

# FCC Test Report

Product Name	Optical Gaming Mouse Dongle
Model No.	ASUSDONGLEL
FCC ID	H4IASUSDONGLEL

Applicant	Lite-on Technology Corp.
Address	16F, 392, Ruey Kuang Road, Neihu, 11492 Taipei, Taiwan

Date of Receipt	Jul. 29, 2021
Issued Date	Sep. 11, 2021
Report No.	2171180R-RFUSOTHV06
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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Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

# Test Report

Issued Date: Sep. 11, 2021

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Product Name	Optical Gaming Mouse Dongle
Applicant	Lite-on Technology Corp.
Address	16F, 392, Ruey Kuang Road, Neihu, 11492 Taipei, Taiwan
Manufacturer	Lite-on Technology Corp.
Model No.	ASUSDONGLEL
FCC ID	H4IASUSDONGLEL
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  
( Supervisor / Jinn Chen )

Tested By : Ivan Chuang  
( Senior Engineer / Ivan Chuang )

Approved By : Alan Chen  
( Senior Engineer / Alan Chen )

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## Revision History

Report No.	Version	Description	Issued Date
2171180R-RFUSOTHV06	V1.0	Initial issue of report.	2021-09-13

## 1. GENERAL INFORMATION

### 1.1. EUT Description

Product Name	Optical Gaming Mouse Dongle
Trade Name	ASUS
Model No.	ASUSDONGLEL
FCC ID	H4IASUSDONGLEL
Frequency Range	2403-2480MHz
Channel Number	78CH
Type of Modulation	GFSK
Antenna Type	Ceramic Chip Antenna
Antenna Gain	Refer to the table "Antenna List"
Channel Control	Auto

#### Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	Unictron	H2U34W1H1Z0600	Ceramic Chip Antenna	2.5 dBi for 2.4GHz

Note: The antenna of EUT is conform to FCC 15.203

**Center Frequency of Each Channel:**

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 01:	2403 MHz	Channel 21:	2423 MHz	Channel 41:	2443 MHz	Channel 61:	2463 MHz
Channel 02:	2404 MHz	Channel 22:	2424 MHz	Channel 42:	2444 MHz	Channel 62:	2464 MHz
Channel 03:	2405 MHz	Channel 23:	2425 MHz	Channel 43:	2445 MHz	Channel 63:	2465 MHz
Channel 04:	2406 MHz	Channel 24:	2426 MHz	Channel 44:	2446 MHz	Channel 64:	2466 MHz
Channel 05:	2407 MHz	Channel 25:	2427 MHz	Channel 45:	2447 MHz	Channel 65:	2467 MHz
Channel 06:	2408 MHz	Channel 26:	2428 MHz	Channel 46:	2448 MHz	Channel 66:	2468 MHz
Channel 07:	2409 MHz	Channel 27:	2429 MHz	Channel 47:	2449 MHz	Channel 67:	2469 MHz
Channel 08:	2410 MHz	Channel 28:	2430 MHz	Channel 48:	2450 MHz	Channel 68:	2470 MHz
Channel 09:	2411 MHz	Channel 29:	2431 MHz	Channel 49:	2451 MHz	Channel 69:	2471 MHz
Channel 10:	2412 MHz	Channel 30:	2432 MHz	Channel 50:	2452 MHz	Channel 70:	2472 MHz
Channel 11:	2413 MHz	Channel 31:	2433 MHz	Channel 51:	2453 MHz	Channel 71:	2473 MHz
Channel 12:	2414 MHz	Channel 32:	2434 MHz	Channel 52:	2454 MHz	Channel 72:	2474 MHz
Channel 13:	2415 MHz	Channel 33:	2435 MHz	Channel 53:	2455 MHz	Channel 73:	2475 MHz
Channel 14:	2416 MHz	Channel 34:	2436 MHz	Channel 54:	2456 MHz	Channel 74:	2476 MHz
Channel 15:	2417 MHz	Channel 35:	2437 MHz	Channel 55:	2457 MHz	Channel 75:	2477 MHz
Channel 16:	2418 MHz	Channel 36:	2438 MHz	Channel 56:	2458 MHz	Channel 76:	2478 MHz
Channel 17:	2419 MHz	Channel 37:	2439 MHz	Channel 57:	2459 MHz	Channel 77:	2479 MHz
Channel 18:	2420 MHz	Channel 38:	2440 MHz	Channel 58:	2460 MHz	Channel 78:	2480 MHz
Channel 19:	2421 MHz	Channel 39:	2441 MHz	Channel 59:	2461 MHz		
Channel 20:	2422 MHz	Channel 40:	2442 MHz	Channel 60:	2462 MHz		

Note:

1. The EUT is an Optical Gaming Mouse Dongle with a built-in 2.4G wireless transceiver.
2. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
3. These tests are conducted on a sample of the equipment for the purpose of demonstrating compliance of transmitter with Part 15 Subpart C Paragraph 15.249 for spread spectrum devices.

