FCC Test Report

Product Name	Wireless Gaming Keyboard Dongle
Model No.	ROGDONGLEH
FCC ID.	2AWUFDROGDONGLE

Applicant	DongGuan City Heatmoving Electronic Technology Co.,Ltd.
Address	XinLid industrial part Jinyuling road #28 SangYuan Village, Dongcheng Distric, DongGuan, China

Date of Receipt	Jun. 20, 2020
Issued Date	Aug. 20, 2020
Report No.	2060791R-E3032110109
Report Version	V1.0

Testing Laboratory
3023

Test Report

Issued Date: Aug. 20, 2020
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Applicant	DongGuan City Heatmoving Electronic Technology Co.,Ltd.
Address	XinLid industrial part Jinyuling road #28 SangYuan Village, Dongcheng Distric, DongGuan, China
Manufacturer	DongGuan City Heatmoving Electronic Technology Co.,Ltd.
Model No.	ROGDONGLEH
FCC ID.	2AWUFDROGDONGLE
EUT Rated Voltage	DC 5V (Power by USB)
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)

TABLE OF CONTENTS

Revision History

Report No.	Version	Description	Issued Date
2060791R-E3032110109	V1.0	Initial issue of report.	2020-08-20

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Wireless Gaming Keyboard Dongle
Trade Name	ASUS
Model No.	ROGDONGLEH
FCC ID.	2AWUFDROGDONGLE
Frequency Range	2403 – 2480MHz
Channel Number	78CH
Type of Modulation	GFSK
Antenna Type	Chip Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”
USB Type-C Cable	MFR: ASUS , M/N: M601 Shielded, 1.9m
Wireless dongle extender	MFR: ASUS , M/N: M601

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	Unictron	S2M1E120Z296030	Chip Antenna	1.2dBi for 2.4GHz

Note: The antenna of EUT is conforming 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 Wireless Gaming Keyboard Dongle with built-in 2.4GHz wireless transceiver, this report for 2.4GHz wireless.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of 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.
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

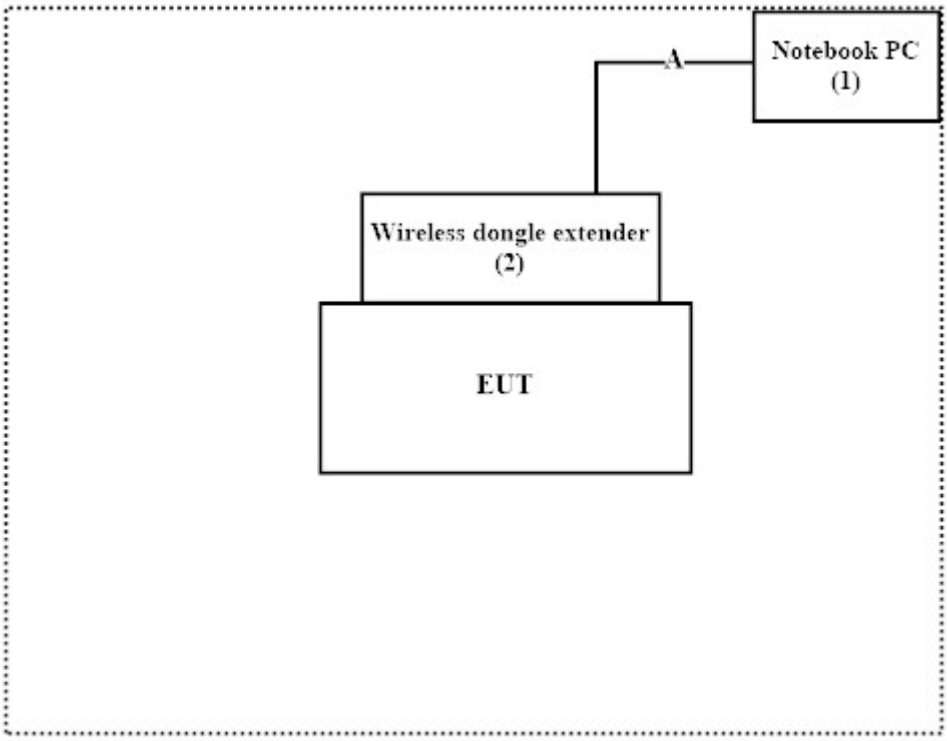
1.3. Tested System Details

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 5501	9V4JL13	N/A
2	Wireless dongle extender	ASUS	M601	N/A	N/A

Signal Cable Type		Signal cable Description
A	USB Type-C Cable	Shielded, 1.9m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

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

(2) Execute software “USB_hid_cmd v1.07” on the Notebook PC.

(3) Configure the test mode, the test channel.

(4) Press “OK” to start the continuous Transmit.

(5) Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Performed Item	Items	Required	Actual
Conducted Emission	Temperature (°C)	10~40 ℃	22 ℃
	Humidity (%RH)	10~90 %	55.3 %
Radiated Emission	Temperature (°C)	10~40 ℃	23.2 ℃
	Humidity (%RH)	10~90 %	57.4 %
Conductive	Temperature (°C)	10~40 ℃	22 ℃
	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

1.7. 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	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	DEKRA	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 V1.2

For Conducted measurements /ASR2

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Spectrum Analyzer	R&S	FSV30	103464	2020.02.11	2021.02.10
X	Power Meter	Anritsu	ML2496A	1548003	2019.12.17	2020.12.16
X	Power Sensor	Anritsu	MA2411B	1531024	2019.12.17	2020.12.16
X	Power Sensor	Anritsu	MA2411B	1531025	2019.12.17	2020.12.16

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	9168-678	2019.08.12	2020.08.11
X	Horn Antenna	ETS-Lindgren	3117	00203800	2019.12.12	2020.12.11
X	Horn Antenna	Com-Power	AH-840	101088	2019.08.29	2020.08.28
X	Pre-Amplifier	EMCI	EMC001330	980301	2020.06.04	2021.06.03
X	Pre-Amplifier	EMCI	EMC051835SE	980311	2020.06.23	2021.06.22
X	Pre-Amplifier	EMCI	EMC05820SE	980310	2020.06.24	2021.06.23
X	Pre-Amplifier	EMCI	EMC184045SE	980314	2020.06.10	2021.06.09
X	Filter	MICRO TRONICS	BRM50702	G251	2019.09.03	2020.09.02
	Filter	MICRO TRONICS	BRM50716	G188	2019.09.03	2020.09.02
X	EMI Test Receiver	R&S	ESR7	101602	2019.12.16	2020.12.15
X	Spectrum Analyzer	R&S	FSV40	101148	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 V1.2

1.8. Uncertainty

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

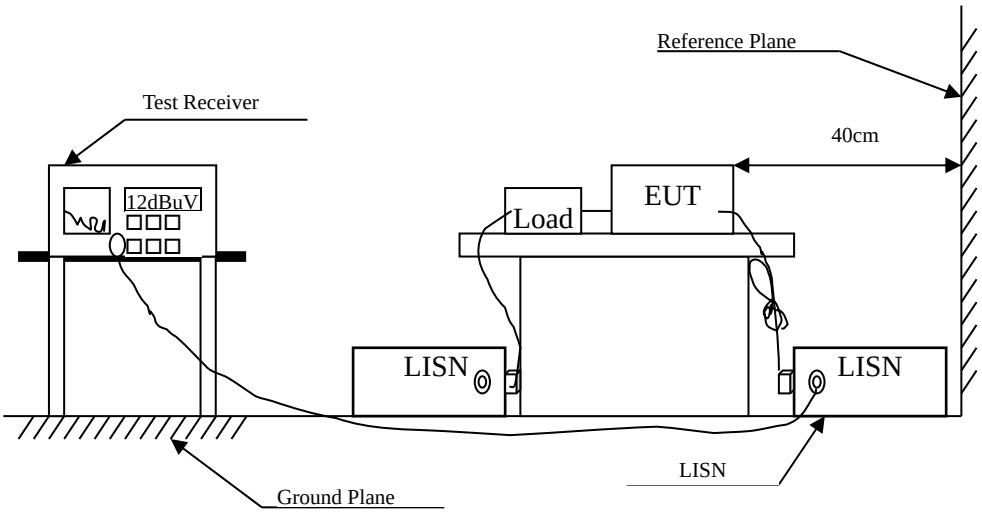
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

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	
Peak Power Output	Power Meter ±0.91 dB	Spectrum Analyzer ±2.53 dB
Radiated Emission	Under 1GHz ±4.06 dB	Above 1GHz ±3.73 dB
RF Antenna Conducted Test	±2.53 dB	
Band Edge	Under 1GHz ±4.06 dB	Above 1GHz ±3.73 dB
6dB Bandwidth	±682.83 Hz	
Power Density	±2.53 dB	
Duty Cycle	±2.31 ms	

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) 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.)

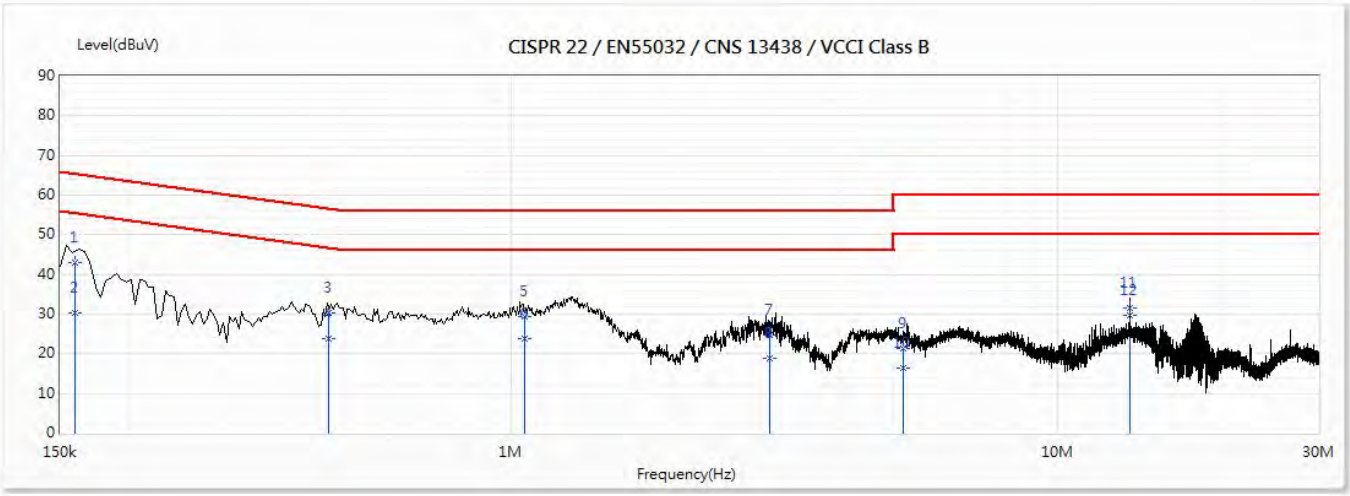
Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were invested 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. Test Result of Conducted Emission

Product : Wireless Gaming Keyboard Dongle
Test Item : Conducted Emission Test
Power Line : L 1
Test Mode : Mode 1: Transmit (2440MHz)
Test Date : 2020/08/07

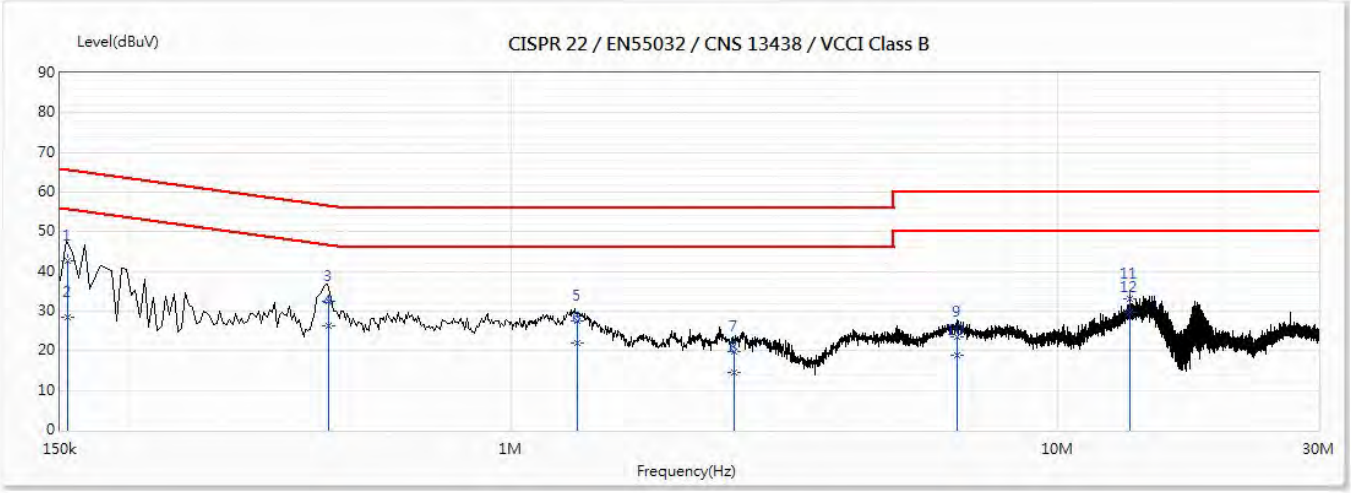


No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	0.16	43.07	65.49	-22.42	33.41	9.66	QP
2	0.16	30.32	55.49	-25.16	20.66	9.66	AV
3	0.465	30.18	56.61	-26.43	20.52	9.66	QP
4	0.465	23.90	46.61	-22.71	14.24	9.66	AV
5	1.062	29.47	56.00	-26.53	19.78	9.69	QP
6	1.062	23.77	46.00	-22.23	14.08	9.69	AV
7	2.972	24.88	56.00	-31.12	15.13	9.74	QP
8	2.972	18.98	46.00	-27.02	9.24	9.74	AV
9	5.206	21.43	60.00	-38.57	11.62	9.80	QP
10	5.206	16.52	50.00	-33.48	6.72	9.80	AV
11	13.561	31.56	60.00	-28.44	21.63	9.93	QP
*12	13.561	29.54	50.00	-20.46	19.61	9.93	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	:	Wireless Gaming Keyboard Dongle
Test Item	:	Conducted Emission Test
Power Line	:	N
Test Mode	:	Mode 1: Transmit (2440MHz)
Test Date	:	2020/08/07



