

FCC Test Report

Product Name	Gaming Mouse
Model No.	P508
FCC ID	EMJMP508

Applicant	Primax Electronics Ltd
Address	669 Ruey Kuang Road Neihu 114, Taipei, Taiwan

Date of Receipt	Jan. 30, 2019
Issued Date	Apr. 24, 2019
Report No.	1910347R-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

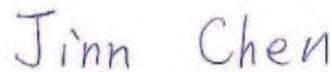
Issued Date: Apr. 24, 2019

Report No.: 1910347R-RFUSP15V00



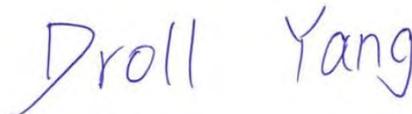
Product Name	Gaming Mouse
Applicant	Primax Electronics Ltd
Address	669 Ruey Kuang Road Neihu 114, Taipei, Taiwan
Manufacturer	Primax Electronics Ltd
Model No.	P508
FCC ID.	EMJMP508
EUT Rated Voltage	DC 3V (Power by Battery)
EUT Test Voltage	DC 3V (Power by Battery)
Trade Name	ASUS
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2017 ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By :



(Senior Adm. Specialist / Jinn Chen)

Tested By :



(Assistant Engineer / Droll Yang)

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.	P508
FCC ID	EMJMP508
Frequency Range	2402~2479MHz
Channel Number	78CH
Type of Modulation	GFSK
Antenna Type	Multilayer Chip Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	GainForce Technology	690800003300	Multilayer Chip Antenna	0.5dBi for 2.4 GHz

Note: The antenna of EUT is conform to FCC 15.203

Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 02:	2402 MHz	Channel 22:	2422 MHz	Channel 42:	2442 MHz	Channel 62:	2462 MHz
Channel 03:	2403 MHz	Channel 23:	2423 MHz	Channel 43:	2443 MHz	Channel 63:	2463 MHz
Channel 04:	2404 MHz	Channel 24:	2424 MHz	Channel 44:	2444 MHz	Channel 64:	2464 MHz
Channel 05:	2405 MHz	Channel 25:	2425 MHz	Channel 45:	2445 MHz	Channel 65:	2465 MHz
Channel 06:	2406 MHz	Channel 26:	2426 MHz	Channel 46:	2446 MHz	Channel 66:	2466 MHz
Channel 07:	2407 MHz	Channel 27:	2427 MHz	Channel 47:	2447 MHz	Channel 67:	2467 MHz
Channel 08:	2408 MHz	Channel 28:	2428 MHz	Channel 48:	2448 MHz	Channel 68:	2468 MHz
Channel 09:	2409 MHz	Channel 29:	2429 MHz	Channel 49:	2449 MHz	Channel 69:	2469 MHz
Channel 10:	2410 MHz	Channel 30:	2430 MHz	Channel 50:	2450 MHz	Channel 70:	2470 MHz
Channel 11:	2411 MHz	Channel 31:	2431 MHz	Channel 51:	2451 MHz	Channel 71:	2471 MHz
Channel 12:	2412 MHz	Channel 32:	2432 MHz	Channel 52:	2452 MHz	Channel 72:	2472 MHz
Channel 13:	2413 MHz	Channel 33:	2433 MHz	Channel 53:	2453 MHz	Channel 73:	2473 MHz
Channel 14:	2414 MHz	Channel 34:	2434 MHz	Channel 54:	2454 MHz	Channel 74:	2474 MHz
Channel 15:	2415 MHz	Channel 35:	2435 MHz	Channel 55:	2455 MHz	Channel 75:	2475 MHz
Channel 16:	2416 MHz	Channel 36:	2436 MHz	Channel 56:	2456 MHz	Channel 76:	2476 MHz
Channel 17:	2417 MHz	Channel 37:	2437 MHz	Channel 57:	2457 MHz	Channel 77:	2477 MHz
Channel 18:	2418 MHz	Channel 38:	2438 MHz	Channel 58:	2458 MHz	Channel 78:	2478 MHz
Channel 19:	2419 MHz	Channel 39:	2439 MHz	Channel 59:	2459 MHz	Channel 79:	2479 MHz
Channel 20:	2420 MHz	Channel 40:	2440 MHz	Channel 60:	2460 MHz		
Channel 21:	2421 MHz	Channel 41:	2441 MHz	Channel 61:	2461 MHz		

Note:

1. The EUT is a Gaming Mouse with a built-in 2.4GHz wireless transceiver.
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 of the equipment for the purpose of demonstrating compliance of transmitter with Part 15 Subpart C Paragraph 15.249 for spread spectrum devices.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode	Mode 1: Transmit
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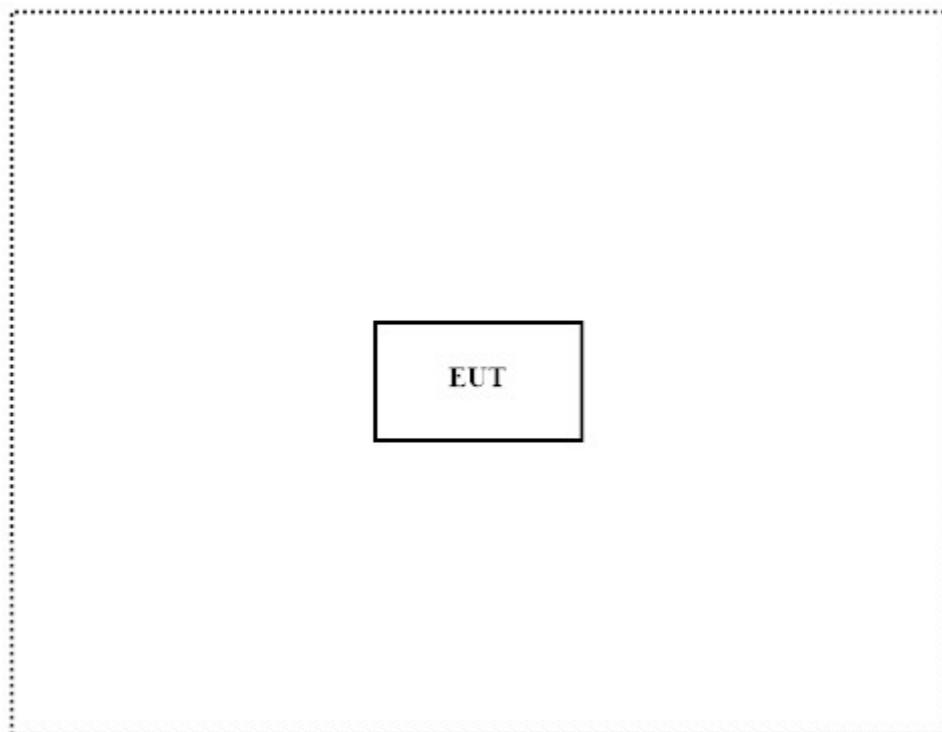
1.3. Tested System Details

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
N/A				

Signal Cable Type	Signal cable Description
N/A	

1.4. Configuration of Test System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.4.
- (2) Press the left button and start transmits continually.
- (3) 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

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<http://www.dekra.com.tw/english/about/certificates.aspx?bval=5>

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Accredited Number: 3023

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FCC Accreditation Number: TW0023

1.7. List of Test Equipment

For Conduction measurements /ASR1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	EMI Test Receiver	R&S	ESR7	101602	2018.12.17	2019.12.16
X	Two-Line V-Network	R&S	ENV216	101306	2019.03.11	2020.03.10
X	Two-Line V-Network	R&S	ENV216	101307	2019.04.03	2020.04.02
X	Coaxial Cable	Quietek	RG400_BNC	RF001	2018.05.24	2019.05.23

