FCC Test Report

Product Name	Gaming Mouse Dongle
Model No.	P508DONGLE
FCC ID	EMJDP508DONGLE

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

Date of Receipt	Jan. 30, 2019
Issued Date	Apr. 08, 2019
Report No.	1910353R-RFUSP15V00
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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Test Report

Issued Date: Apr. 08, 2019
Report No.: 1910353R-RFUSP15V00

Product Name	Gaming Mouse Dongle
Applicant	Primax Electronics Ltd
Address	669 Ruey Kuang Road Neihu 114,Taipei,Taiwan
Manufacturer	Primax Electronics Ltd
Model No.	P508DONGLE
EUT Rated Voltage	DC 5V by USB
EUT Test Voltage	DC 5V by USB
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 : Jinn Chen

(Senior Adm. Specialist / Jinn Chen)

Tested By : Leo Chen

(Assistant Engineer / Leo Chen)

Approved By :

(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Gaming Mouse Dongle
Trade Name	ASUS
Model No.	P508DONGLE
FCC ID	EMJDP508DONGLE
Frequency Range	2402~2479MHz
Channel Number	78CH
Type of Modulation	GFSK
Antenna Type	Multilayer Chip Antenna
Channel Control	Refer to the table “Antenna List”
Antenna Gain	Auto

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	GainForce Technology Co.,Ltd	AT8010-E2R9HAAT/LF	Multilayer Chip Antenna	2.5dBi 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 Dongle 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

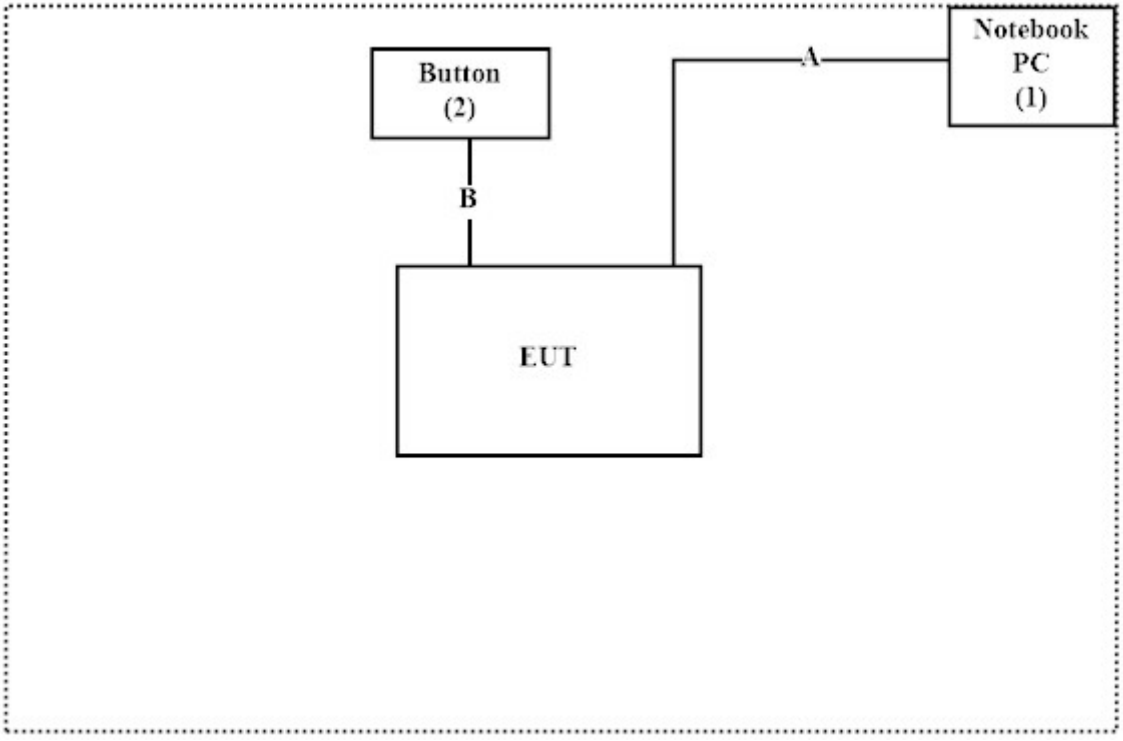
1.3. Tested System Datails

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	P62G	229FJC2	N/A
2	Button	ASUS	N/A	N/A	N/A

Signal Cable Type		Signal cable Description
A	USB Cable	Non-shielded, 1.8m
B	Signal Cable	Non-shielded, 0.01m

1.4. Configuration of Test System



1.5. EUT Exercise Software

(1) Setup the EUT as shown in Section 1.4.

(2) Press the test button.

(3) Configure the test mode and the test channel

(4) 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

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:
http://www.dekra.com.tw/english/about/certificates.aspx?bval=5
The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: http://www.dekra.com.tw/index_en

Site Description: Accredited by TAF
Accredited Number: 3023

Site Name: DEKRA Testing and Certification Co., Ltd.
Site Address: No.159, Sec. 2, Wenhua 1st Rd., Linkou Dist.,
New Taipei City 24457, Taiwan.
TEL: 886-2-2602-7968 / FAX : 866-2-2602-3286
E-Mail : info.tw@dekra.com

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	2018.03.20	2019.03.19
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
	Power Meter	Anritsu	ML2496A	1548003	2018.12.19	2019.12.18
	Power Sensor	Anritsu	MA2411B	1531024	2018.12.19	2019.12.18
	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 V9.0.1

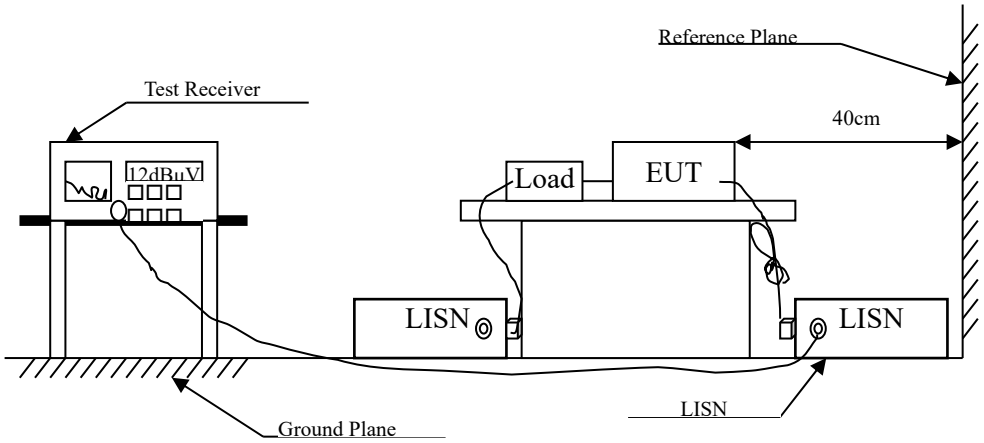
For Radiated measurements /ACB1

	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 (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

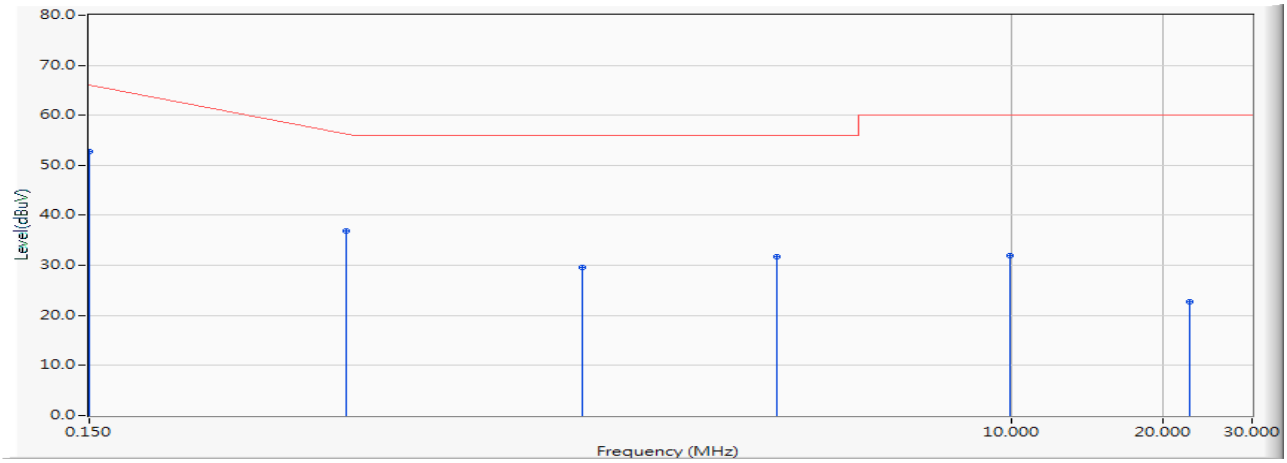
The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling 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. Uncertainty

± 2.35 dB

2.5. Test Result of Conducted Emission

Product : Gaming Mouse Dongle
Test Item : Conducted Emission Test
Power Line : Line 1
Test Date : 2019/03/18
Test Mode : Mode 1: Transmit (2441MHz)