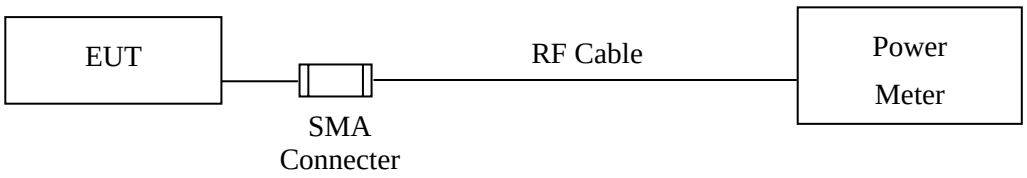
No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	0.154	42.79	65.76	-22.97	33.12	9.67	QP
2	0.154	28.31	55.76	-27.45	18.64	9.67	AV
3	0.464	32.55	56.61	-24.07	22.88	9.67	QP
*4	0.464	26.44	46.61	-20.17	16.77	9.67	AV
5	1.323	27.53	56.00	-28.47	17.82	9.70	QP
6	1.323	22.09	46.00	-23.91	12.39	9.70	AV
7	2.567	19.66	56.00	-36.34	9.91	9.74	QP
8	2.567	14.69	46.00	-31.31	4.95	9.74	AV
9	6.536	23.48	60.00	-36.52	13.64	9.85	QP
10	6.536	18.75	50.00	-31.25	8.91	9.85	AV
11	13.561	32.96	60.00	-27.04	22.99	9.97	QP
12	13.561	29.71	50.00	-20.29	19.74	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

3. Peak Power Output

3.1. Test Setup



3.2. Limit

The maximum peak power shall be less 1Watt.

3.3. Test Procedure

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

3.4. Test Result of Peak Power Output

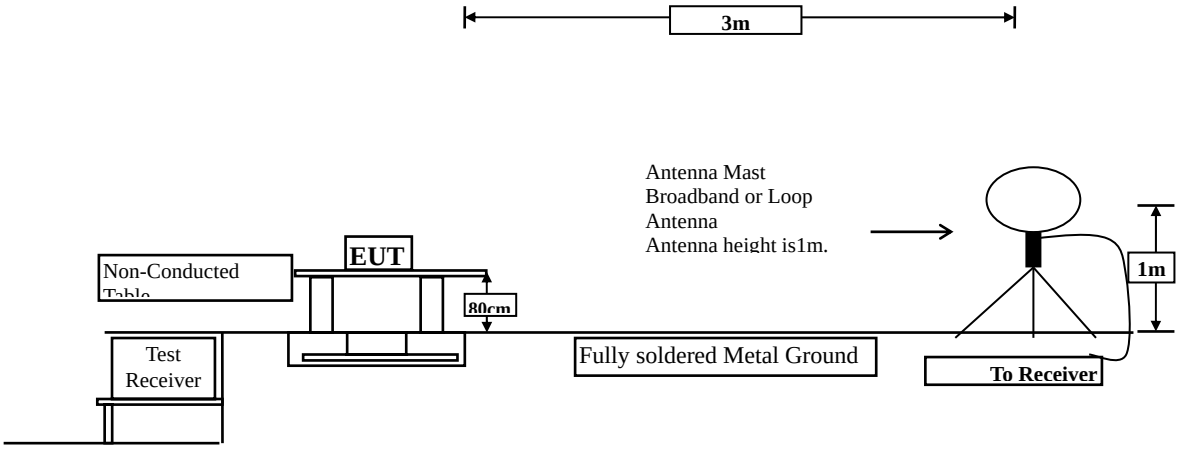
Product : Wireless Gaming Keyboard Dongle
Test Item : Peak Power Output
Test Mode : Mode 1: Transmit
Test Date : 2020/08/15

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 01	2403.00	-1.75	1 Watt= 30 dBm	Pass
Channel 38	2440.00	-2.87	1 Watt= 30 dBm	Pass
Channel 78	2480.00	-8.29	1 Watt= 30 dBm	Pass

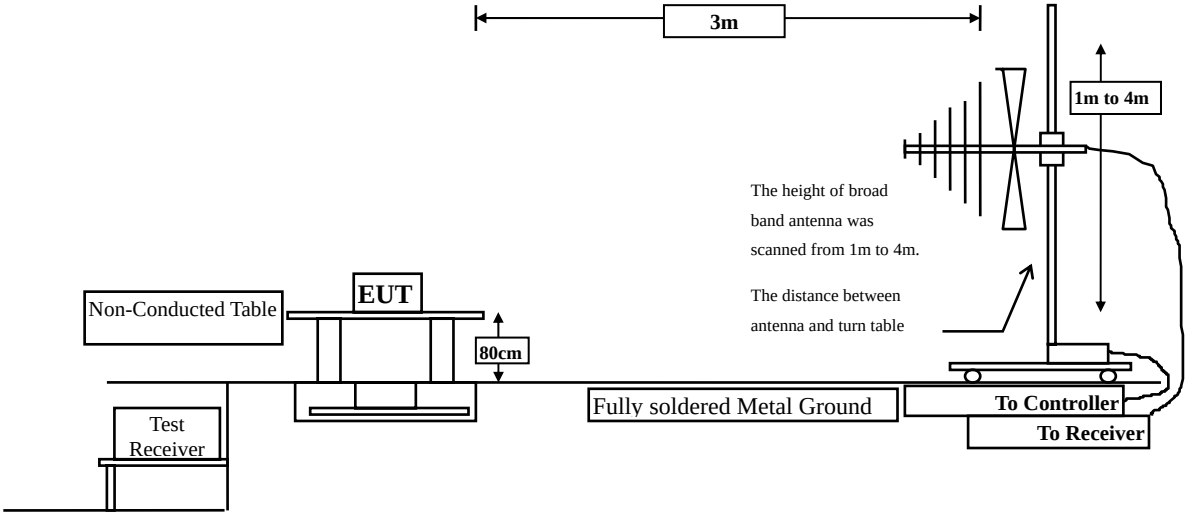
4. Radiated Emission

4.1. Test Setup

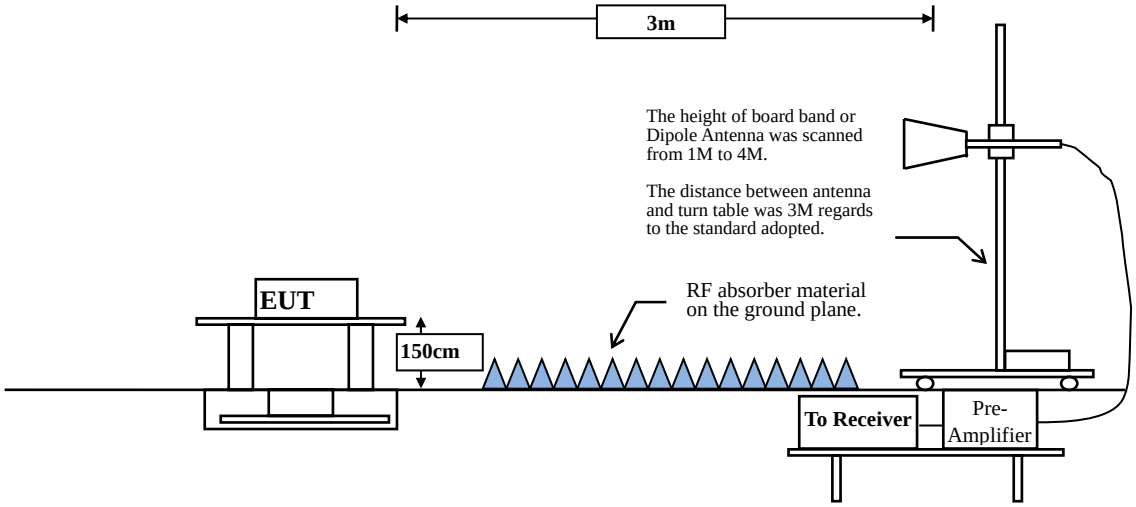
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission 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 (dBuV) = 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 C63.10:2013 Section 11.12.1 for compliance to FCC 47CFR 15.247 requirements.

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

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

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

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

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

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

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

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

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

RBW and VBW Parameter setting:

According to C63.10 Section 11.12.2.4 Peak measurement procedure.

RBW = as specified in Table 1.

VBW ≥ 3 x RBW.

Table 1 —RBW as a function of frequency

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

According to C63.10 Section 11.12.2.5 Average measurement procedure.

RBW = 1MHz.

VBW = 10Hz, when duty cycle ≥ 98 %

VBW ≥ 1/T, when duty cycle < 98 %

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

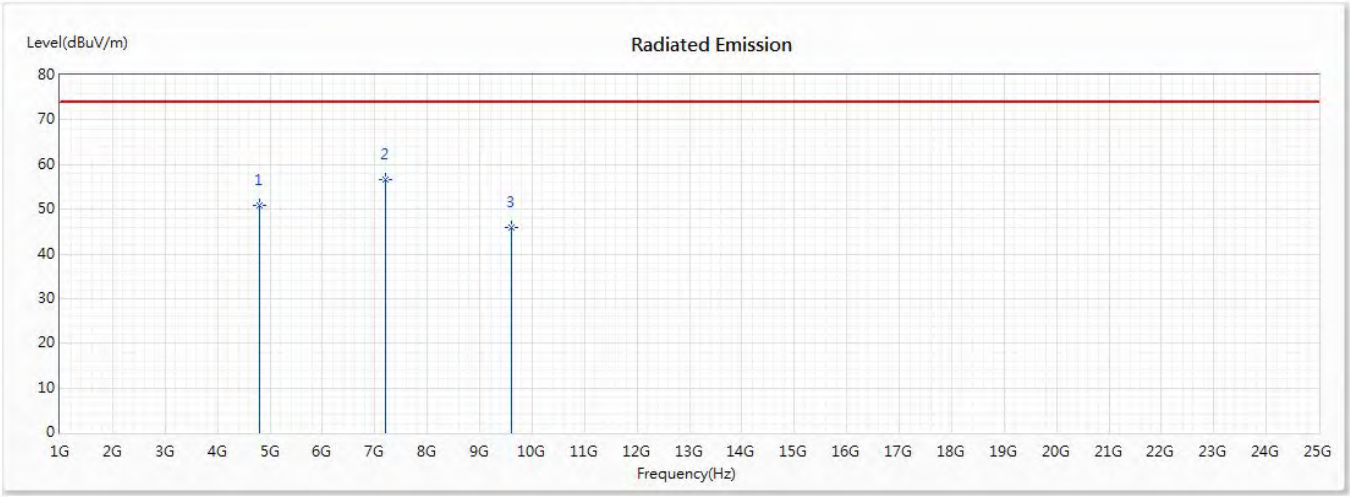
2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
2.4GHz wireless	100.00	--	--	10

Note: Duty Cycle Refer to Section 9

4.4. Test Result of Radiated Emission

Product : Wireless Gaming Keyboard Dongle
Test Item : Harmonic Radiated Emission
Test Mode : Mode 1: Transmit(2403MHz)
Test Date : 2020/08/15

