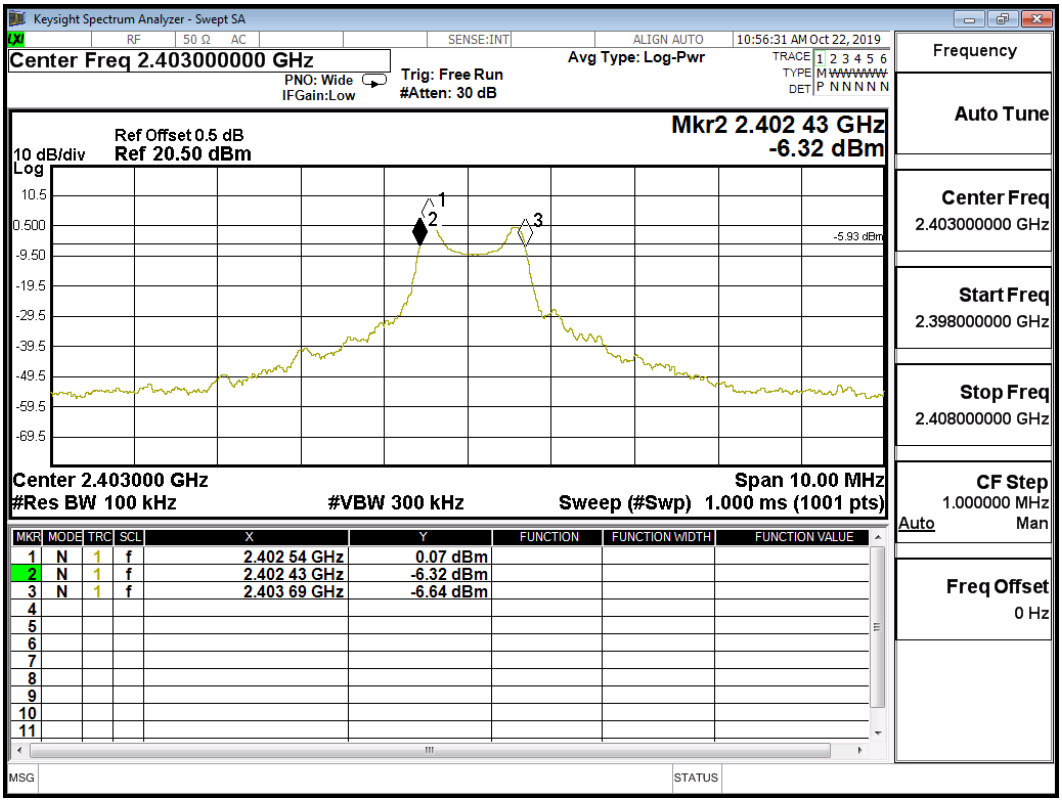
7.4. Uncertainty

± 283Hz

7.5. Test Result of 6dB Bandwidth

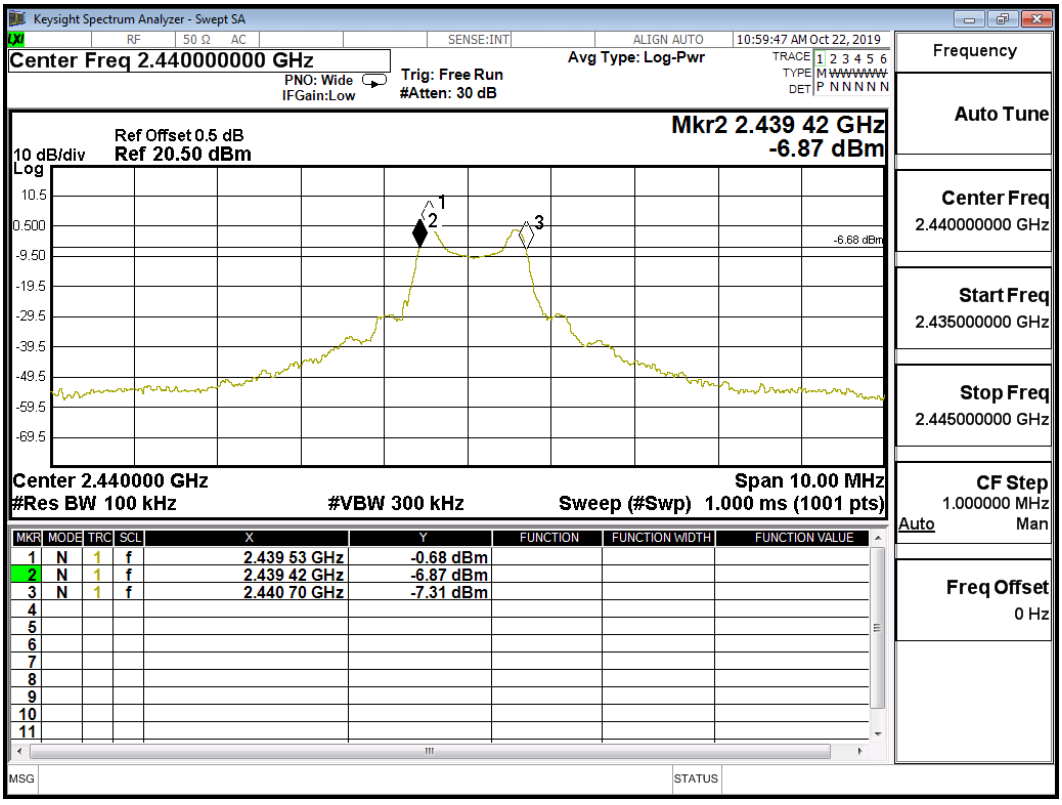
Product : Gaming Mouse
Test Item : 6dB Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (2403MