FCC Test Report

Product Name	Gaming Mouse
Model No.	P706
FCC ID	EMJMSP706

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

Date of Receipt	Dec. 24, 2020
Issued Date	Jan. 28, 2021
Report No.	20C0908R-E3032110120
Report Version	V1.0

Testing Laboratory
3023

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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The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.
Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test Report

Issued Date: Jan. 28, 2021
Report No.: 20C0908R-E3032110120

Product Name	Gaming Mouse
Applicant	Primax Electronics Ltd
Address	669 Ruey Kuang Road Neihu 114, Taipei, Taiwan
Manufacturer	Primax Electronics Ltd
Model No.	P706
FCC ID	EMJMSP706
EUT Rated Voltage	DC 5V (Power by USB) or DC 3.7V (Power by battery)
EUT Test Voltage	DC 5V (Power by USB)
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 : Jinn Chen

(Senior Adm. Specialist / Jinn Chen)

Tested By : Ivan Chuang

(Senior Engineer / Ivan Chuang)

Approved By :

(Director / Vincent Lin)

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Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

Revision History

Report No.	Version	Description	Issued Date
20C0908R-E3032110120	V1.0	Initial issue of report.	Jan. 28, 2021

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Gaming Mouse
Trade Name	ASUS
Model No.	P706
FCC ID	EMJMSP706
Frequency Range	2403-2480MHz
Channel Number	78CH
Type of Modulation	GFSK
Antenna Type	Multilayer Chip Antenna
Antenna Gain	Refer to the table “Antenna List”
Channel Control	Auto
USB Cable	MFR: ASUS, M/N: P706, Non-shielded, 2m
Type C to USB Extender	MFR: ASUS, M/N: P706

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	Advanced Ceramic X	AT3216-B2R7HAA_/LF	Multilayer Chip Antenna	-1.00 dBi for 2.4GHz

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 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 BluetoothV5.0 and 2.4G wireless transceiver, this report is for 2.4G wireless.
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.

Test Mode	Mode 1: Transmit Mode 2: Normal mode

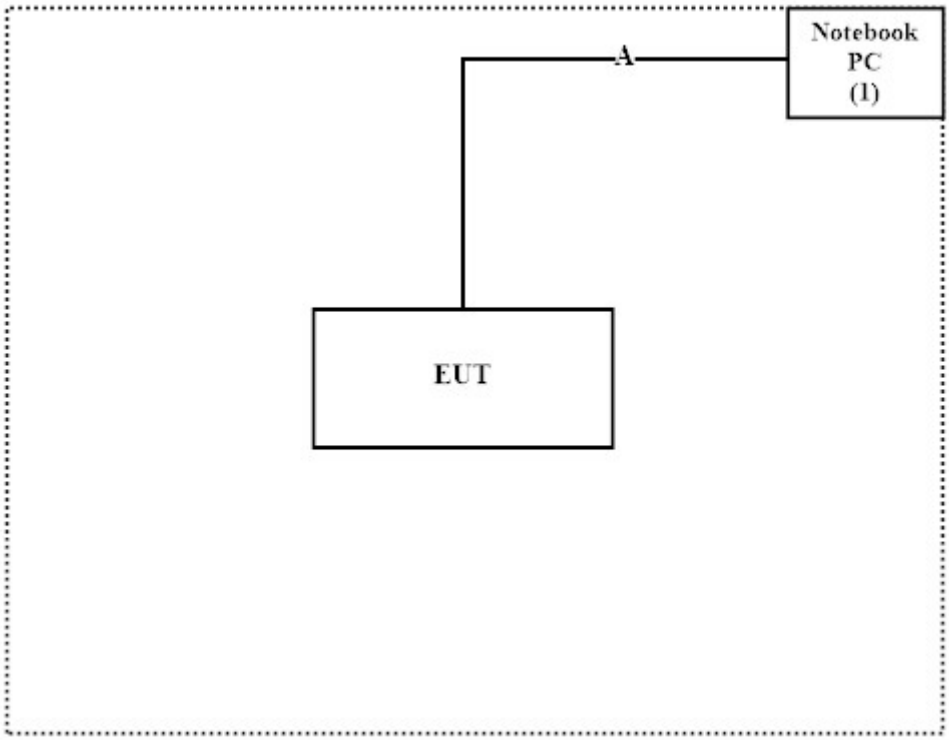
1.2. Tested System Datails

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 E5440	FS9TK32	Non-shielded, 0.8m

Signal Cable Type		Signal cable Description
A	USB Cable	Non-shielded, 2m

1.3. Configuration of Test System



1.4. EUT Exercise Software

(1) Setup the EUT as shown in Section 1.3.

(2) Execute software ”usb_hid_cmd V1.07” on the Notebook PC.

(3) Configure the test mode and the test channel

(4) Start the continuous transmit.

(5) Verify that the EUT works properly.

1.5. Test Facility

Ambient conditions in the laboratory:

Performed Item	Items	Required	Actual
Radiated Emission	Temperature (°C)	10~40 °C	19.3 °C
	Humidity (%RH)	10~90 %	64.0 %
Conductive	Temperature (°C)	10~40 °C	23.5 °C
	Humidity (%RH)	10~90 %	56 %

USA : FCC Registration Number: TW0023

Canada : IC Registration Number: 25880

Site Description : Accredited by TAF
Accredited Number: 3023

Test Laboratory : DEKRA Testing and Certification Co., Ltd
Address : No.159, Sec. 2, Wenhua 1st Rd., Linkou Dist.,
New Taipei City 24457, Taiwan, R.O.C.
Phone number : 886-2-2602-7968
Fax number : 866-2-2602-3286
Email address : info.tw@dekra.com
Website : http://www.dekra.com.tw

1.6. 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	101601	2020.05.28	2021.05.27
X	Two-Line V-Network	R&S	ENV216	101306	2020.03.25	2021.03.24
X	Two-Line V-Network	R&S	ENV216	101307	2020.04.17	2021.04.16
X	Coaxial Cable	Quietek	RG400_BNC	RF001	2020.05.24	2021.05.23

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 : DEKRA Testing System V2.0

For Conducted measurements /ASR2

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
	Spectrum Analyzer	R&S	FSV30	103466	2020.12.28	2021.12.27
X	Spectrum Analyzer (PXA)	Keysight	N9030B(AT0-74915)	MY56320509	2020.08.10	2021.08.09
	Power Meter	Anritsu	ML2496A	1548003	2020.05.13	2021.05.12
	Power Sensor	Anritsu	MA2411B	1531024	2020.05.22	2021.05.21
	Power Sensor	Anritsu	MA2411B	1531025	2020.05.22	2021.05.21

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 V9.0.5

For Radiated measurements /ACB1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	AMETEK	HLA6121	49611	2020.03.16	2021.03.15
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-675	2021.01.03	2022.01.02
X	Horn Antenna	ETS-Lindgren	3117	00203761	2020.12.22	2021.12.21
X	Horn Antenna	Com-Power	AH-840	101087	2020.06.08	2021.06.07
X	Pre-Amplifier	EMCI	EMC001330	980301	2020.06.23	2021.06.22
X	Pre-Amplifier	EMCI	EMC051835SE	980312	2020.06.23	2021.06.22
	Pre-Amplifier	EMCI	EMC05820SE	980308	2020.06.24	2021.06.23
	Pre-Amplifier	EMCI	EMC184045SE	980314	2020.06.10	2021.06.09
X	Filter	MICRO TRONICS	BRM50702	G251	2020.09.17	2021.09.16
	Filter	MICRO TRONICS	BRM50716	G188	2020.09.17	2021.09.16
X	EMI Test Receiver	R&S	ESR7	101602	2020.12.16	2021.12.15
X	Spectrum Analyzer	R&S	FSV40	101147	2020.03.16	2021.03.15
X	Coaxial Cable	SUHNER	SUCOFLEX 106	RF002	2020.07.03	2021.07.02
X	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2020.06.10	2021.06.09

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 Testing System V2.0

1.7. Uncertainty

Uncertainties have been calculated according to the DEKRA internal document, and is described in each test chapter of this report.

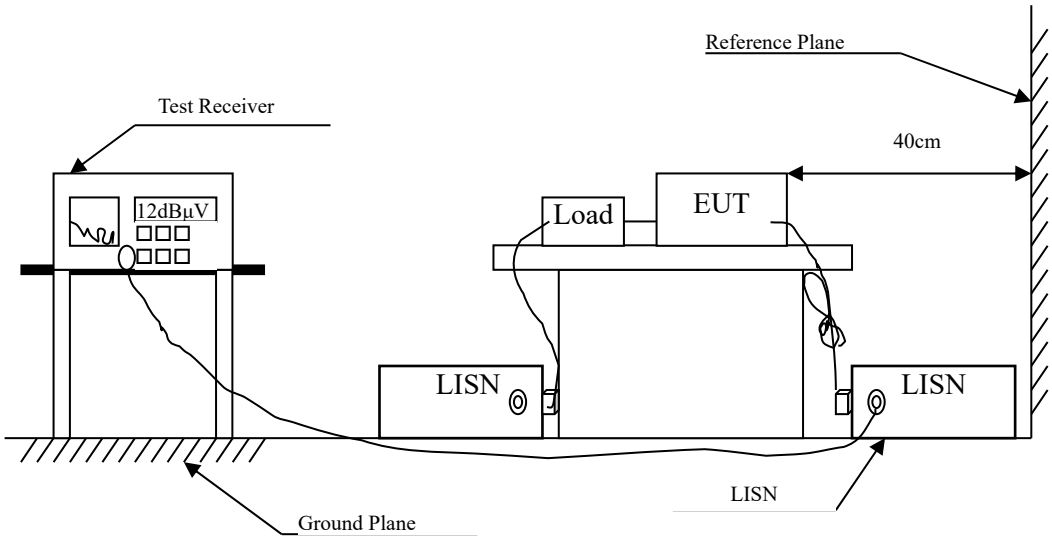
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test item	Uncertainty	
Conducted Emission	±3.42 dB	
Radiated Emission	Under 1GHz ±4.06 dB	Above 1GHz ±3.73 dB
Band Edge	Under 1GHz ±4.06 dB	Above 1GHz ±3.73 dB
Duty Cycle	±2.31 ms	