Horizontal



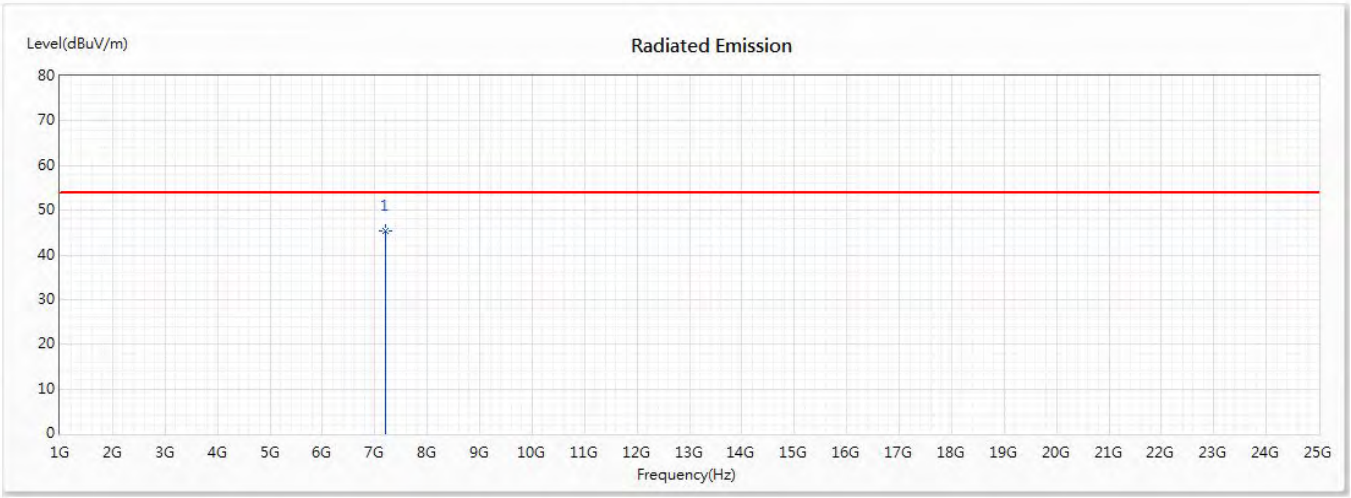
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	4806	50.75	74.00	-23.25	51.81	-1.06	PK
* 2	7209	56.57	74.00	-17.43	54.37	2.20	PK
3	9612	45.81	74.00	-28.19	41.66	4.15	PK

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	:	Wireless Gaming Keyboard Dongle
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 1: Transmit(2403MHz)
Test Date	:	2020/08/15

Horizontal



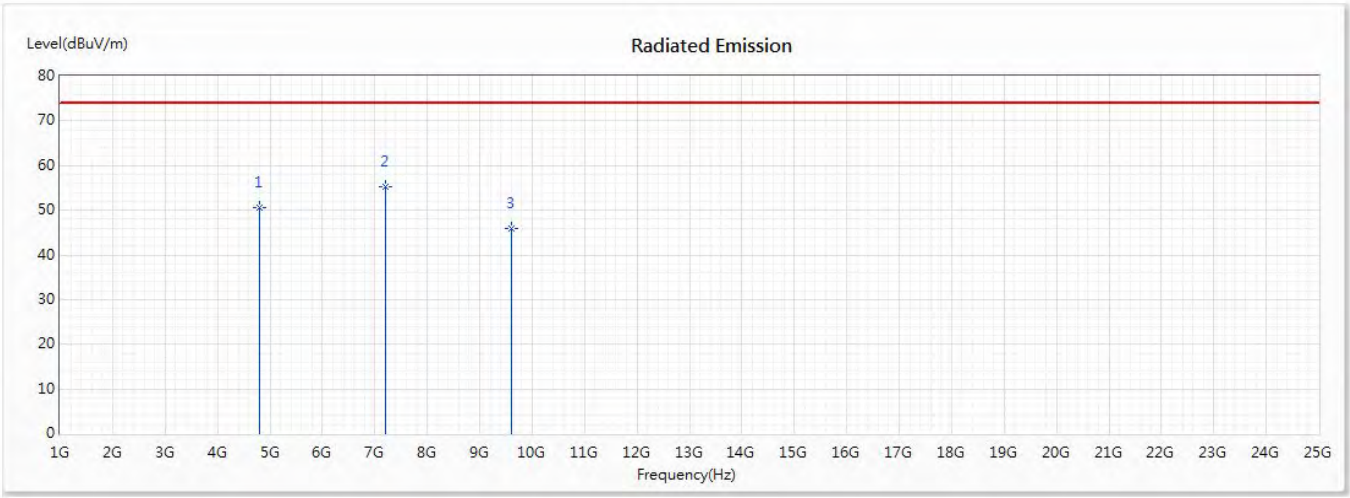
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	7209	45.23	54.00	-8.77	43.03	2.20	AV

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	:	Wireless Gaming Keyboard Dongle
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 1: Transmit(2403MHz)
Test Date	:	2020/08/15

Vertical



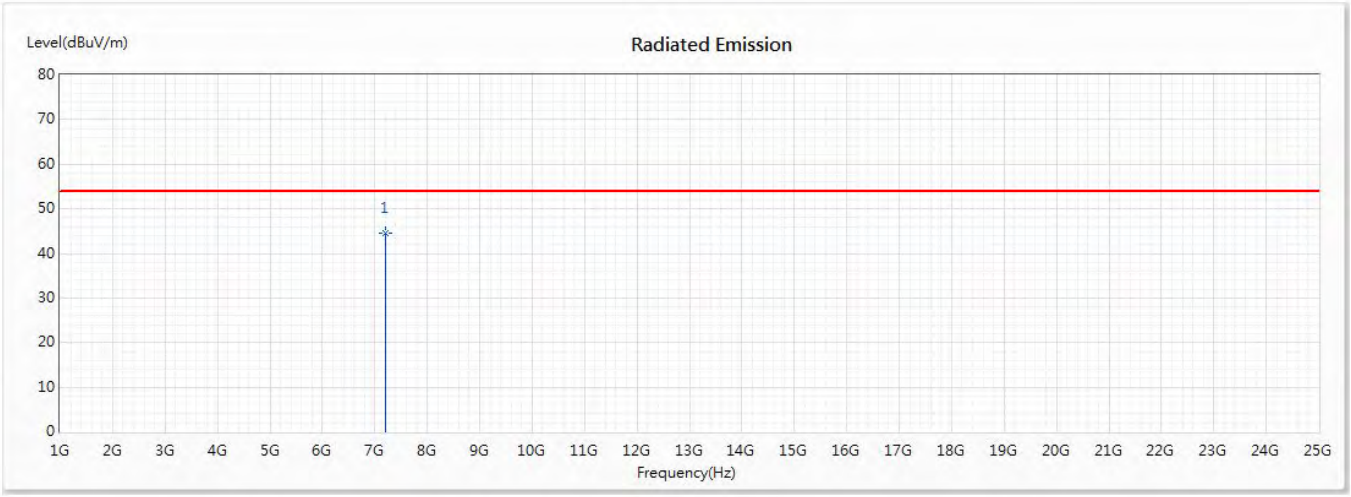
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	4806	50.65	74.00	-23.35	51.71	-1.06	PK
* 2	7209	55.22	74.00	-18.78	53.02	2.20	PK
3	9612	46.02	74.00	-27.98	41.87	4.15	PK

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	:	Wireless Gaming Keyboard Dongle
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 1: Transmit(2403MHz)
Test Date	:	2020/08/15

Vertical



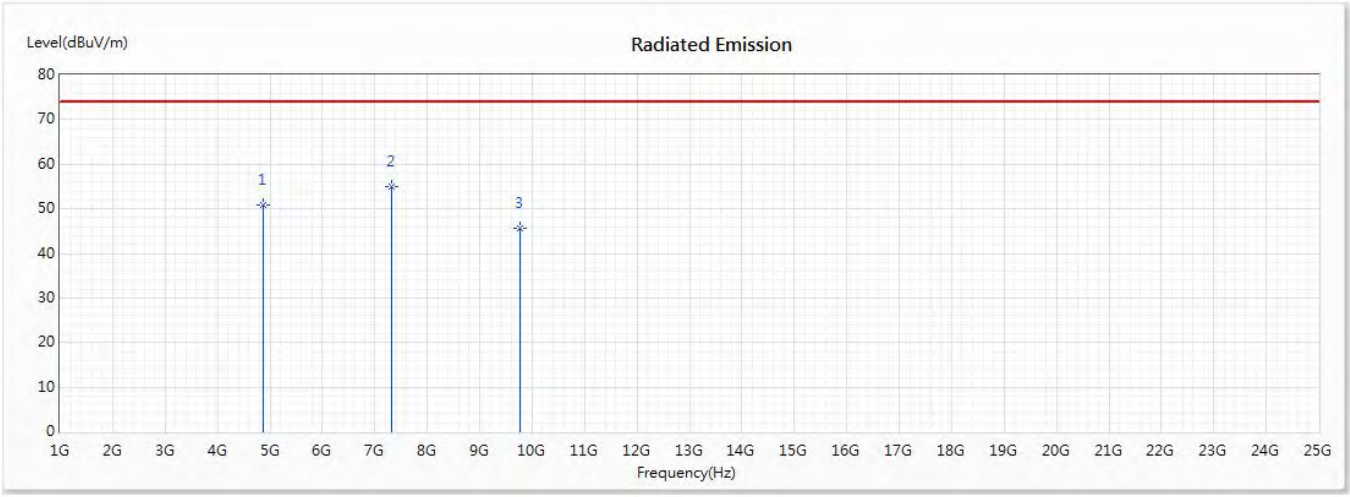
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	7209	44.62	54.00	-9.38	42.42	2.20	AV

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	:	Wireless Gaming Keyboard Dongle
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 1: Transmit (2440MHz)
Test Date	:	2020/08/15

Horizontal



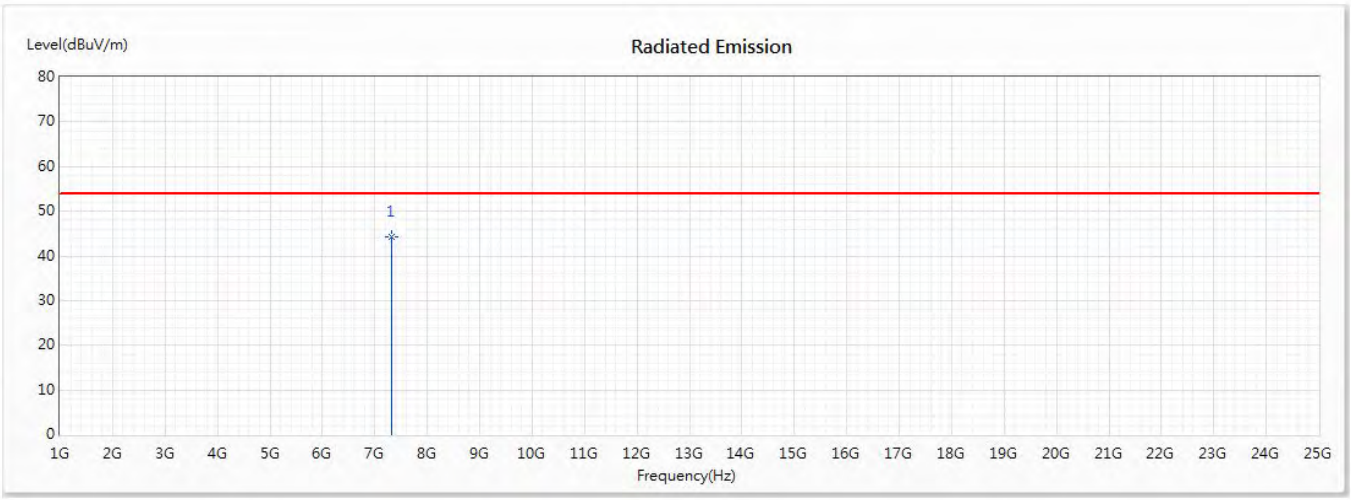
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	4880	50.88	74.00	-23.12	51.79	-0.91	PK
* 2	7320	54.93	74.00	-19.07	52.76	2.17	PK
3	9760	45.52	74.00	-28.48	41.10	4.42	PK

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	:	Wireless Gaming Keyboard Dongle
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 1: Transmit (2440MHz)
Test Date	:	2020/08/15

