

FCC Test Report

Product Name	Gaming Mouse
Model No.	P704
FCC ID.	H4IMSP704

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

Date of Receipt	Aug. 22, 2019
Issued Date	Oct. 15, 2019
Report No.	1980348R-RFUSP01V00-B
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: Oct. 15, 2019

Report No.: 1980348R-RFUSP01V00-B



Product Name	Gaming Mouse
Applicant	Lite-on Technology Corp.
Address	16F,392,Ruey Kuang Road, Neihu ,Taipei
Manufacturer	Lite-on Technology Corp.
Model No.	P704
FCC ID.	H4IMSP704
EUT Rated Voltage	DC 3.7V (Power by battery)
EUT Test Voltage	DC 3.7V (Power by battery)
Trade Name	ASUS
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2018 ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By :

April Chen

(Senior Adm. Specialist / April Chen)

Tested By :

Jason Tuan

(Engineer / Jason Tuan)

Approved By :

Vincent Lin

(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Gaming Mouse
Trade Name	ASUS
Model No.	P704
FCC ID.	H4IMSP704
Frequency Range	2402 – 2480MHz
Channel Number	V4.2: 40CH
Type of Modulation	V4.2: GFSK(1Mbps)
Antenna Type	MULTILAYER CERAMIC
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”
USB to Type C Cable	MFR: YUE YANG, M/N: USB CABLE SM9380, Shielded, 1.88m

Antenna List

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

Note: The antenna of EUT is conforming to FCC 15.203.

Center Frequency of Each Channel: (For V4.2)

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	2402 MHz	Channel 01:	2404 MHz	Channel 02:	2406 MHz	Channel 03:	2408 MHz
Channel 04:	2410 MHz	Channel 05:	2412 MHz	Channel 06:	2414 MHz	Channel 07:	2416 MHz
Channel 08:	2418 MHz	Channel 09:	2420 MHz	Channel 10:	2422 MHz	Channel 11:	2424 MHz
Channel 12:	2426 MHz	Channel 13:	2428 MHz	Channel 14:	2430 MHz	Channel 15:	2432 MHz
Channel 16:	2434 MHz	Channel 17:	2436 MHz	Channel 18:	2438 MHz	Channel 19:	2440 MHz
Channel 20:	2442 MHz	Channel 21:	2444 MHz	Channel 22:	2446 MHz	Channel 23:	2448 MHz
Channel 24:	2450 MHz	Channel 25:	2452 MHz	Channel 26:	2454 MHz	Channel 27:	2456 MHz
Channel 28:	2458 MHz	Channel 29:	2460 MHz	Channel 30:	2462 MHz	Channel 31:	2464 MHz
Channel 32:	2466 MHz	Channel 33:	2468 MHz	Channel 34:	2470 MHz	Channel 35:	2472 MHz
Channel 36:	2474 MHz	Channel 37:	2476 MHz	Channel 38:	2478 MHz	Channel 39:	2480 MHz

Note:

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

Test Mode	Mode 1: Transmit - BLE (GFSK)
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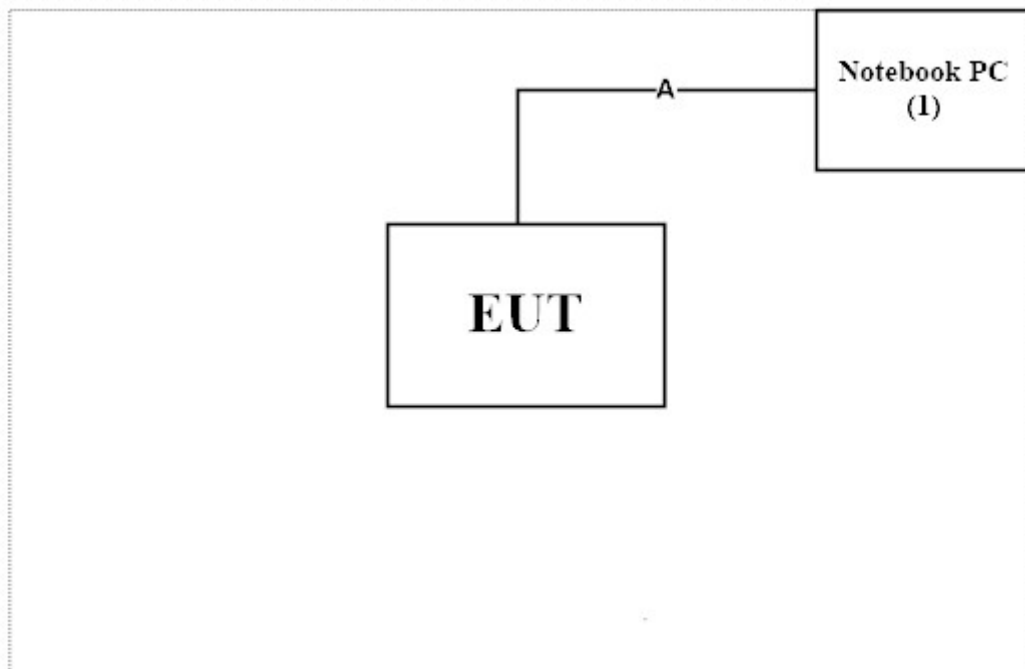
1.3. Tested System Details

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

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

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

1.4. Configuration of Tested System



1.5. EUT Exercise Software

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

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	30-65
Barometric pressure (mbar)	860-1060	950-1000

USA : FCC Registration Number: TW3023

Canada : IC Registration Number: 4075A

Site Description: Accredited by TAF
Accredited Number: 3023

Test Laboratory: DEKRA Testing and Certification Co., Ltd
Address: No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451,
Taiwan, R.O.C.
Phone number: 886-2-8601-3788
Fax number: 886-2-8601-3789
Email address: info.tw@dekra.com
Website: <http://www.dekra.com.tw>

1.7. List of Test Equipment

For Conducted measurements /CB3/SR8

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

For Radiated measurements /Site3/CB8

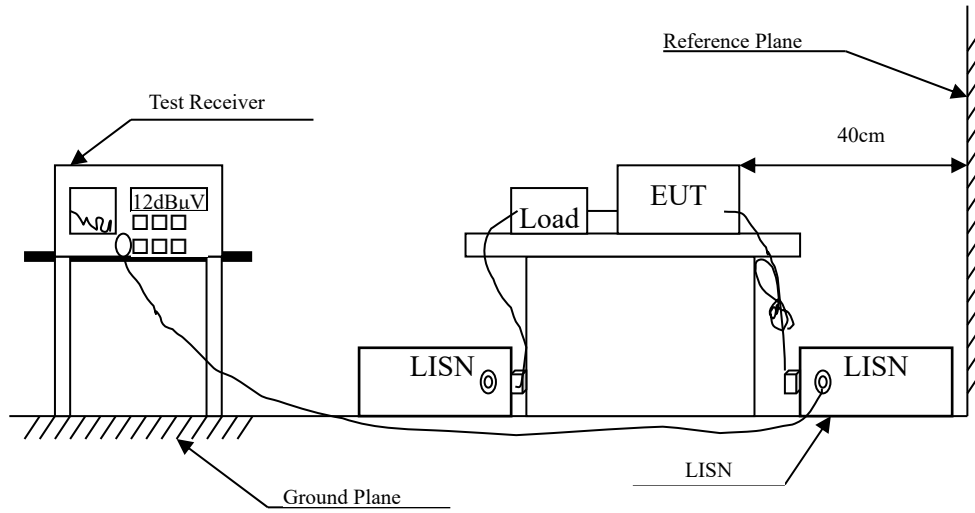
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
X	Spectrum Analyzer	R&S	FSP40	100170	2019/03/11	2020/03/10
X	Loop Antenna	Teseq	HLA6121	37133	2019/10/13	2020/10/12
X	Bilog Antenna	Schaffner Chase	CBL6112B	2707	2019/06/23	2020/06/22
X	Coaxial Cable	DEKRA	RG 214	LC003-RG	2019/06/13	2020/06/12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

Note:

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

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (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 Peripherals 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 refer 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 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.

The EUT was setup to ANSI C63.4, 2014; tested to DTS test procedure of FCC KDB-558074 for compliance to FCC 47CFR Subpart C requirements.

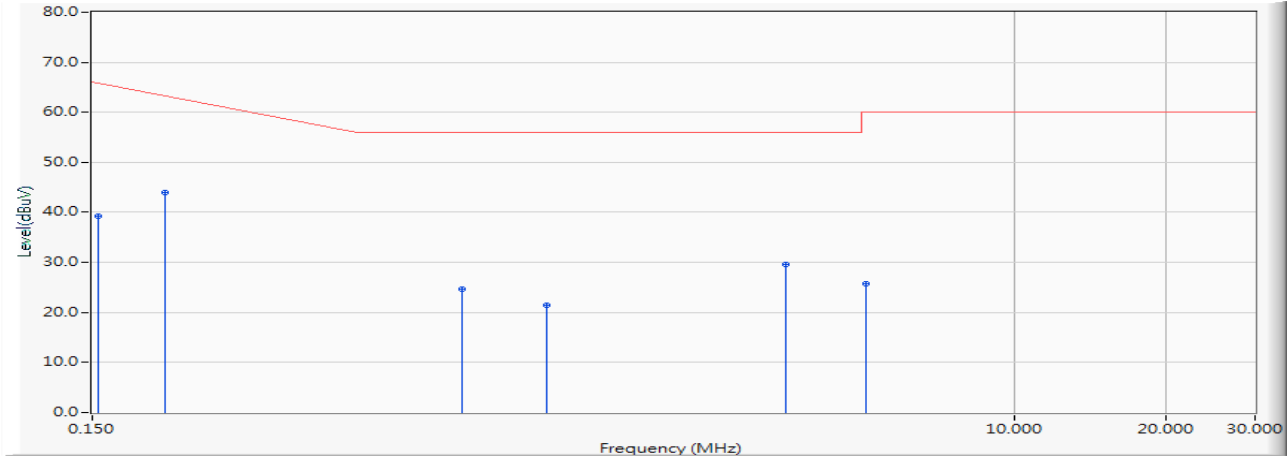
2.4. Uncertainty

± 2.26 dB

2.5. Test Result of Conducted Emission

Product : Gaming Mouse
 Test Item : Conducted Emission Test
 Test date : 2019/09/26
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Line1



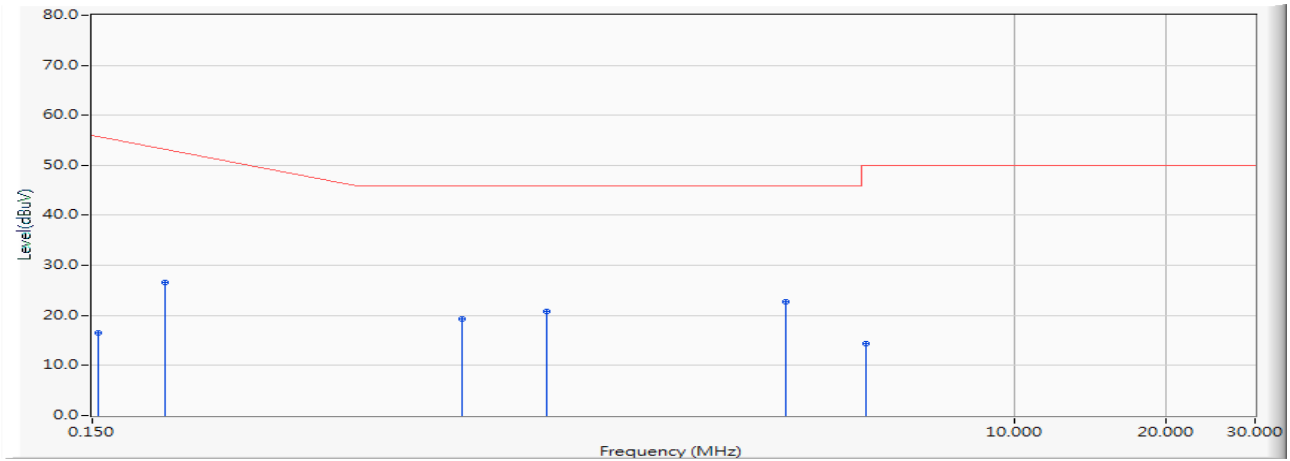
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.154	9.668	29.660	39.328	-26.558	65.886	QUASIPeAK
2	*	0.209	9.671	34.280	43.951	-20.363	64.314	QUASIPeAK
3		0.810	9.704	14.900	24.604	-31.396	56.000	QUASIPeAK
4		1.189	9.724	11.700	21.424	-34.576	56.000	QUASIPeAK
5		3.525	9.830	19.680	29.510	-26.490	56.000	QUASIPeAK
6		5.080	9.875	15.880	25.755	-34.245	60.000	QUASIPeAK