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBμV) 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

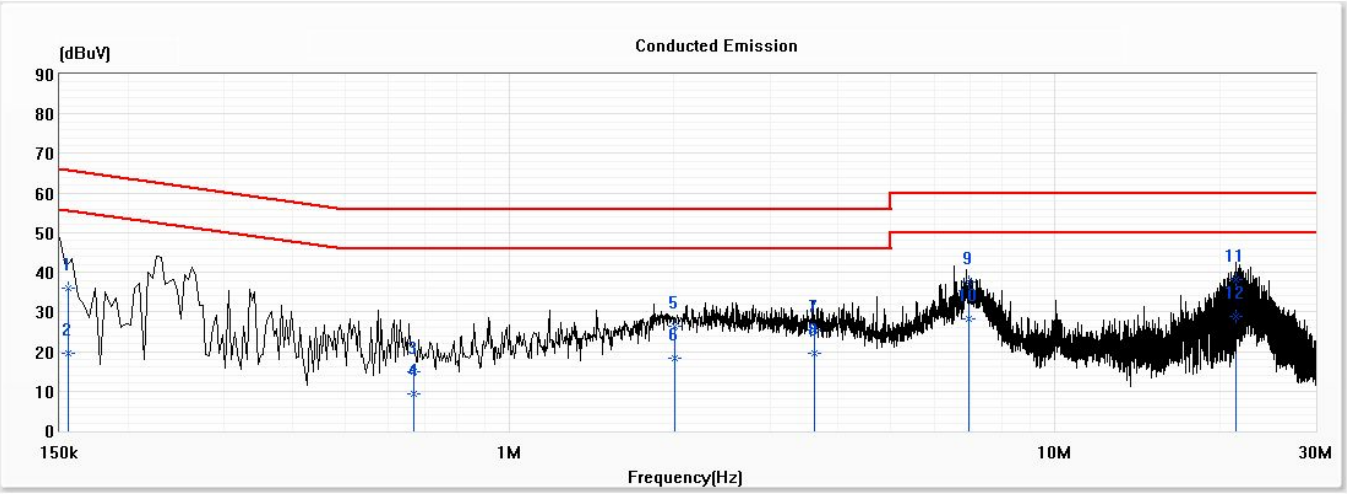
The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling 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 invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.4. Test Result of Conducted Emission

Product : Gaming Mouse
Test Item : Conducted Emission Test
Power Line : L 1
Test Date : 2021/01/28
Test Mode : Mode 1: Transmit (2440MHz)

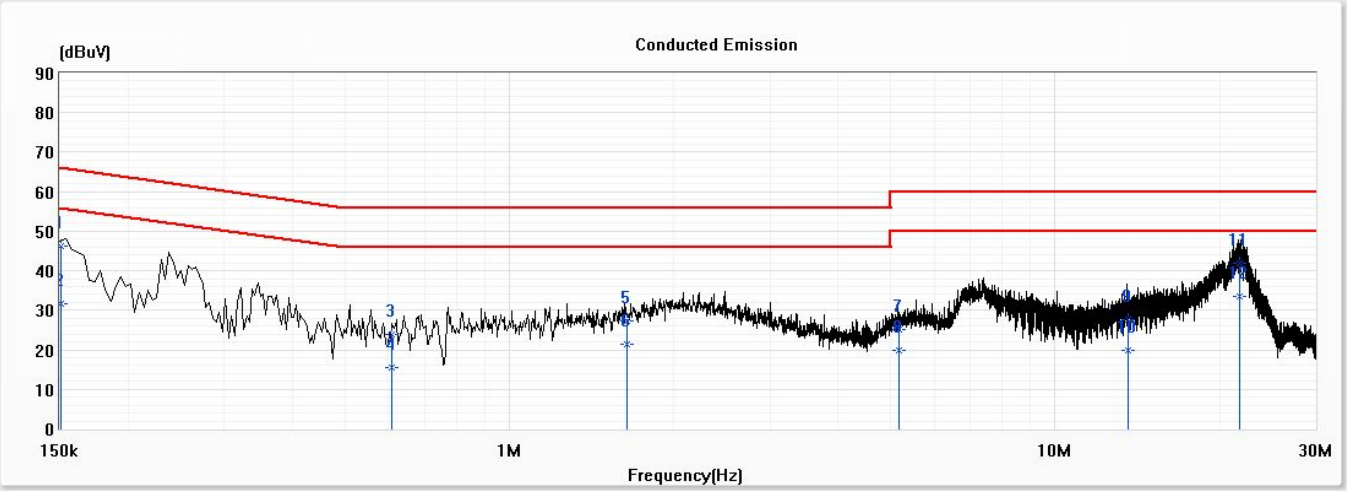


No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	0.156	35.95	65.68	-29.74	26.29	9.66	QP
2	0.156	19.52	55.68	-36.17	9.86	9.66	AV
3	0.668	14.94	56.00	-41.06	5.27	9.67	QP
4	0.668	9.38	46.00	-36.62	-0.29	9.67	AV
5	2.009	26.33	56.00	-29.67	16.61	9.72	QP
6	2.009	18.20	46.00	-27.80	8.48	9.72	AV
7	3.621	25.40	56.00	-30.60	15.64	9.76	QP
8	3.621	19.70	46.00	-26.30	9.93	9.76	AV
9	6.952	37.66	60.00	-22.34	27.82	9.83	QP
10	6.952	28.23	50.00	-21.77	18.39	9.83	AV
11	21.480	38.07	60.00	-21.93	28.10	9.97	QP
*12	21.480	28.78	50.00	-21.22	18.82	9.97	AV

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 : N
Test Date : 2021/01/28
Test Mode : Mode 1: Transmit (2440MHz)



No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	0.150	46.22	65.97	-19.75	36.55	9.67	QP
2	0.150	31.74	55.97	-24.24	22.07	9.67	AV
3	0.607	24.01	56.00	-31.99	14.33	9.67	QP
4	0.607	15.67	46.00	-30.33	6.00	9.67	AV
5	1.645	27.26	56.00	-28.74	17.55	9.72	QP
6	1.645	21.51	46.00	-24.49	11.80	9.72	AV
7	5.185	25.00	60.00	-35.00	15.19	9.81	QP
8	5.185	19.79	50.00	-30.21	9.97	9.81	AV
9	13.605	27.61	60.00	-32.39	17.64	9.97	QP
10	13.605	19.78	50.00	-30.22	9.80	9.97	AV
11	21.825	41.94	60.00	-18.06	31.88	10.06	QP
*12	21.825	33.39	50.00	-16.61	23.33	10.06	AV

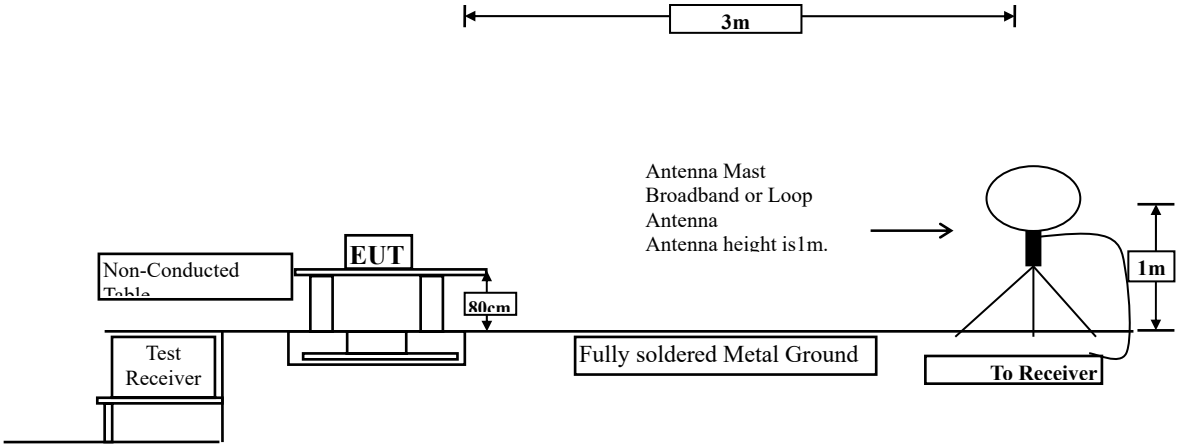
Note:

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

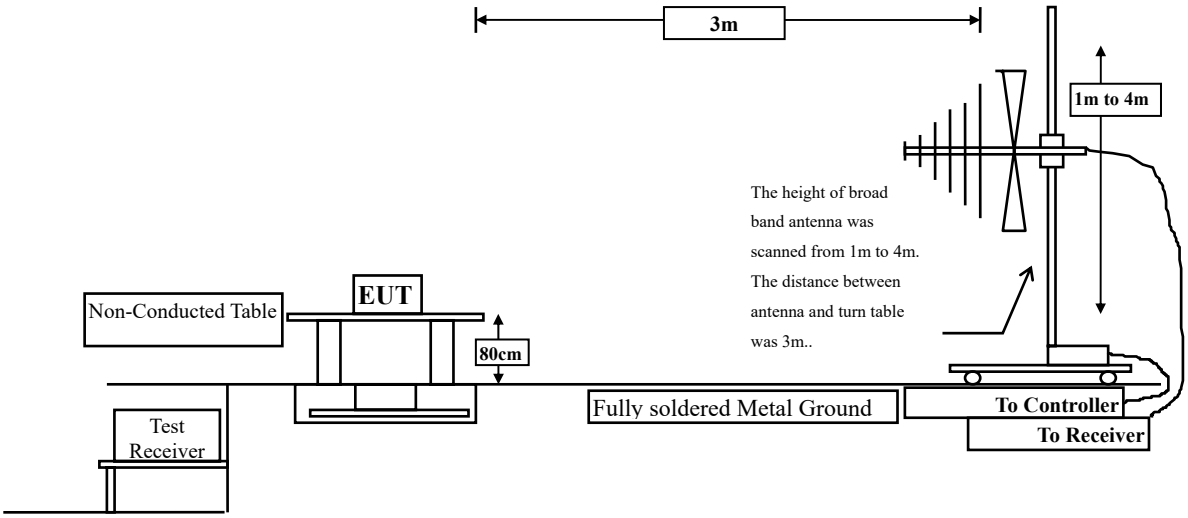
3. Radiated Emission

3.1. Test Setup

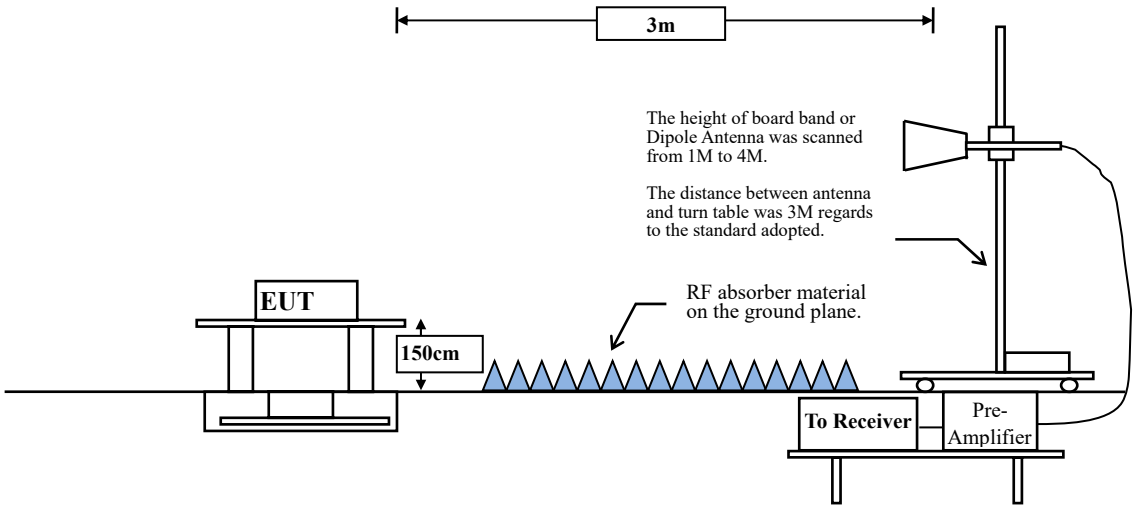
Radiated Emission Under 30MHz



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)	(dBμV /m @3m)	(uV/m @3m)	(dBμV /m @3m)
902-928	50	94	500	54
2400-2483.5	50	94	500	54
5725-5875	50	94	500	54
24000-24250	250	108	2500	68

Remarks : 1. RF Voltage (dBμV /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 (dBμV /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.

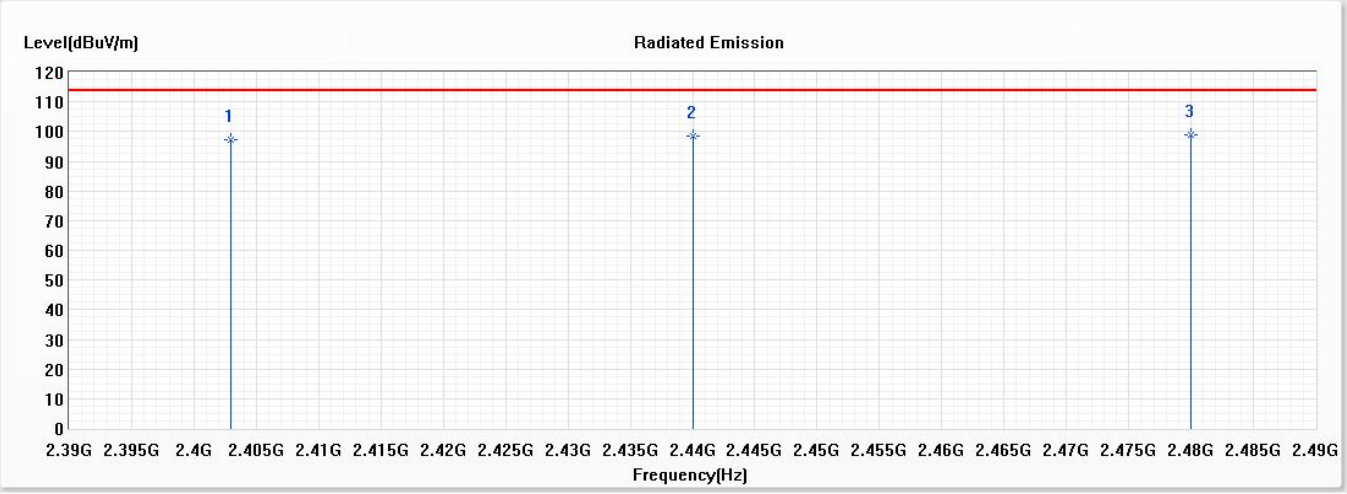
The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the 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 form 9kHz - 10th Harmonic of fundamental was investigated.

3.4. Test Result of Radiated Emission

Product : Gaming Mouse
Test Item : Fundamental Radiated Emission
Test Date : 2021/01/20
Test Mode : Mode 1: Transmit

Horizontal_X-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	2403.000	97.19	114.00	-16.81	85.21	11.98	PK
2	2440.000	98.55	114.00	-15.45	86.42	12.13	PK
* 3	2480.000	99.06	114.00	-14.94	86.83	12.23	PK

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.

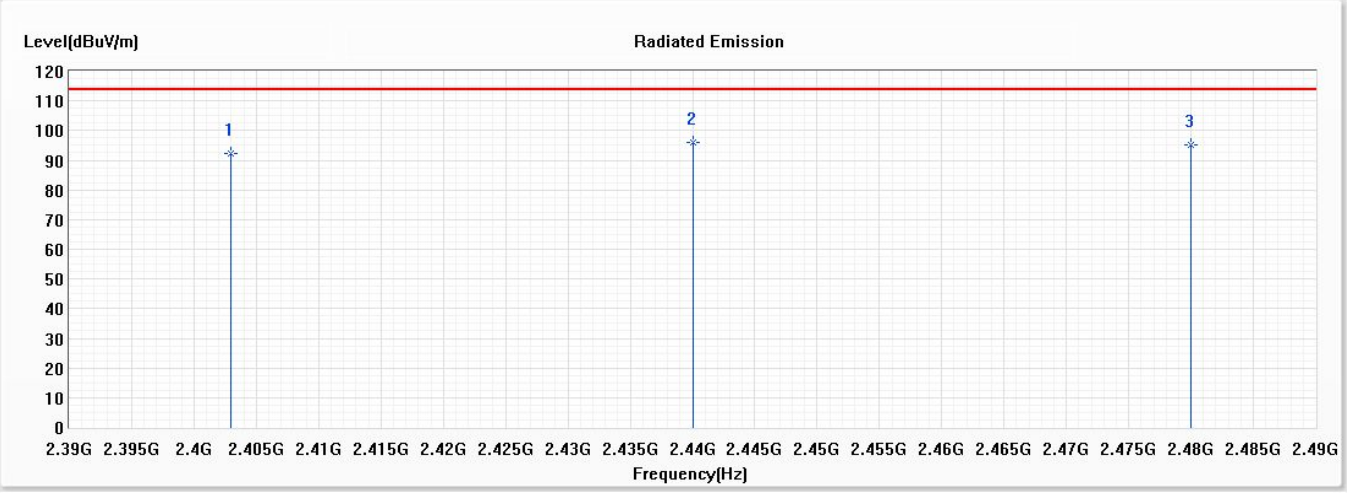
Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2403	97.190	-17.856	79.334	-14.666	94.000
2440	98.550	-17.856	80.694	-13.306	94.000
2480	99.060	-17.856	81.204	-12.796	94.000

Note:

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

Product : Gaming Mouse
Test Item : Fundamental Radiated Emission
Test Date : 2021/01/20
Test Mode : Mode 1: Transmit

Vertical_X-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	2403.000	92.48	114.00	-21.52	80.50	11.98	PK
* 2	2440.000	95.82	114.00	-18.18	83.69	12.13	PK
3	2480.000	95.31	114.00	-18.69	83.08	12.23	PK

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.