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

For Conducted measurements /ASR4

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Spectrum Analyzer	R&S	FSV30	103464	2019.01.25	2020.01.24
X	Power Meter	Anritsu	ML2496A	1548003	2018.12.19	2019.12.18
X	Power Sensor	Anritsu	MA2411B	1531024	2018.12.19	2019.12.18
X	Power Sensor	Anritsu	MA2411B	1531025	2018.12.19	2019.12.18
	Bluetooth Tester	R&S	CBT	101238	2019.01.21	2020.01.20

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 System V8.0.110

For Radiated measurements /ACB1

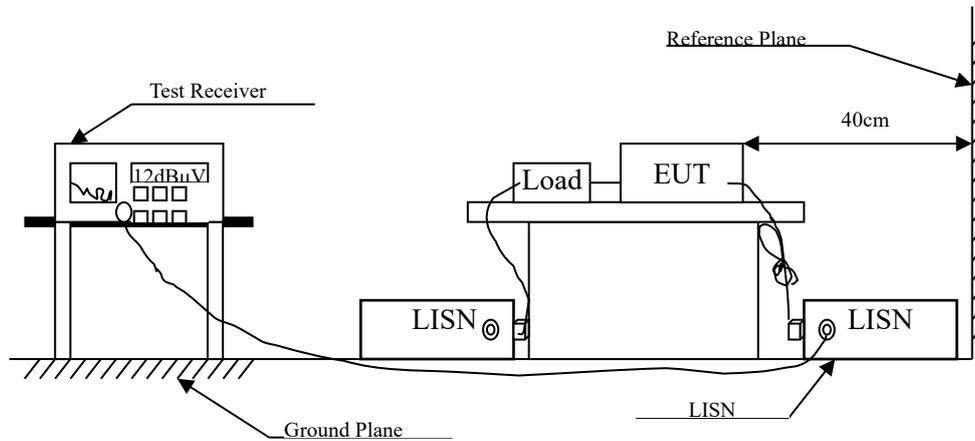
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	AMETEK	HLA6121	49611	2019.02.22	2020.02.21
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-675	2018.06.05	2019.06.04
X	Horn Antenna	ETS-Lindgren	3117	00203800	2018.12.11	2019.12.10
X	Horn Antenna	Com-Power	AH-840	101087	2018.06.01	2019.05.31
X	Pre-Amplifier	EMCI	EMC001330	980316	2018.06.01	2019.05.31
X	Pre-Amplifier	EMCI	EMC051835SE	980311	2018.06.04	2019.06.03
X	Pre-Amplifier	EMCI	EMC05820SE	980310	2018.06.04	2019.06.03
X	Pre-Amplifier	EMCI	EMC184045SE	980314	2018.05.16	2019.05.15
X	Filter	MICRO TRONICS	BRM50702	G251	2018.09.04	2019.09.03
	Filter	MICRO TRONICS	BRM50716	G188	2018.09.04	2019.09.03
X	EMI Test Receiver	R&S	ESR7	101602	2018.12.17	2019.12.16
X	Spectrum Analyzer	R&S	FSV40	101148	2019.02.20	2020.02.19
X	Coaxial Cable	SUHNER	SUCOFLEX 106	RF002	2018.05.25	2019.05.24
X	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2018.05.16	2019.05.15

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 (dB μ V) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

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 investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.4. Uncertainty

± 2.35 dB

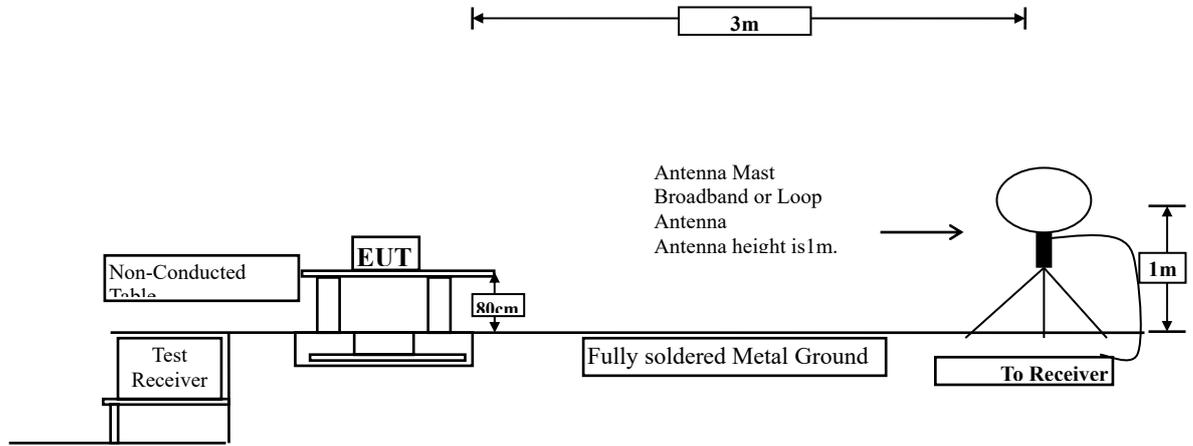
2.5. Test Result of Conducted Emission

Owing to the Battery operation of EUT, this test item is not performed.