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
01	2403.00	1260	>500	Pass



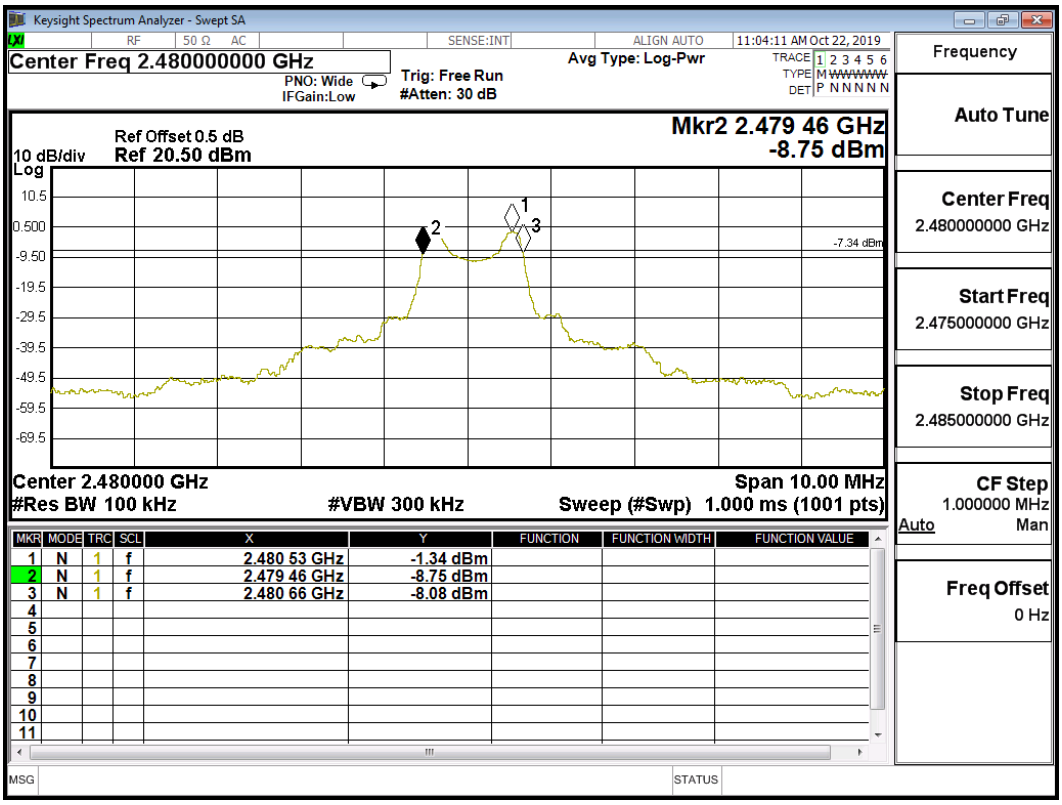
Product : Gaming Mouse
Test Item : 6dB Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
38	2440.00	1280	>500	Pass