Note:

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

Product : Gaming Mouse
 Test Item : Conducted Emission Test
 Test date : 2019/09/26
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Line1



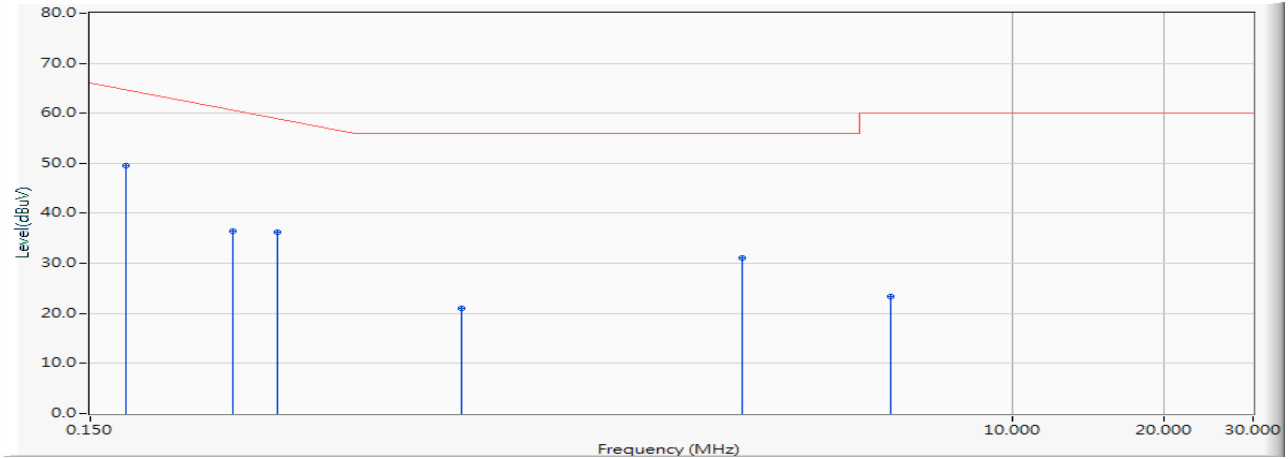
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.154	9.668	6.890	16.558	-39.328	55.886	AVERAGE
2		0.209	9.671	16.950	26.621	-27.693	54.314	AVERAGE
3		0.810	9.704	9.630	19.334	-26.666	46.000	AVERAGE
4		1.189	9.724	10.980	20.704	-25.296	46.000	AVERAGE
5	*	3.525	9.830	12.830	22.660	-23.340	46.000	AVERAGE
6		5.080	9.875	4.550	14.425	-35.575	50.000	AVERAGE

Note:

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

Product : Gaming Mouse
 Test Item : Conducted Emission Test
 Test date : 2019/09/26
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Line2



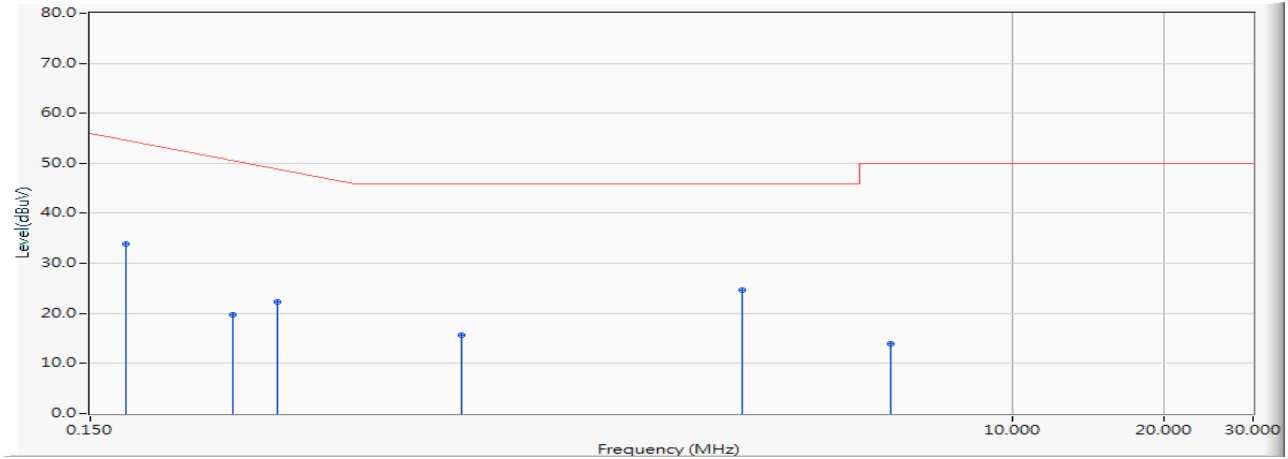
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	*	0.177	9.703	39.920	49.623	-15.606	65.229	QUASIPeAK
2		0.287	9.705	26.740	36.445	-25.641	62.086	QUASIPeAK
3		0.353	9.709	26.520	36.229	-23.971	60.200	QUASIPeAK
4		0.814	9.744	11.180	20.924	-35.076	56.000	QUASIPeAK
5		2.931	9.846	21.220	31.066	-24.934	56.000	QUASIPeAK
6		5.752	9.941	13.540	23.481	-36.519	60.000	QUASIPeAK

Note:

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

Product : Gaming Mouse
 Test Item : Conducted Emission Test
 Test date : 2019/09/26
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Line2



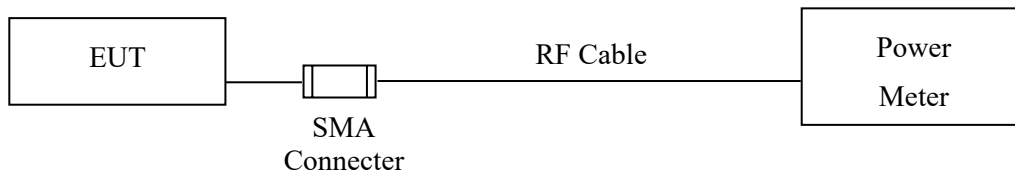
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	*	0.177	9.703	24.190	33.893	-21.336	55.229	AVERAGE
2		0.287	9.705	10.030	19.735	-32.351	52.086	AVERAGE
3		0.353	9.709	12.500	22.209	-27.991	50.200	AVERAGE
4		0.814	9.744	5.910	15.654	-30.346	46.000	AVERAGE
5		2.931	9.846	14.780	24.626	-21.374	46.000	AVERAGE
6		5.752	9.941	4.060	14.001	-35.999	50.000	AVERAGE

Note:

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

3. Peak Power Output

3.1. Test Setup



3.2. Limit

The maximum peak power shall be less 1Watt.

3.3. Test Procedure

Tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements. The maximum peak conducted output power using KDB 558074 section 9.1.3 PKPM1 Peak power meter method.

3.4. Uncertainty

± 1.19 dB

3.5. Test Result of Peak Power Output

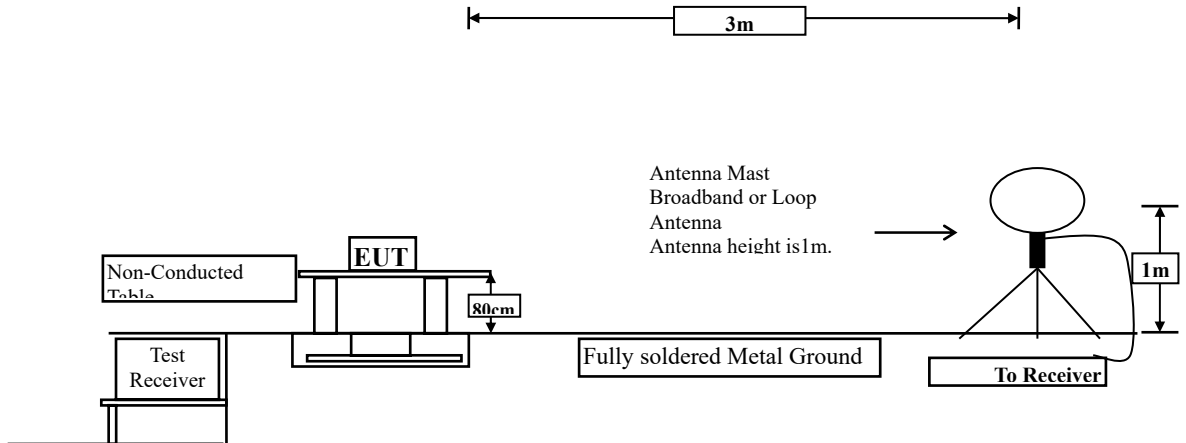
Product : Gaming Mouse
Test Item : Peak Power Output
Test Site : No.3 OATS
Test date : 2019/09/19
Test Mode : Mode 1: Transmit - BLE (GFSK)

Channel No.	Frequency (MHz)	Peak Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	-0.70	1 Watt= 30 dBm	Pass
Channel 19	2440.00	-1.08	1 Watt= 30 dBm	Pass
Channel 39	2480.00	-1.43	1 Watt= 30 dBm	Pass