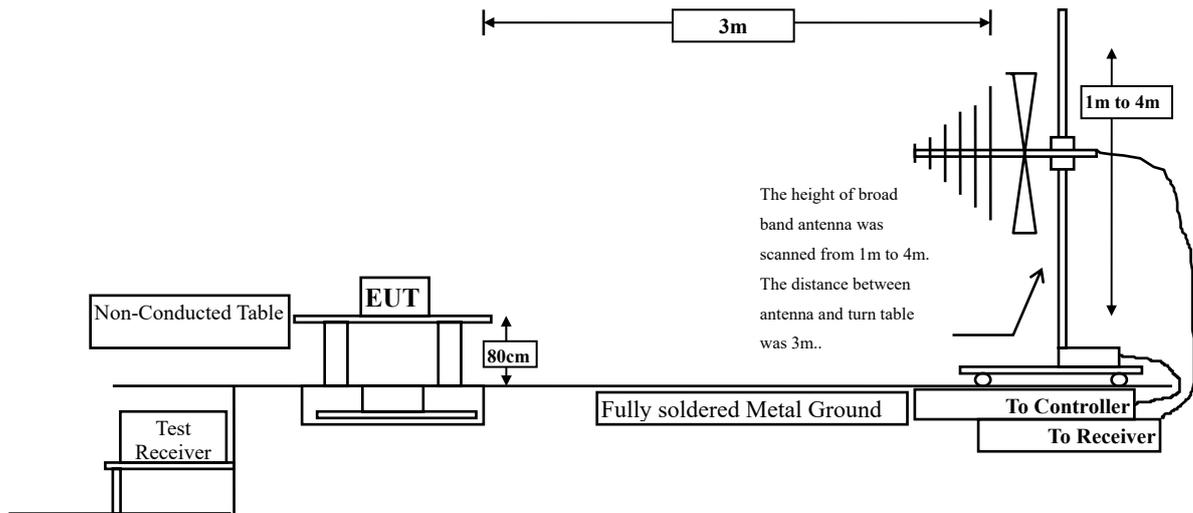
3. Radiated Emission

3.1. Test Setup

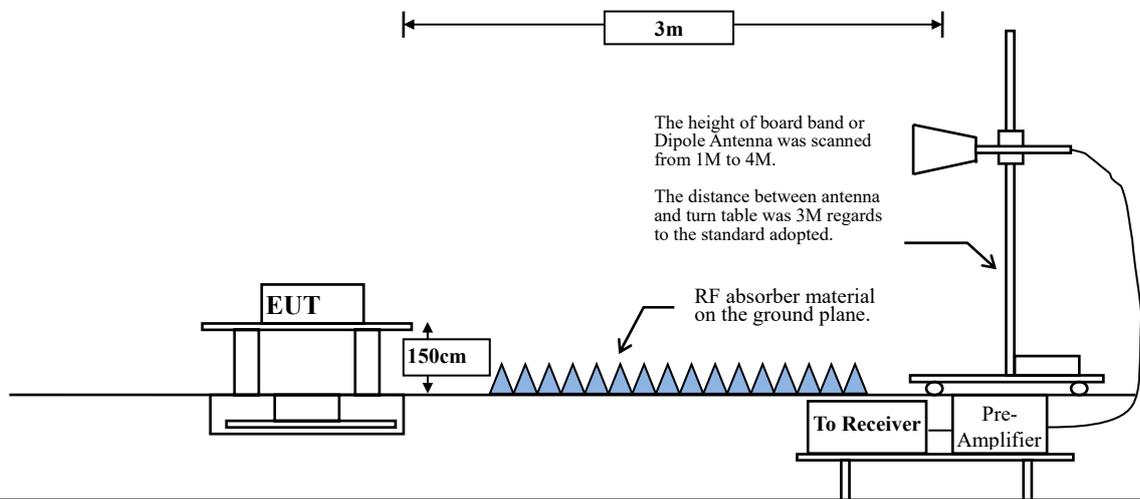
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



3.2. Limits

➤ Fundamental and Harmonics Emission Limits

FCC Part 15 Subpart C Paragraph 15.249 Limits				
Frequency MHz	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m @3m)	(dB μ V /m @3m)	(uV/m @3m)	(dB μ V /m @3m)
902-928	50	94	500	54
2400-2483.5	50	94	500	54
5725-5875	50	94	500	54

- Remarks :
1. RF Voltage (dB μ V /m) = 20 log RF Voltage (uV/m)
 2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

➤ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB 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	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remarks: E field strength (dB μ V /m) = 20 log E field strength (uV/m)

3.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested compliance to FCC 47CFR 15.249 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 measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

3.4. Uncertainty

Horizontal :

30-300MHz: ± 4.08 dB ; 300M-1GHz: ± 3.86 dB ; 1-18GHz: ± 3.77 dB ; 18-40GHz: ± 3.98 dB ◦

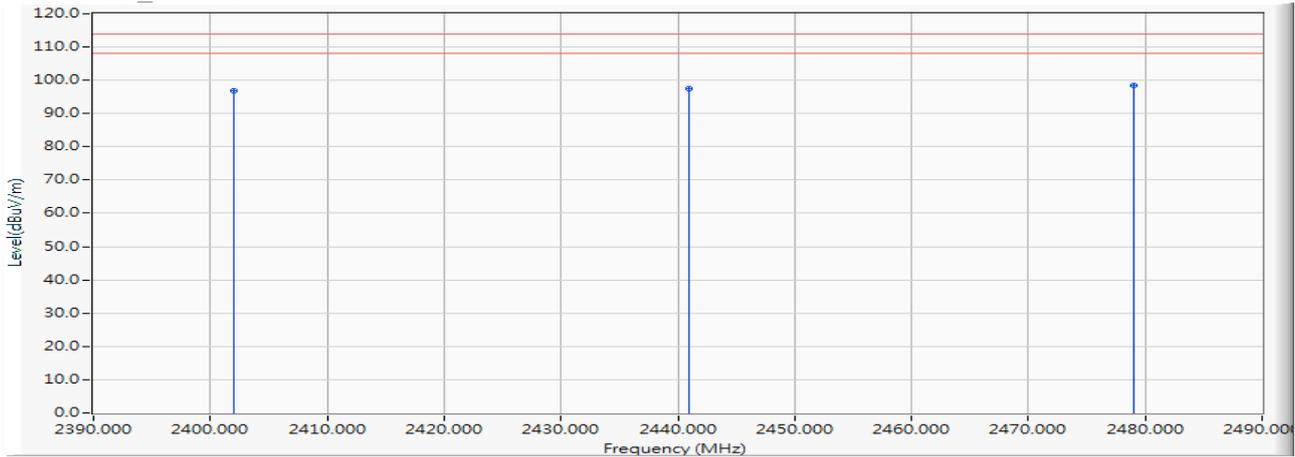
Vertical :

30-300MHz: ± 4.81 dB ; 300M-1GHz: ± 3.87 dB ; 1-18GHz: ± 3.83 dB ; 18-40GHz: ± 3.98 dB ◦

3.5. Test Result of Radiated Emission

Product : Gaming Mouse
 Test Item : Fundamental Radiated Emission
 Test Date : 2019/04/10
 Test Mode : Mode 1: Transmit (X-Axis)

Horizontal_X-Axis



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2402.000	-8.907	105.830	96.924	-17.076	114.000	PEAK
2	2441.000	-8.761	106.310	97.550	-16.450	114.000	PEAK
3	* 2479.000	-8.620	106.980	98.360	-15.640	114.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.

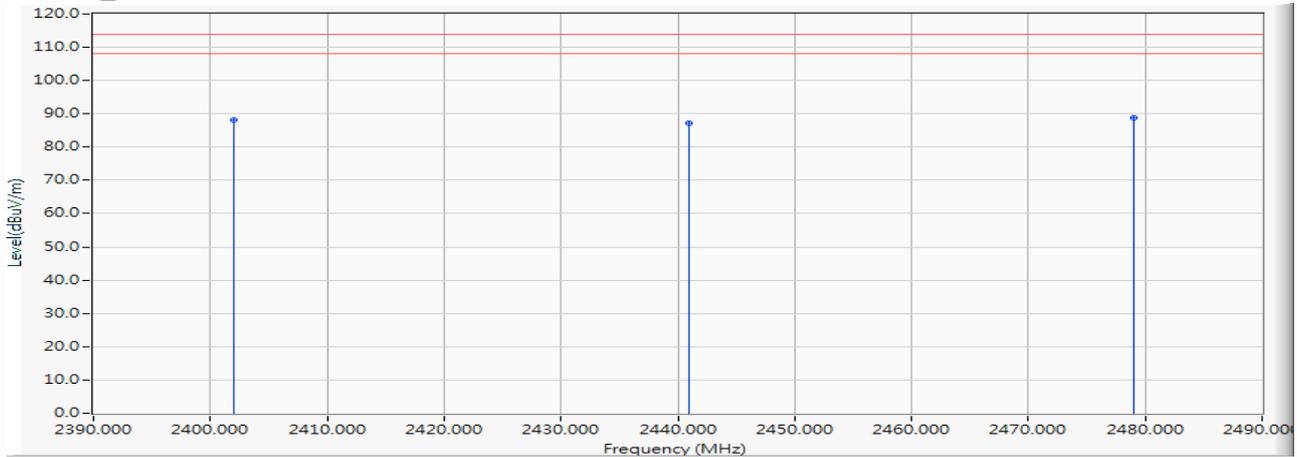
Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
Horizontal_X-Axis						
02 (Average)	2402.000	96.924	-33.363	63.561	-30.439	94.00
41 (Average)	2441.000	97.550	-33.363	64.187	-29.813	94.00
79 (Average)	2479.000	98.360	-33.363	64.997	-29.003	94.00

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Gaming Mouse
 Test Item : Fundamental Radiated Emission
 Test Date : 2019/04/10
 Test Mode : Mode 1: Transmit (X-Axis)

Vertical_X-Axis



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2402.000	-8.907	96.910	88.004	-25.996	114.000	PEAK
2		2441.000	-8.761	95.930	87.170	-26.830	114.000	PEAK
3	*	2479.000	-8.620	97.520	88.900	-25.100	114.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.