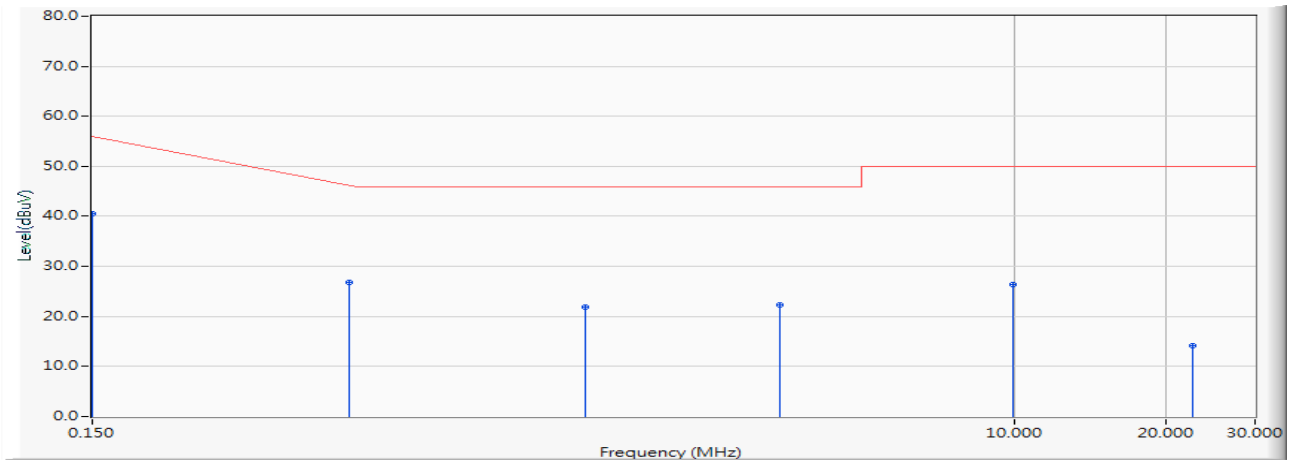


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	*	0.150	9.611	43.141	52.752	-13.248	66.000	QUASIPEAK
2		0.485	9.629	27.174	36.803	-19.626	56.429	QUASIPEAK
3		1.419	9.650	19.911	29.561	-26.439	56.000	QUASIPEAK
4		3.449	9.695	22.047	31.742	-24.258	56.000	QUASIPEAK
5		9.937	9.840	22.108	31.948	-28.052	60.000	QUASIPEAK
6		22.540	9.990	12.845	22.835	-37.165	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 Dongle
Test Item : Conducted Emission Test
Power Line : Line 1
Test Date : 2019/03/18
Test Mode : Mode 1: Transmit (2441MHz)

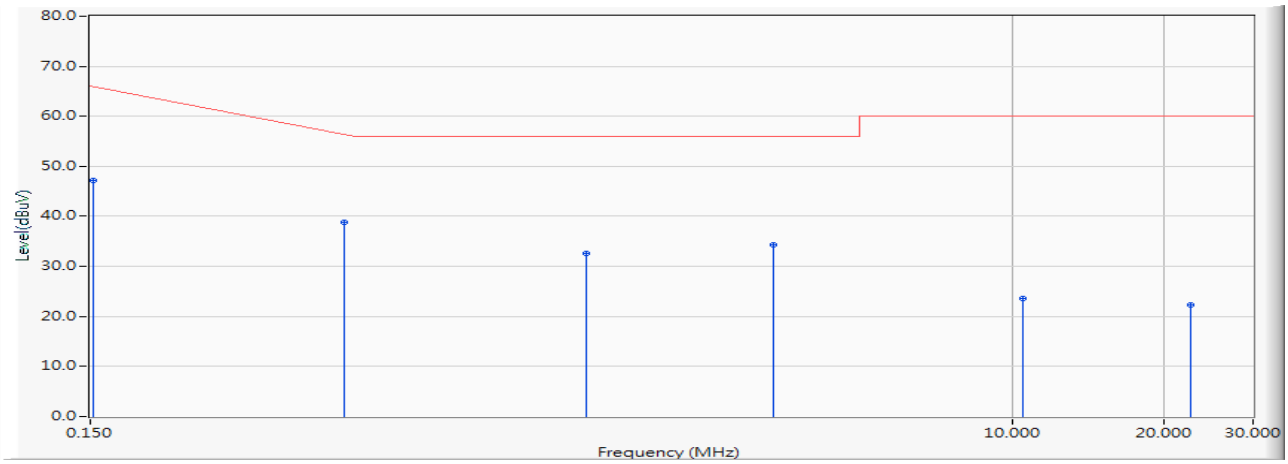


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	*	0.150	9.611	31.028	40.640	-15.360	56.000	AVERAGE
2		0.485	9.629	17.237	26.866	-19.563	46.429	AVERAGE
3		1.419	9.650	12.201	21.851	-24.149	46.000	AVERAGE
4		3.449	9.695	12.544	22.238	-23.762	46.000	AVERAGE
5		9.937	9.840	16.647	26.487	-23.513	50.000	AVERAGE
6		22.540	9.990	4.077	14.067	-35.933	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 Dongle
Test Item : Conducted Emission Test
Power Line : Line 2
Test Date : 2019/03/18
Test Mode : Mode 1: Transmit (2441MHz)

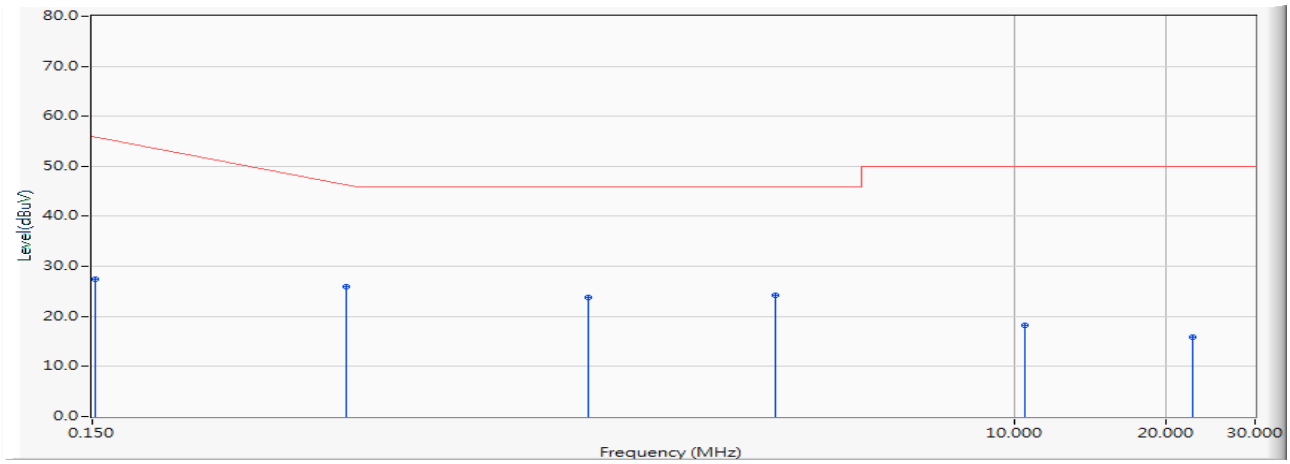


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.152	9.602	37.589	47.191	-18.752	65.943	QUASIPEAK
2	*	0.476	9.620	29.242	38.862	-17.824	56.686	QUASIPEAK
3		1.442	9.650	22.956	32.606	-23.394	56.000	QUASIPEAK
4		3.372	9.694	24.725	34.419	-21.581	56.000	QUASIPEAK
5		10.525	9.855	13.814	23.669	-36.331	60.000	QUASIPEAK
6		22.564	10.030	12.184	22.214	-37.786	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 Dongle
Test Item : Conducted Emission Test
Power Line : Line 2
Test Date : 2019/03/18
Test Mode : Mode 1: Transmit (2441MHz)



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.152	9.602	17.899	27.500	-28.443	55.943	AVERAGE
2	*	0.476	9.620	16.376	25.995	-20.691	46.686	AVERAGE
3		1.442	9.650	14.148	23.798	-22.202	46.000	AVERAGE
4		3.372	9.694	14.577	24.271	-21.729	46.000	AVERAGE
5		10.525	9.855	8.400	18.255	-31.745	50.000	AVERAGE
6		22.564	10.030	5.895	15.925	-34.075	50.000	AVERAGE

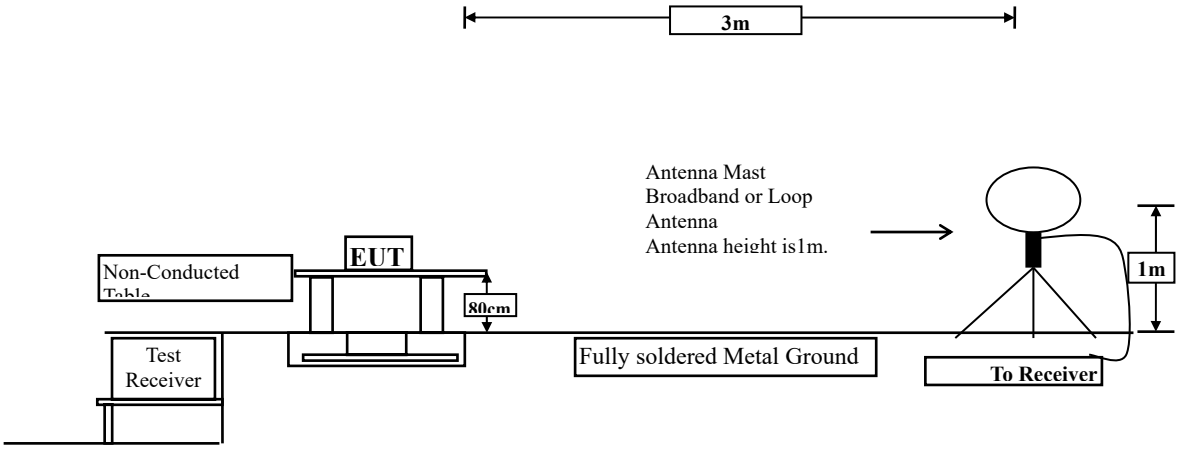
Note:

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

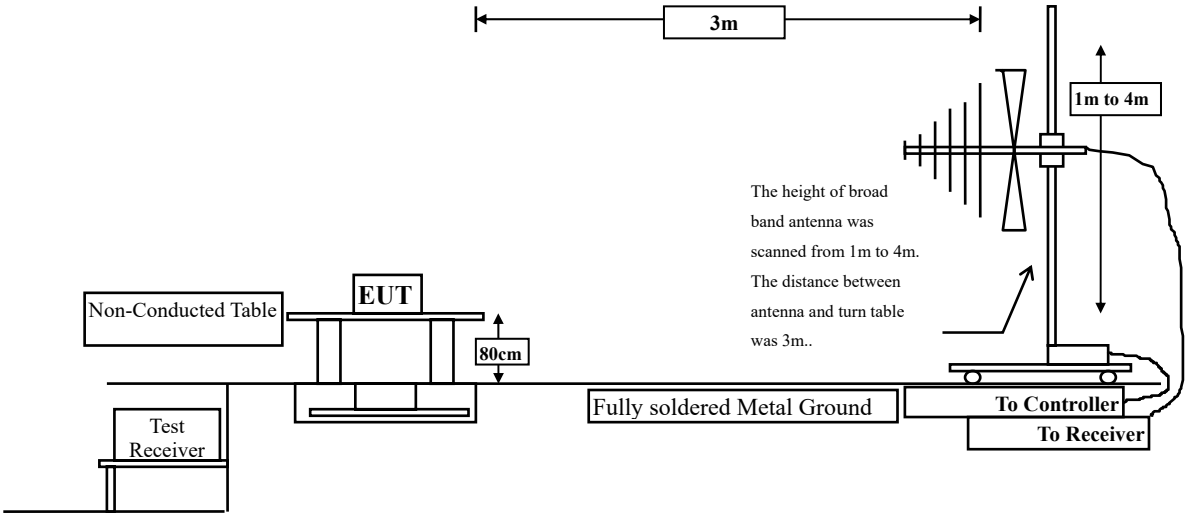
3. Radiated Emission

3.1. Test Setup

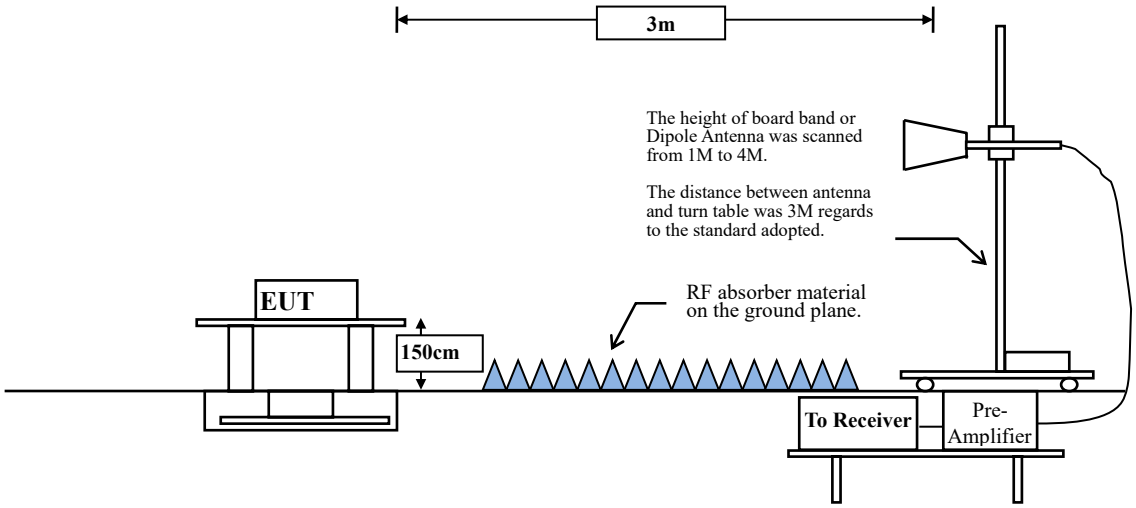
Radiated Emission Under 30MHz



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

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. Uncertainty

Horizontal：

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

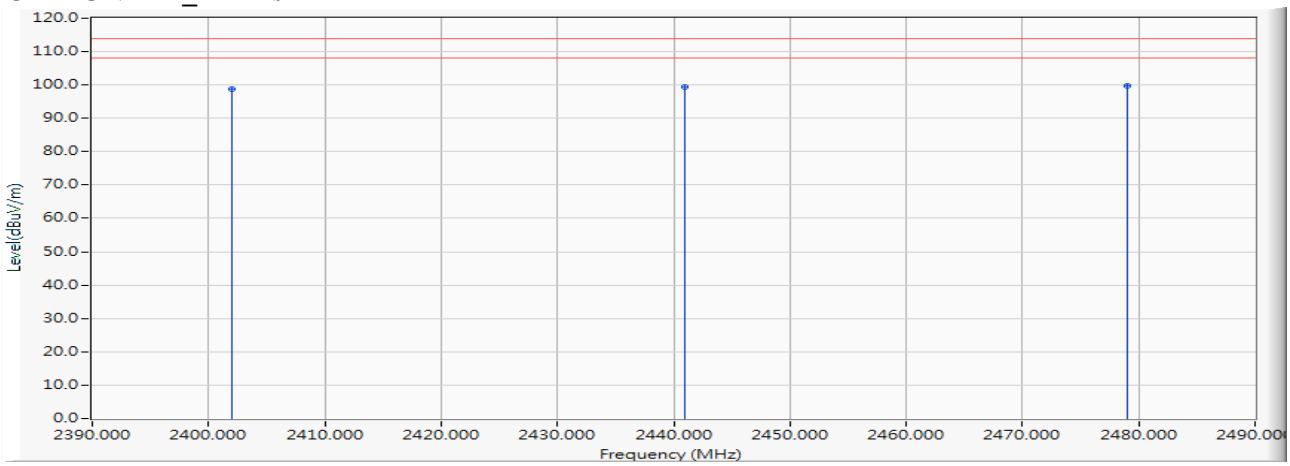
Vertical：

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

3.5. Test Result of Radiated Emission

Product : Gaming Mouse Dongle
Test Item : Fundamental Radiated Emission
Test Date : 2019/03/28
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	107.620	98.714	-15.286	114.000	PEAK
2		2441.000	-8.761	108.020	99.260	-14.740	114.000	PEAK
3	*	2479.000	-8.620	108.210	99.590	-14.410	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.

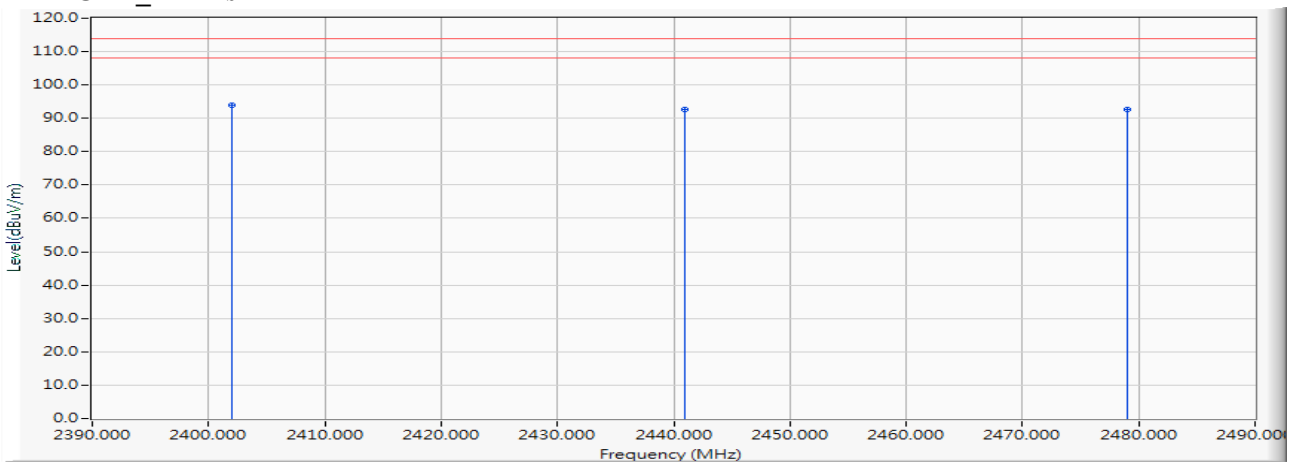
Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
HORIZONTAL_X-Axis						
02 (Average)	2402.000	98.714	-38.416	60.298	-33.702	94.00
41 (Average)	2441.000	99.260	-38.416	60.844	-33.156	94.00
79 (Average)	2479.000	99.590	-38.416	61.174	-32.826	94.00

Note:

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

Product : Gaming Mouse Dongle
Test Item : Fundamental Radiated Emission
Test Date : 2019/03/28
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	102.880	93.974	-20.026	114.000	PEAK
2		2441.000	-8.761	101.410	92.650	-21.350	114.000	PEAK
3		2479.000	-8.620	101.230	92.610	-21.390	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.