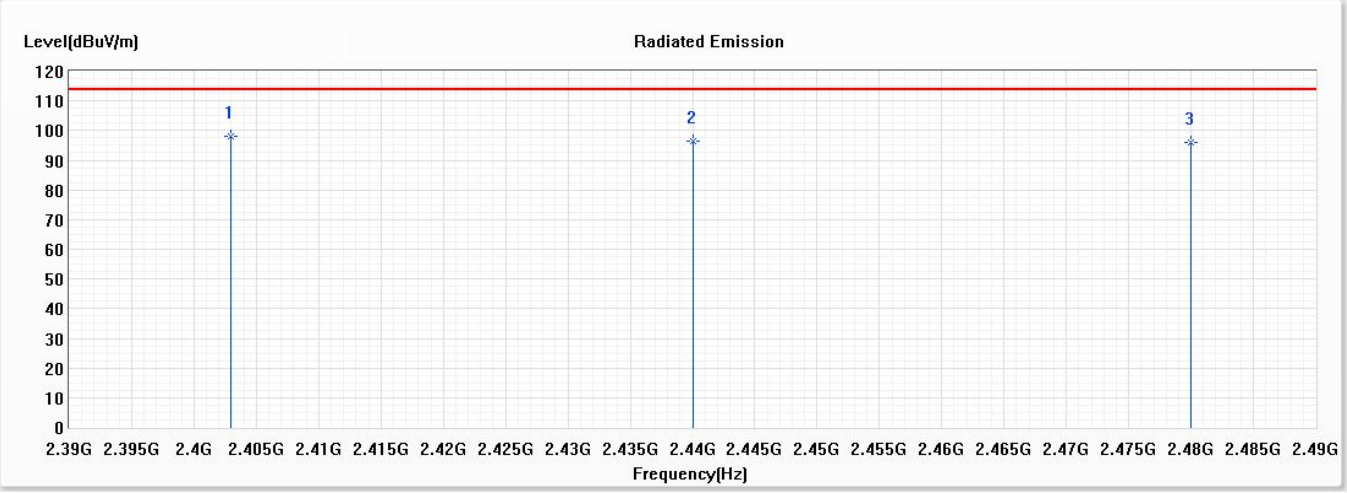
Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2403	92.480	-17.856	74.624	-19.376	94.000
2440	95.820	-17.856	77.964	-16.036	94.000
2480	95.310	-17.856	77.454	-16.546	94.000

Note:

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

Product : Gaming Mouse
Test Item : Fundamental Radiated Emission
Test Date : 2021/01/20
Test Mode : Mode 1: Transmit

Horizontal_Y-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	2403.000	97.93	114.00	-16.07	85.95	11.98	PK
2	2440.000	96.60	114.00	-17.40	84.47	12.13	PK
3	2480.000	96.08	114.00	-17.92	83.85	12.23	PK

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.

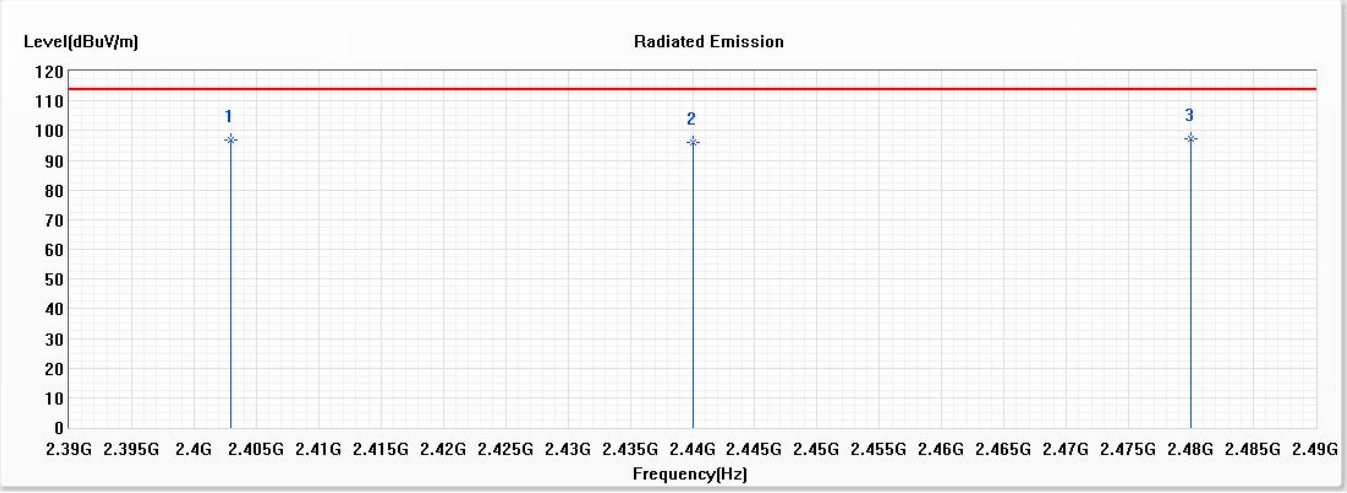
Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2403	97.930	-17.856	80.074	-13.926	94.000
2440	96.600	-17.856	78.744	-15.256	94.000
2480	96.080	-17.856	78.224	-15.776	94.000

Note:

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

Product : Gaming Mouse
Test Item : Fundamental Radiated Emission
Test Date : 2021/01/20
Test Mode : Mode 1: Transmit

Vertical_Y-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	2403.000	96.75	114.00	-17.25	84.77	11.98	PK
2	2440.000	96.18	114.00	-17.82	84.05	12.13	PK
* 3	2480.000	97.16	114.00	-16.84	84.93	12.23	PK

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.

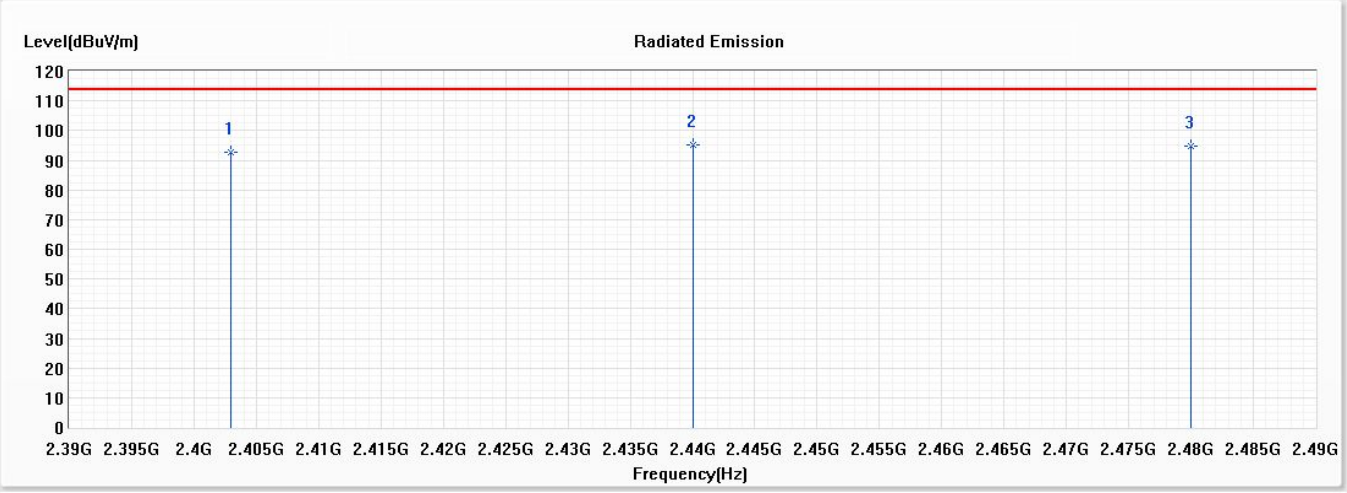
Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2403	96.750	-17.856	78.894	-15.106	94.000
2440	96.180	-17.856	78.324	-15.676	94.000
2480	97.160	-17.856	79.304	-14.696	94.000

Note:

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

Product	:	Gaming Mouse
Test Item	:	Fundamental Radiated Emission
Test Date	:	2021/01/20
Test Mode	:	Mode 1: Transmit

Horizontal_Z-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	2403.000	92.69	114.00	-21.31	80.71	11.98	PK
* 2	2440.000	95.17	114.00	-18.83	83.04	12.13	PK
3	2480.000	94.69	114.00	-19.31	82.46	12.23	PK

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.

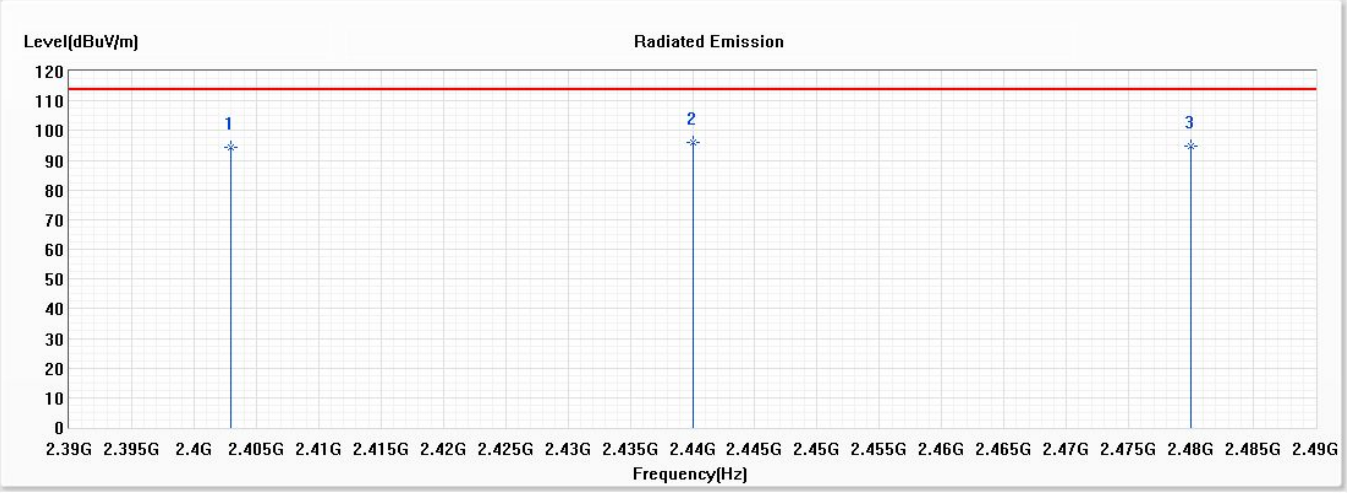
Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2403	92.690	-17.856	74.834	-19.166	94.000
2440	95.170	-17.856	77.314	-16.686	94.000
2480	94.690	-17.856	76.834	-17.166	94.000

Note:

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

Product	:	Gaming Mouse
Test Item	:	Fundamental Radiated Emission
Test Date	:	2021/01/20
Test Mode	:	Mode 1: Transmit

Vertical_Z-Axis



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	2403.000	94.35	114.00	-19.65	82.37	11.98	PK
* 2	2440.000	95.98	114.00	-18.02	83.85	12.13	PK
3	2480.000	94.77	114.00	-19.23	82.54	12.23	PK

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.