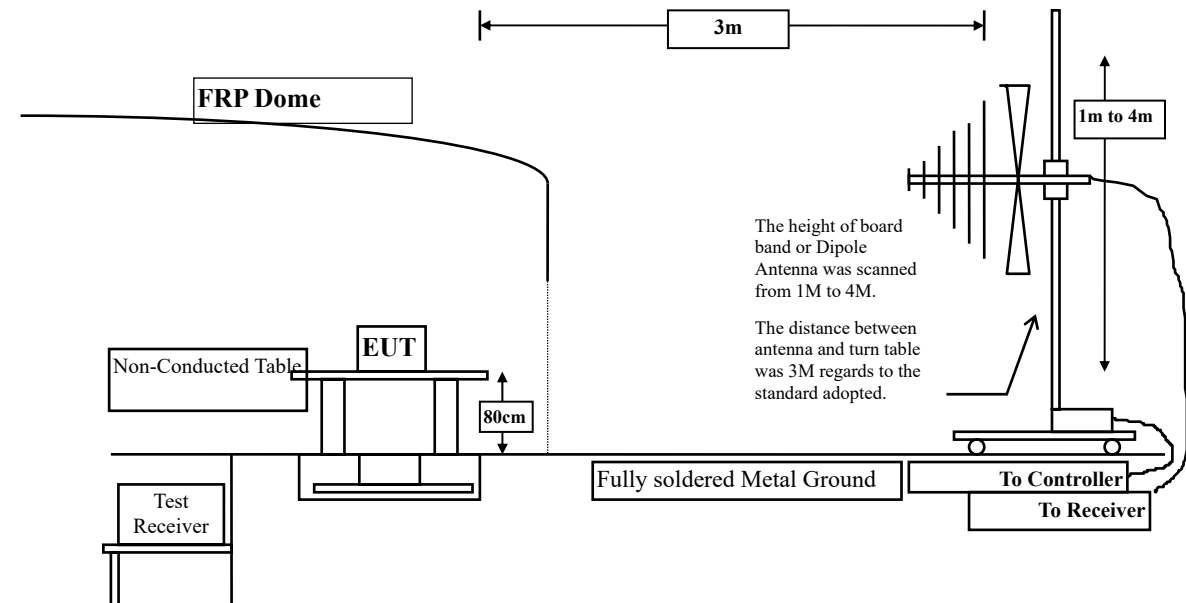
4. Radiated Emission

4.1. Test Setup

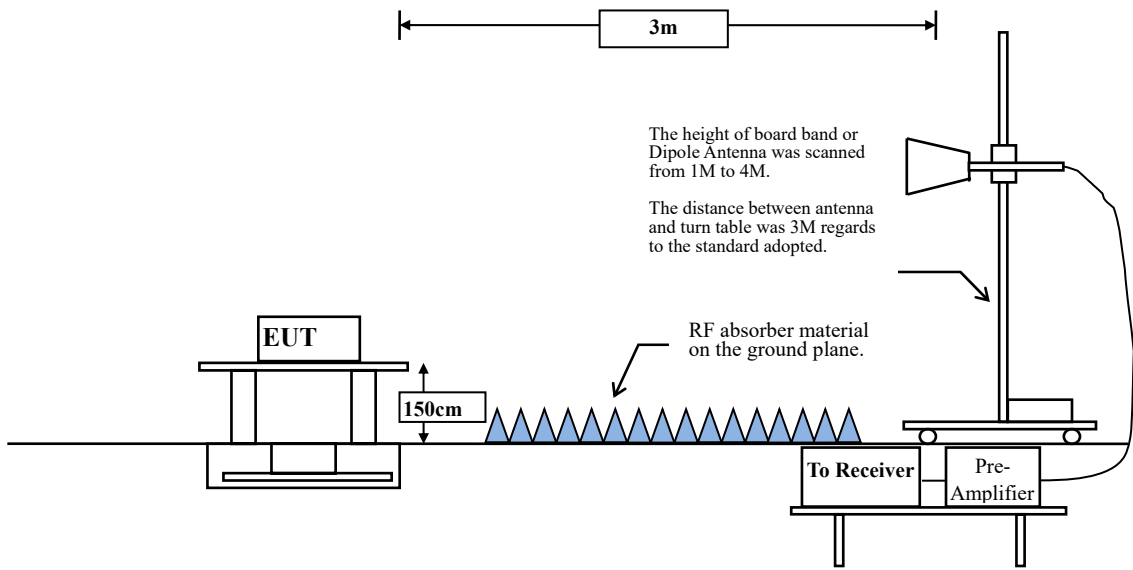
Under 30MHz



Below 1GHz



Above 1GHz



4.2. Limits

➤ General Radiated Emission Limits

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

FCC Part 15 Subpart C Paragraph 15.209 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:
1. RF Voltage (dB μ V) = 20 log RF Voltage (uV)
 2. In the Above Table, the tighter limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

4.3. Test Procedure

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

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

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

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

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

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

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

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

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

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

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

RBW and VBW Parameter setting:

According to KDB 558074 section 12.2.4. Peak power measurement procedure

RBW = as specified in Table 1.

$VBW \geq 3 \times RBW$.

Table 1 —RBW as a function of frequency

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

According to KDB 558074 section 12.2.5. Average power measurement procedure

RBW = 1MHz.

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

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

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

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

Note: Duty Cycle Refer to Section 9

4.4. Uncertainty

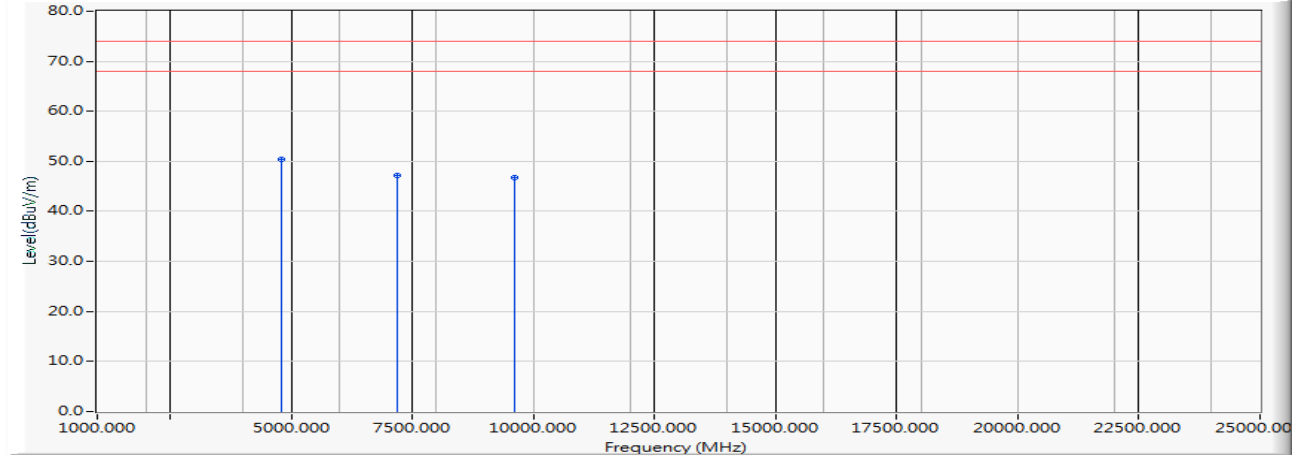
± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

4.5. Test Result of Radiated Emission

Product : Gaming Mouse
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/09/24
 Test Mode : Mode 1: Transmit - BLE (GFSK)(2402MHz)

Horizontal



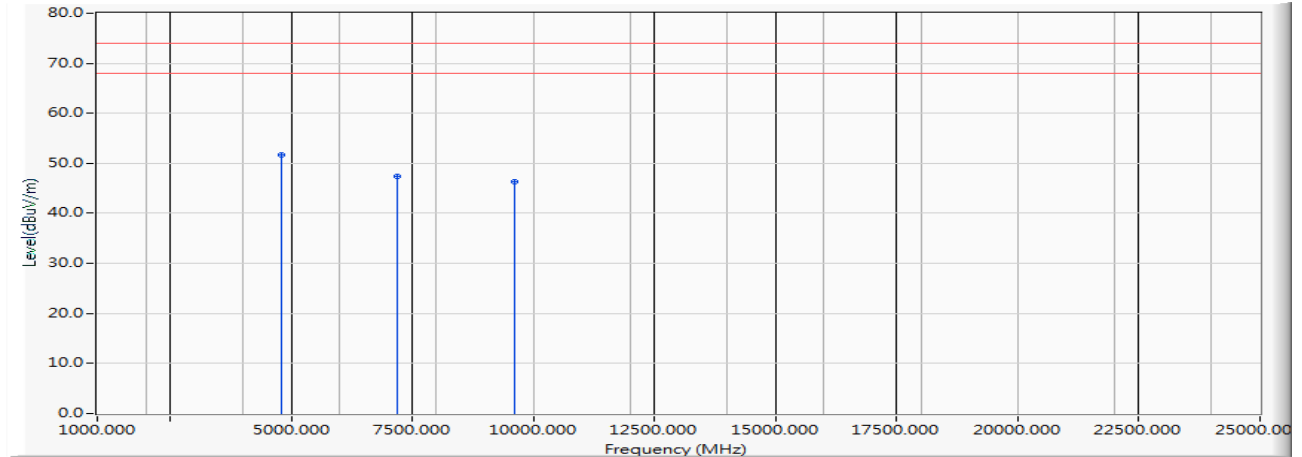
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4804.000	-15.236	65.620	50.384	-23.616	74.000	PEAK
2		7206.000	-12.053	59.160	47.107	-26.893	74.000	PEAK
3		9608.000	-11.738	58.490	46.752	-27.248	74.000	PEAK

Note:

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

Product : Gaming Mouse
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/09/24
 Test Mode : Mode 1: Transmit - BLE (GFSK)(2402MHz)

Vertical



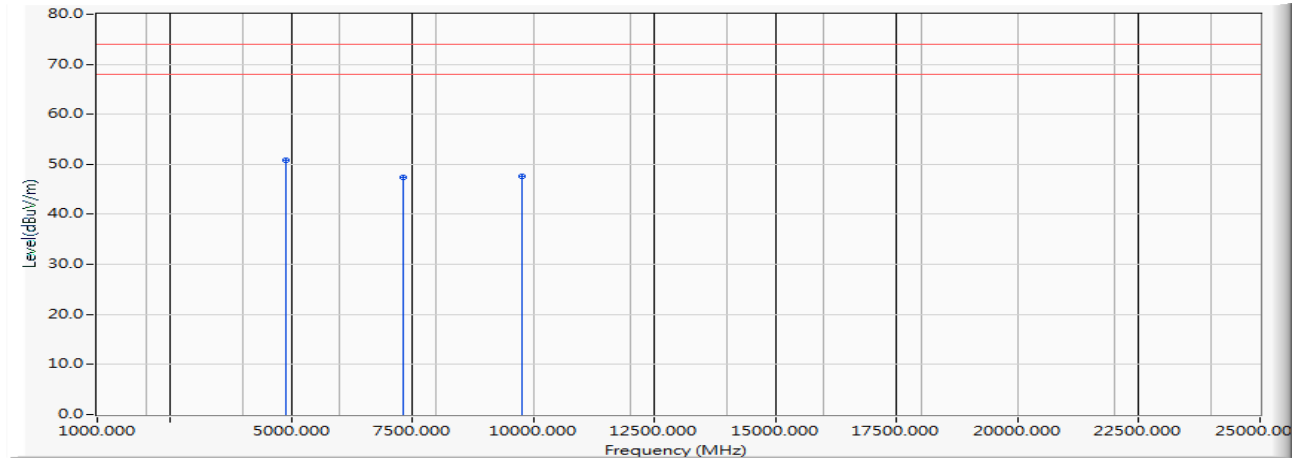
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4804.000	-15.236	67.010	51.774	-22.226	74.000	PEAK
2		7206.000	-12.053	59.480	47.427	-26.573	74.000	PEAK
3		9608.000	-11.738	58.000	46.262	-27.738	74.000	PEAK

Note:

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

Product : Gaming Mouse
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/09/24
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Horizontal



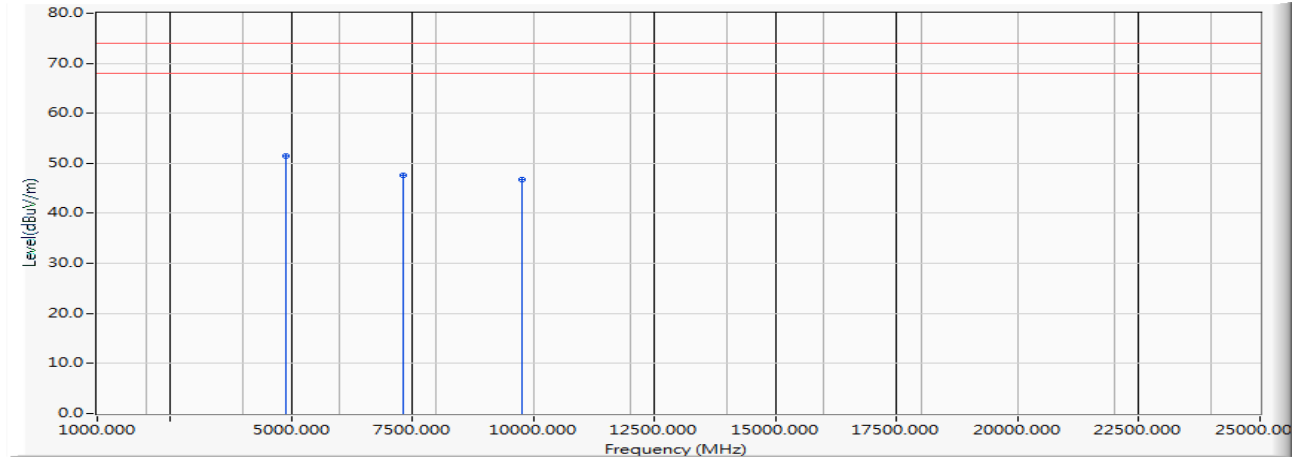
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4880.000	-14.401	65.230	50.829	-23.171	74.000	PEAK
2		7320.000	-12.527	59.940	47.413	-26.587	74.000	PEAK
3		9760.000	-10.666	58.370	47.705	-26.295	74.000	PEAK