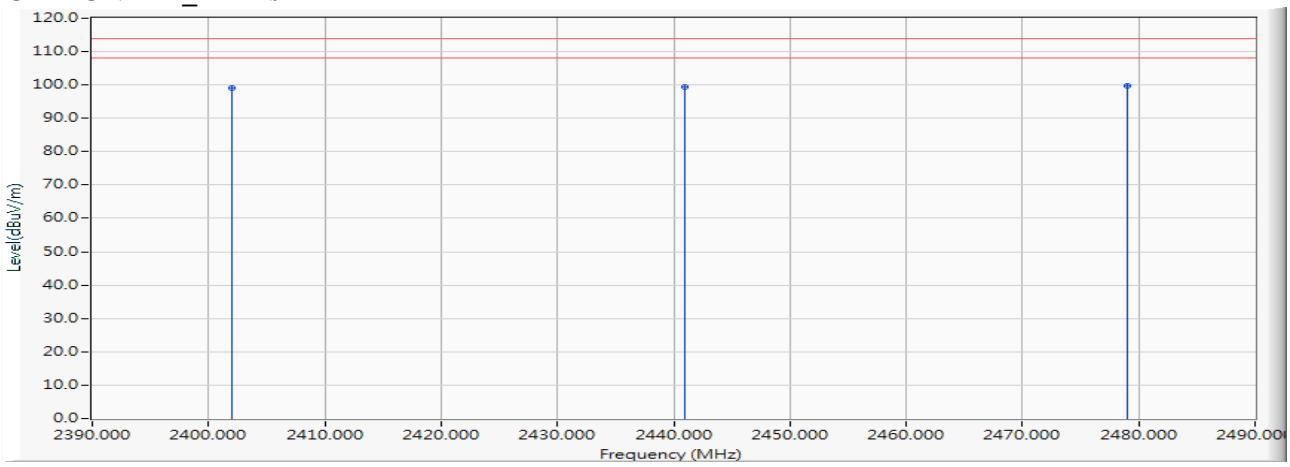
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)
VERTICAL_X-Axis						
02 (Average)	2402.000	93.974	-38.416	55.558	-38.442	94.00
41 (Average)	2441.000	92.650	-38.416	54.234	-39.766	94.00
79 (Average)	2479.000	92.610	-38.416	54.194	-39.806	94.00

Note:

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

Product : Gaming Mouse Dongle
Test Item : Fundamental Radiated Emission
Test Date : 2019/03/28
Test Mode : Mode 1: Transmit (Y-Axis)

HORIZONTAL_Y-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	107.860	98.954	-15.046	114.000	PEAK
2		2441.000	-8.761	108.140	99.380	-14.620	114.000	PEAK
3	*	2479.000	-8.620	108.440	99.820	-14.180	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.

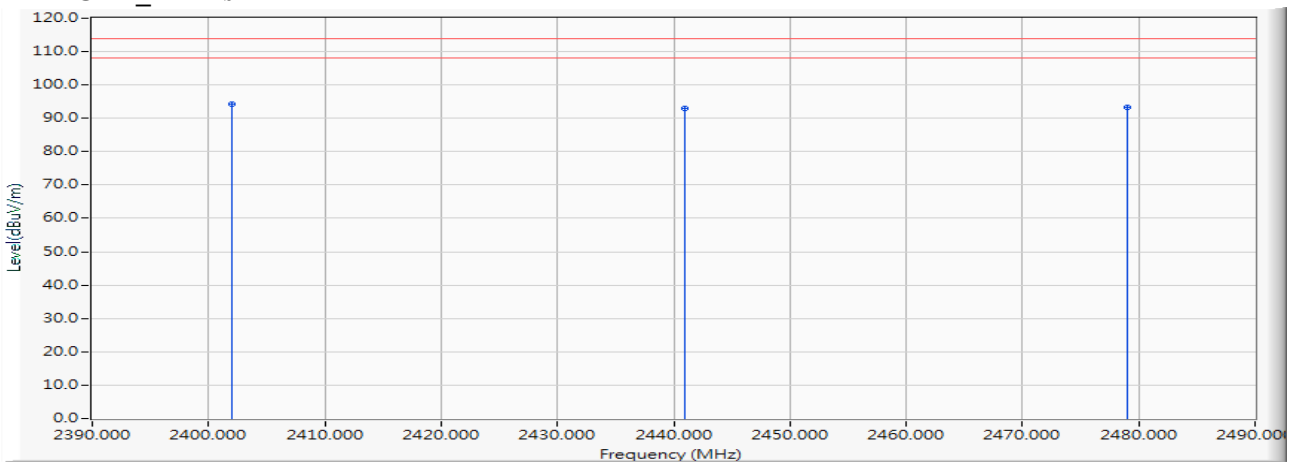
Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
HORIZONTAL_Y-Axis						
02 (Average)	2402.000	98.954	-38.416	60.538	-33.462	94.00
41 (Average)	2441.000	99.380	-38.416	60.964	-33.036	94.00
79 (Average)	2479.000	99.820	-38.416	61.404	-32.596	94.00

Note:

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

Product : Gaming Mouse Dongle
Test Item : Fundamental Radiated Emission
Test Date : 2019/03/28
Test Mode : Mode 1: Transmit (Y-Axis)

VERTICAL_Y-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	103.030	94.124	-19.876	114.000	PEAK
2		2441.000	-8.761	101.750	92.990	-21.010	114.000	PEAK
3		2479.000	-8.620	101.770	93.150	-20.850	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.

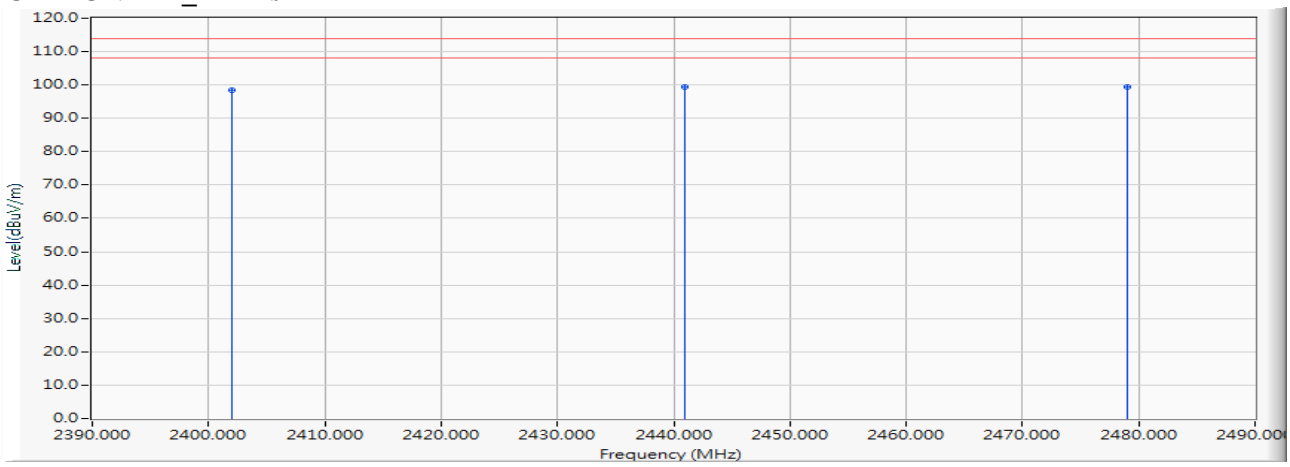
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)
VERTICAL_Y-Axis						
02 (Average)	2402.000	94.124	-38.416	55.708	-38.292	94.00
41 (Average)	2441.000	92.990	-38.416	54.574	-39.426	94.00
79 (Average)	2479.000	93.150	-38.416	54.734	-39.266	94.00

Note:

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

Product	:	Gaming Mouse Dongle
Test Item	:	Fundamental Radiated Emission
Test Date	:	2019/03/28
Test Mode	:	Mode 1: Transmit (Z-Axis)

HORIZONTAL_Z-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	107.260	98.354	-15.646	114.000	PEAK
2		2441.000	-8.761	108.050	99.290	-14.710	114.000	PEAK
3	*	2479.000	-8.620	108.110	99.490	-14.510	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.

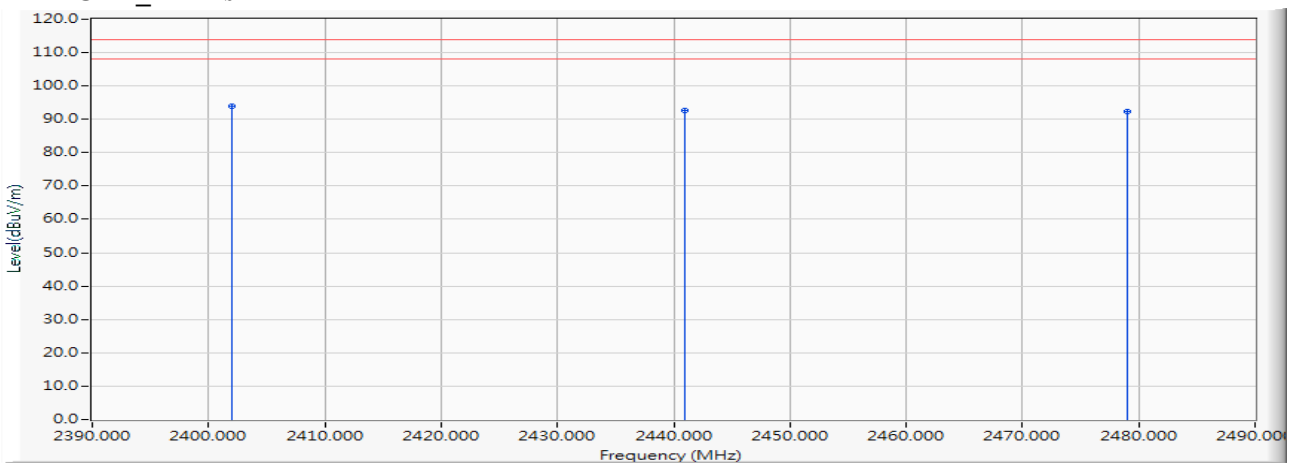
Channel No.	Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
HORIZONTAL_Z-Axis						
02 (Average)	2402.000	98.354	-38.416	59.938	-34.062	94.00
41 (Average)	2441.000	99.290	-38.416	60.874	-33.126	94.00
79 (Average)	2479.000	99.490	-38.416	61.074	-32.926	94.00

Note:

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

Product : Gaming Mouse Dongle
Test Item : Fundamental Radiated Emission
Test Date : 2019/03/28
Test Mode : Mode 1: Transmit (Z-Axis)

VERTICAL_Z-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	102.720	93.814	-20.186	114.000	PEAK
2		2441.000	-8.761	101.350	92.590	-21.410	114.000	PEAK
3		2479.000	-8.620	101.070	92.450	-21.550	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.