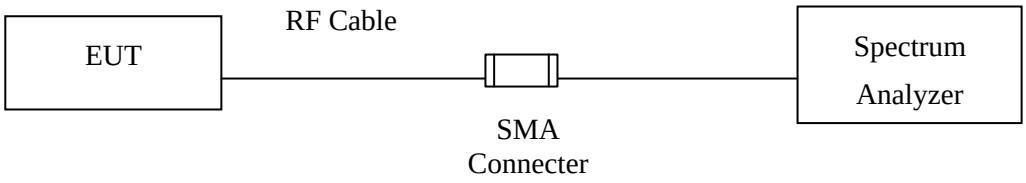
Product : Gaming Mouse
Test Item : 6dB Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (2480MHz)

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 C63.10 Section 11.10.2 Method PKPSD (peak PSD).

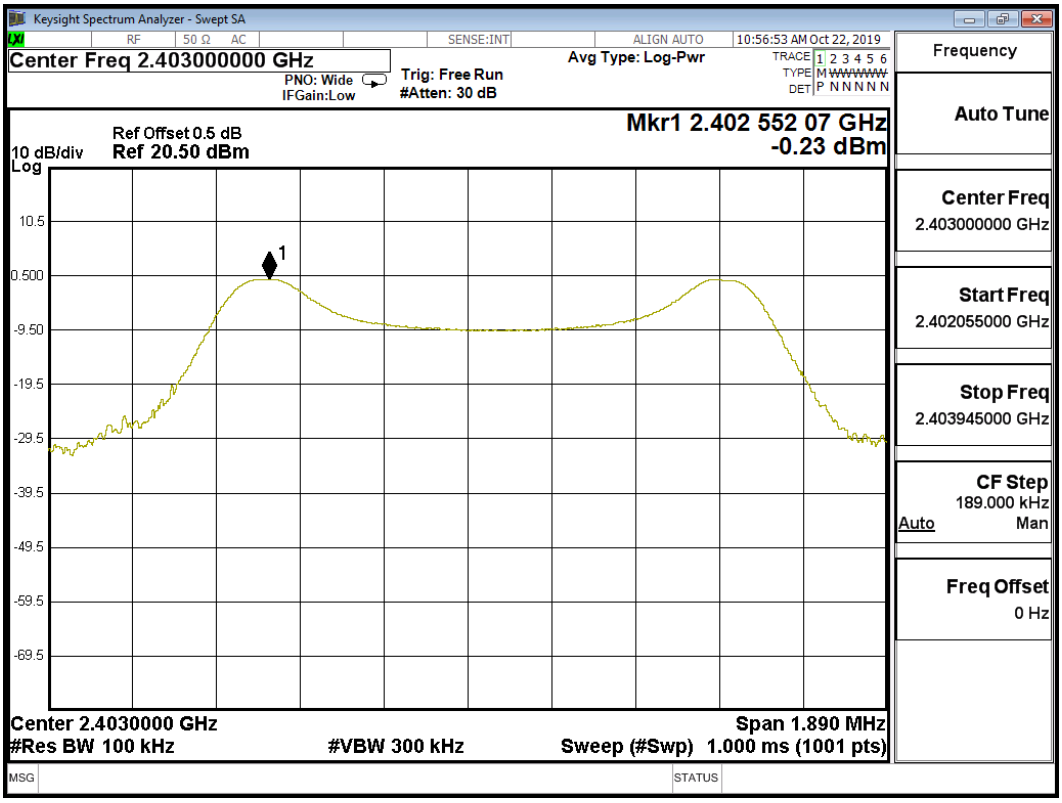
8.4. Uncertainty

± 1.20 dB

8.5. Test Result of Power Density

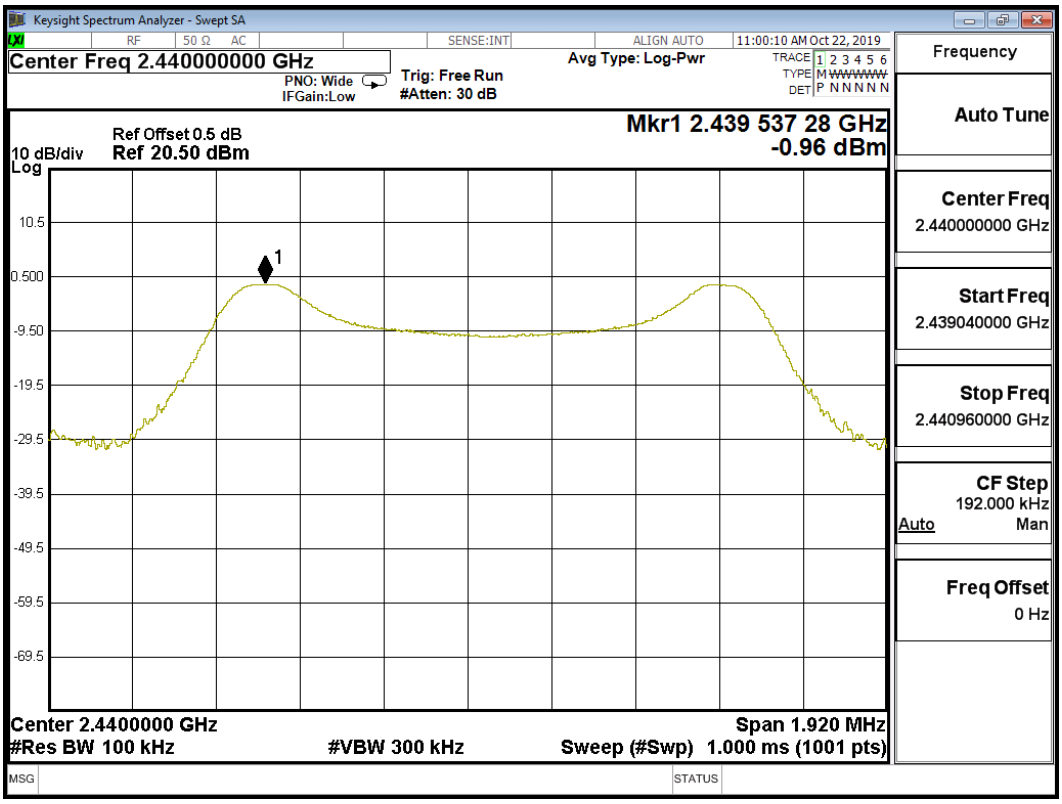
Product : Gaming Mouse