Note:

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

Product : Gaming Mouse
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/09/24
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Vertical



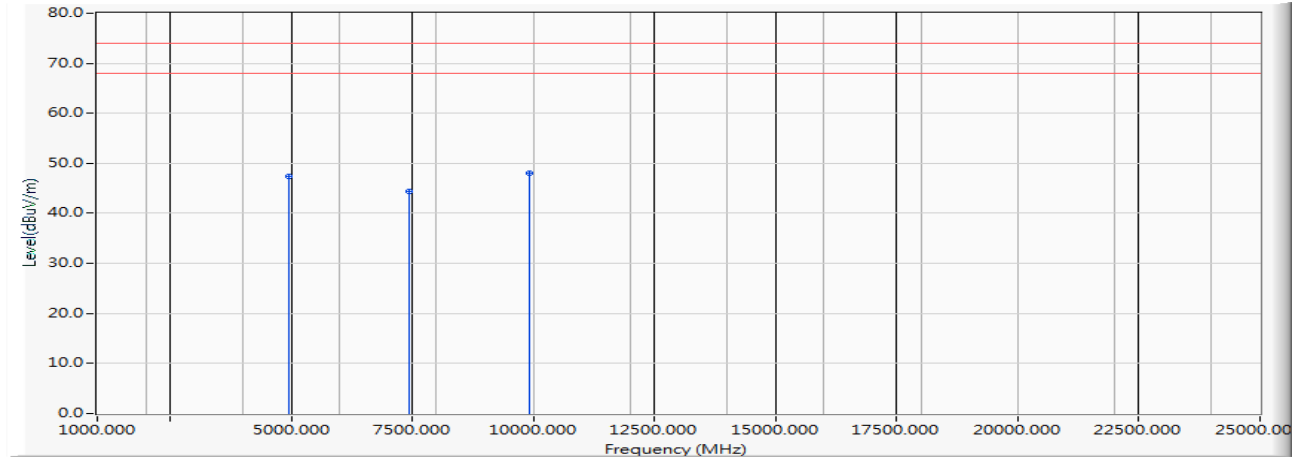
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4880.000	-14.401	65.960	51.559	-22.441	74.000	PEAK
2		7320.000	-12.527	60.060	47.533	-26.467	74.000	PEAK
3		9760.000	-10.666	57.450	46.785	-27.215	74.000	PEAK

Note:

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

Product : Gaming Mouse
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/09/24
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

Horizontal



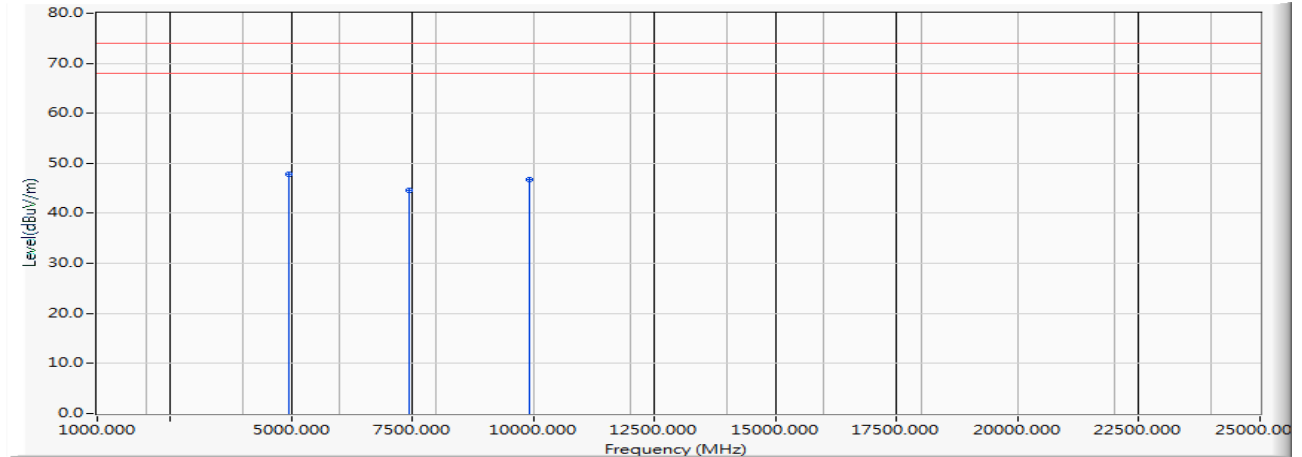
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4960.000	-13.462	60.930	47.468	-26.532	74.000	PEAK
2		7440.000	-13.842	58.210	44.368	-29.632	74.000	PEAK
3	*	9920.000	-12.531	60.500	47.969	-26.031	74.000	PEAK

Note:

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

Product : Gaming Mouse
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/09/24
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

Vertical



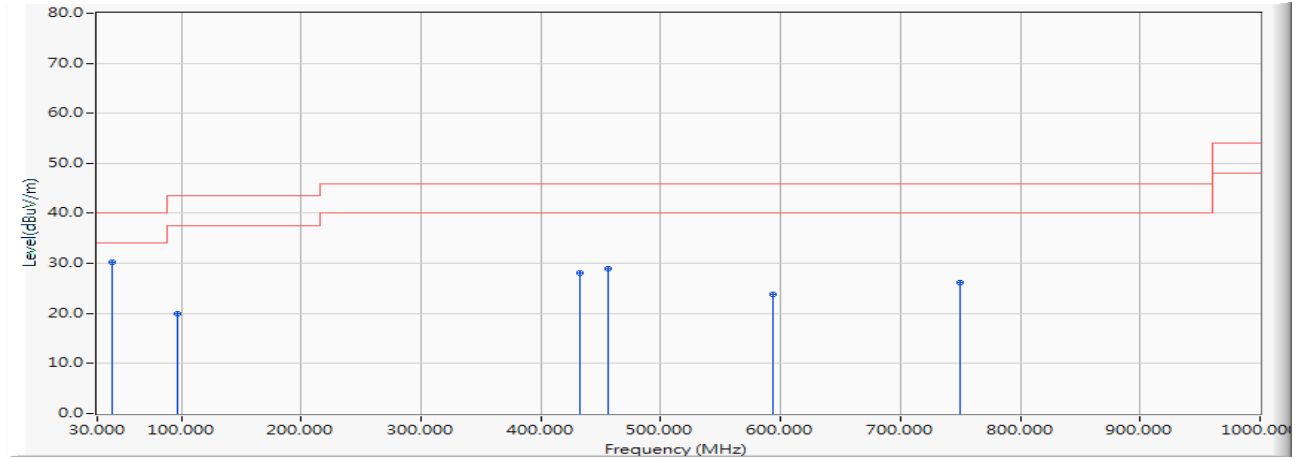
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4960.000	-13.462	61.240	47.778	-26.222	74.000	PEAK
2		7440.000	-13.842	58.350	44.508	-29.492	74.000	PEAK
3		9920.000	-12.531	59.210	46.679	-27.321	74.000	PEAK

Note:

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

Product : Gaming Mouse
 Test Item : General Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/09/06
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Horizontal



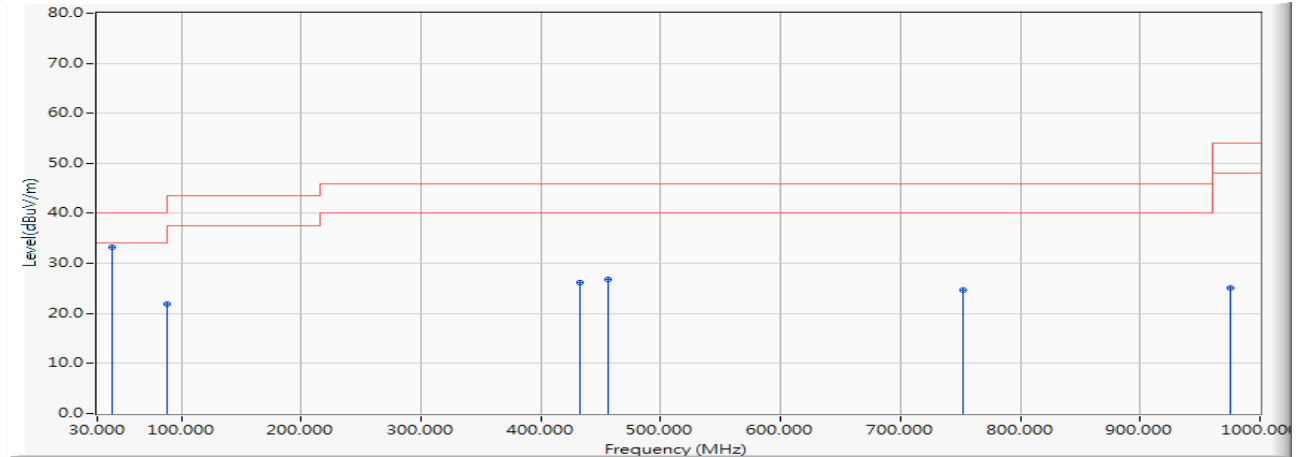
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	42.652	-16.829	46.990	30.161	-9.839	40.000	QUASIPEAK
2		97.478	-16.060	35.999	19.939	-23.561	43.500	QUASIPEAK
3		432.058	-8.652	36.676	28.024	-17.976	46.000	QUASIPEAK
4		455.957	-8.361	37.398	29.037	-16.963	46.000	QUASIPEAK
5		593.725	-5.886	29.762	23.876	-22.124	46.000	QUASIPEAK
6		749.768	-6.265	32.453	26.188	-19.812	46.000	QUASIPEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
4. The 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
 Test Site : No.3 OATS
 Test date : 2019/09/06
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Vertical



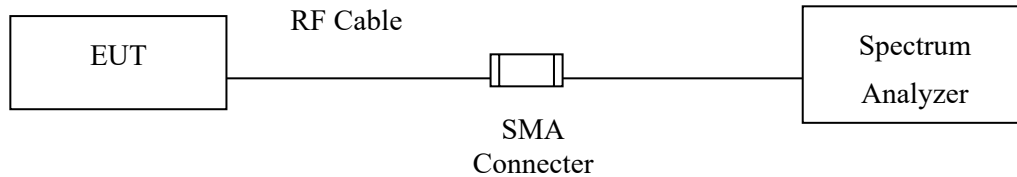
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	42.652	-16.829	50.038	33.209	-6.791	40.000	QUASIPeAK
2		87.638	-16.744	38.671	21.927	-18.073	40.000	QUASIPeAK
3		432.058	-8.652	34.878	26.226	-19.774	46.000	QUASIPeAK
4		455.957	-8.361	35.239	26.878	-19.122	46.000	QUASIPeAK
5		752.580	-6.109	30.863	24.755	-21.245	46.000	QUASIPeAK
6		974.696	-5.699	30.776	25.076	-28.924	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. 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.