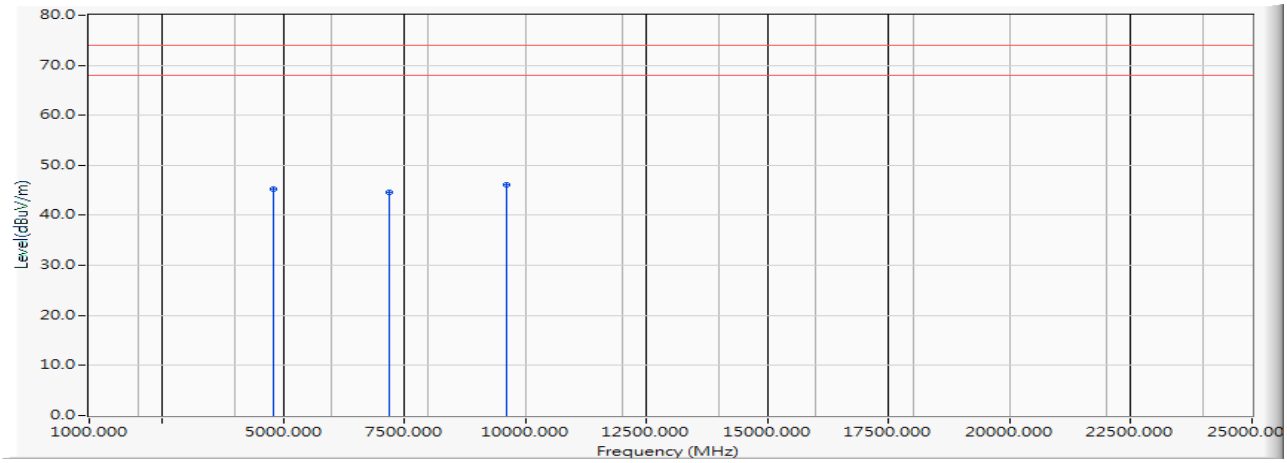
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)
VERTICAL_Z-Axis						
02 (Average)	2402.000	93.814	-38.416	55.398	-38.602	94.00
41 (Average)	2441.000	92.590	-38.416	54.174	-39.826	94.00
79 (Average)	2479.000	92.450	-38.416	54.034	-39.966	94.00

Note:

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

Product	:	Gaming Mouse Dongle
Test Item	:	Harmonic Radiated Emission Data
Test Date	:	2019/03/12
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	51.320	45.239	-28.761	74.000	PEAK
2		7206.000	-3.033	47.660	44.627	-29.373	74.000	PEAK
3	*	9608.000	-0.774	46.990	46.217	-27.783	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.

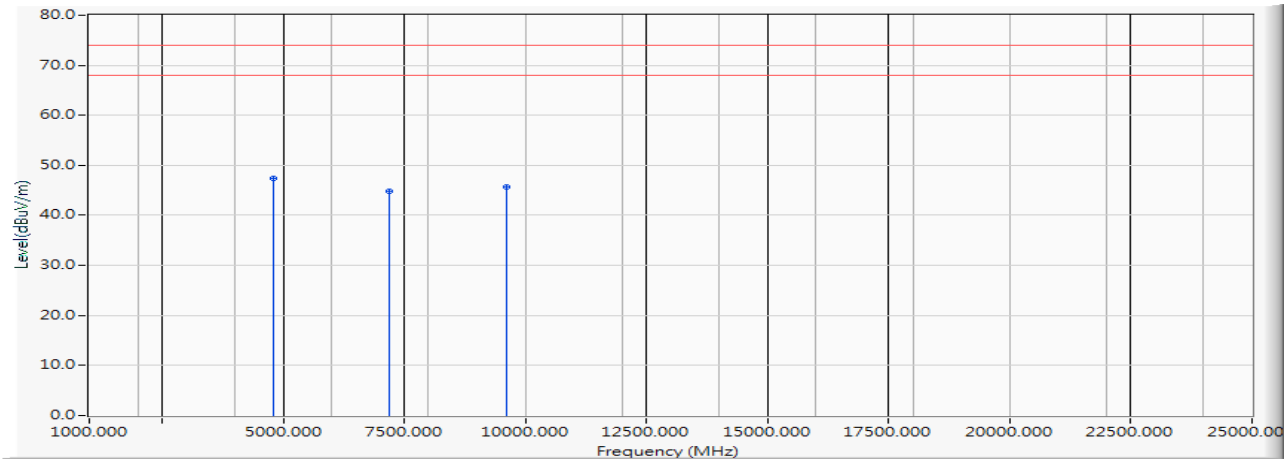
Frequency MHz	Peak Measurement dBµV /m	Duty Cycle Correct Factor dB	Measurement Level dBµV /m	Margin dB	Limit dBµV /m
Horizontal Average Detector:					
--	--	--	--	--	54.000

Note:

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

Product : Gaming Mouse Dongle
Test Item : Harmonic Radiated Emission Data
Test Date : 2019/03/12
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	53.500	47.419	-26.581	74.000	PEAK
2		7206.000	-3.033	47.770	44.737	-29.263	74.000	PEAK
3		9608.000	-0.774	46.530	45.757	-28.243	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.

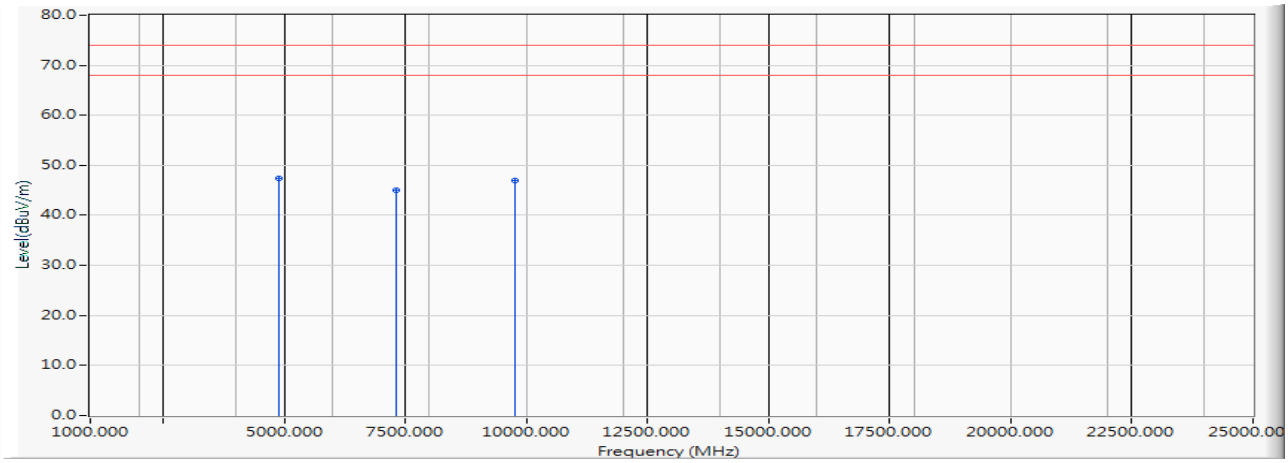
Frequency MHz	Peak Measurement dBµV /m	Duty Cycle Correct Factor dB	Measurement Level dBµV /m	Margin dB	Limit dBµV /m
Vertical Average Detector:					
--	--	--	--	--	54.000

Note:

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

Product	:	Gaming Mouse Dongle
Test Item	:	Harmonic Radiated Emission Data
Test Date	:	2019/03/12
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	53.510	47.468	-26.532	74.000	PEAK
2		7323.000	-2.954	48.010	45.056	-28.944	74.000	PEAK
3		9764.000	-0.487	47.380	46.893	-27.107	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.