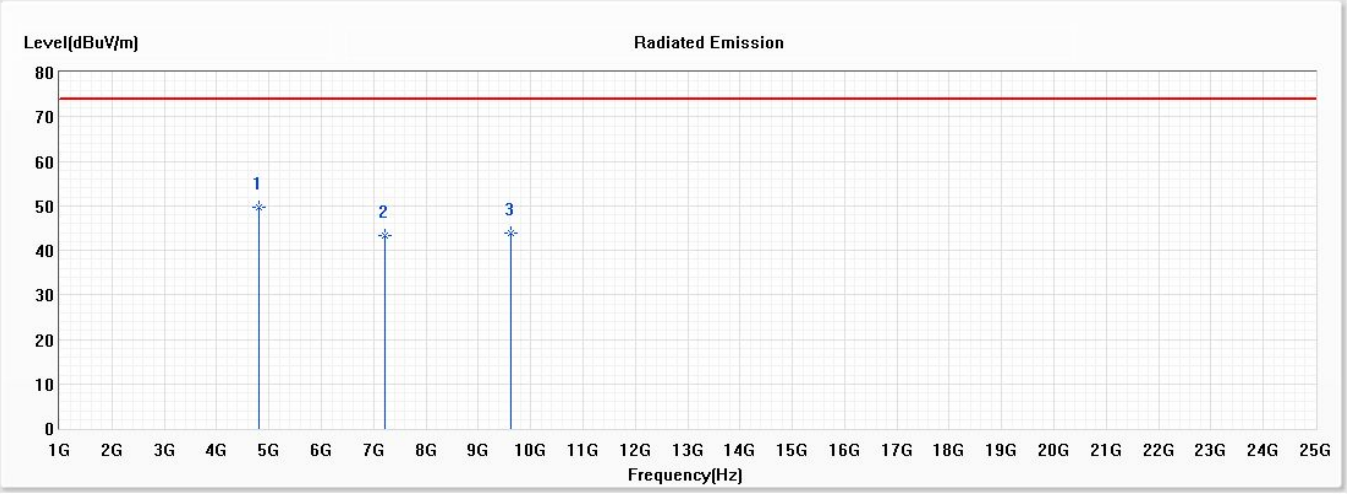
Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2403	94.350	-17.856	76.494	-17.506	94.000
2440	95.980	-17.856	78.124	-15.876	94.000
2480	94.770	-17.856	76.914	-17.086	94.000

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	:	2021/01/20
Test Mode	:	Mode 1: Transmit (2403MHz)

Horizontal



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	4806.000	49.73	74.00	-24.27	62.76	-13.03	PK
2	7209.000	43.30	74.00	-30.70	54.99	-11.69	PK
3	9616.000	43.73	74.00	-30.27	54.91	-11.18	PK

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.

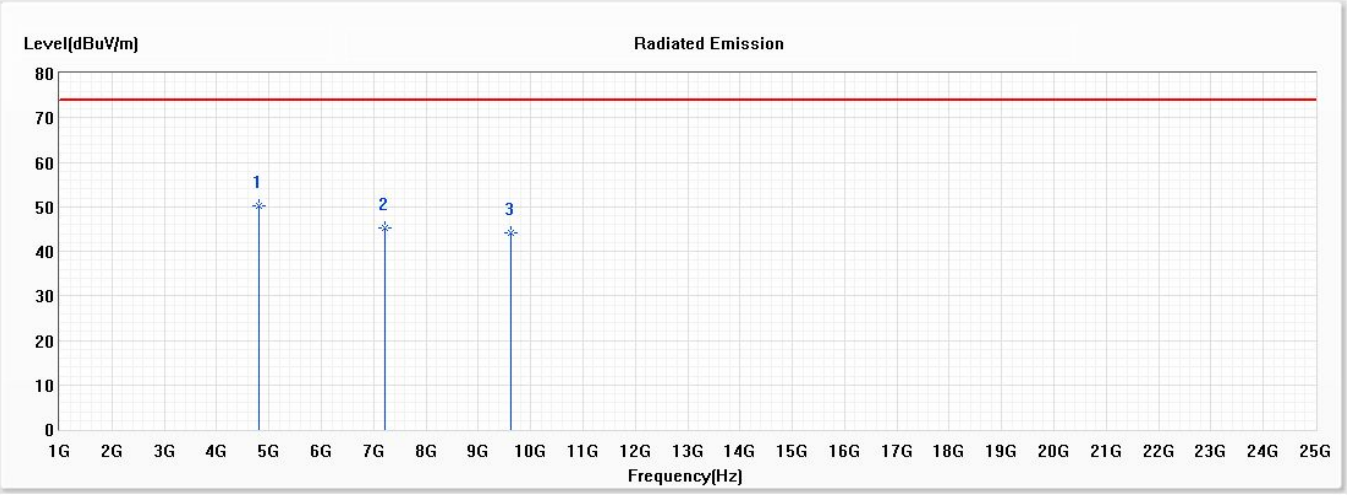
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

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	:	2021/01/20
Test Mode	:	Mode 1: Transmit (2403MHz)

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	4806.000	50.11	74.00	-23.89	63.14	-13.03	PK
2	7209.000	45.12	74.00	-28.88	56.81	-11.69	PK
3	9612.000	44.07	74.00	-29.93	55.25	-11.18	PK

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.

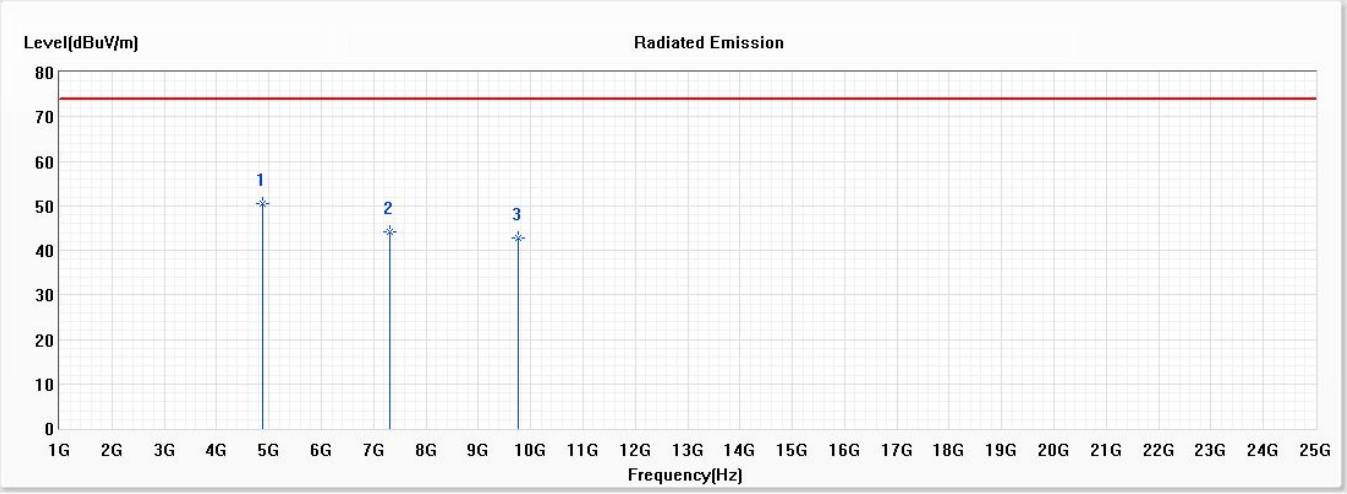
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

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	:	2021/01/20
Test Mode	:	Mode 1: Transmit (2440MHz)

Horizontal



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	4880.000	50.56	74.00	-23.44	63.58	-13.02	PK
2	7320.000	44.27	74.00	-29.73	56.22	-11.95	PK
3	9760.000	42.86	74.00	-31.14	53.81	-10.95	PK

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.