Horizontal



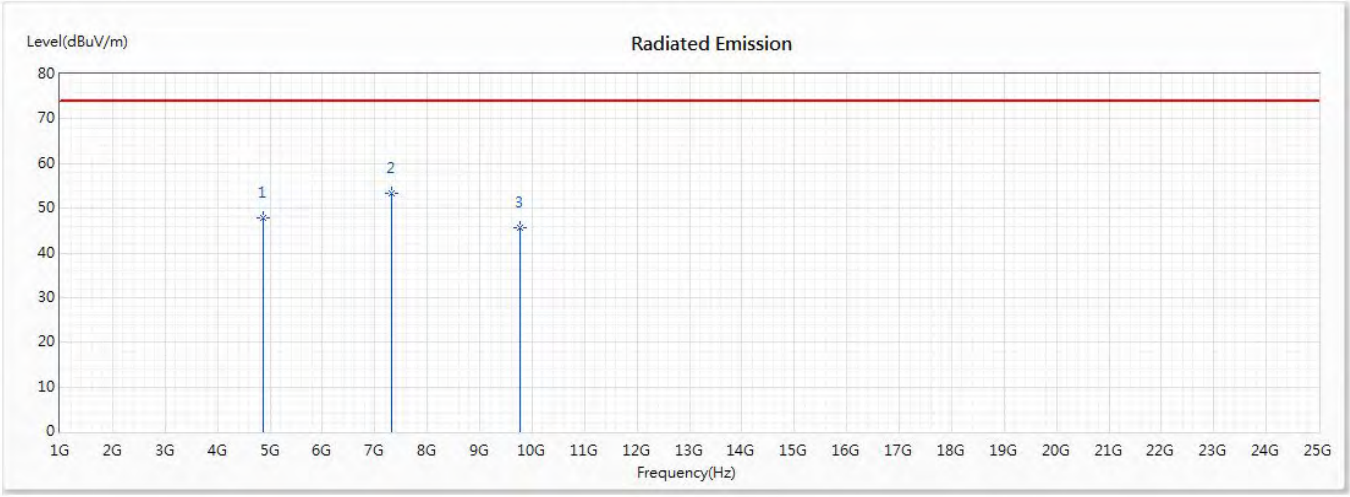
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	7320	44.36	54.00	-9.64	42.19	2.17	AV

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	:	Wireless Gaming Keyboard Dongle
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 1: Transmit (2440MHz)
Test Date	:	2020/08/15

Vertical



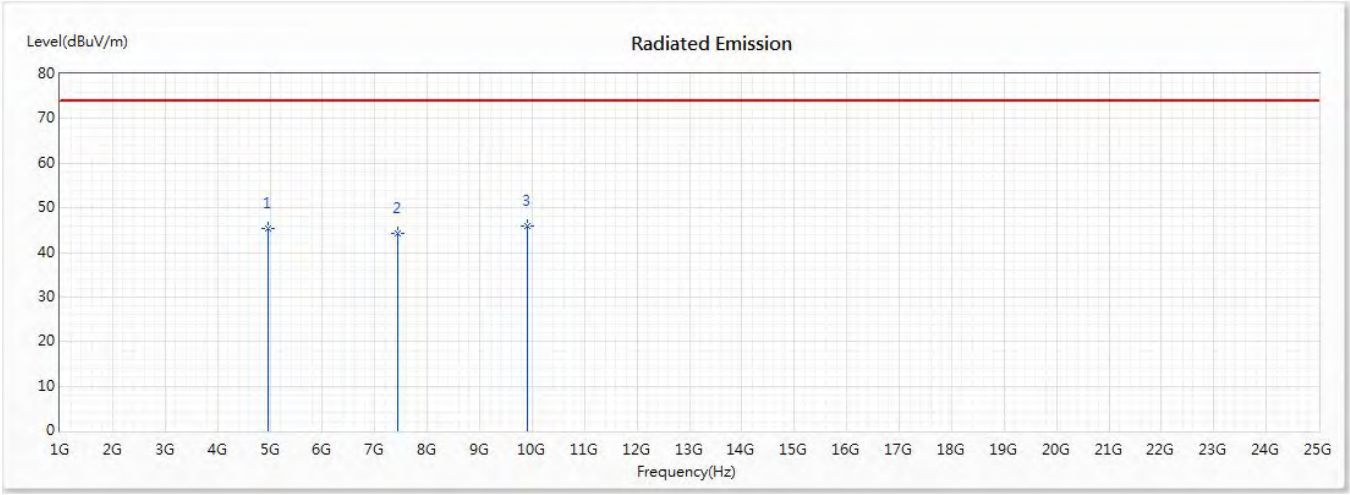
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	4880	47.95	74.00	-26.05	48.86	-0.91	PK
* 2	7320	53.32	74.00	-20.68	51.15	2.17	PK
3	9760	45.69	74.00	-28.31	41.27	4.42	PK

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	:	Wireless Gaming Keyboard Dongle
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 1: Transmit (2480MHz)
Test Date	:	2020/08/15

Horizontal



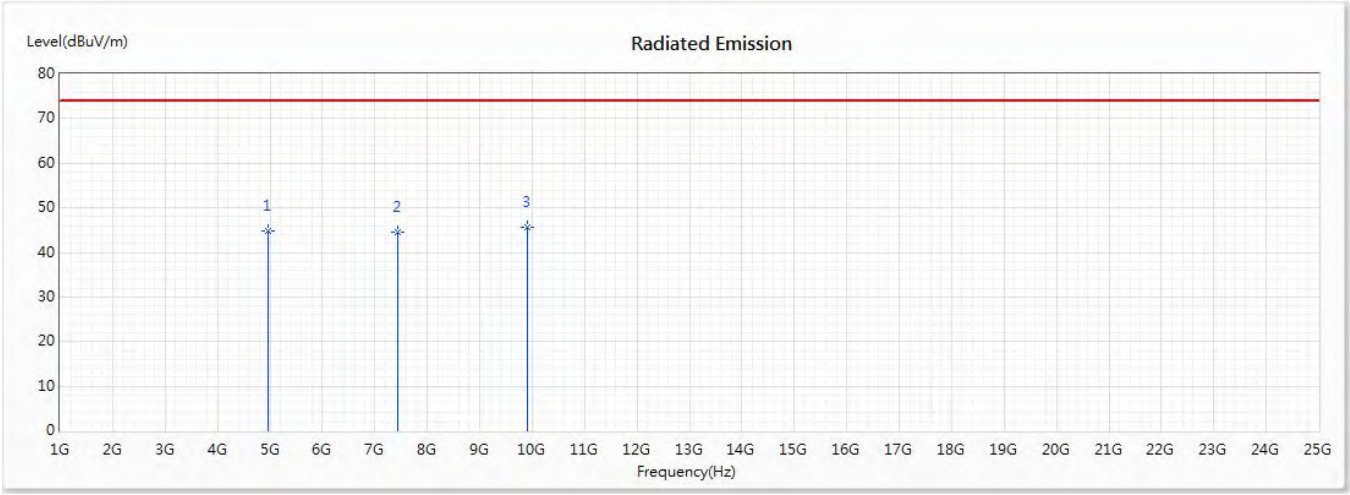
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	4960	45.48	74.00	-28.52	46.28	-0.80	PK
2	7440	44.39	74.00	-29.61	42.26	2.13	PK
* 3	9920	45.81	74.00	-28.19	41.12	4.69	PK

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	:	Wireless Gaming Keyboard Dongle
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 1: Transmit (2480MHz)
Test Date	:	2020/08/15

Vertical



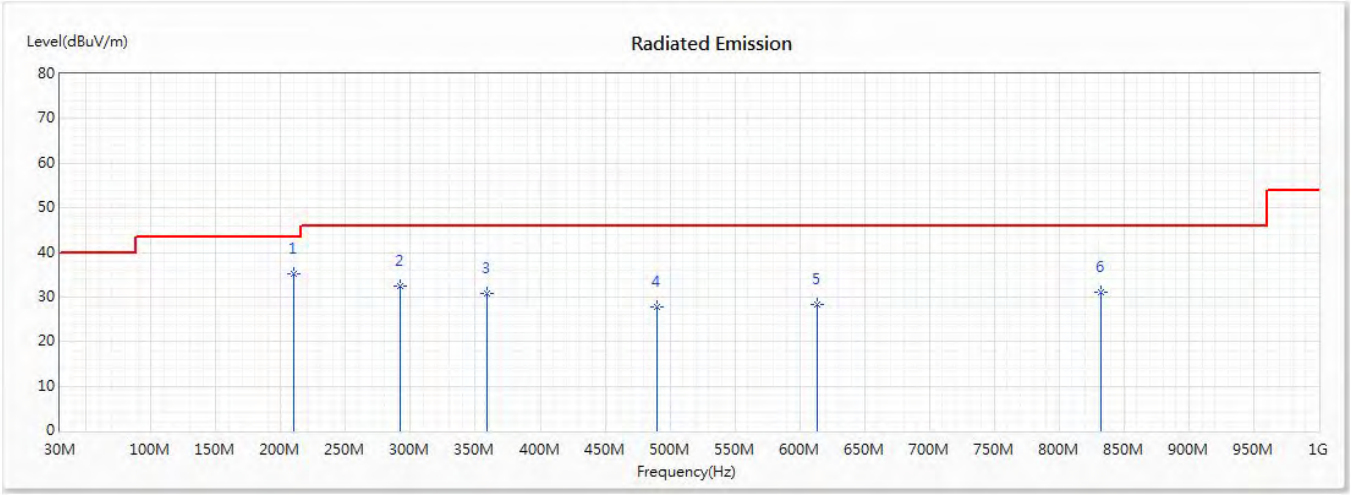
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	4960	44.86	74.00	-29.14	45.66	-0.80	PK
2	7440	44.65	74.00	-29.35	42.52	2.13	PK
* 3	9920	45.74	74.00	-28.26	41.05	4.69	PK

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	:	Wireless Gaming Keyboard Dongle
Test Item	:	General Radiated Emission
Test Mode	:	Mode 1: Transmit (2440MHz)
Test Date	:	2020/08/07

Horizontal



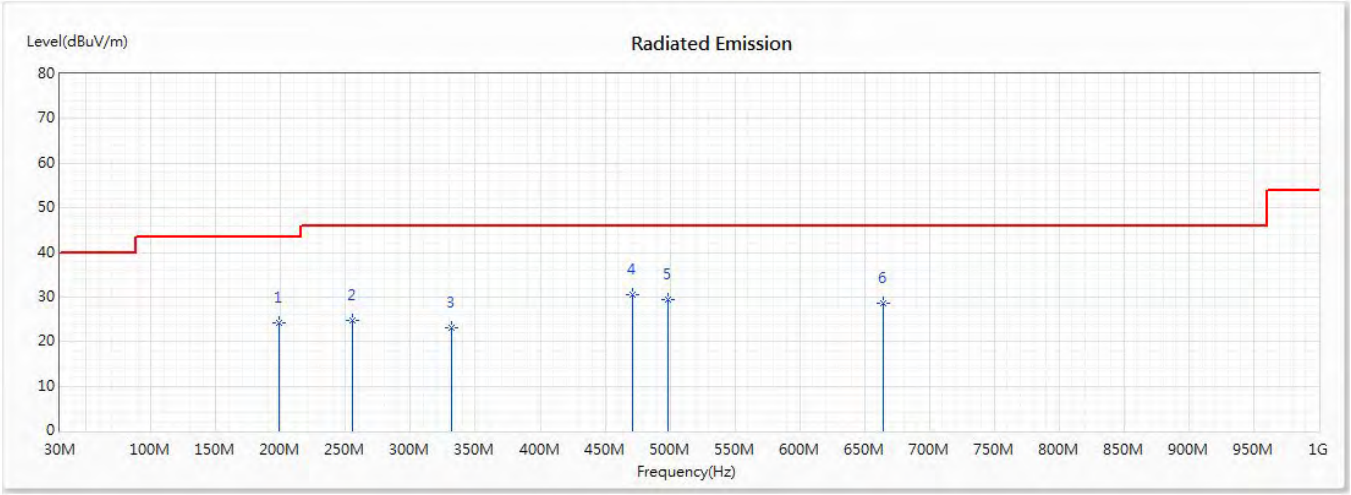
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
* 1	210.42	35.09	43.50	-8.41	48.41	-13.32	PK
2	291.9	32.40	46.00	-13.60	42.52	-10.12	PK
3	358.83	30.71	46.00	-15.29	39.28	-8.57	PK
4	489.78	27.66	46.00	-18.34	33.27	-5.61	PK
5	613.94	28.30	46.00	-17.70	31.48	-3.18	PK
6	832.19	31.01	46.00	-14.99	31.35	-0.34	PK

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	:	Wireless Gaming Keyboard Dongle
Test Item	:	General Radiated Emission
Test Mode	:	Mode 1: Transmit (2440MHz)
Test Date	:	2020/08/07

Vertical



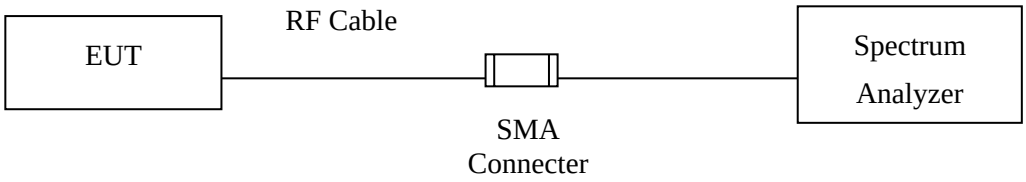
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	198.78	24.30	43.50	-19.20	37.87	-13.57	PK
2	255.04	24.66	46.00	-21.34	36.14	-11.48	PK
3	331.67	23.05	46.00	-22.95	32.16	-9.11	PK
* 4	471.35	30.43	46.00	-15.57	36.38	-5.95	PK
5	498.51	29.49	46.00	-16.51	34.89	-5.40	PK
6	664.38	28.69	46.00	-17.31	31.42	-2.73	PK

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 C63.10:2013 Section 11.11 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 100 kHz, Set VBW> RBW, scan up through 10th harmonic.