Test Item : Power Density Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit(2403MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
01	2403.00	-0.23	≦8dBm	Pass



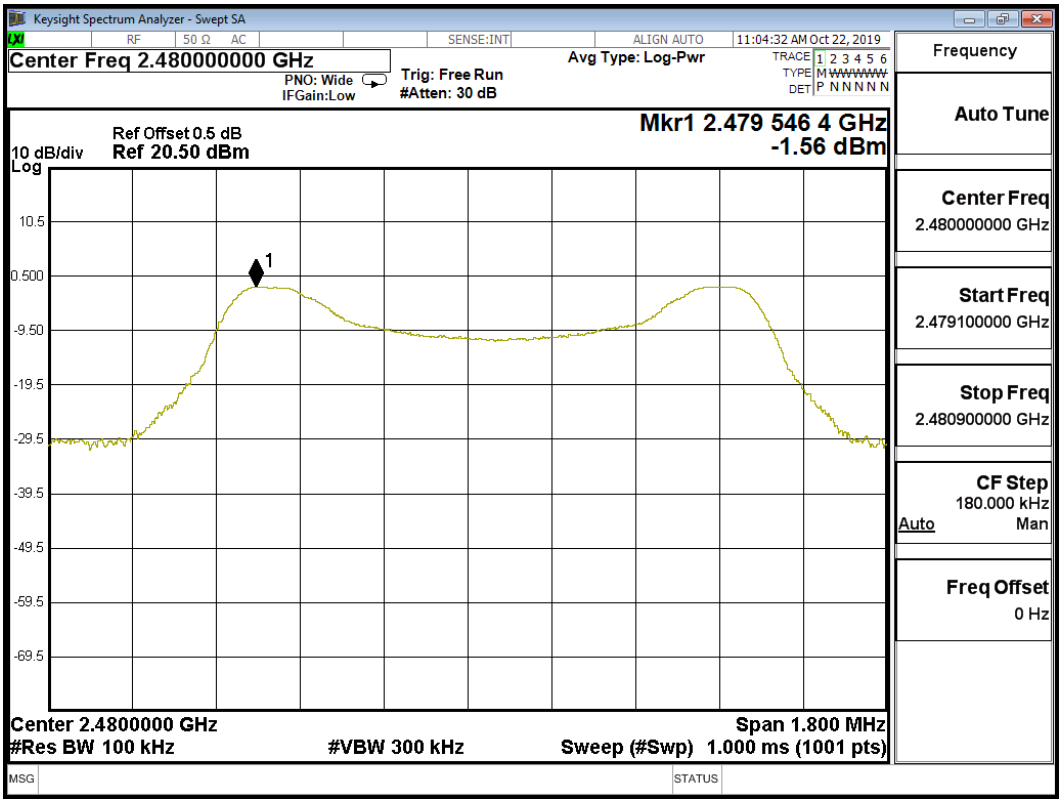
Product : Gaming Mouse
Test Item : Power Density Data
Test Site : No.3OATS
Test Mode : Mode 1: Transmit (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
38	2440	-0.96	≦8dBm	Pass