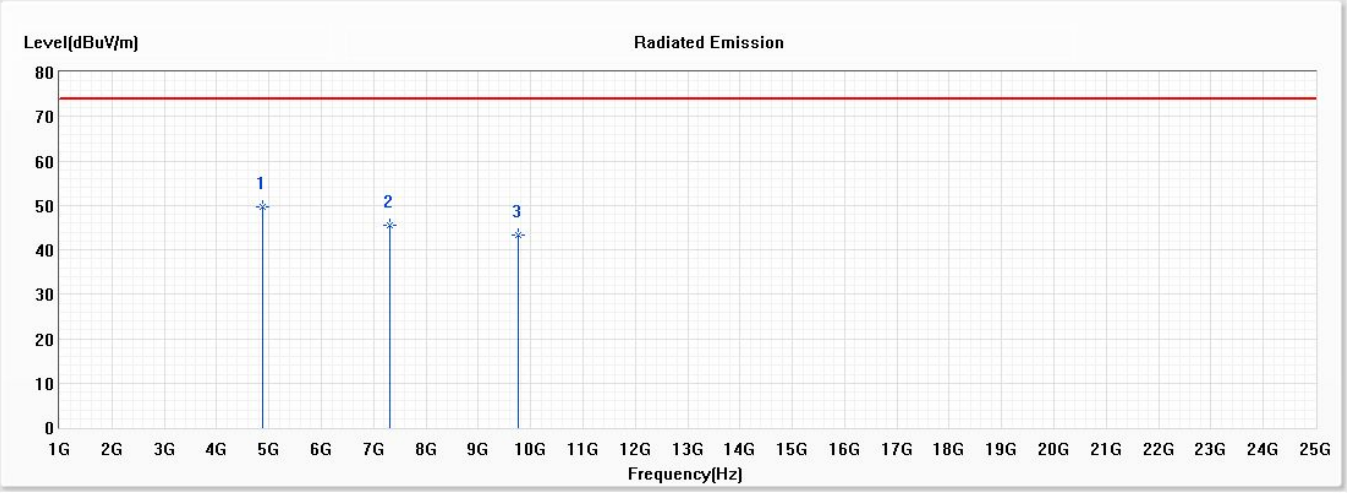
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

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	:	2021/01/20
Test Mode	:	Mode 1: Transmit (2440MHz)

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	4880.000	49.76	74.00	-24.24	62.78	-13.02	PK
2	7320.000	45.43	74.00	-28.57	57.38	-11.95	PK
3	9760.000	43.33	74.00	-30.67	54.28	-10.95	PK

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.

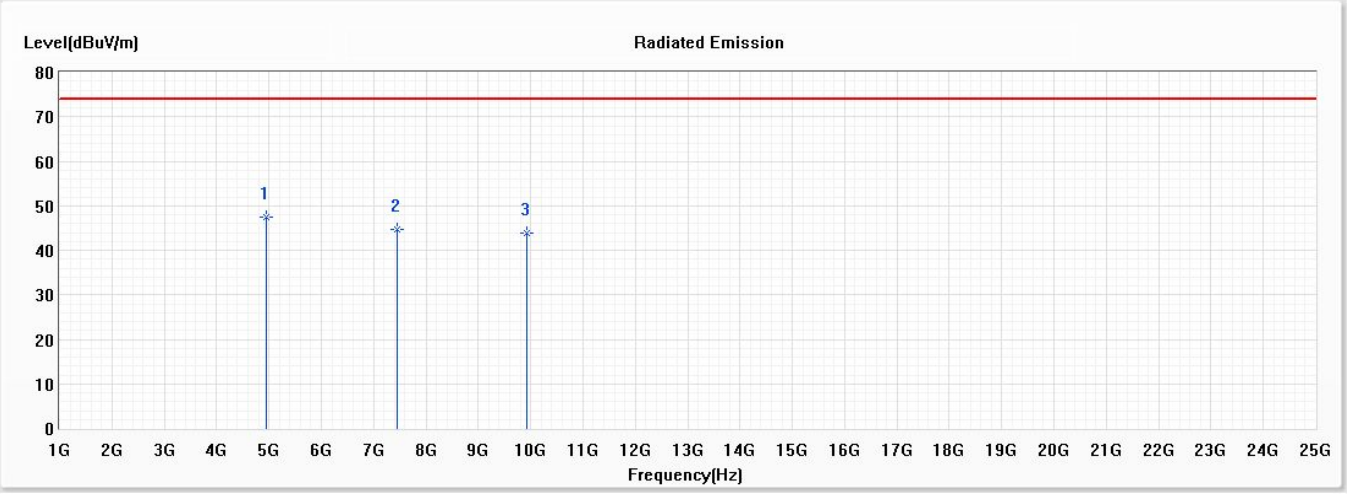
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

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	:	2021/01/20
Test Mode	:	Mode 1: Transmit (2480MHz)

Horizontal



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	4960.000	47.50	74.00	-26.50	60.21	-12.71	PK
2	7440.000	44.65	74.00	-29.35	56.73	-12.08	PK
3	9920.000	43.98	74.00	-30.02	54.85	-10.87	PK

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.

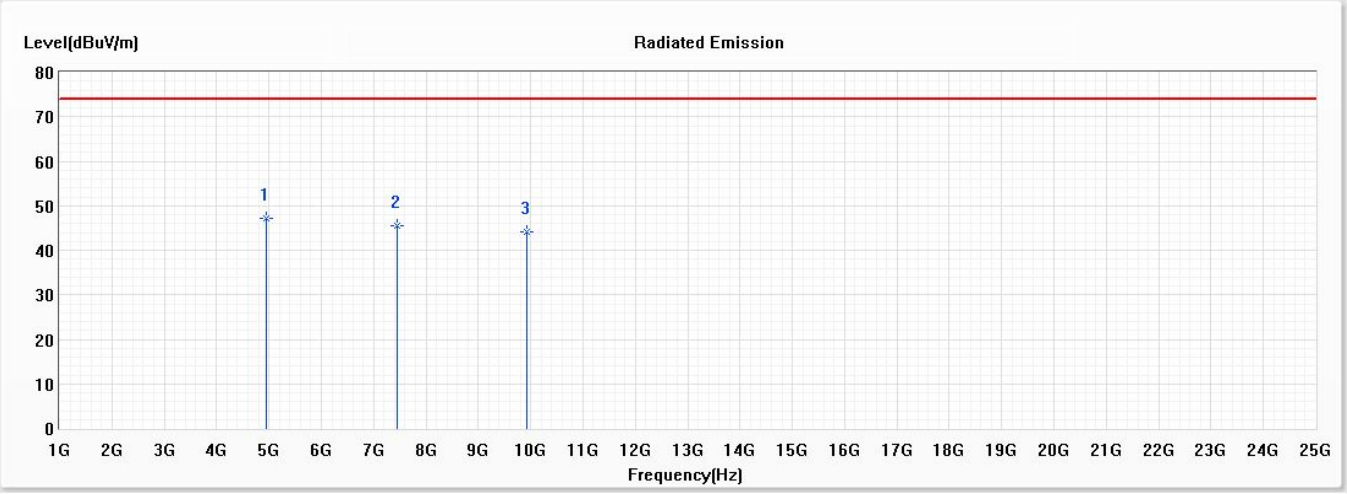
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

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	:	2021/01/20
Test Mode	:	Mode 1: Transmit (2480MHz)

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	4960.000	47.05	74.00	-26.95	59.76	-12.71	PK
2	7440.000	45.38	74.00	-28.62	57.46	-12.08	PK
3	9920.000	44.01	74.00	-29.99	54.88	-10.87	PK

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.

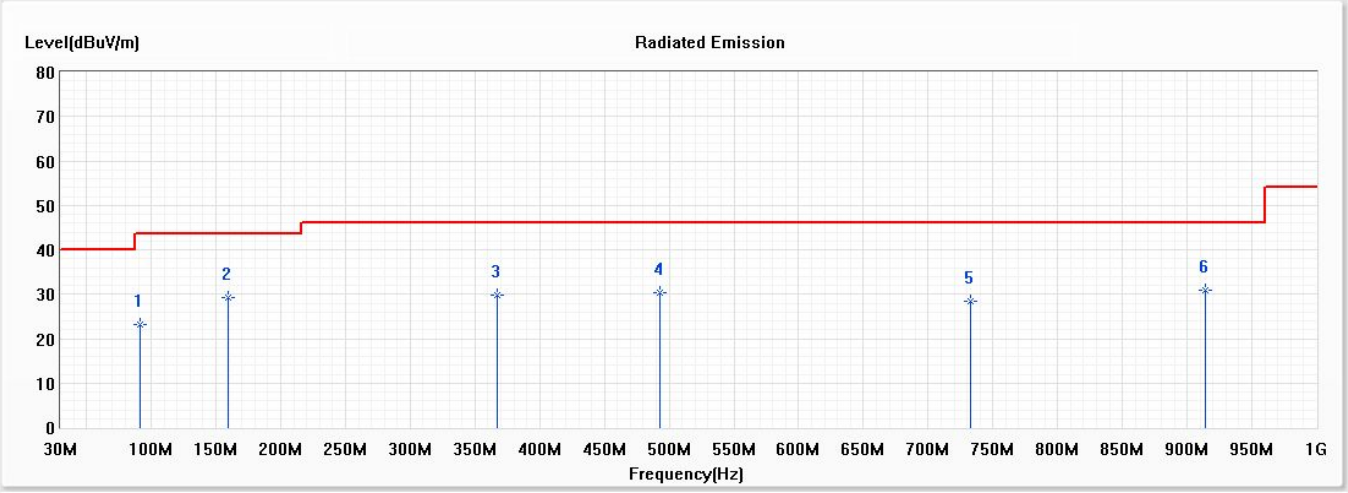
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

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 : 2021/01/20
Test Mode : Mode 1: Transmit (2440MHz)