5.4. Test Result of RF Antenna Conducted Test

Product : Wireless Gaming Keyboard Dongle
Test Item : RF Antenna Conducted Test
Test Mode : Mode 1: Transmit
Test Date : 2020/08/12

Figure Channel 01:

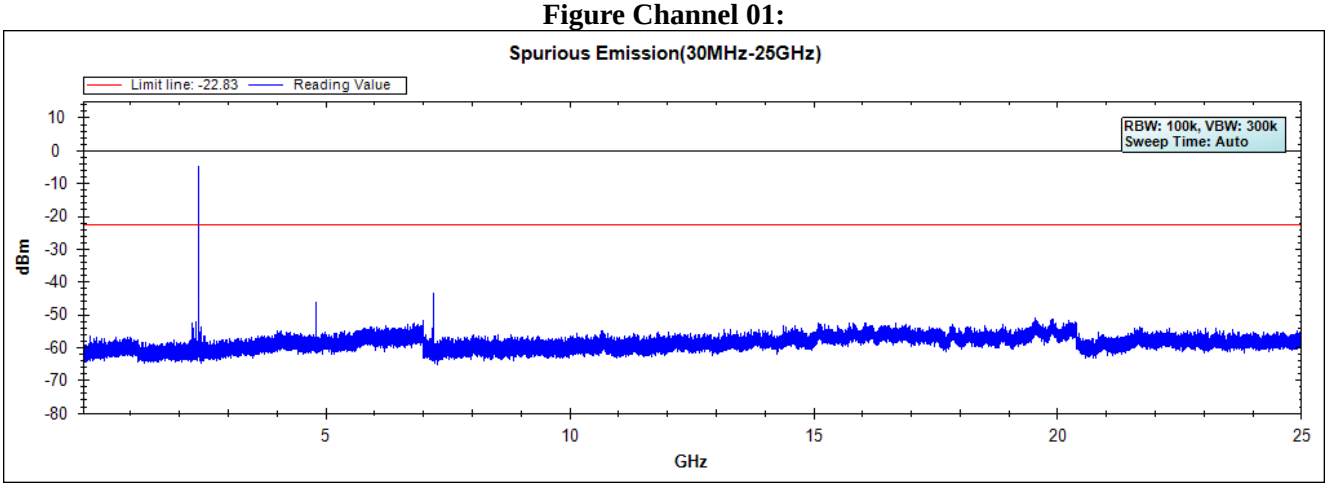


Figure Channel 38:

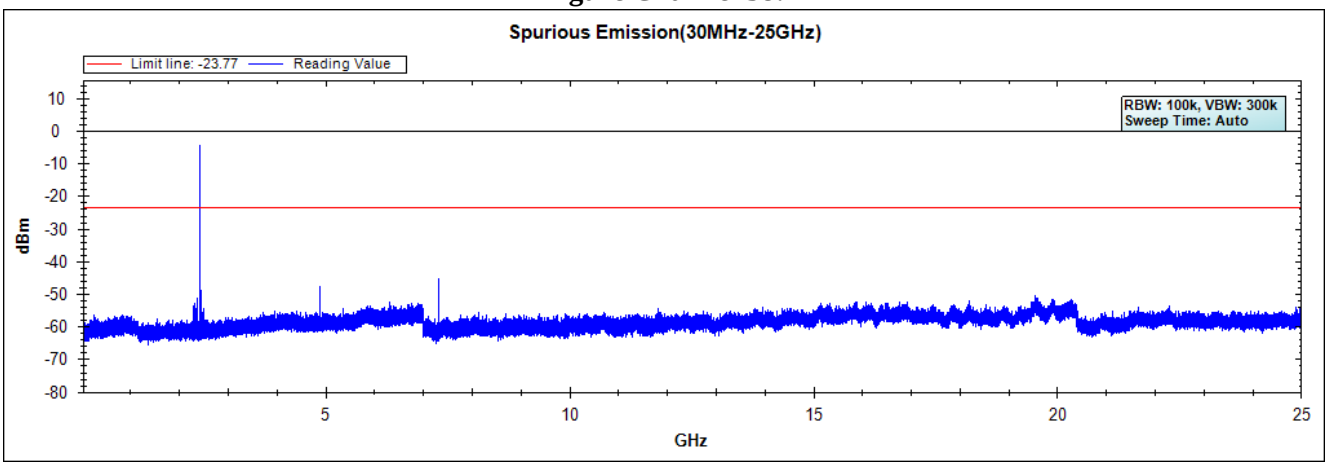
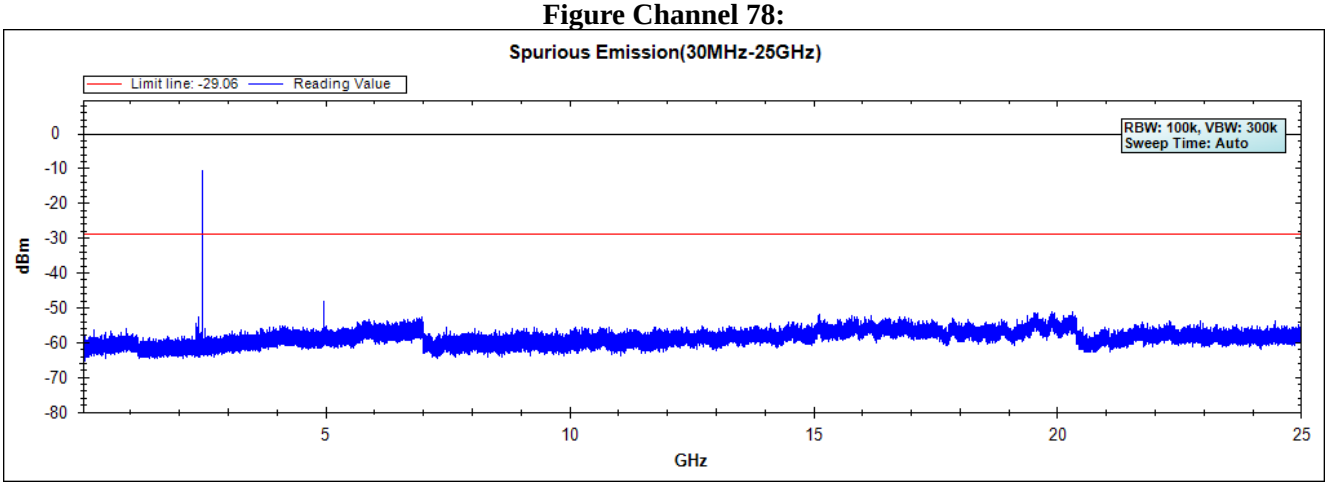


Figure Channel 78:

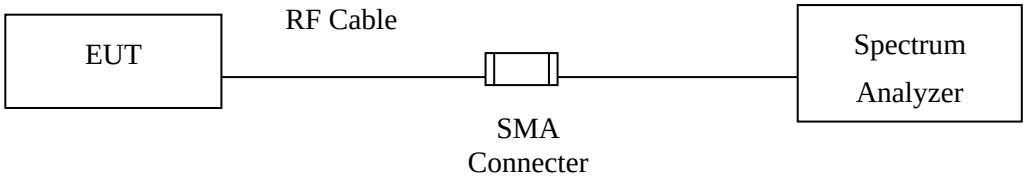


Note: The above test pattern is synthesized by multiple of the frequency range.

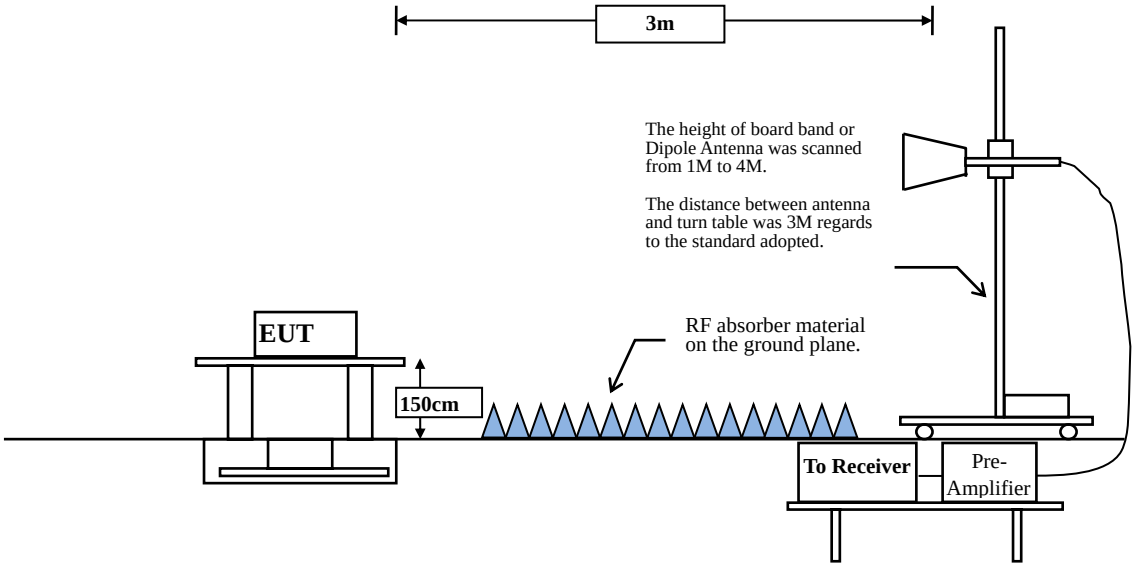
6. Band Edge

6.1. Test Setup

RF Conducted Measurement



RF Radiated Measurement:



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 C63.10:2013 Section 11.12.1 for compliance to FCC 47CFR 15.247 requirements.

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

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

RBW and VBW Parameter setting:

According to C63.10 Section 11.12.2.4 Peak measurement procedure.

RBW = as specified in Table 1.

VBW ≥ 3 x RBW.

Table 1 —RBW as a function of frequency

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

According to C63.10 Section 11.12.2.5 Average measurement procedure.

RBW = 1MHz.

VBW = 10Hz, when duty cycle ≥ 98 %

VBW ≥ 1/T, when duty cycle < 98 %

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

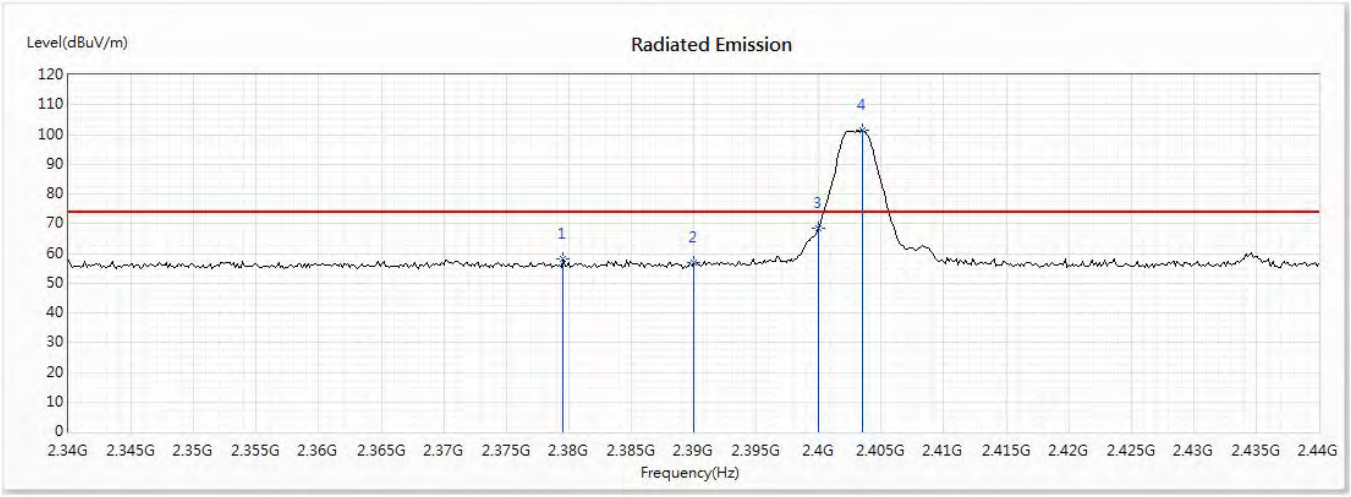
2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
2.4GHz wireless	100.00	--	--	10