5. RF Antenna Conducted Test

5.1. Test Setup



5.2. Limits

According to FCC Section 15.247(d). In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.3. Test Procedure

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

5.4. Uncertainty

$\pm 1.20\text{dB}$

5.5. Test Result of RF Antenna Conducted Test

Product : Gaming Mouse
Test Item : RF Antenna Conducted Test
Test Site : No.3 OATS
Test date : 2019/09/12
Test Mode : Mode 1: Transmit - BLE (GFSK)

Figure Channel 00:

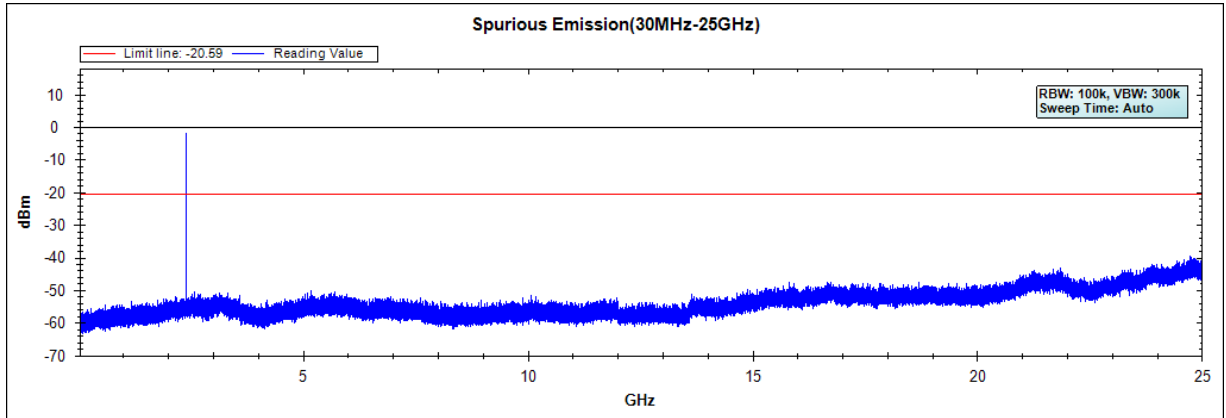


Figure Channel 19:

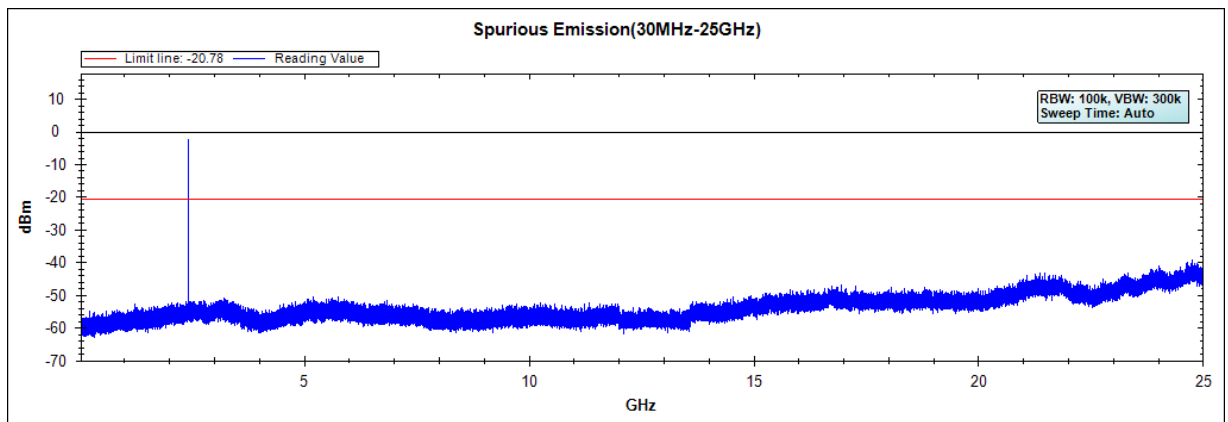
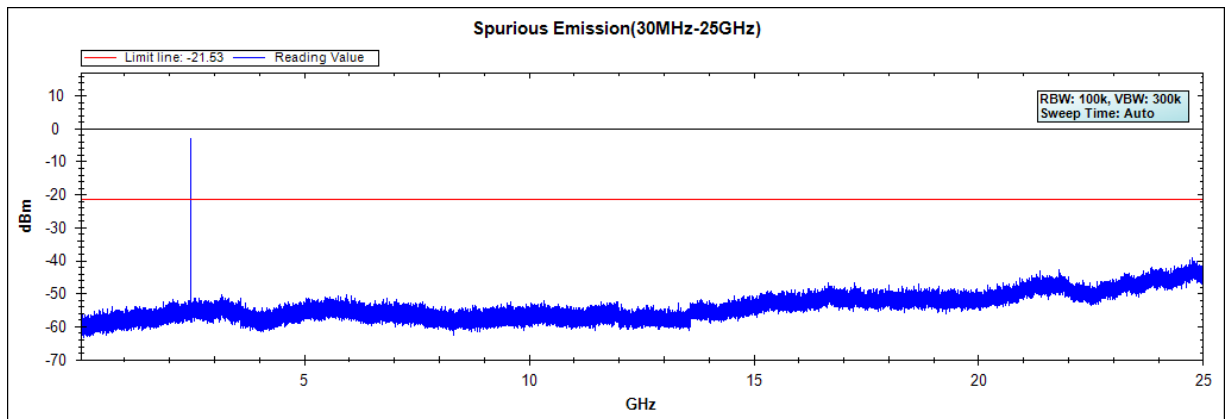


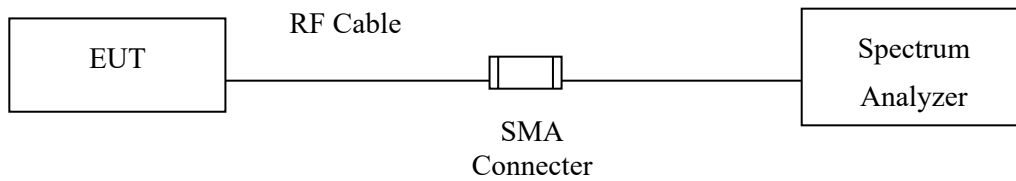
Figure Channel 39:



6. Band Edge

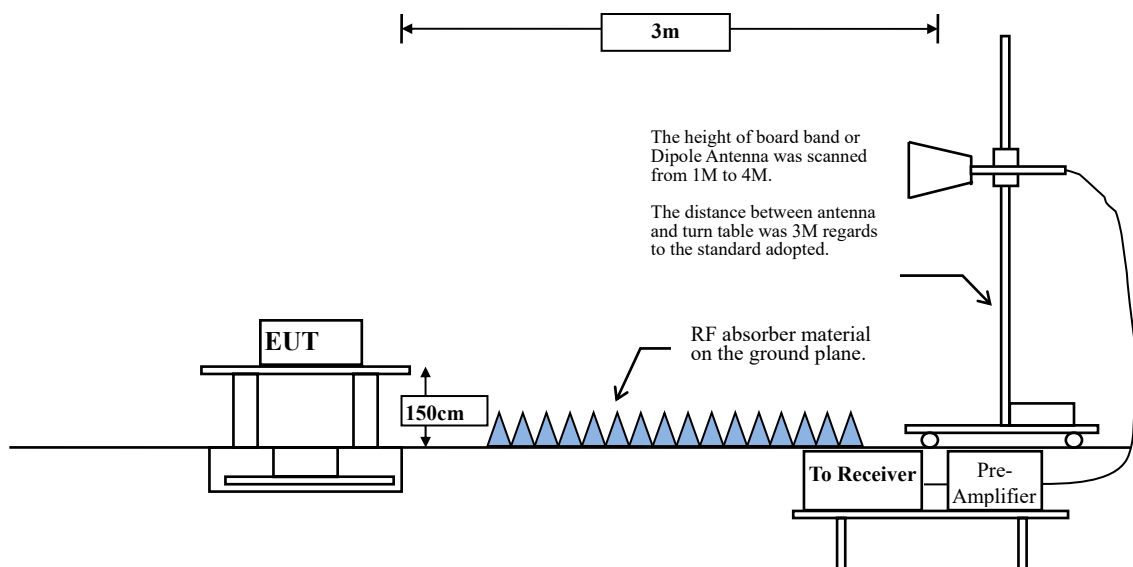
6.1. Test Setup

RF Conducted Measurement



RF Radiated Measurement:

Above 1GHz



6.2. Limit

According to FCC Section 15.247(d). In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.3. Test Procedure

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

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

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

RBW and VBW Parameter setting:

According to KDB 558074 section 12.2.4. Peak power measurement procedure

RBW = as specified in Table 1.

$VBW \geq 3 \times RBW$.

Table 1 —RBW as a function of frequency

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

According to KDB 558074 section 12.2.5. Average power measurement procedure

RBW = 1MHz.

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

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

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

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

Note: Duty Cycle Refer to Section 9

6.4. Uncertainty

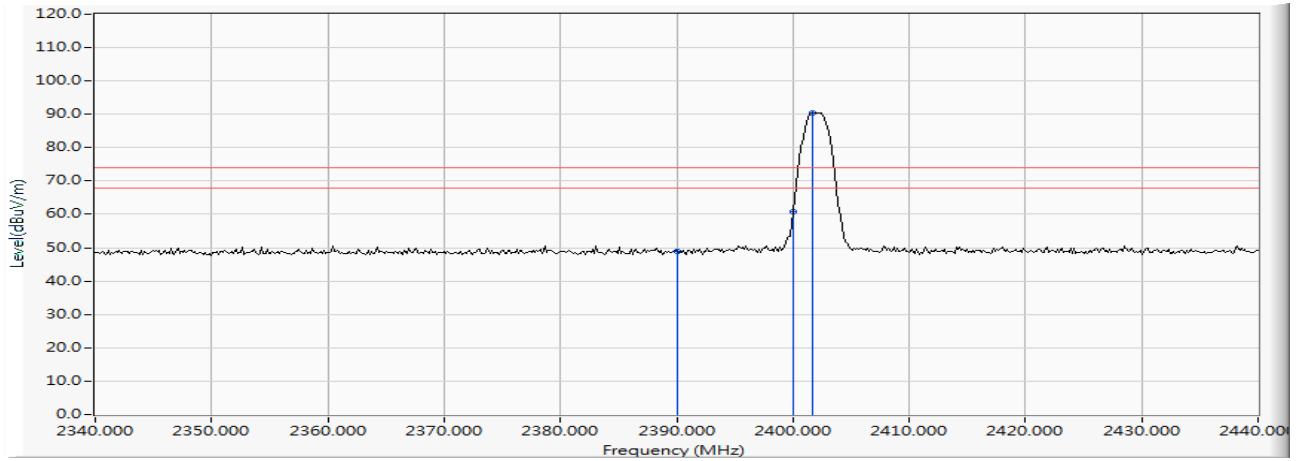
± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

6.5. Test Result of Band Edge

Product : Gaming Mouse
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/09/09
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Horizontal