Horizontal



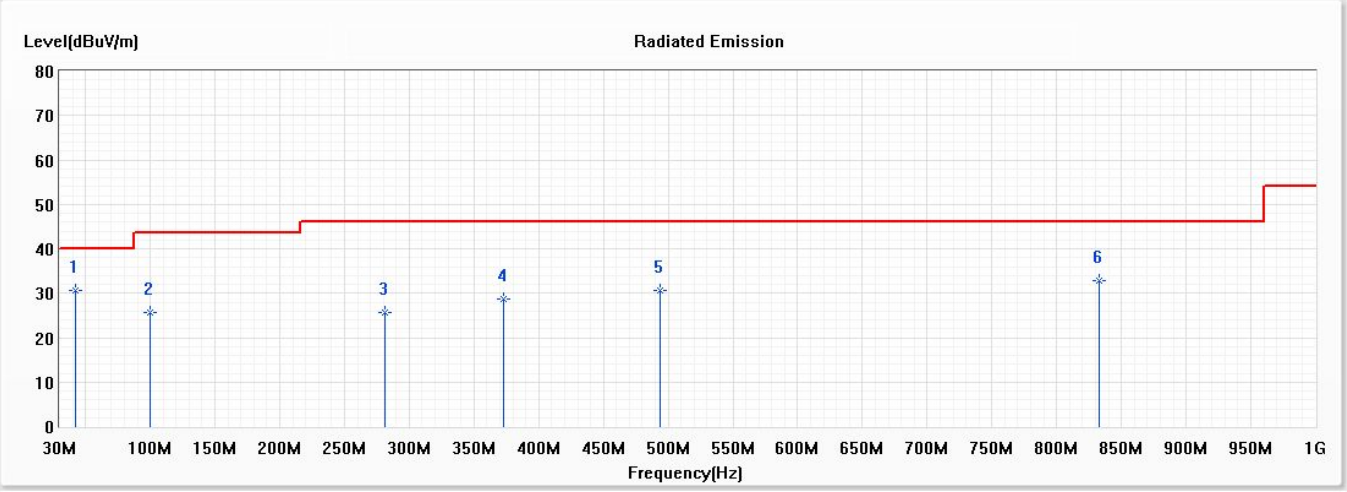
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	91.855	23.25	43.50	-20.25	40.22	-16.97	QP
* 2	159.333	29.37	43.50	-14.13	40.14	-10.77	QP
3	367.391	29.66	46.00	-16.34	37.86	-8.20	QP
4	492.507	30.46	46.00	-15.54	35.96	-5.50	QP
5	732.899	28.51	46.00	-17.49	30.06	-1.55	QP
6	914.246	30.78	46.00	-15.22	30.02	0.76	QP

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 emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

Product	:	Gaming Mouse
Test Item	:	General Radiated Emission Data
Test Date	:	2021/01/20
Test Mode	:	Mode 1: Transmit (2440MHz)

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	42.652	30.63	40.00	-9.37	41.42	-10.79	QP
2	100.290	25.53	43.50	-17.97	41.29	-15.76	QP
3	281.638	25.78	46.00	-20.22	36.12	-10.34	QP
4	373.014	28.67	46.00	-17.33	36.65	-7.98	QP
5	493.913	30.52	46.00	-15.48	35.99	-5.47	QP
6	832.710	32.79	46.00	-13.21	33.03	-0.24	QP

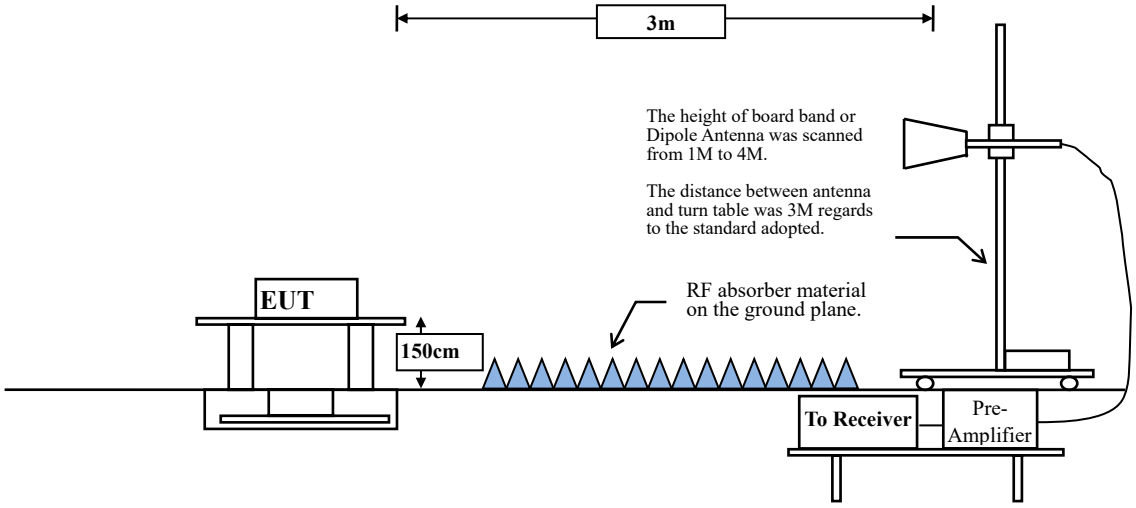
Note:

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 emission levels of other frequencies are very lower than the limit and not show in test report.
5. 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.

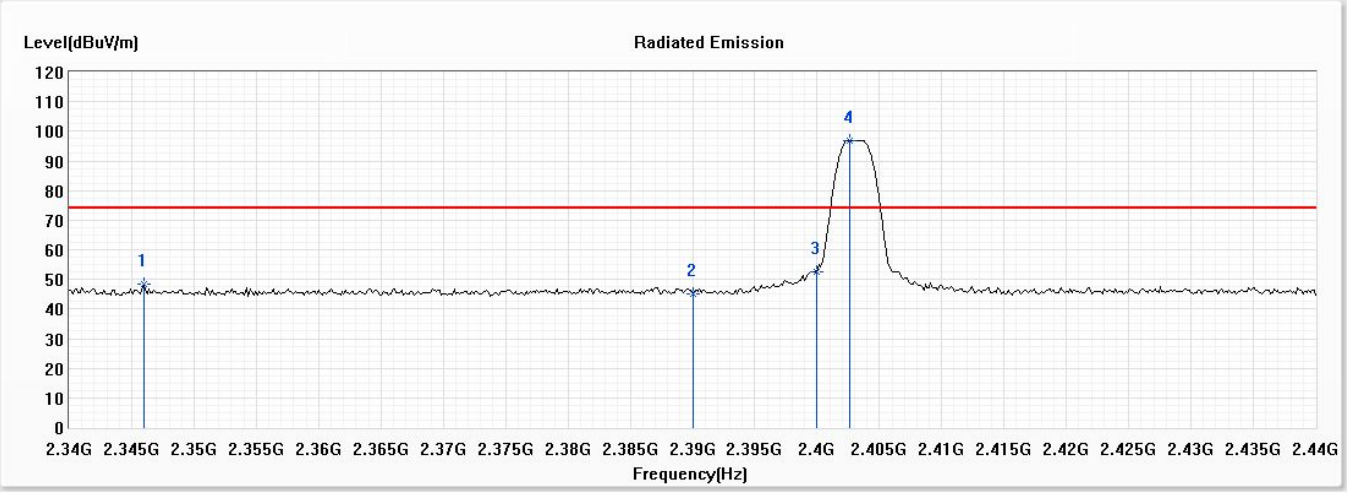
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

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

4.4. Test Result of Band Edge

Product : Gaming Mouse
Test Item : Band Edge Data
Test Date : 2021/01/20
Test Mode : Mode 1: Transmit (2403MHz)

Horizontal



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	2345.942	48.24	74.00	-25.76	36.52	11.72	PK
2	2390.000	44.91	74.00	-29.09	32.99	11.92	PK
3	2400.000	52.60	74.00	-21.40	40.64	11.96	PK
4	2402.609	97.03	--	--	85.05	11.98	PK

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.

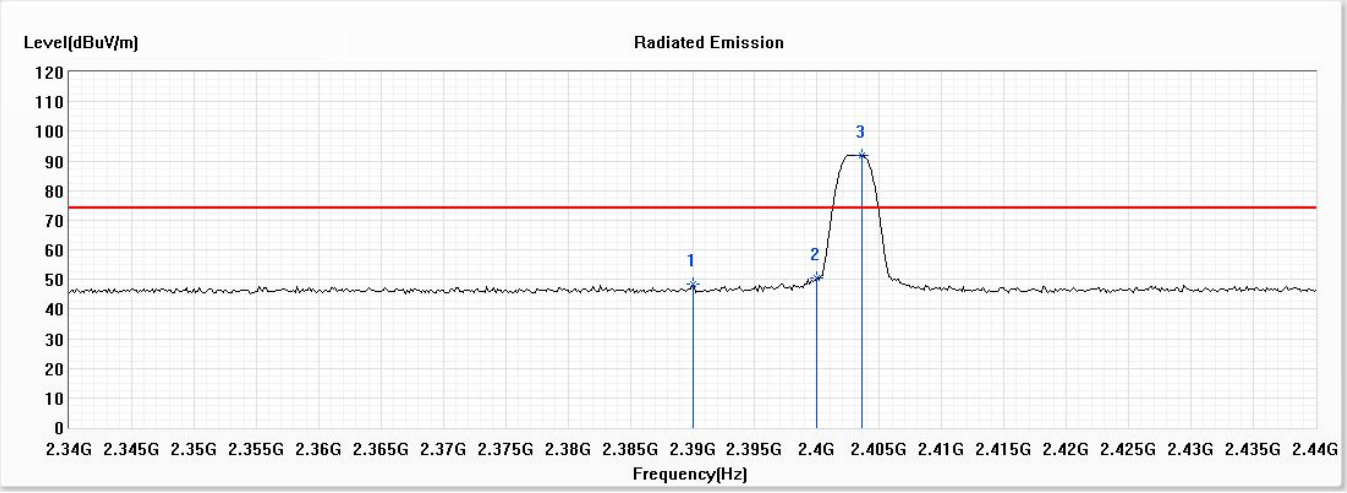
Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
2345.942	48.240	-17.856	30.384	-23.616	54.000	Pass
2390.000	44.910	-17.856	27.054	-26.946	54.000	Pass
2400.000	52.600	-17.856	34.744	-19.256	54.000	Pass
2402.609	97.030	-17.856	79.174	--	--	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 : 2021/01/20
Test Mode : Mode 1: Transmit (2403MHz)

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	2390.000	48.26	74.00	-25.74	36.34	11.92	PK
2	2400.000	50.63	74.00	-23.37	38.67	11.96	PK
3	2403.623	91.90	--	--	79.91	11.99	PK

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.