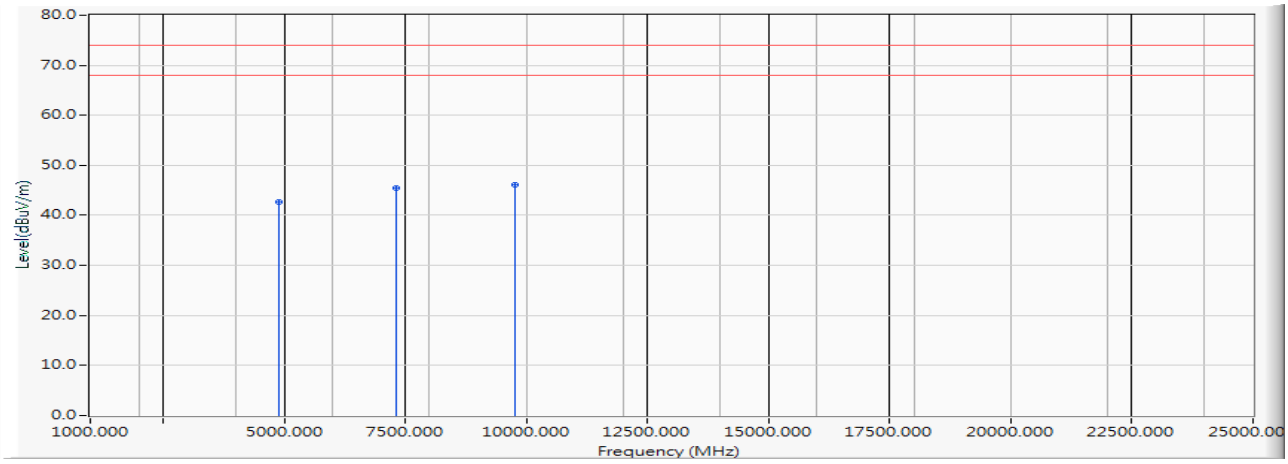
Frequency MHz	Peak Measurement dBµV /m	Duty Cycle Correct Factor dB	Measurement Level dBµV /m	Margin dB	Limit dBµV /m
Horizontal Average Detector:					
--	--	--	--	--	54.000

Note:

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

Product : Gaming Mouse Dongle
Test Item : Harmonic Radiated Emission Data
Test Date : 2019/03/12
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	48.630	42.588	-31.412	74.000	PEAK
2		7323.000	-2.954	48.520	45.566	-28.434	74.000	PEAK
3	*	9764.000	-0.487	46.520	46.033	-27.967	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.

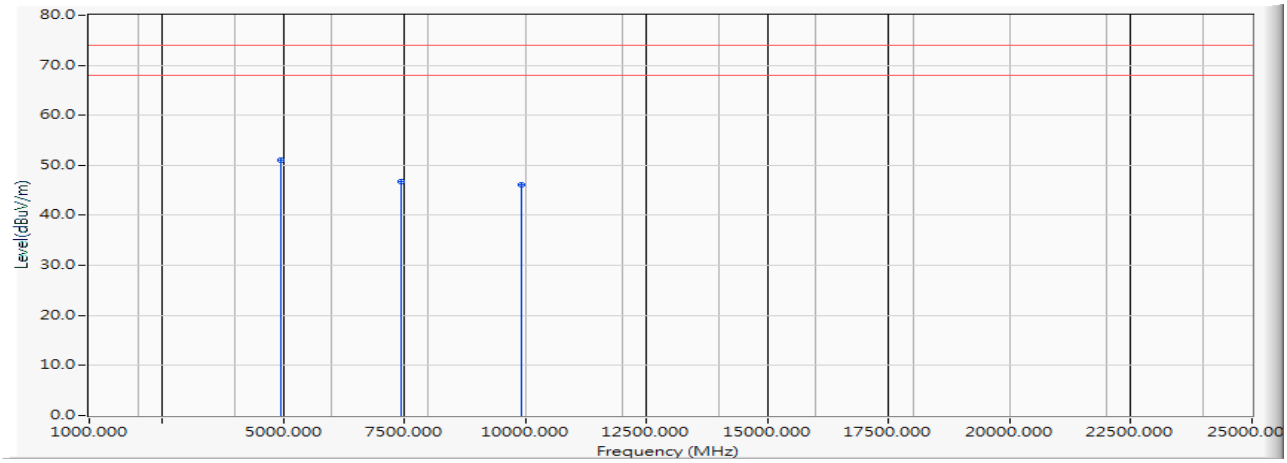
Frequency MHz	Peak Measurement dBµV /m	Duty Cycle Correct Factor dB	Measurement Level dBµV /m	Margin dB	Limit dBµV /m
Vertical Average Detector:					
--	--	--	--	--	54.000

Note:

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

Product : Gaming Mouse Dongle
Test Item : Harmonic Radiated Emission Data
Test Date : 2019/03/12
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	57.170	51.129	-22.871	74.000	PEAK
2		7437.000	-2.813	49.660	46.847	-27.153	74.000	PEAK
3		9916.000	-0.278	46.440	46.162	-27.838	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.

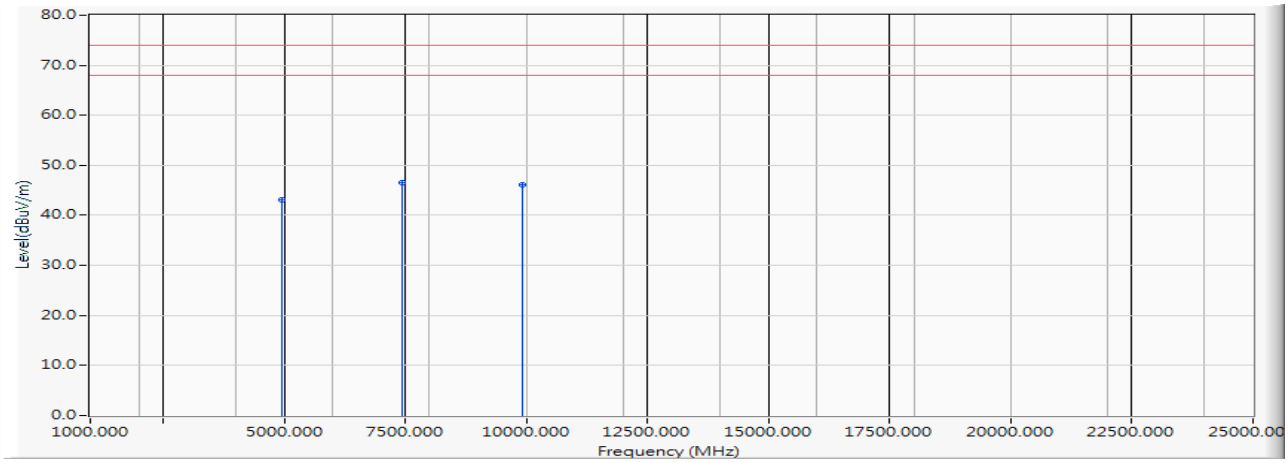
Frequency MHz	Peak Measurement dBµV /m	Duty Cycle Correct Factor dB	Measurement Level dBµV /m	Margin dB	Limit dBµV /m
Horizontal Average Detector:					
--	--	--	--	--	54.000

Note:

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

Product	:	Gaming Mouse Dongle
Test Item	:	Harmonic Radiated Emission Data
Test Date	:	2019/03/12
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	49.210	43.169	-30.831	74.000	PEAK
2	*	7437.000	-2.813	49.280	46.467	-27.533	74.000	PEAK
3		9916.000	-0.278	46.360	46.082	-27.918	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.

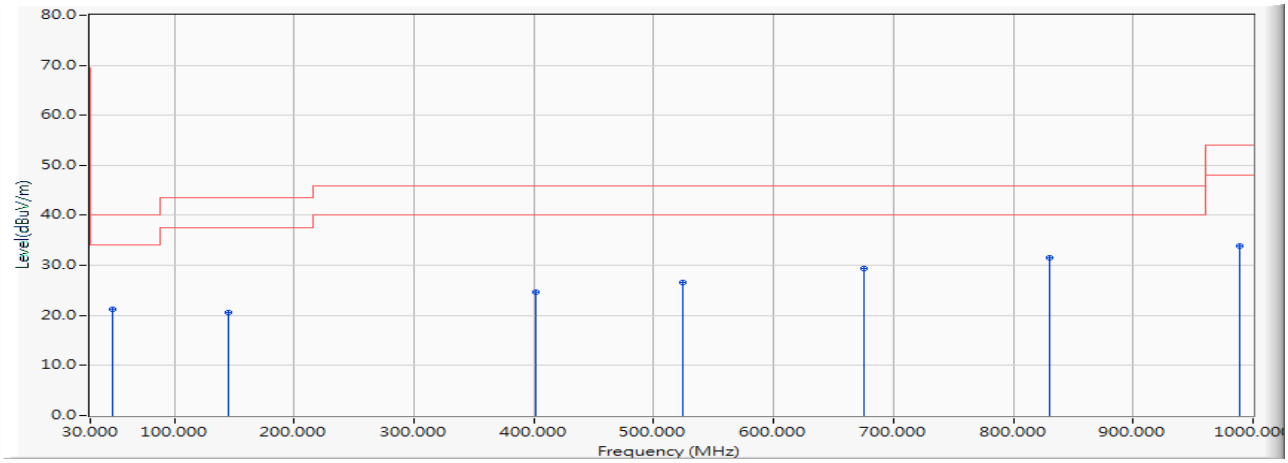
Frequency	Peak Measurement	Duty Cycle Correct Factor	Measurement Level	Margin	Limit
MHz	dBµV /m	dB	dBµV /m	dB	dBµV /m
Vertical Average Detector:					
--	--	--	--	--	54.000

Note:

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

Product : Gaming Mouse Dongle
Test Item : General Radiated Emission Data
Test Date : 2019/03/12
Test Mode : Mode 1: Transmit (2441MHz)