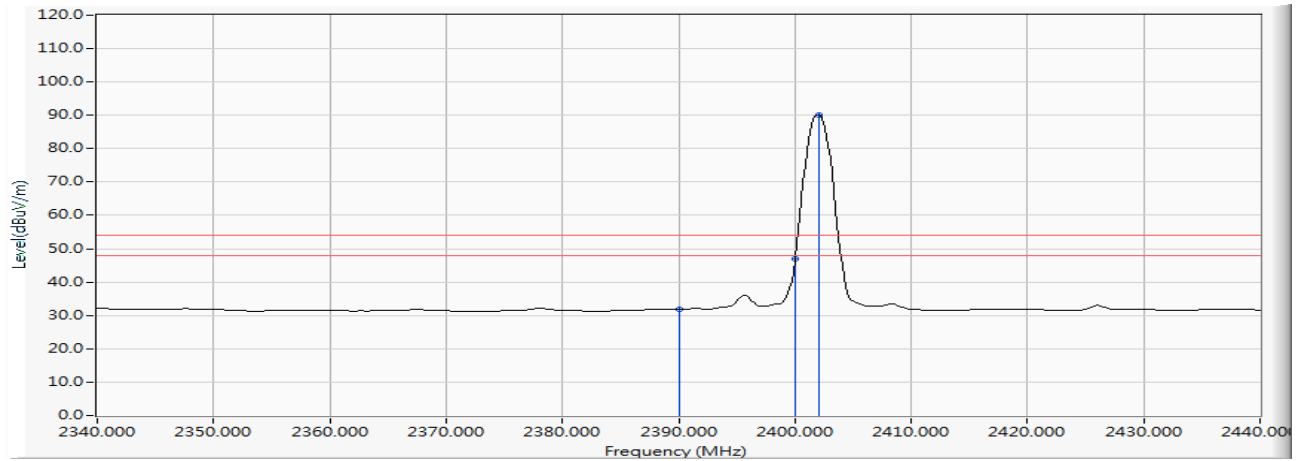
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	8.763	40.022	48.785	-25.215	74.000	PEAK
2		2400.000	8.799	51.953	60.752	--	--	PEAK
3	*	2401.739	8.806	81.755	90.560	--	--	PEAK

Note:

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

Product : Gaming Mouse
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/09/09
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Horizontal



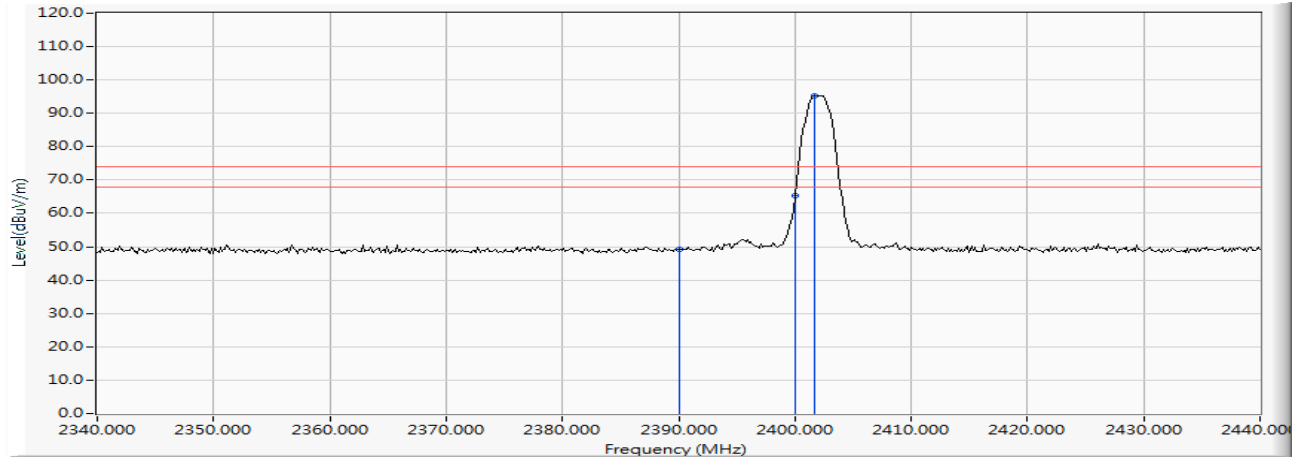
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	8.763	23.058	31.821	-22.179	54.000	AVERAGE
2		2400.000	8.799	38.109	46.908	--	--	AVERAGE
3	*	2402.029	8.807	81.430	90.236	--	--	AVERAGE

Note:

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

Product : Gaming Mouse
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/09/09
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Vertical



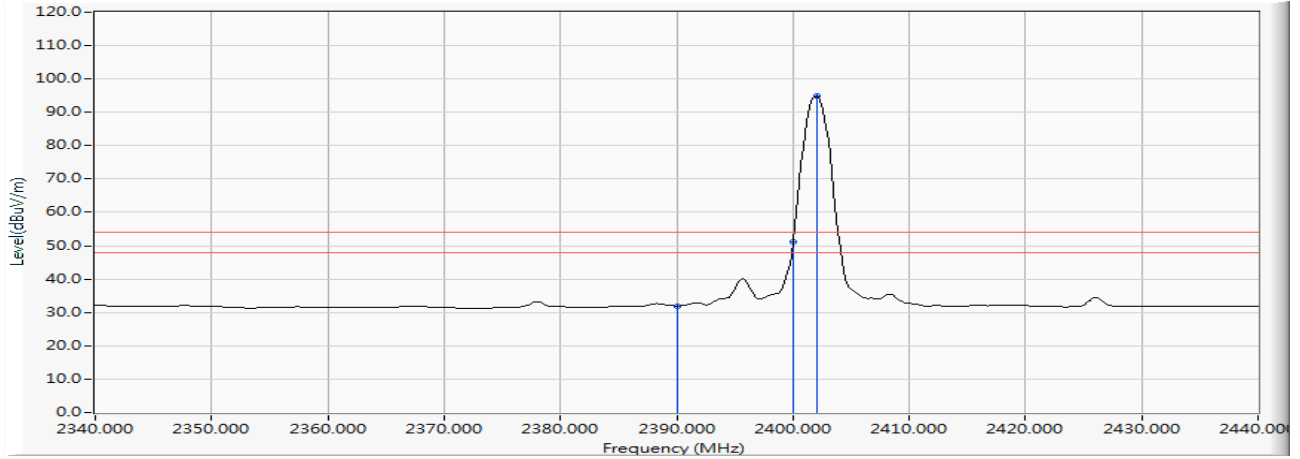
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	8.763	40.346	49.109	-24.891	74.000	PEAK
2		2400.000	8.799	56.614	65.413	--	--	PEAK
3	*	2401.739	8.806	86.482	95.287	--	--	PEAK

Note:

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

Product : Gaming Mouse
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/09/09
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Vertical



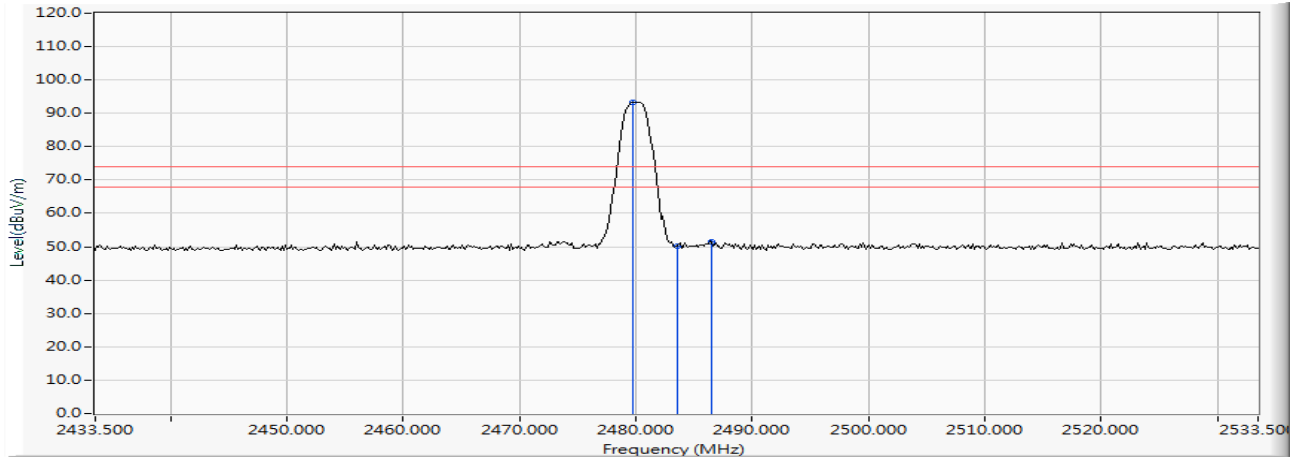
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	8.763	23.223	31.986	-22.014	54.000	AVERAGE
2		2400.000	8.799	42.443	51.242	--	--	AVERAGE
3	*	2402.029	8.807	85.964	94.770	--	--	AVERAGE

Note:

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

Product : Gaming Mouse
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/09/09
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

Horizontal



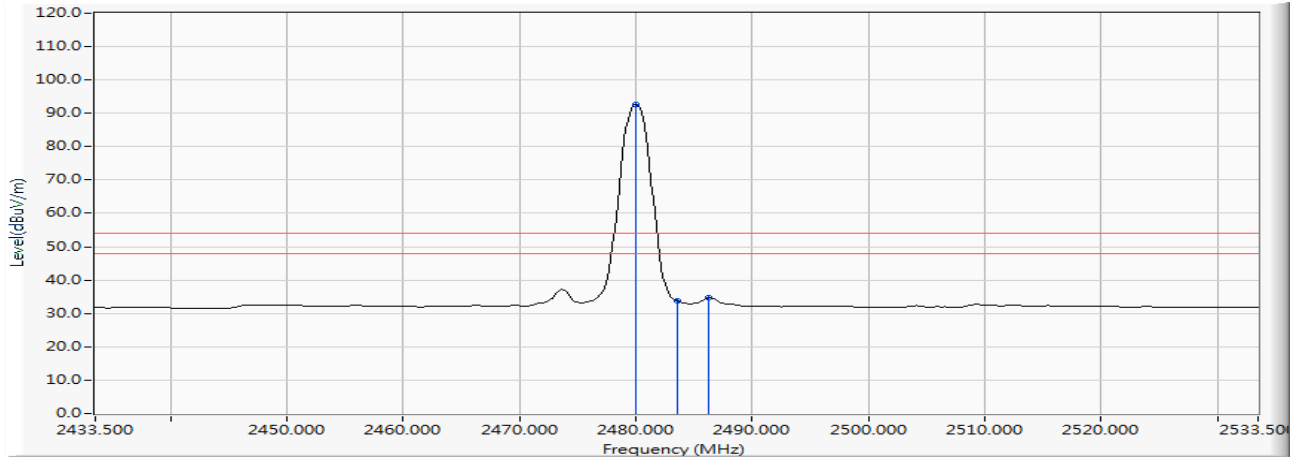
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2479.732	9.086	84.315	93.401	--	--	PEAK
2		2483.500	9.100	41.247	50.346	-23.654	74.000	PEAK
3		2486.543	9.110	42.401	51.511	-22.489	74.000	PEAK

Note:

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

Product : Gaming Mouse
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/09/09
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

Horizontal



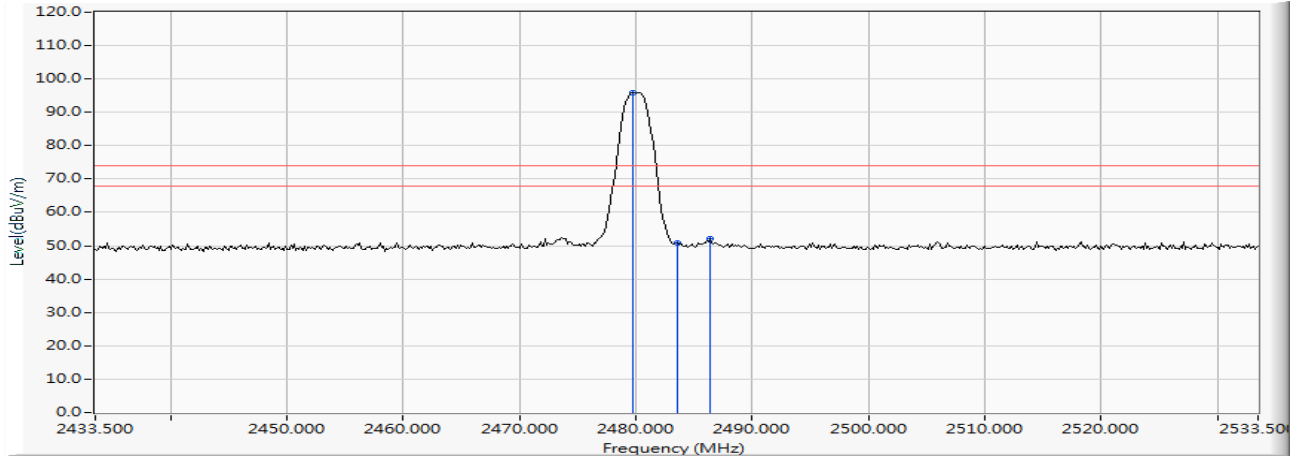
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	9.086	83.652	92.739	--	--	AVERAGE
2		2483.500	9.100	24.632	33.731	-20.269	54.000	AVERAGE
3		2486.254	9.109	25.486	34.595	-19.405	54.000	AVERAGE