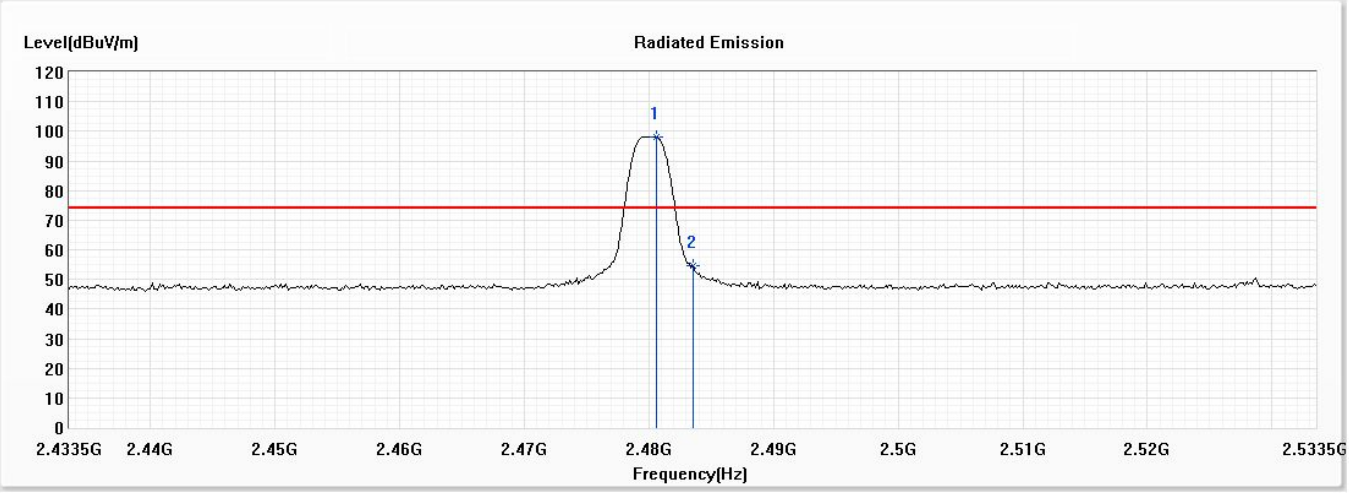
Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)	Result
2390.000	48.260	-17.856	30.404	-23.596	54.000	Pass
2400.000	50.630	-17.856	32.774	-21.226	54.000	Pass
2403.623	91.900	-17.856	74.044	--	--	Pass

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	:	2021/01/20
Test Mode	:	Mode 1: Transmit (2480MHz)

Horizontal



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	2480.601	98.20	--	--	85.97	12.23	PK
2	2483.500	54.66	74.00	-19.34	42.42	12.24	PK

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.

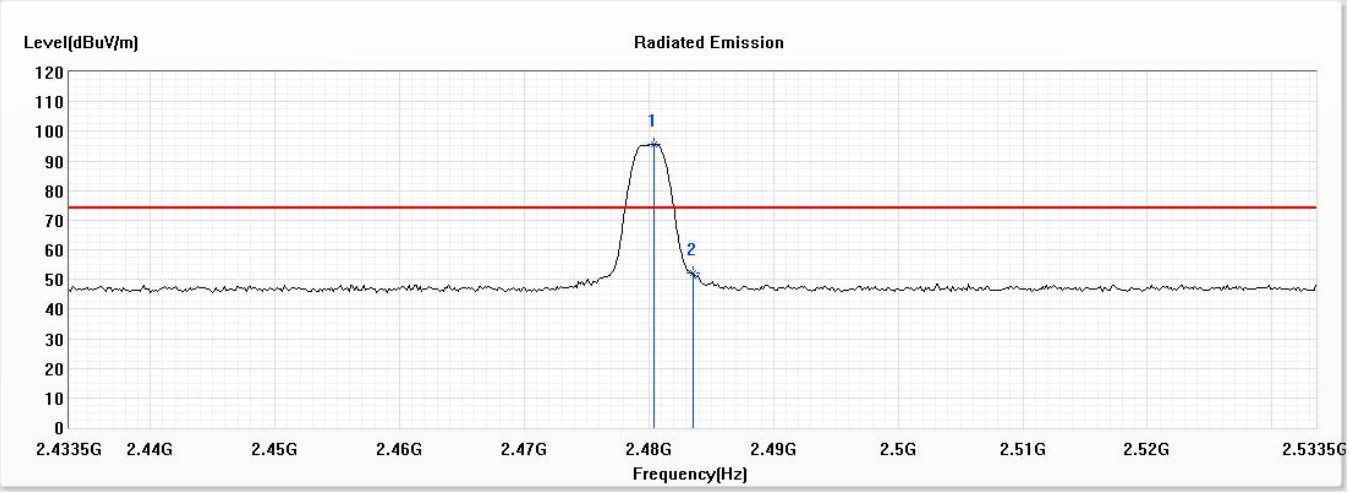
Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
2480.601	98.200	-17.856	80.344	--	--	Pass
2483.500	54.660	-17.856	36.804	-17.196	54.000	Pass

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	:	2021/01/20
Test Mode	:	Mode 1: Transmit (2480MHz)

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	2480.457	95.48	--	--	83.25	12.23	PK
2	2483.500	52.01	74.00	-21.99	39.77	12.24	PK

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.

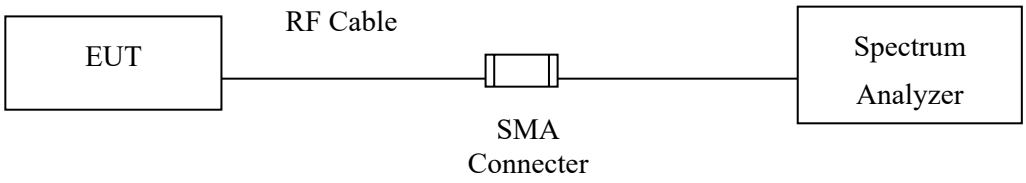
Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
2480.457	95.480	-17.856	77.624	--	--	Pass
2483.500	52.010	-17.856	34.154	-19.846	54.000	Pass

Note:

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

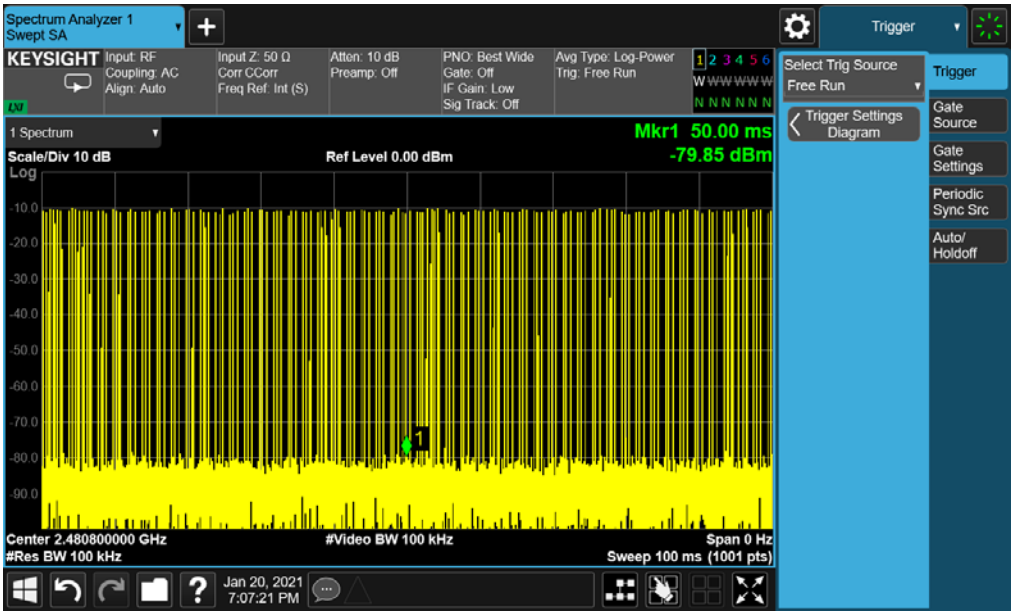
5. Duty Cycle

5.1. Test Setup



5.2. Test Result of Duty Cycle

Product : Gaming Mouse
Test Item : Duty Cycle Data
Test Mode : Mode 2: Normal mode



Time on of 100ms= 80us*160= 12.800ms

Duty Cycle= 12.8ms / 100ms= 0.128

Duty Cycle correction factor= 20 LOG 0.128= -17.856 dB

Duty Cycle correction factor	**-17.856 dB**

6. EMI Reduction Method During Compliance Testing

No modification was made during testing.