Note: Duty Cycle Refer to Section 9

6.4. Test Result of Band Edge

Product : Wireless Gaming Keyboard Dongle
Test Item : Band Edge
Test Mode : Mode 1: Transmit (2403MHz)
Test Date : 2020/08/15

Horizontal



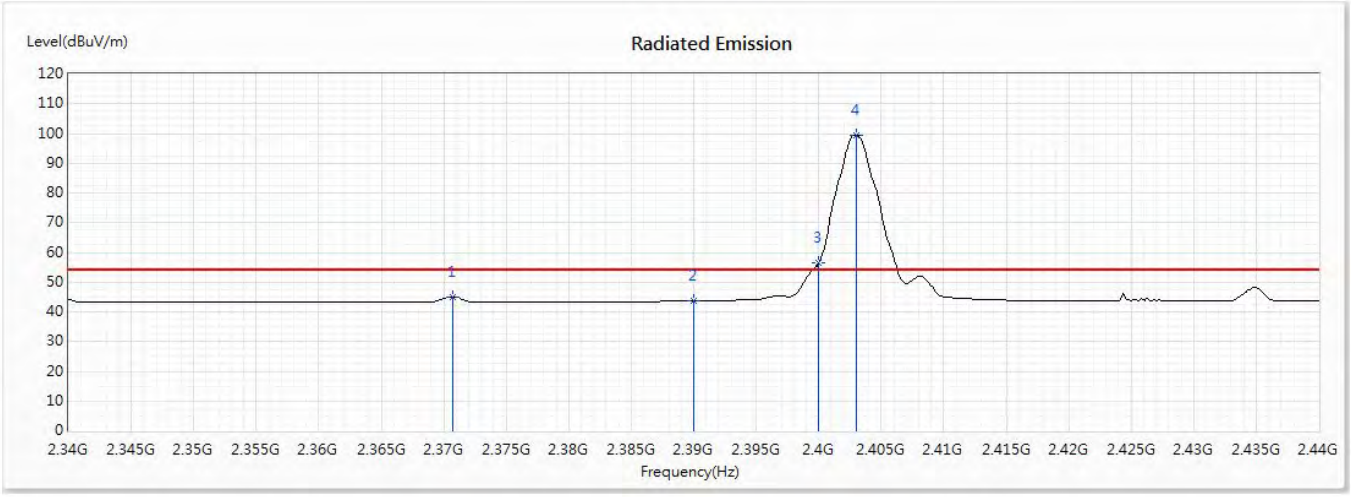
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	2379.565	58.10	74.00	-15.90	44.66	13.44	PK
2	2390	56.89	74.00	-17.11	43.43	13.46	PK
3	2400	68.52	--	--	55.03	13.49	PK
4	2403.478	101.26	--	--	87.75	13.51	PK

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	:	Wireless Gaming Keyboard Dongle
Test Item	:	Band Edge
Test Mode	:	Mode 1: Transmit (2403MHz)
Test Date	:	2020/08/15

Horizontal



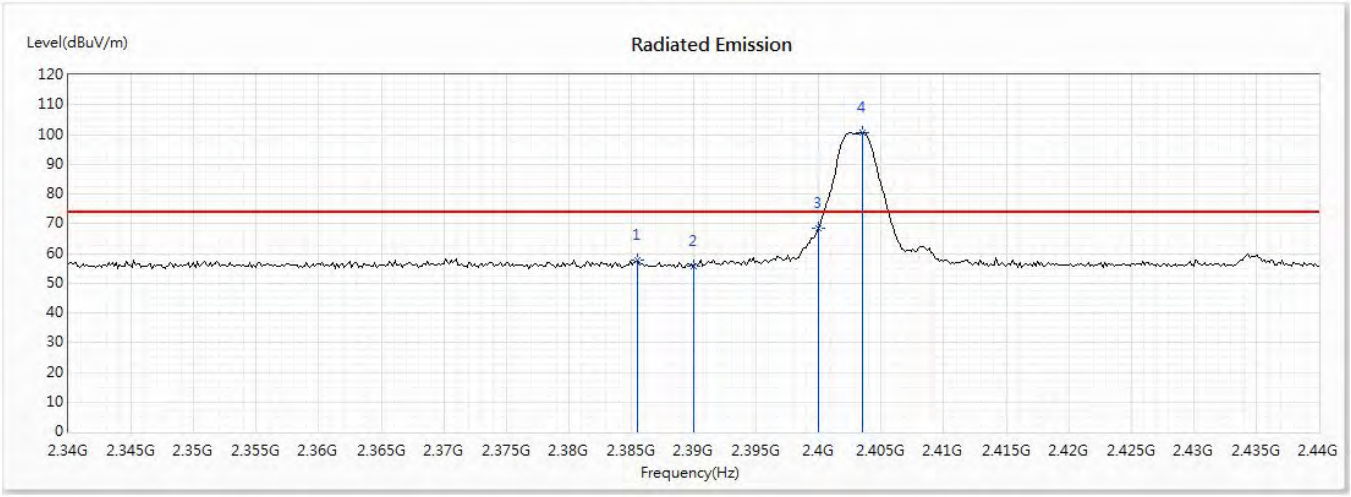
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	2370.725	45.14	54.00	-8.86	31.72	13.42	AV
2	2390	43.62	54.00	-10.38	30.16	13.46	AV
3	2400	56.34	--	--	42.85	13.49	AV
4	2403.043	99.51	--	--	86.00	13.51	AV

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	:	Wireless Gaming Keyboard Dongle
Test Item	:	Band Edge
Test Mode	:	Mode 1: Transmit (2403MHz)
Test Date	:	2020/08/15

Vertical



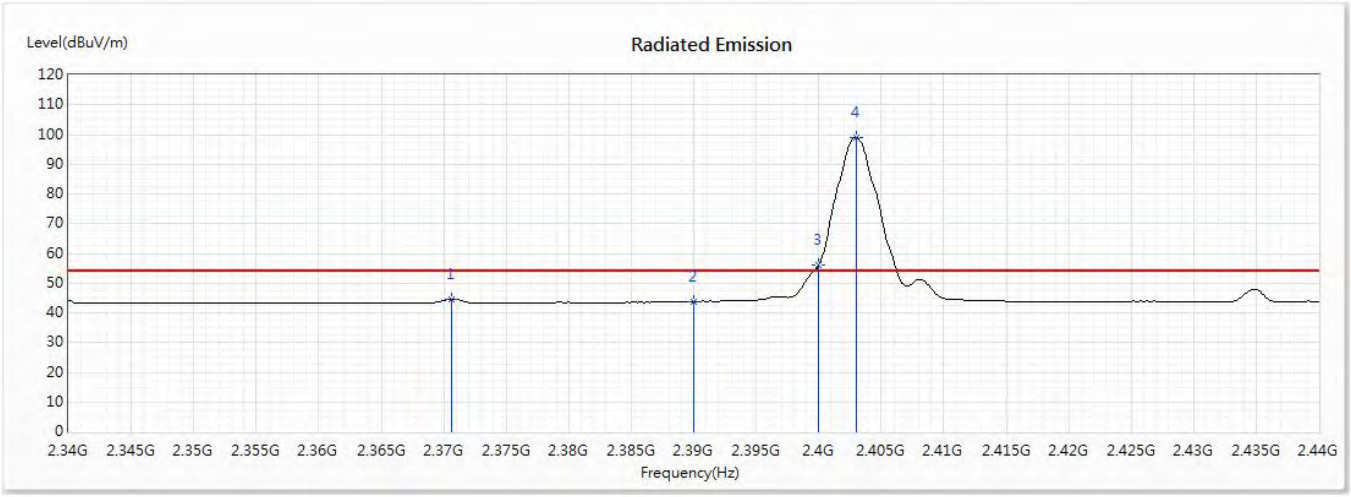
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	2385.507	57.82	74.00	-16.18	44.37	13.45	PK
2	2390	55.87	74.00	-18.13	42.41	13.46	PK
3	2400	68.31	--	--	54.82	13.49	PK
4	2403.478	100.61	--	--	87.10	13.51	PK

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	:	Wireless Gaming Keyboard Dongle
Test Item	:	Band Edge
Test Mode	:	Mode 1: Transmit (2403MHz)
Test Date	:	2020/08/15

Vertical



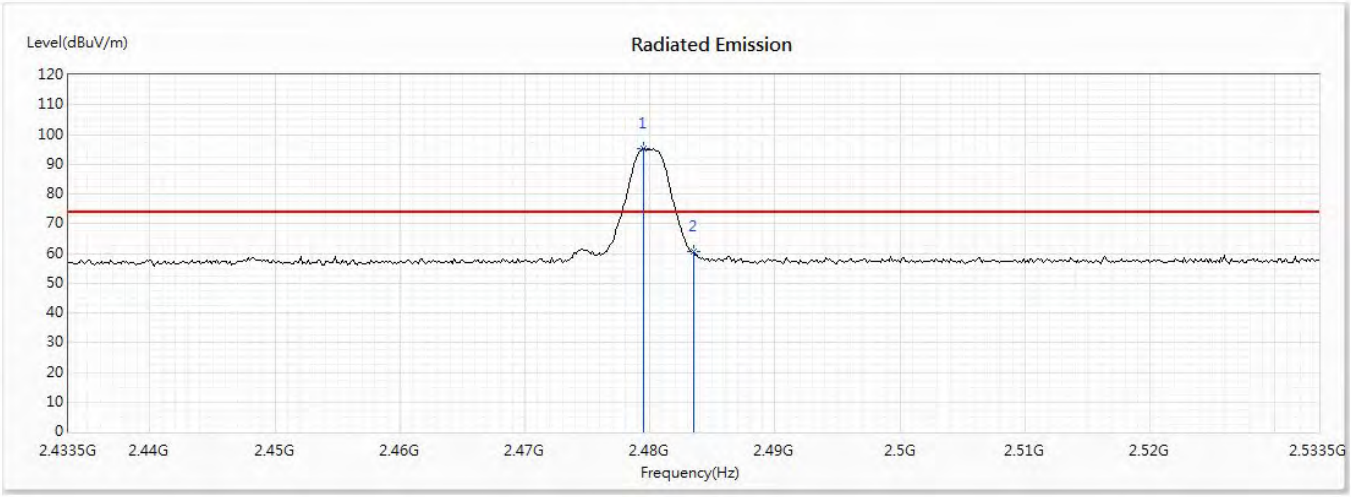
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	2370.58	44.63	54.00	-9.37	31.21	13.42	AV
2	2390	43.70	54.00	-10.30	30.24	13.46	AV
3	2400	55.89	--	--	42.40	13.49	AV
4	2403.043	98.90	--	--	85.39	13.51	AV

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	:	Wireless Gaming Keyboard Dongle
Test Item	:	Band Edge
Test Mode	:	Mode 1: Transmit (2480MHz)
Test Date	:	2020/08/15

Horizontal



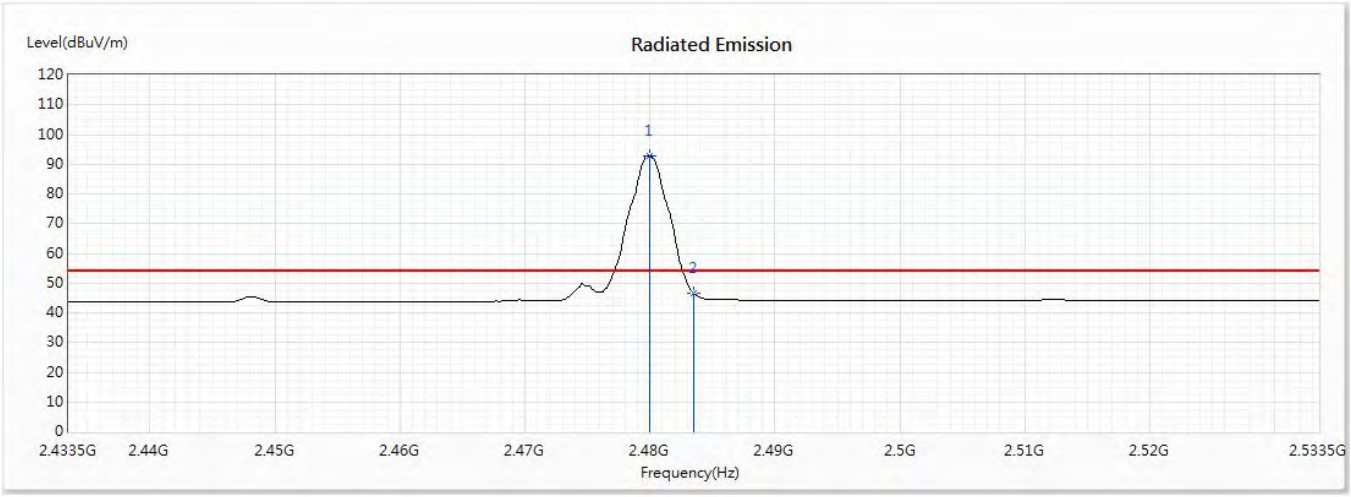
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	2479.442	95.28	--	--	81.38	13.90	PK
2	2483.5	60.43	74.00	-13.57	46.51	13.92	PK