Horizontal



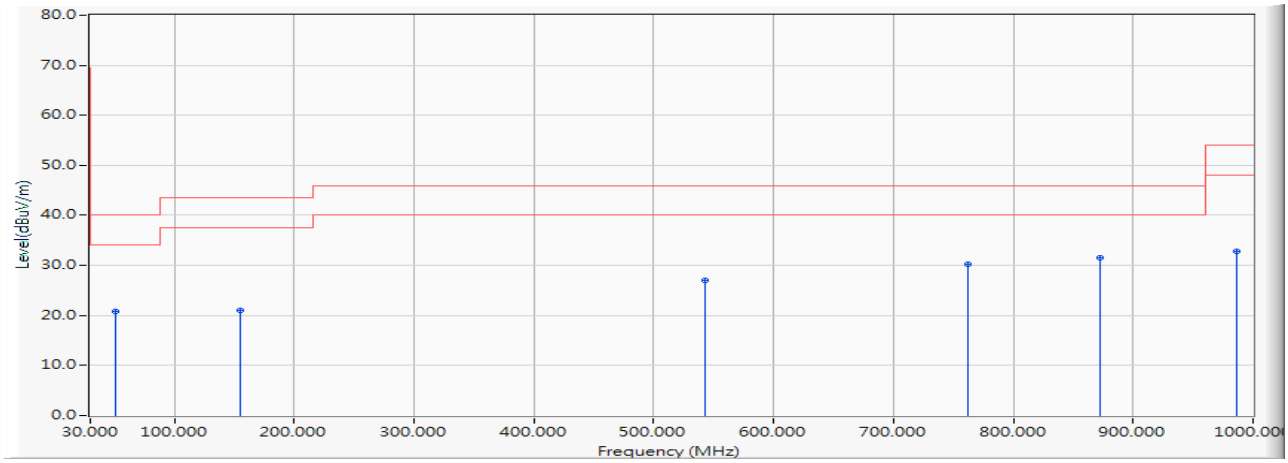
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		48.275	-10.879	32.027	21.148	-18.852	40.000	QUASIPEAK
2		145.275	-11.246	31.846	20.601	-22.899	43.500	QUASIPEAK
3		401.130	-8.008	32.680	24.672	-21.328	46.000	QUASIPEAK
4		524.841	-5.570	32.260	26.690	-19.310	46.000	QUASIPEAK
5		675.261	-3.339	32.676	29.336	-16.664	46.000	QUASIPEAK
6	*	829.899	-1.190	32.720	31.530	-14.470	46.000	QUASIPEAK
7		988.754	0.861	33.122	33.983	-20.017	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 Dongle
Test Item : General Radiated Emission Data
Test Date : 2019/03/12
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		51.087	-11.048	31.799	20.751	-19.249	40.000	QUASIPEAK
2		155.116	-10.950	31.935	20.985	-22.515	43.500	QUASIPEAK
3		543.116	-5.286	32.399	27.112	-18.888	46.000	QUASIPEAK
4		762.420	-1.936	32.266	30.330	-15.670	46.000	QUASIPEAK
5	*	872.072	-0.578	32.058	31.480	-14.520	46.000	QUASIPEAK
6		985.942	0.824	32.084	32.908	-21.092	54.000	QUASIPEAK

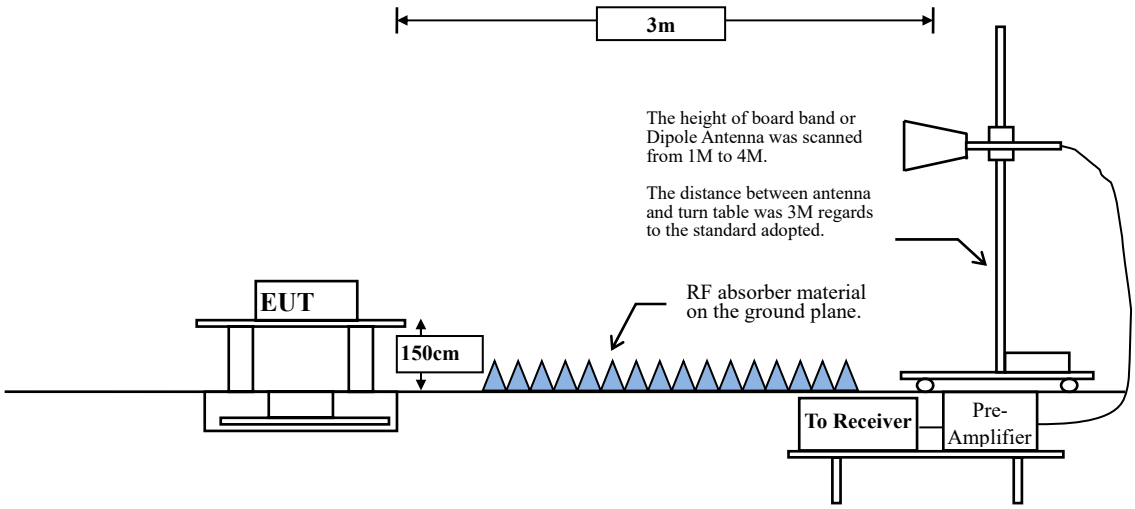
Note:

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.

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.

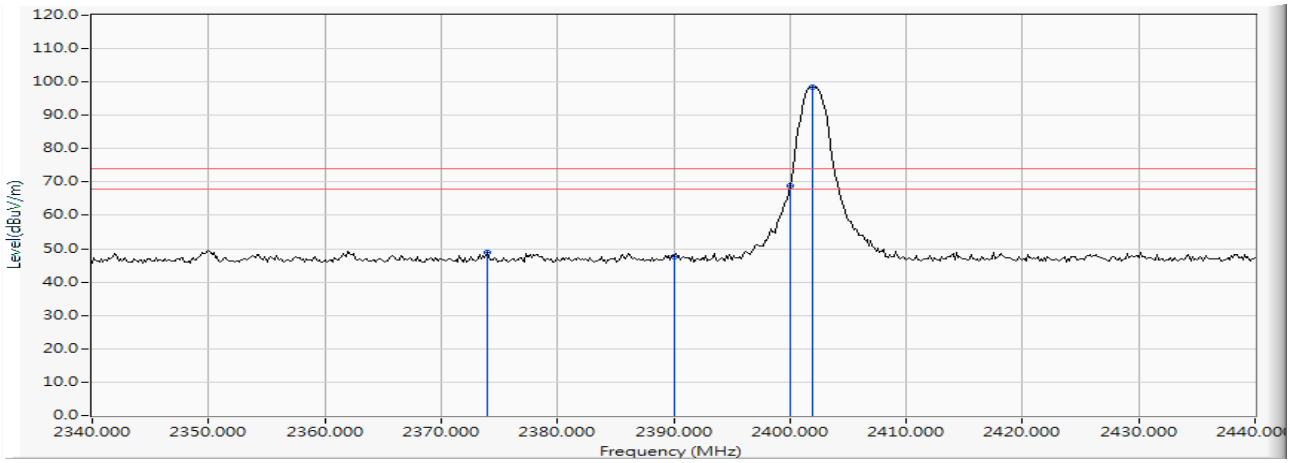
4.4. Uncertainty

Horizontal polarization：1-18GHz: ±3.77dB
Vertical polarization：1-18GHz : ±3.83dB

4.5. Test Result of Band Edge

Product : Gaming Mouse Dongle
Test Item : Band Edge Data
Test Date : 2019/03/28
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		2373.913	10.197	38.554	48.751	-25.249	74.000	PEAK
2		2390.000	10.262	37.497	47.759	-26.241	74.000	PEAK
3		2400.000	10.304	58.549	68.852	-5.148	74.000	PEAK
4	*	2401.884	10.311	88.113	98.424	24.424	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.

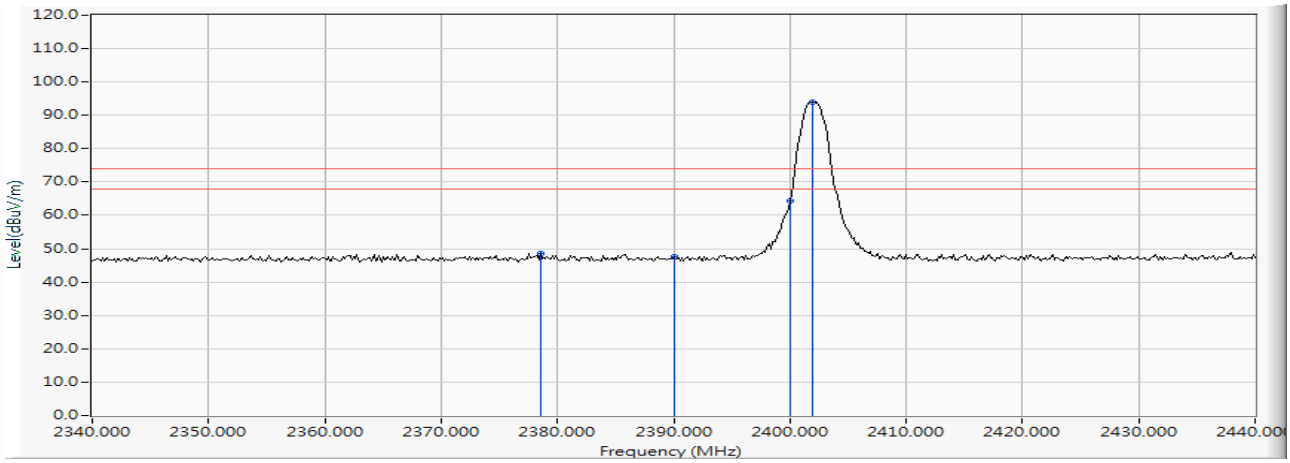
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)	Result
02 (Average)	2373.913	48.751	-38.416	10.335	-43.665	54.00	Pass
02 (Average)	2390.000	47.759	-38.416	9.343	-44.657	54.00	Pass

Note:

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

Product : Gaming Mouse Dongle
Test Item : Band Edge Data
Test Date : 2019/03/28
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		2378.551	10.215	38.282	48.497	-25.503	74.000	PEAK
2		2390.000	10.262	37.453	47.715	-26.285	74.000	PEAK
3		2400.000	10.304	53.945	64.248	-9.752	74.000	PEAK
4	*	2401.884	10.311	83.645	93.956	19.956	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.