Note:

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

Product : Gaming Mouse
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/09/09
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

Vertical



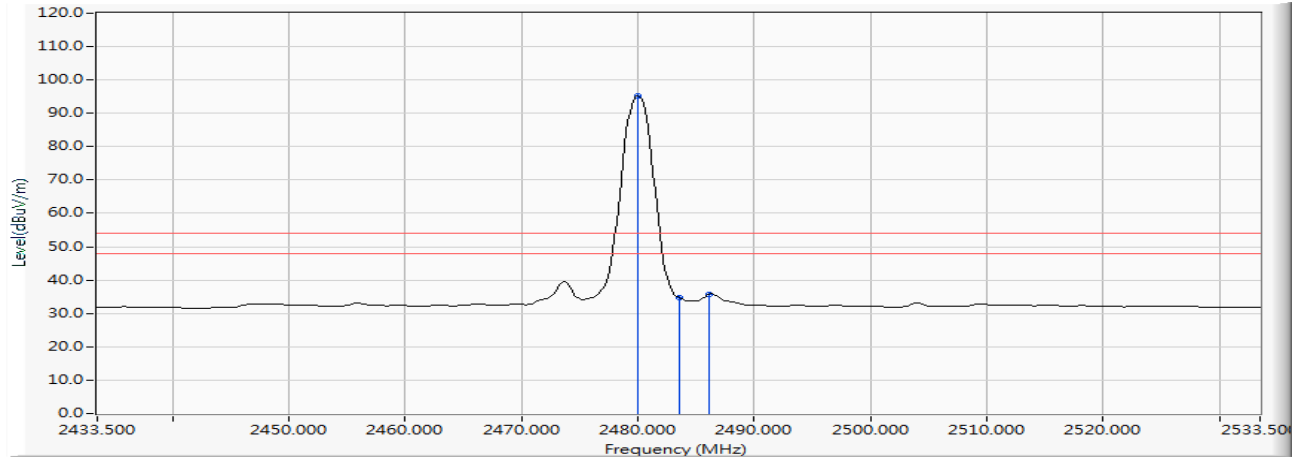
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2479.732	9.086	86.788	95.874	--	--	PEAK
2		2483.500	9.100	41.786	50.885	-23.115	74.000	PEAK
3		2486.399	9.110	42.888	51.998	-22.002	74.000	PEAK

Note:

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

Product : Gaming Mouse
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/09/09
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

Vertical



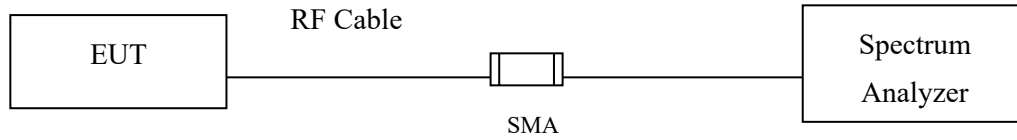
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	9.086	86.113	95.200	--	--	AVERAGE
2		2483.500	9.100	25.689	34.788	-19.212	54.000	AVERAGE
3		2486.109	9.109	26.741	35.850	-18.150	54.000	AVERAGE

Note:

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

7. 6dB Bandwidth

7.1. Test Setup



7.2. Limits

The minimum bandwidth shall be at least 500 kHz.

7.3. Test Procedure

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

Set RBW = 1-5% of the emission bandwidth, $VBW \geq 3 * RBW$

7.4. Uncertainty

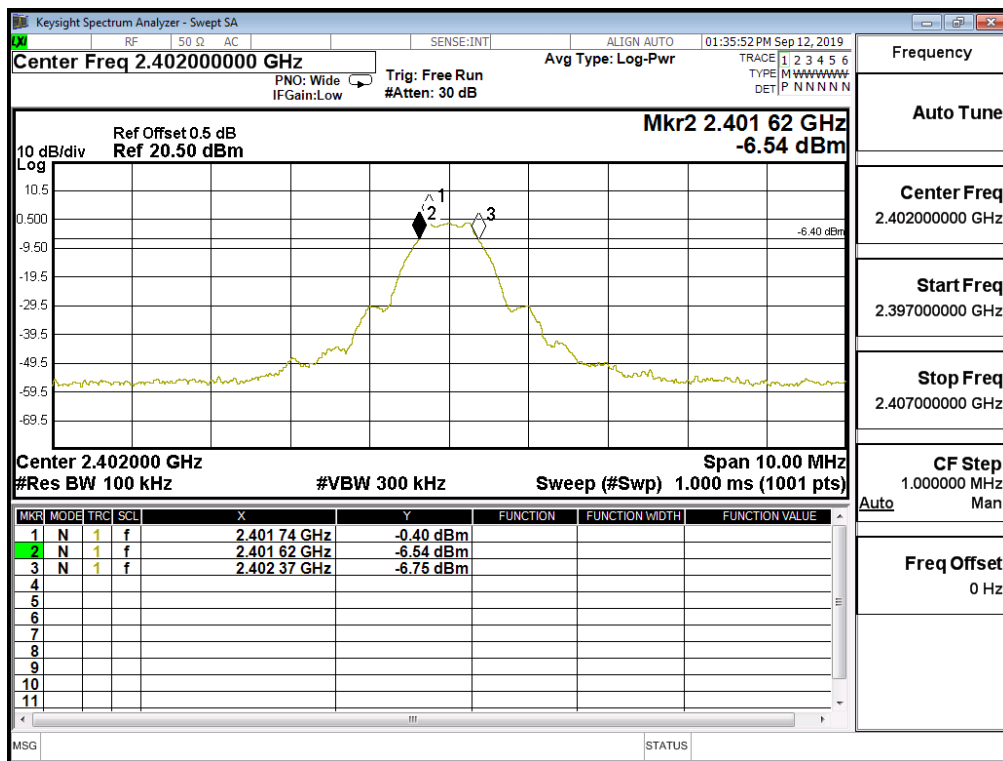
$\pm 283\text{Hz}$

7.5. Test Result of 6dB Bandwidth

Product : Gaming Mouse
 Test Item : 6dB Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	750.0	>500	Pass

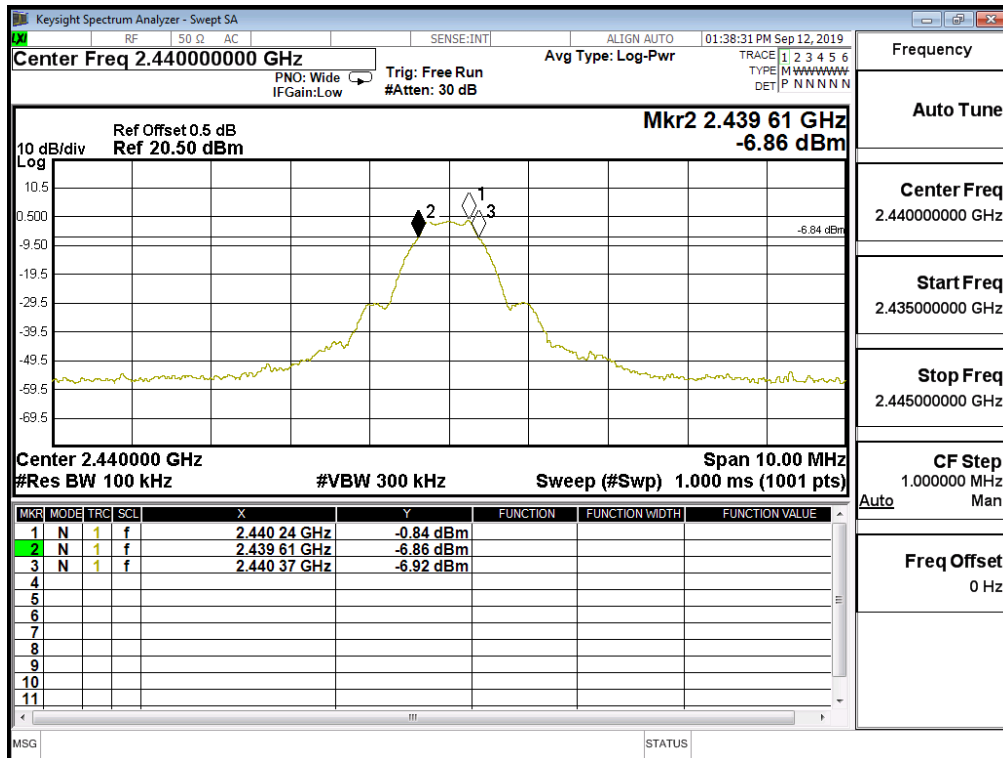
Figure Channel 00:



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

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
19	2440	760.0	>500	Pass

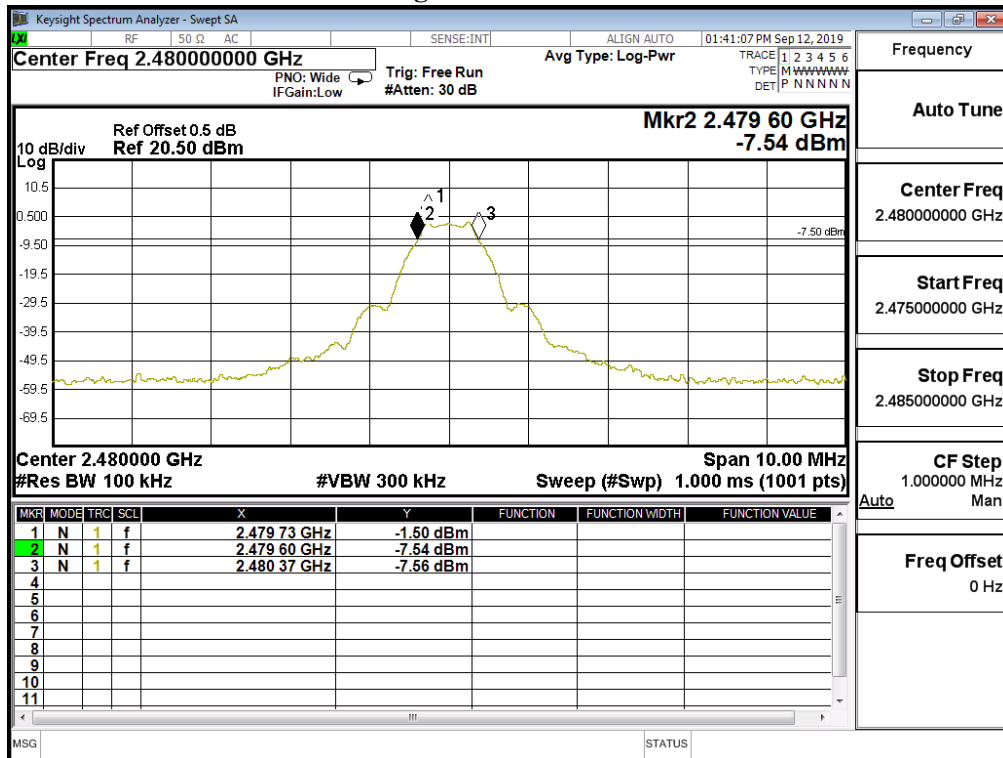
Figure Channel 19:



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

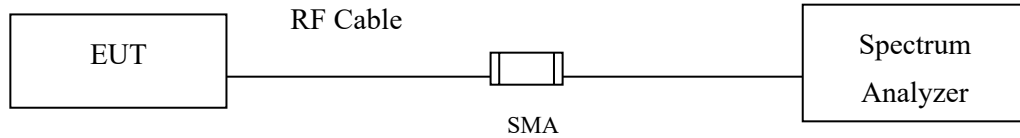
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
39	2480	770.0	>500	Pass

Figure Channel 39:



8. Power Density

8.1. Test Setup



8.2. Limits

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

8.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013, the maximum power spectral density using KDB 558074 section 10.2 PKPSD (peak PSD) method.