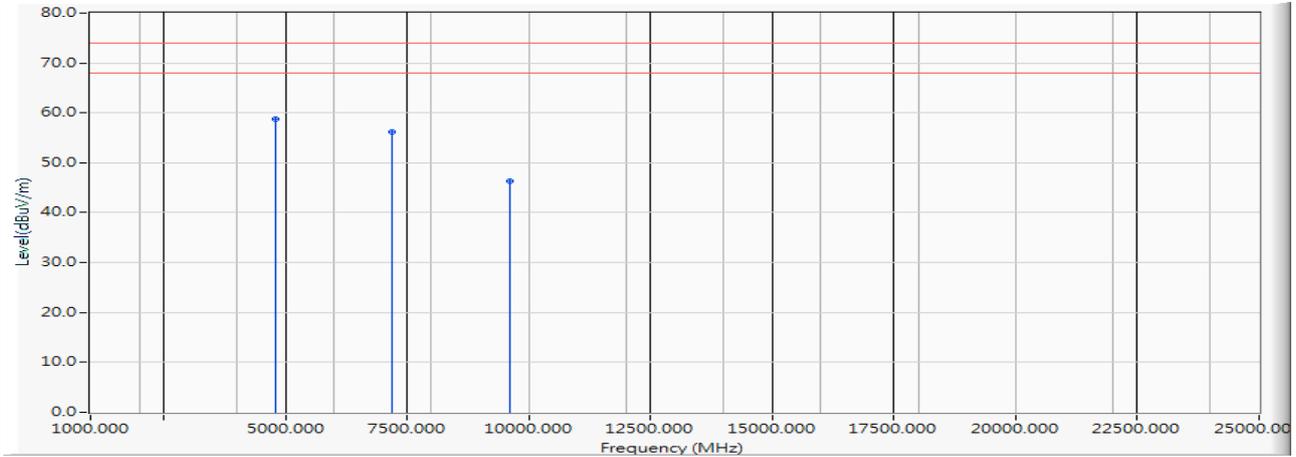
Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
Vertical_X-Axis						
02 (Average)	2402.000	88.004	-33.363	54.641	-39.359	94.00
41 (Average)	2441.000	87.170	-33.363	53.807	-40.193	94.00
79 (Average)	2479.000	88.900	-33.363	55.537	-38.463	94.00

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Gaming Mouse
 Test Item : Harmonic Radiated Emission Data
 Test Date : 2019/04/10
 Test Mode : Mode 1: Transmit (2402MHz)

Horizontal



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4804.000	-6.081	64.810	58.729	-15.271	74.000	PEAK
2		7206.000	-3.033	59.330	56.297	-17.703	74.000	PEAK
3		9608.000	-0.774	47.090	46.317	-27.683	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. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

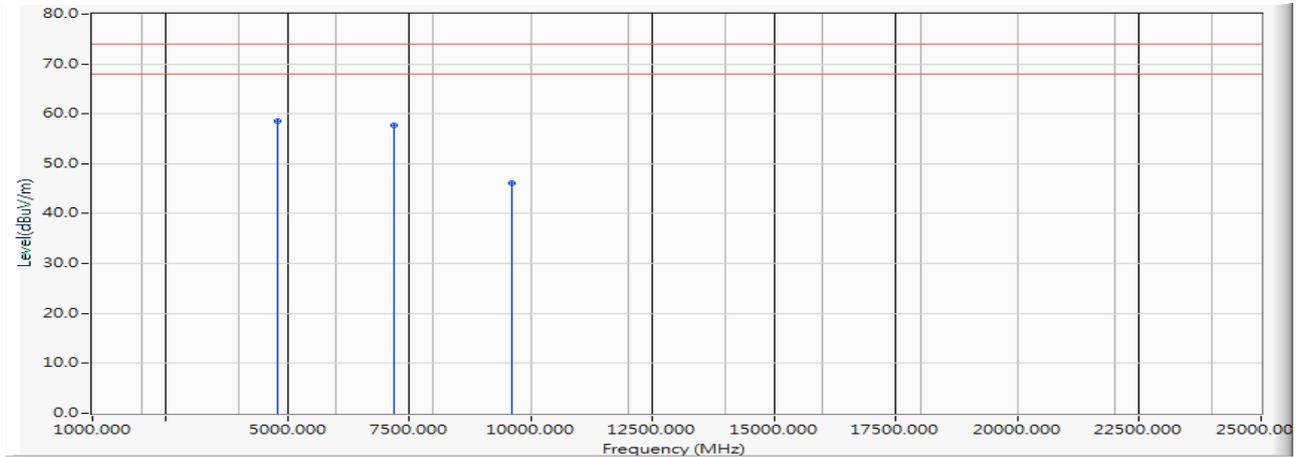
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
4804	58.729	-33.363	25.366	-28.634	74.000	54.000
7206	56.297	-33.363	22.934	-31.066	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Gaming Mouse
 Test Item : Harmonic Radiated Emission Data
 Test Date : 2019/04/10
 Test Mode : Mode 1: Transmit (2402MHz)

Vertical



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4804.000	-6.081	64.720	58.639	-15.361	74.000	PEAK
2		7206.000	-3.033	60.660	57.627	-16.373	74.000	PEAK
3		9608.000	-0.774	46.820	46.047	-27.953	74.000	PEAK

Note:

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

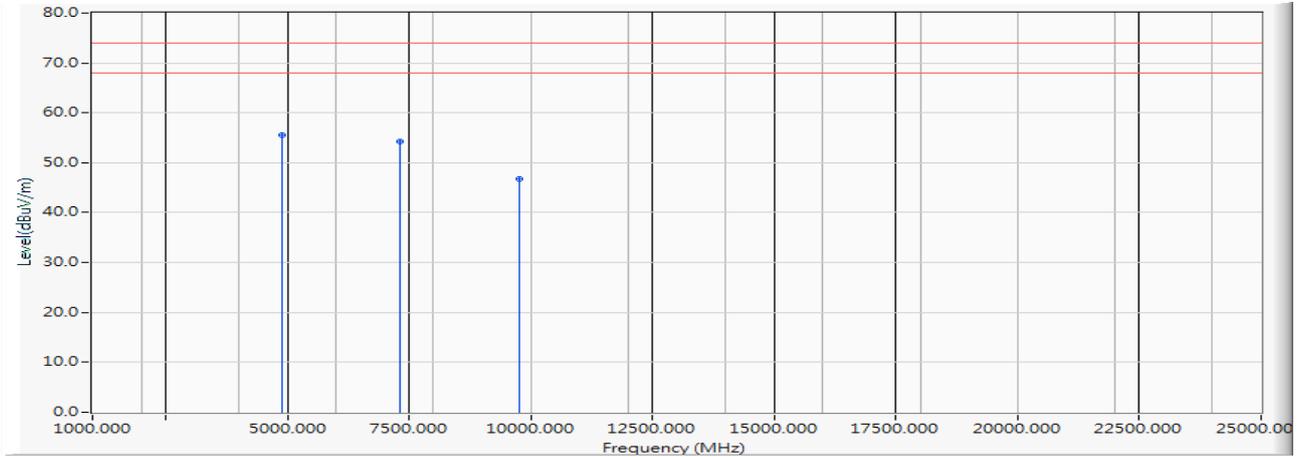
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
4804	58.639	-33.363	25.276	-28.724	74.000	54.000
7206	57.627	-33.363	24.264	-29.736	74.000	54.000

Note:

- AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
- The Duty Cycle is refer to section 5.