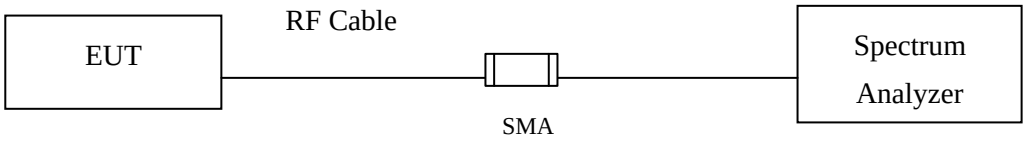
Product : Gaming Mouse
Test Item : Power Density Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit (2480MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
78	2480.00	-1.56	≦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 ANSI C63.10 2013 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

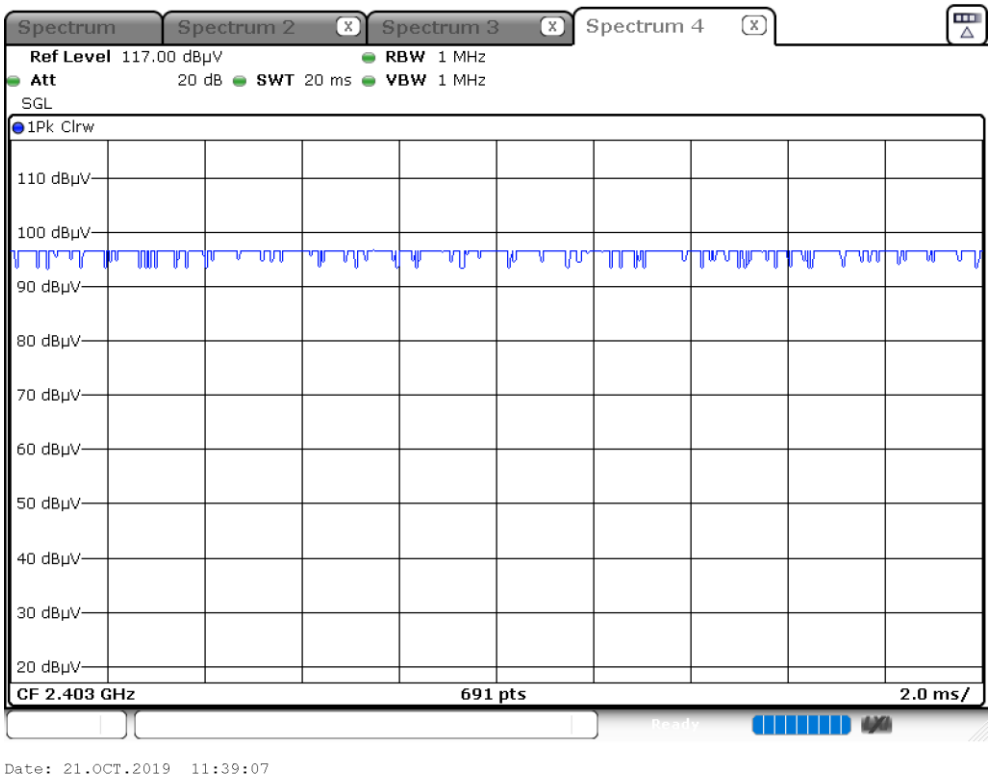
Duty Cycle Formula:

Duty Cycle = Ton / (Ton + Toff)

Duty Factor = 10 Log (1/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.