8.4. Uncertainty

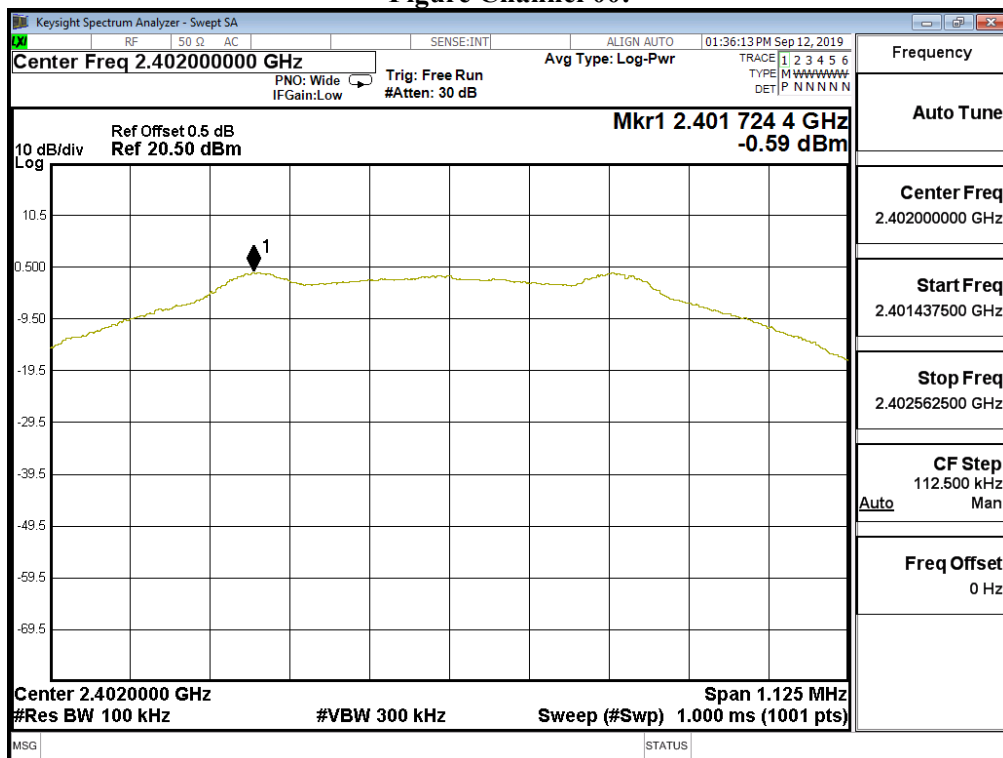
± 1.20 dB

8.5. Test Result of Power Density

Product : Gaming Mouse
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	-0.590	≤ 8dBm	Pass

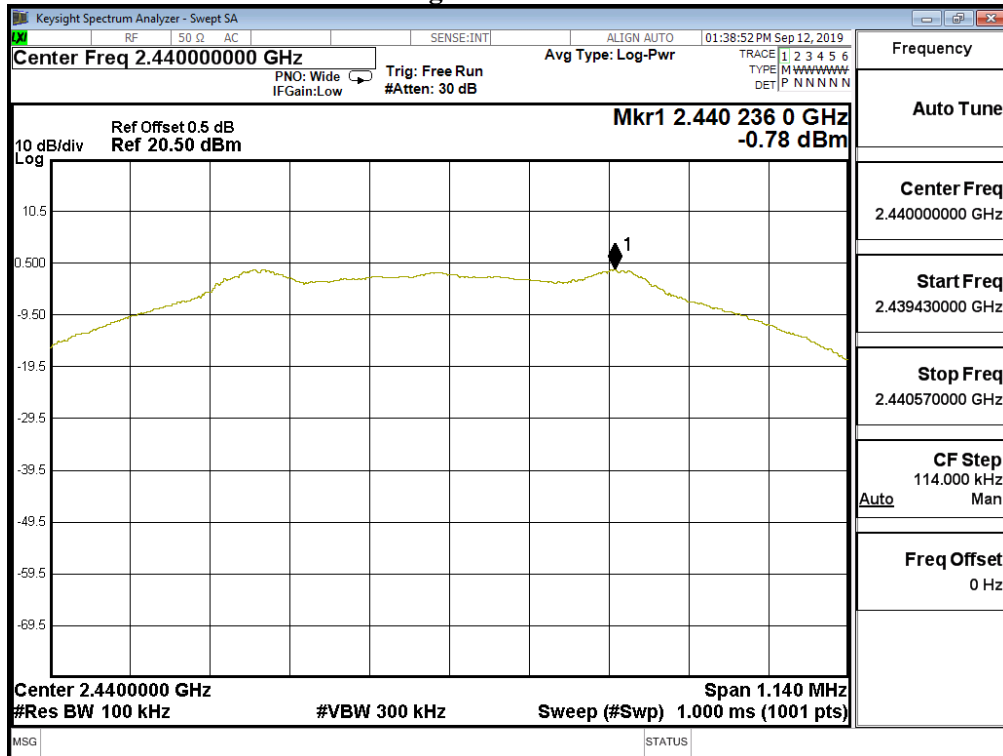
Figure Channel 00:



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

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
19	2440	-0.780	≤ 8dBm	Pass

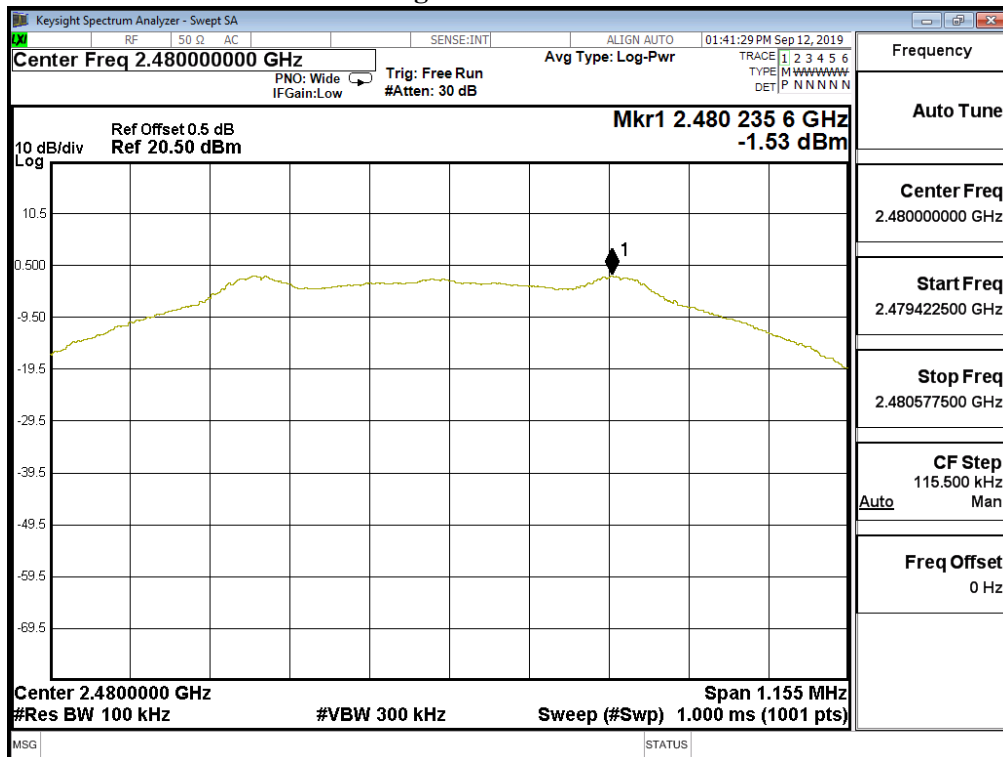
Figure Channel 19:



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

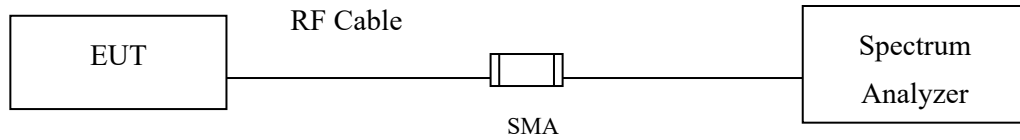
Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
39	2480	-1.530	≤ 8dBm	Pass

Figure Channel 39:



9. Duty Cycle

9.1. Test Setup



9.2. Test Procedure

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

9.3. Uncertainty

$\pm 2.31\text{msec}$

9.4. Test Result of Duty Cycle

Product : Gaming Mouse
 Test Item : Duty Cycle
 Test Mode : Mode 1: Transmit - BLE (GFSK)

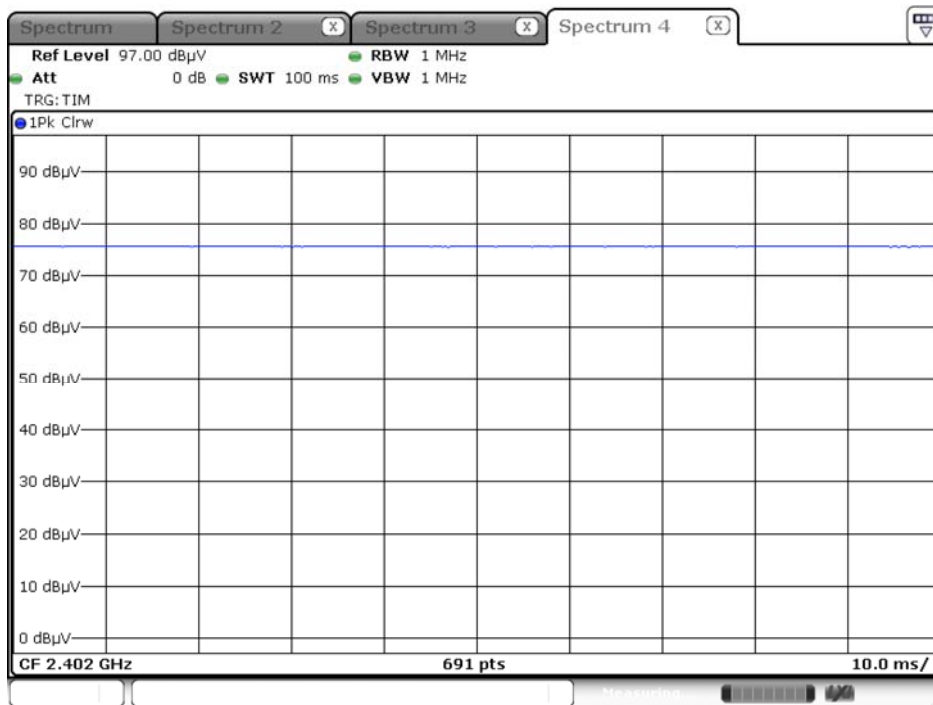
Duty Cycle Formula:

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

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

Results:

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



Date: 9.SEP.2019 19:24:06

10. EMI Reduction Method During Compliance Testing

No modification was made during testing.