Product : Gaming Mouse
 Test Item : Harmonic Radiated Emission Data
 Test Date : 2019/04/10
 Test Mode : Mode 1: Transmit (2441MHz)

Horizontal



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4882.000	-6.042	61.670	55.628	-18.372	74.000	PEAK
2		7323.000	-2.954	57.260	54.306	-19.694	74.000	PEAK
3		9764.000	-0.487	47.140	46.653	-27.347	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. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

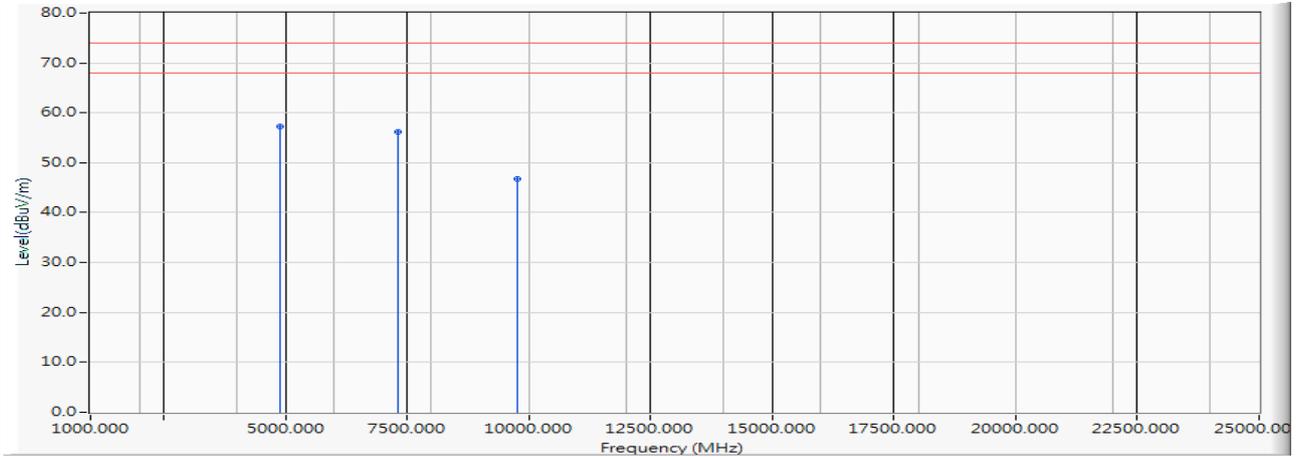
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
4882	55.628	-33.363	22.265	-31.735	74.000	54.000
7323	54.306	-33.363	20.943	-33.057	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Gaming Mouse
 Test Item : Harmonic Radiated Emission Data
 Test Date : 2019/04/10
 Test Mode : Mode 1: Transmit (2441MHz)

Vertical



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4882.000	-6.042	63.400	57.358	-16.642	74.000	PEAK
2		7323.000	-2.954	59.040	56.086	-17.914	74.000	PEAK
3		9764.000	-0.487	47.310	46.823	-27.177	74.000	PEAK

Note:

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

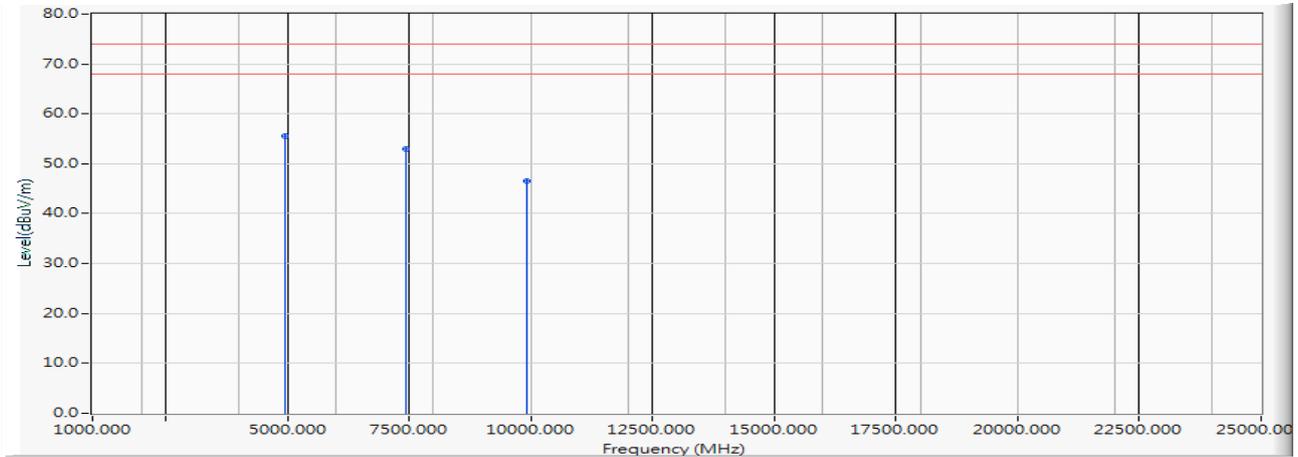
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
4882	57.358	-33.363	23.995	-30.005	74.000	54.000
7323	56.086	-33.363	22.723	-31.277	74.000	54.000

Note:

- AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
- The Duty Cycle is refer to section 5.

Product : Gaming Mouse
 Test Item : Harmonic Radiated Emission Data
 Test Date : 2019/04/10
 Test Mode : Mode 1: Transmit (2479MHz)

Horizontal



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4958.000	-6.041	61.610	55.569	-18.431	74.000	PEAK
2		7437.000	-2.813	55.840	53.027	-20.973	74.000	PEAK
3		9916.000	-0.278	46.770	46.492	-27.508	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. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
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Average Detector:

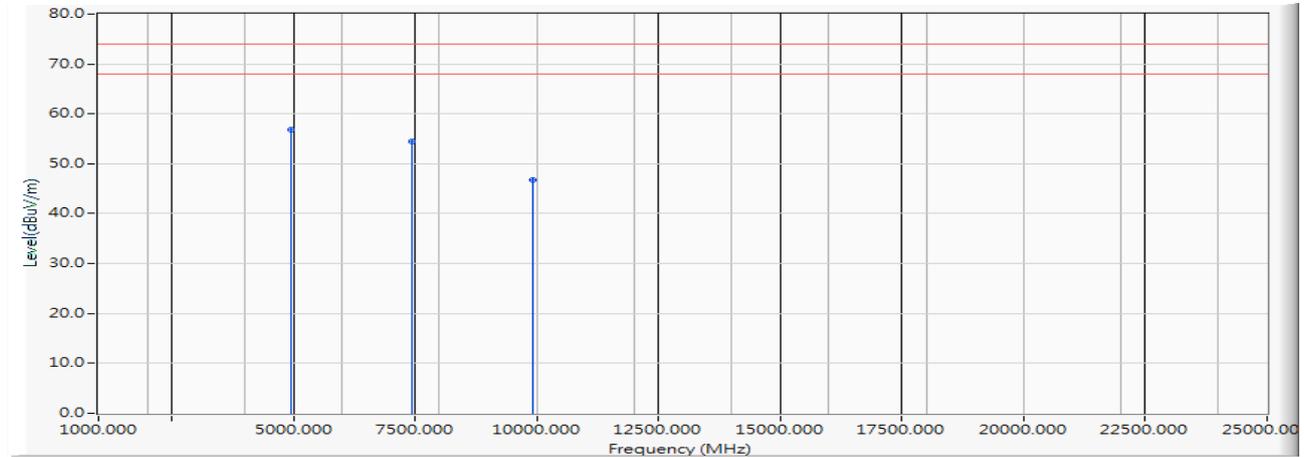
4958	55.569	-33.363	22.206	-31.794	74.000	54.000
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Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Gaming Mouse
 Test Item : Harmonic Radiated Emission Data
 Test Date : 2019/04/10
 Test Mode : Mode 1: Transmit (2479MHz)