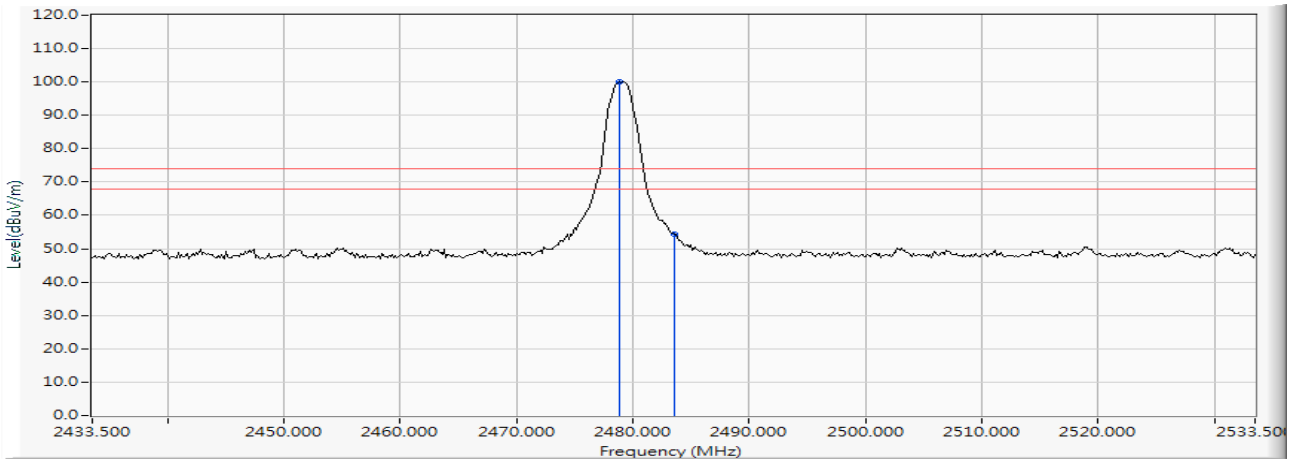
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)	Result
02 (Average)	2378.551	48.497	-38.416	10.081	-43.919	54.00	Pass
02 (Average)	2390.000	47.715	-38.416	9.299	-44.701	54.00	Pass

Note:

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

Product : Gaming Mouse Dongle
Test Item : Band Edge Data
Test Date : 2019/03/28
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	*	2478.862	10.624	89.274	99.897	25.897	74.000	PEAK
2		2483.500	10.640	43.880	54.521	-19.479	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.

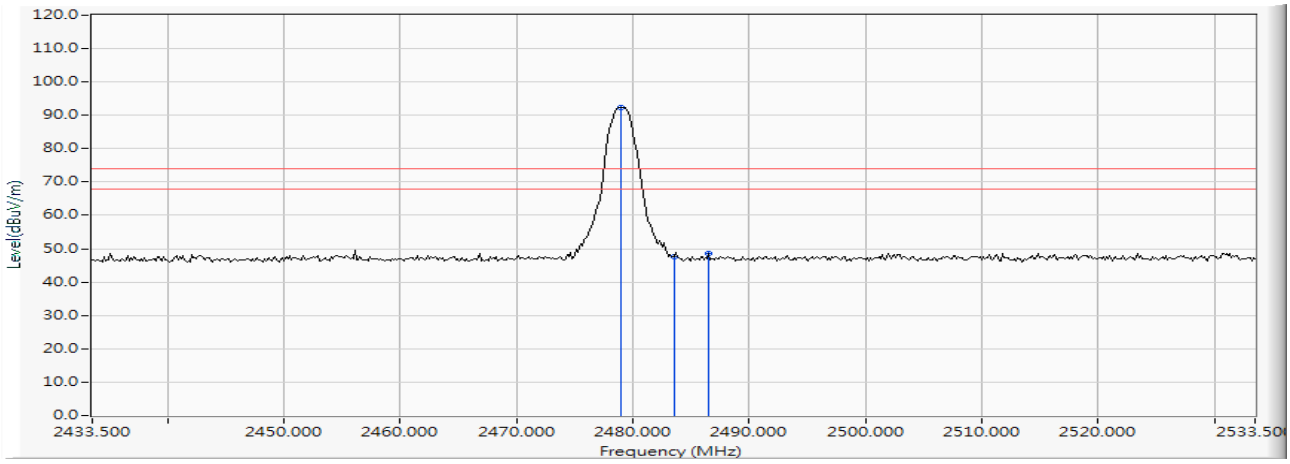
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)	Result
79 (Average)	2483.500	54.521	-38.416	16.105	-37.895	54.00	Pass

Note:

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

Product : Gaming Mouse Dongle
Test Item : Band Edge Data
Test Date : 2019/03/28
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	*	2479.007	10.624	81.717	92.341	18.341	74.000	PEAK
2		2483.500	10.640	36.939	47.580	-26.420	74.000	PEAK
3		2486.543	10.653	37.879	48.532	-25.468	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.

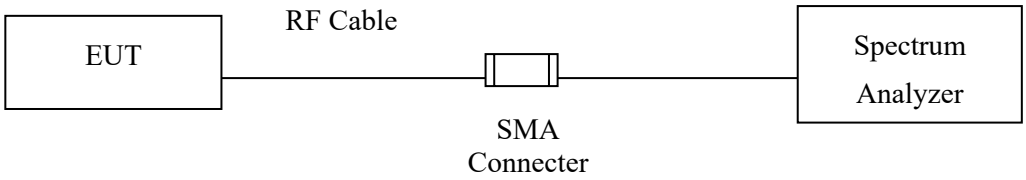
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)	Result
79 (Average)	2483.500	47.580	-38.416	9.164	-44.836	54.00	Pass
79 (Average)	2486.543	48.532	-38.416	10.116	-43.884	54.00	Pass

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

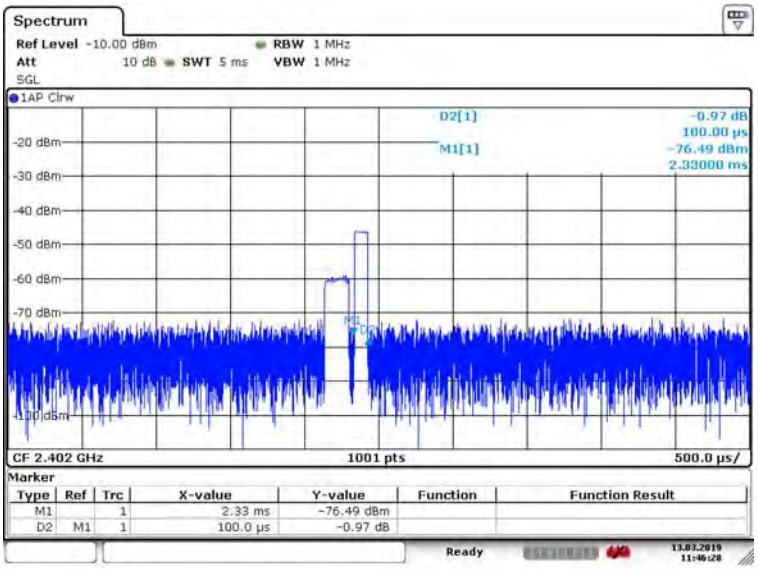


5.2. Uncertainty

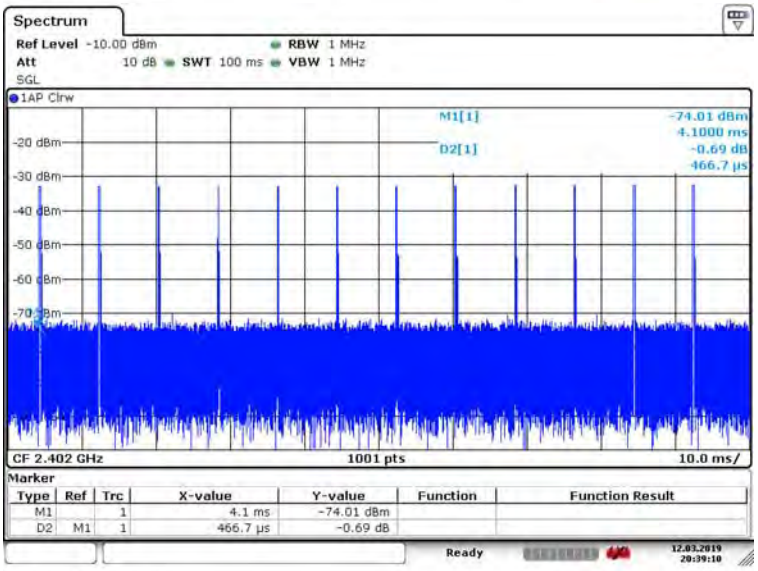
± 2.31ms

5.3. Test Result of Duty Cycle

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



Date: 13.MAR.2019 11:46:28



Date: 12.MAR.2019 20:39:10

Time on of 100ms= 100us*12= 1.2ms

Duty Cycle=6ms / 100ms= 0.012

Duty Cycle correction factor= 20 LOG 0.012= -38.416 dB

Duty Cycle correction factor	**-38.416**	**dB**

6. EMI Reduction Method During Compliance Testing

No modification was made during testing.