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 : Wireless Gaming Keyboard Dongle
Test Item : Band Edge
Test Mode : Mode 1: Transmit (2480MHz)
Test Date : 2020/08/15

Horizontal



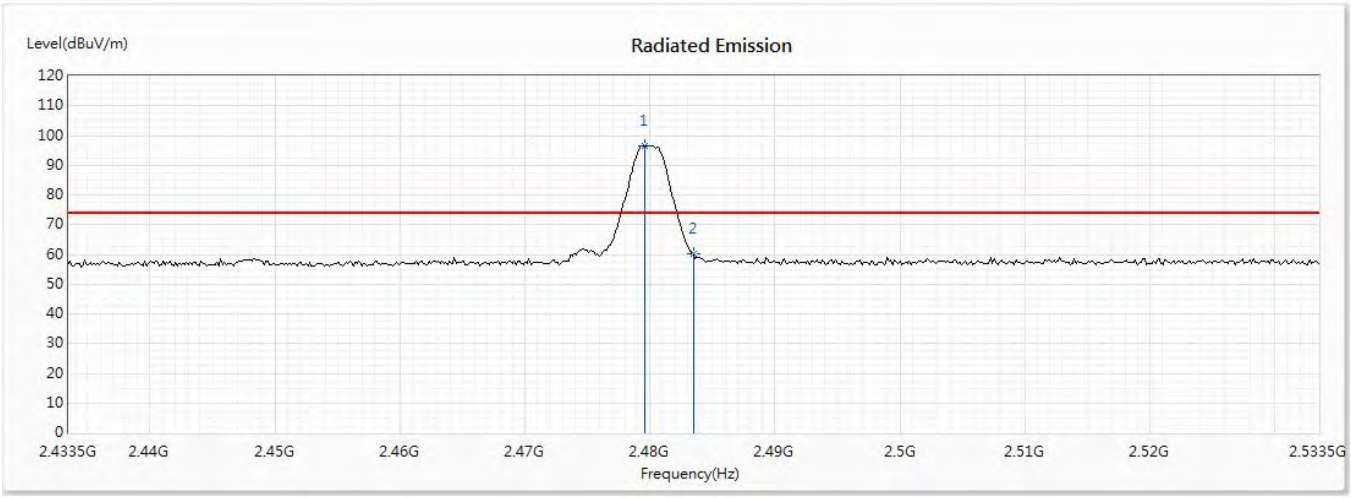
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	2480.022	92.95	--	--	79.04	13.91	AV
2	2483.5	46.51	54.00	-7.49	32.59	13.92	AV

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 : Wireless Gaming Keyboard Dongle
Test Item : Band Edge
Test Mode : Mode 1: Transmit (2480MHz)
Test Date : 2020/08/15

Vertical



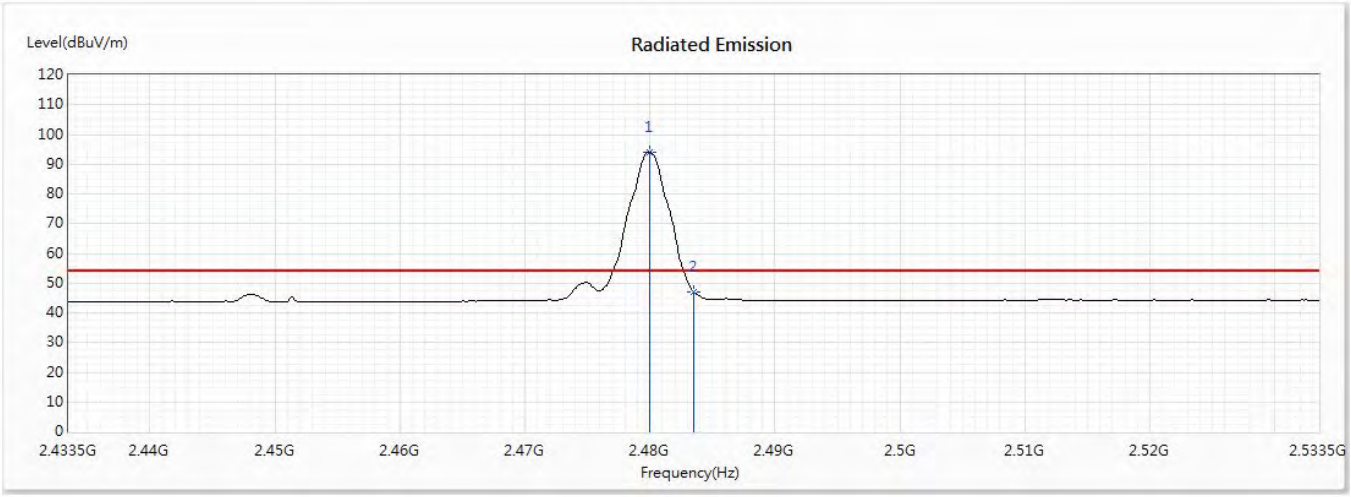
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	2479.587	96.65	--	--	82.74	13.91	PK
2	2483.5	60.18	74.00	-13.82	46.26	13.92	PK

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 : Wireless Gaming Keyboard Dongle
Test Item : Band Edge
Test Mode : Mode 1: Transmit (2480MHz)
Test Date : 2020/08/15

Vertical



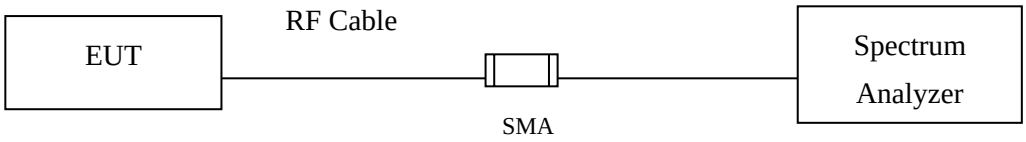
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB/m)	Detector Type
1	2480.022	94.06	--	--	80.15	13.91	AV
2	2483.5	46.93	54.00	-7.07	33.01	13.92	AV

Note:

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

7. 6dB Bandwidth

7.1. Test Setup



7.2. Limits

The minimum bandwidth shall be at least 500 kHz.

7.3. Test Procedure

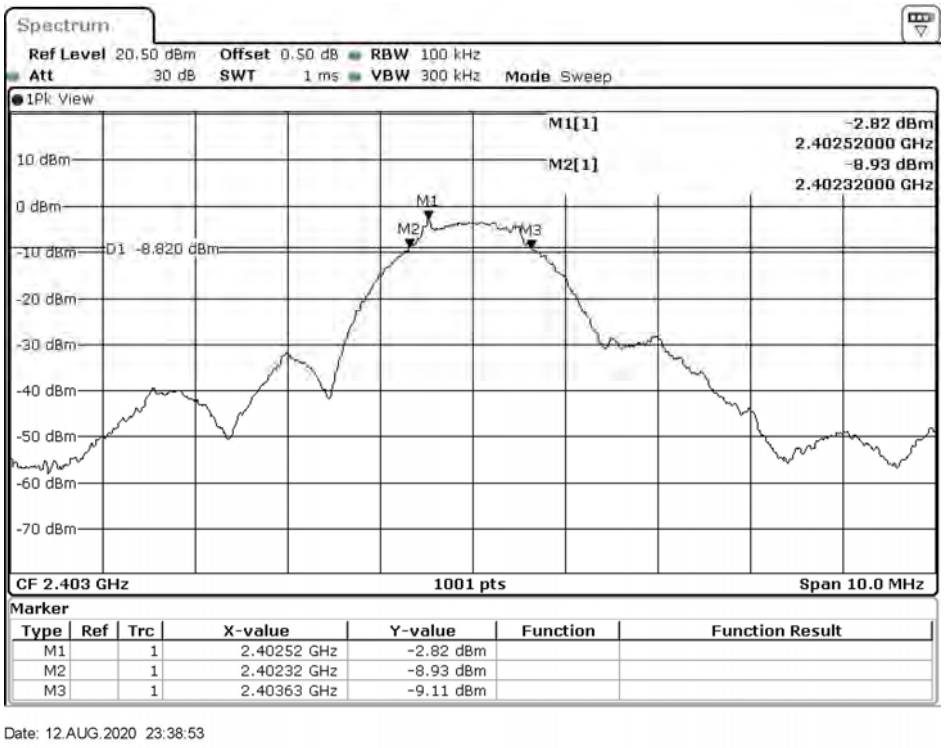
The EUT was setup according to ANSI C63.4, 2014; tested according to ANSI C63.10 Section 11.8 for compliance to FCC 47CFR 15.247 requirements.

7.4. Test Result of 6dB Bandwidth

Product : Wireless Gaming Keyboard Dongle
Test Item : 6dB Bandwidth Data
Test Mode : Mode 1: Transmit (2403MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
01	2403	1310	>500	Pass

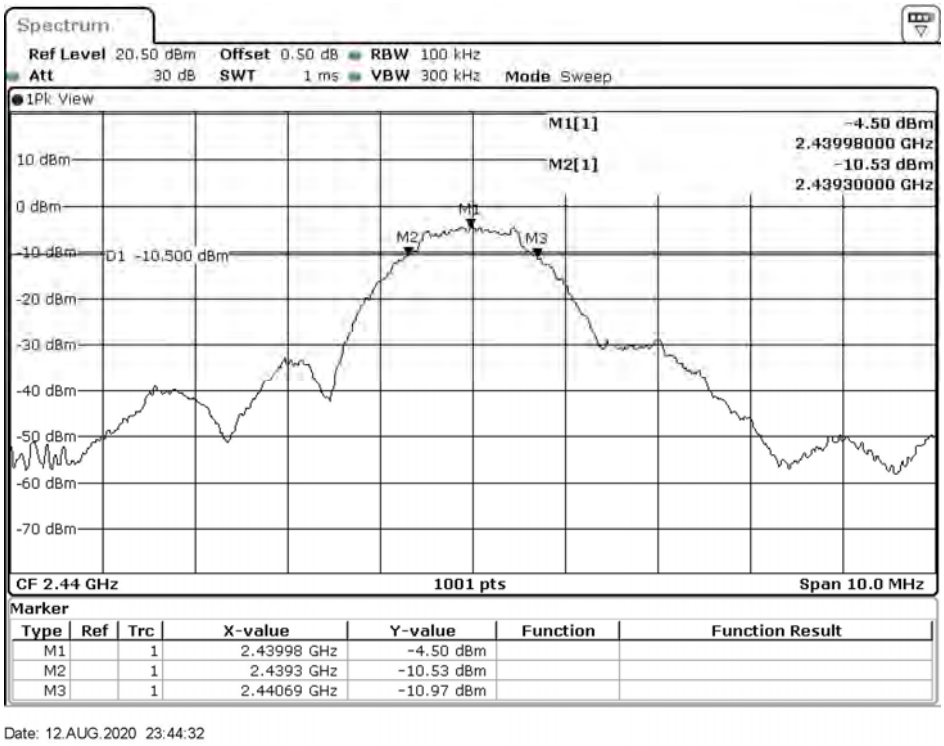
Figure Channel 01:



Product : Wireless Gaming Keyboard Dongle
Test Item : 6dB Bandwidth Data
Test Mode : Mode 1: Transmit (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
38	2440	1390	>500	Pass

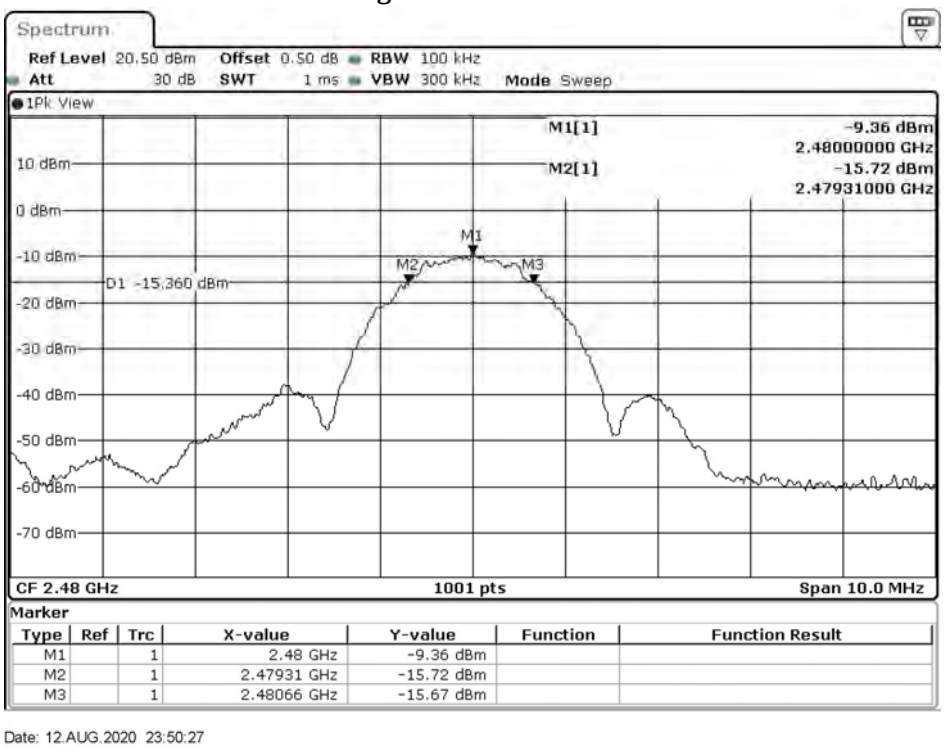
Figure Channel 38:



Product : Wireless Gaming Keyboard Dongle
Test Item : 6dB Bandwidth Data
Test Mode : Mode 1: Transmit (2480MHz)

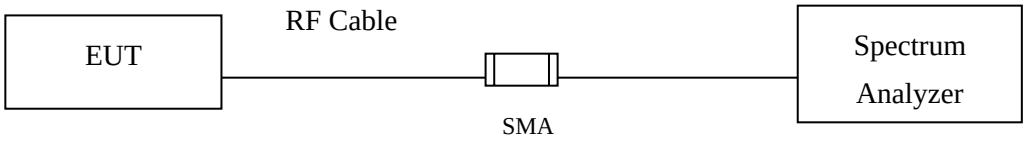
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
78	2480	1350	>500	Pass

Figure Channel 78:



8. Power Density

8.1. Test Setup



8.2. Limits

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

8.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013; tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

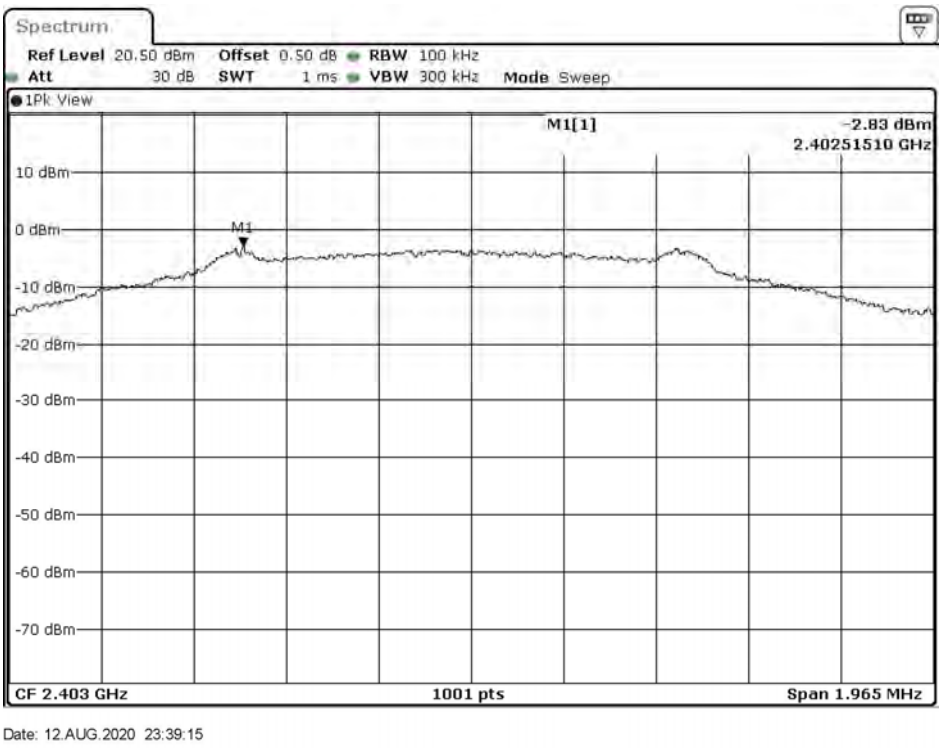
The maximum power spectral density using C63.10 Section 11.10.2 Method PKPSD (peak PSD)

8.4. Test Result of Power Density

Product : Wireless Gaming Keyboard Dongle
Test Item : Power Density Data
Test Mode : Mode 1: Transmit (2403MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
01	2403	-2.83	≦8dBm	Pass

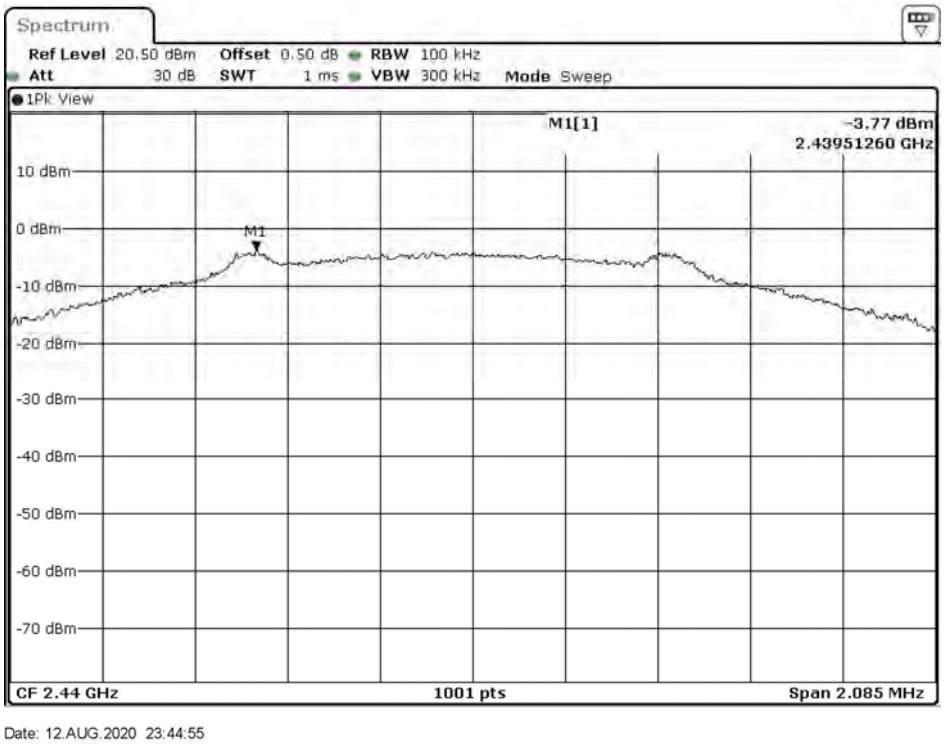
Figure Channel 01:



Product : Wireless Gaming Keyboard Dongle
Test Item : Power Density Data
Test Mode : Mode 1: Transmit (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
38	2440	-3.77	≦8dBm	Pass

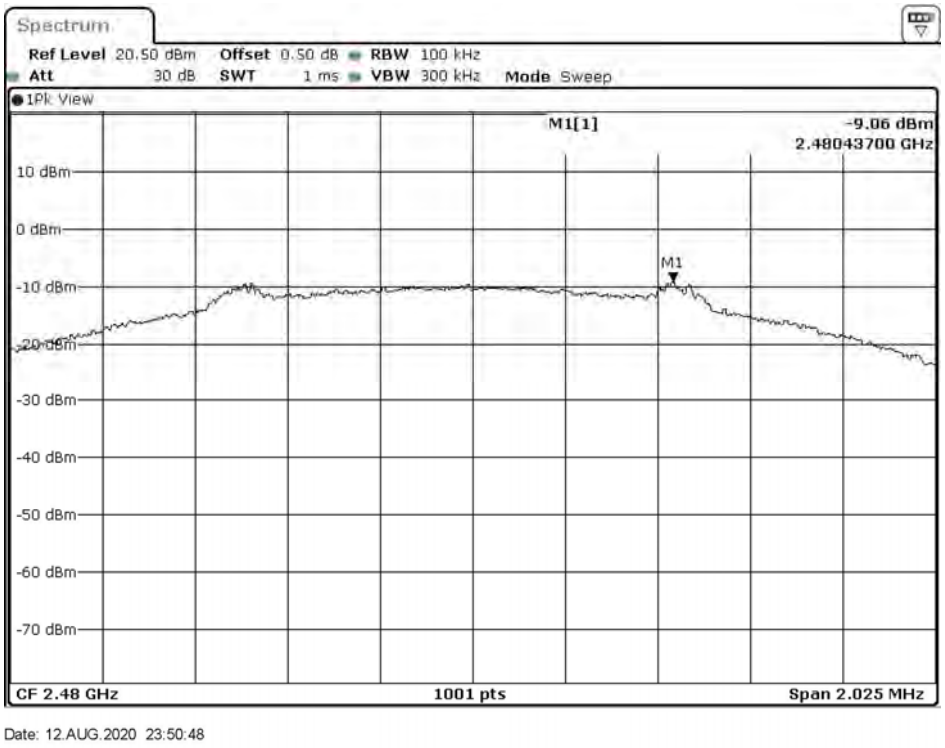
Figure Channel 38:



Product : Wireless Gaming Keyboard Dongle
Test Item : Power Density Data
Test Mode : Mode 1: Transmit (2480MHz)

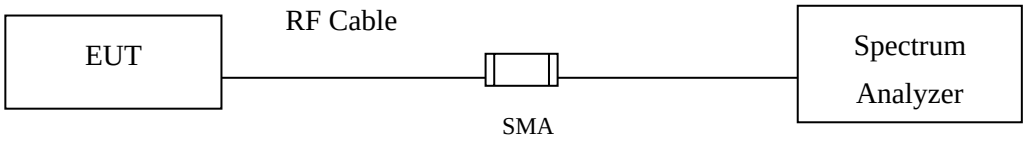
Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
78	2480	-9.06	≦8dBm	Pass

Figure Channel 78:



9. Duty Cycle

9.1. Test Setup



9.2. Test Procedure

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

9.3. Test Result of Duty Cycle

Product : Wireless Gaming Keyboard Dongle
Test Item : Duty Cycle
Test Mode : Mode 1: Transmit

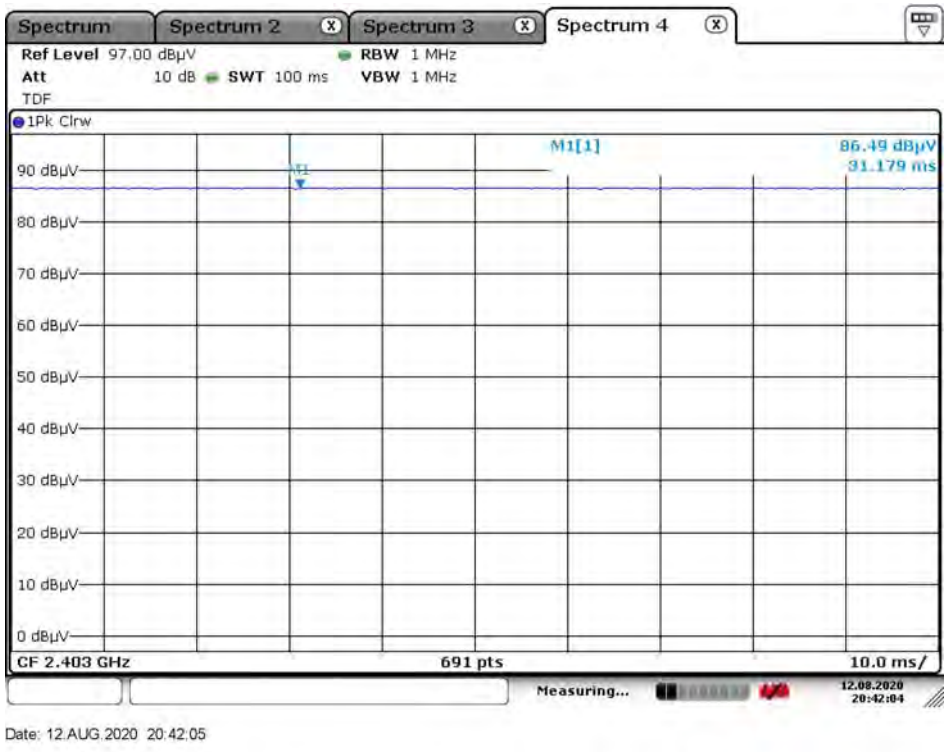
Duty Cycle Formula:

Duty Cycle = Ton / (Ton + Toff)

Duty Factor = 10 Log (1/Duty Cycle)

Results:

2.4GHz band	Ton (ms)	Ton + Toff (ms)	Duty Cycle (%)	Duty Factor (dB)
2.4GHz wireless	--	--	100.00	0.00



10. EMI Reduction Method During Compliance Testing

No modification was made during testing.