Vertical



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4958.000	-6.041	62.810	56.769	-17.231	74.000	PEAK
2		7437.000	-2.813	57.260	54.447	-19.553	74.000	PEAK
3		9916.000	-0.278	46.970	46.692	-27.308	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. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

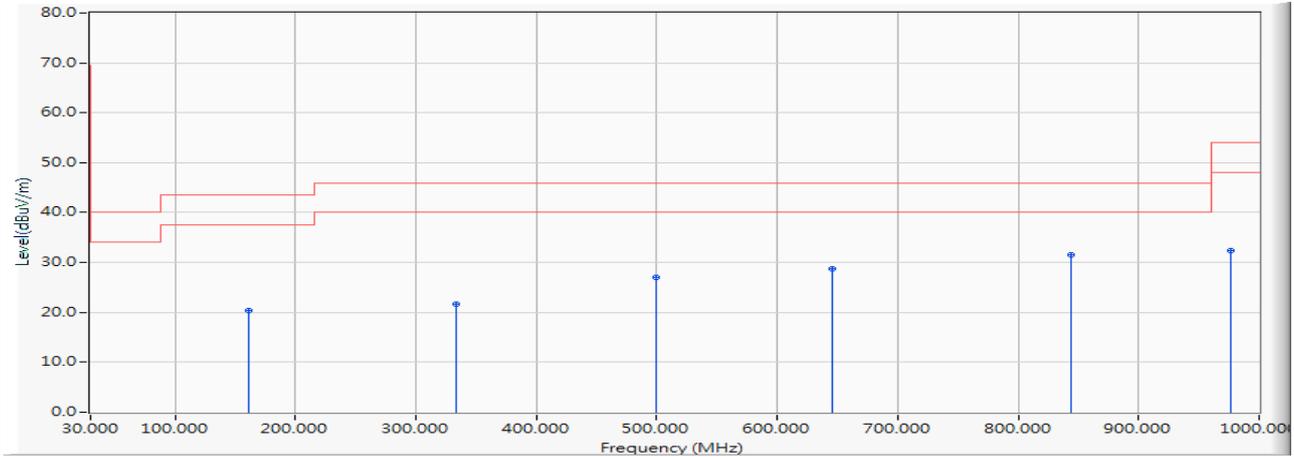
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
4958	56.769	-33.363	23.406	-30.594	74.000	54.000
7437	54.447	-33.363	21.084	-32.916	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 5.

Product : Gaming Mouse
 Test Item : General Radiated Emission Data
 Test Date : 2019/04/11
 Test Mode : Mode 1: Transmit (2441MHz)

Horizontal



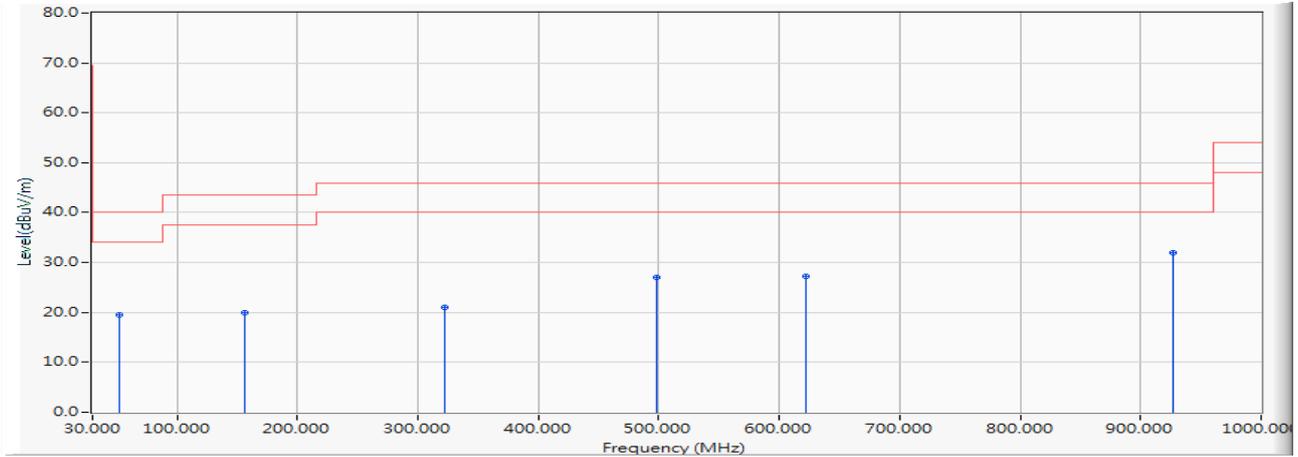
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		160.739	-10.855	31.300	20.445	-23.055	43.500	QUASIPEAK
2		333.652	-9.559	31.173	21.614	-24.386	46.000	QUASIPEAK
3		499.536	-5.960	33.067	27.107	-18.893	46.000	QUASIPEAK
4		645.739	-3.722	32.469	28.747	-17.253	46.000	QUASIPEAK
5	*	843.957	-0.971	32.411	31.440	-14.560	46.000	QUASIPEAK
6		976.101	0.695	31.598	32.294	-21.706	54.000	QUASIPEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.
7. No emission found between lowest internal used/generated frequency to 30MHz.

Product : Gaming Mouse
 Test Item : General Radiated Emission Data
 Test Date : 2019/04/11
 Test Mode : Mode 1: Transmit (2441MHz)

Vertical



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		52.493	-11.223	30.782	19.559	-20.441	40.000	QUASIPeAK
2		156.522	-10.916	30.945	20.030	-23.470	43.500	QUASIPeAK
3		322.406	-9.815	30.896	21.081	-24.919	46.000	QUASIPeAK
4		498.130	-5.984	32.947	26.964	-19.036	46.000	QUASIPeAK
5		621.841	-3.871	31.217	27.345	-18.655	46.000	QUASIPeAK
6	*	926.899	0.098	31.965	32.063	-13.937	46.000	QUASIPeAK

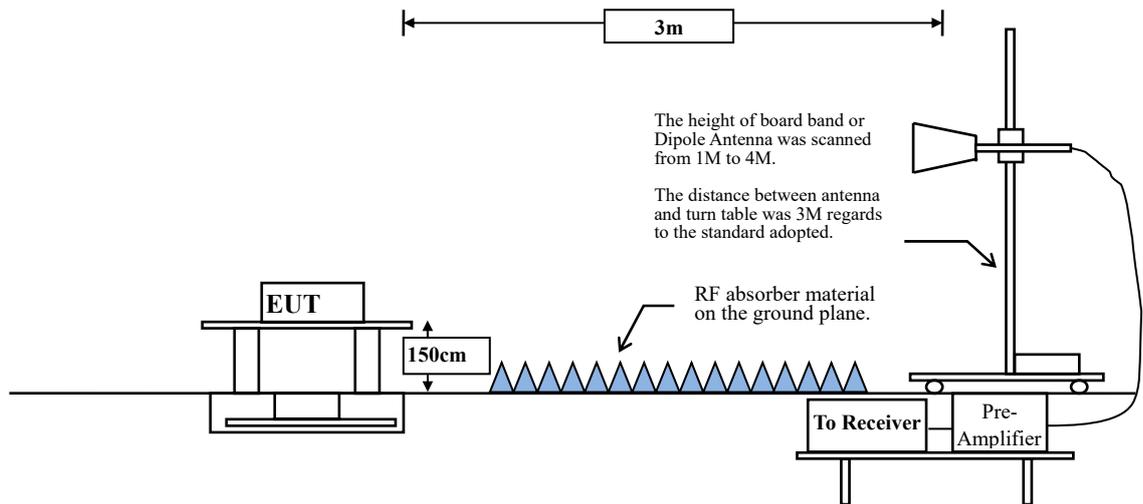
Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.
7. No emission found between lowest internal used/generated frequency to 30MHz.

4. Band Edge

4.1. Test Setup

RF Radiated Measurement:



4.2. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB 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	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

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

4.3. Test Procedure

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 can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The bandwidth setting below 1GHz and above 1GHz on the field strength meter is 120 kHz and 1MHz, respectively.

4.4. Uncertainty

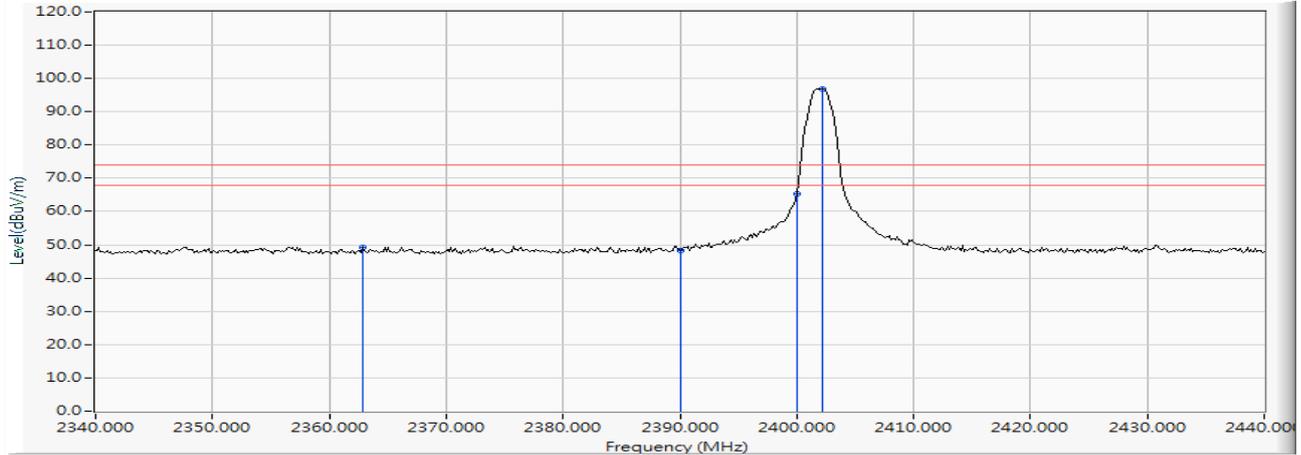
Horizontal polarization : 1-18GHz: ± 3.77 dB

Vertical polarization : 1-18GHz : ± 3.83 dB

4.5. Test Result of Band Edge

Product : Gaming Mouse
 Test Item : Band Edge Data
 Test Date : 2019/04/10
 Test Mode : Mode 1: Transmit (2402MHz)

Horizontal



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2362.899	10.153	39.229	49.382	-24.618	74.000	PEAK
2		2390.000	10.262	38.075	48.337	-25.663	74.000	PEAK
3		2400.000	10.304	54.995	65.298	-8.702	74.000	PEAK
4	*	2402.174	10.312	86.643	96.955	--	--	PEAK

Note:

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

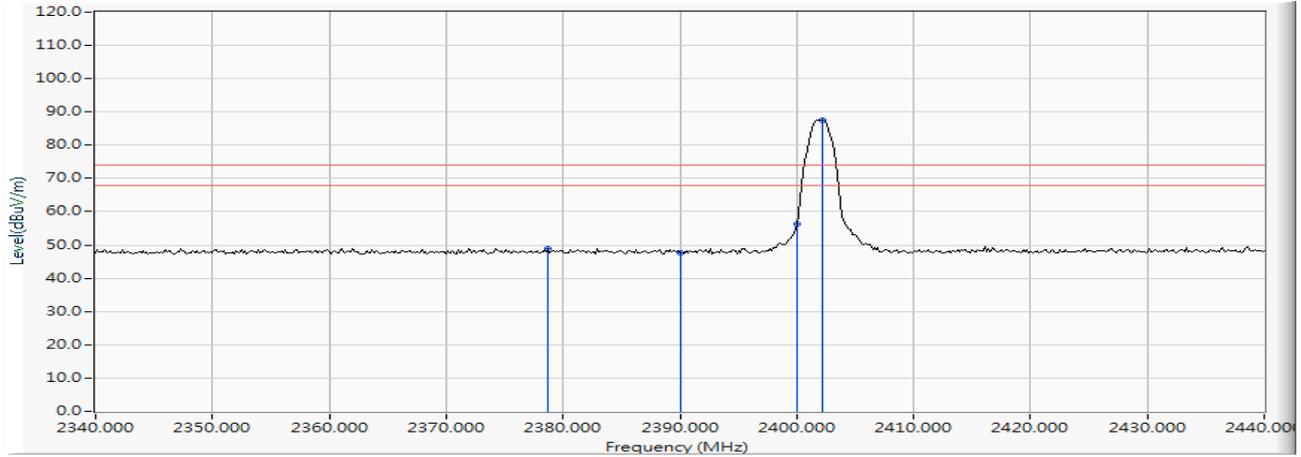
Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
02 (Average)	2362.899	49.382	-33.363	16.019	-37.981	54.00	Pass
02 (Average)	2390	48.337	-33.363	14.974	-39.026	54.00	Pass
02 (Average)	2400	65.298	-33.363	31.935	-22.065	54.00	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 5.

Product : Gaming Mouse
 Test Item : Band Edge Data
 Test Date : 2019/04/10
 Test Mode : Mode 1: Transmit (2402MHz)

Vertical



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2378.696	10.215	38.707	48.923	-25.077	74.000	PEAK
2		2390.000	10.262	37.476	47.738	-26.262	74.000	PEAK
3		2400.000	10.304	45.965	56.268	-17.732	74.000	PEAK
4	*	2402.174	10.312	77.144	87.456	--	--	PEAK

Note:

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

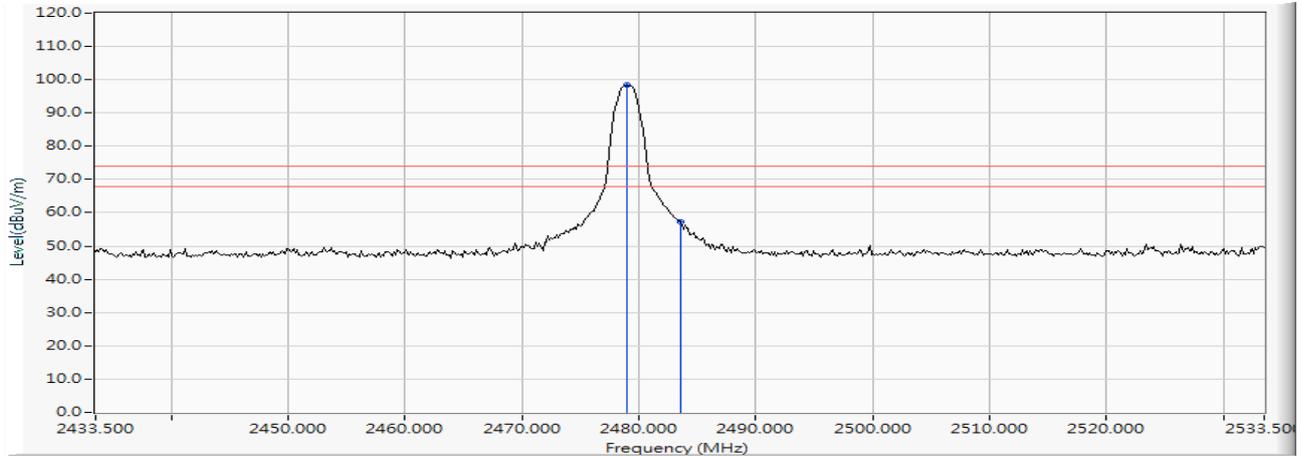
Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
02 (Average)	2378.696	48.923	-33.363	15.560	-38.440	54.00	Pass
02 (Average)	2390	47.738	-33.363	14.375	-39.625	54.00	Pass
02 (Average)	2400	56.268	-33.363	22.905	-31.095	54.00	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 5.

Product : Gaming Mouse
 Test Item : Band Edge Data
 Test Date : 2019/04/10
 Test Mode : Mode 1: Transmit (2479MHz)

Horizontal



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2479.007	10.624	87.858	98.482	--	--	PEAK
2		2483.500	10.640	46.486	57.127	-16.873	74.000	PEAK

Note:

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

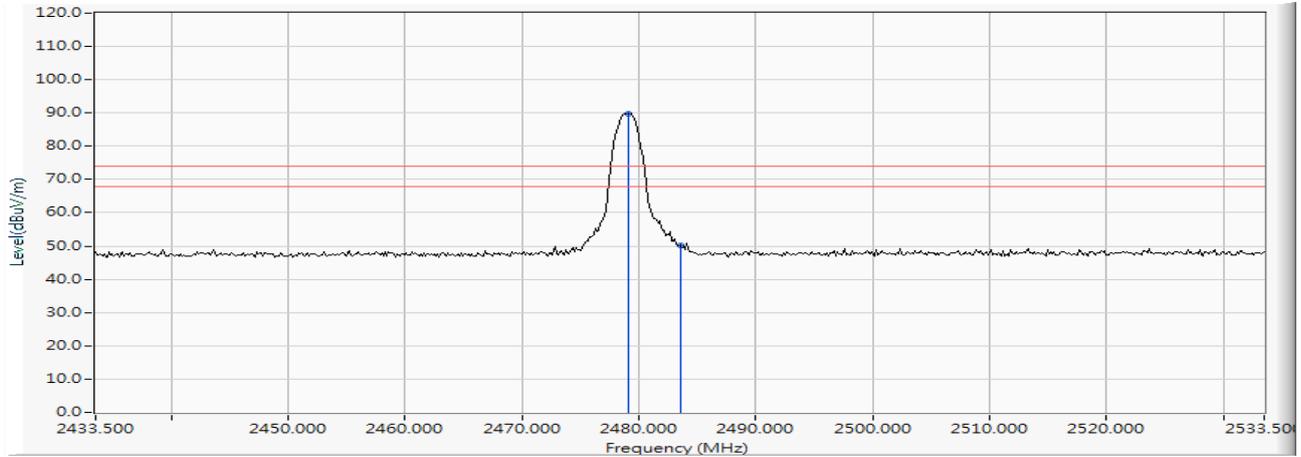
Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
79 (Average)	2483.5	57.127	-33.363	23.764	-30.236	54.00	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 5.

Product : Gaming Mouse
 Test Item : Band Edge Data
 Test Date : 2019/04/10
 Test Mode : Mode 1: Transmit (2479MHz)

Vertical



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2479.152	10.624	79.119	89.744	--	--	PEAK
2		2483.500	10.640	39.615	50.256	-23.744	74.000	PEAK

Note:

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

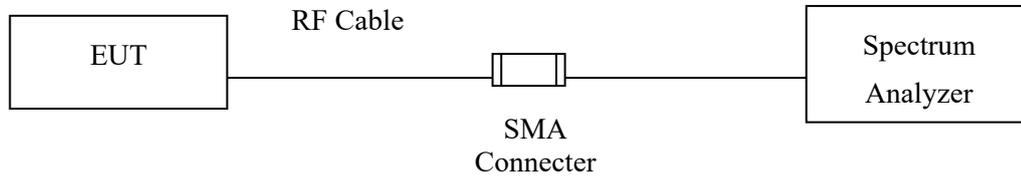
Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
79 (Average)	2483.5	50.256	-33.363	16.893	-37.107	54.00	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 5.

5. Duty Cycle

5.1. Test Setup

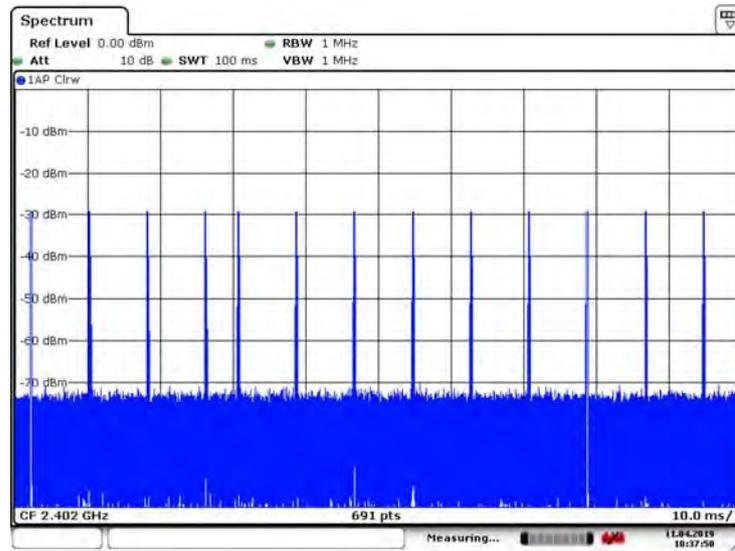
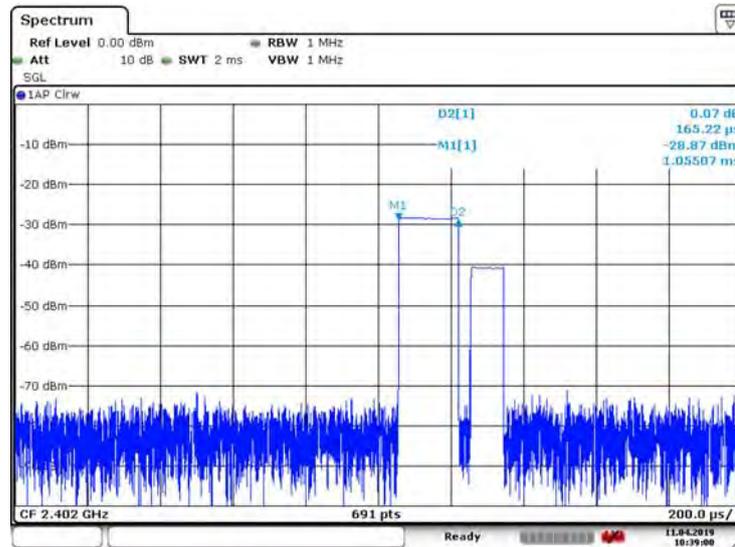


5.2. Uncertainty

$\pm 2.31\text{ms}$

5.3. Test Result of Duty Cycle

Product : Gaming Mouse
 Test Item : Duty Cycle Data
 Test Mode : Normal mode



Time on of 100ms= 165.2us*13= 2.147ms

Duty Cycle=2.147ms / 100ms= 0.06

Duty Cycle correction factor= 20 LOG 0.06= -33.363 dB

Duty Cycle correction factor	-33.363	dB
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6. EMI Reduction Method During Compliance Testing

No modification was made during testing.