Test Mode	Mode 1: Transmit Mode 2: Normal mode
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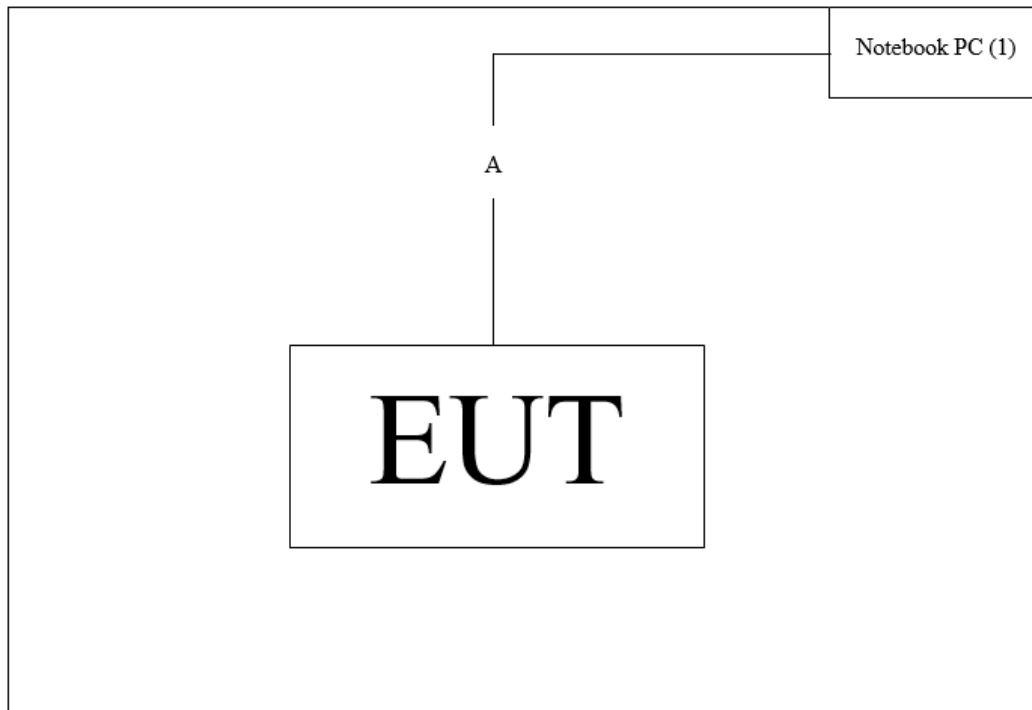
**1.2. Tested System Details**

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	GS9GL13	N/A

Signal Cable Type	Signal cable Description
A   USB Cable	Shielded, 1.8m

**1.3. Configuration of Test System**



**1.4. EUT Exercise Software**

- (1) Setup the EUT as shown in Section 1.3.
- (2) Execute software "usb\_hid\_cmd V1.0" on the Notebook PC.
- (3) Configure the test mode and the test channel
- (4) Start the continuous transmit.
- (5) Verify that the EUT works properly.

## 1.5. Test Facility

Ambient conditions in the laboratory:

Performed Item	Items	Required	Actual
Conducted Emission	Temperature (°C)	10~40 °C	27.1 °C
	Humidity (%RH)	10~90 %	61.8 %
Radiated Emission	Temperature (°C)	10~40 °C	63.1 °C
	Humidity (%RH)	10~90 %	22.7 %

**USA** : FCC Registration Number: TW0033

**Canada** : IC Registration Number: 26930

Site Description : Accredited by TAF  
Accredited Number: 3023

Test Laboratory : DEKRA Testing and Certification Co., Ltd  
Address : No. 26, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan,  
R.O.C.

Phone number : 886-3-275-7255  
Fax number : 866-3-327-5505  
Email address : [info.tw@dekra.com](mailto:info.tw@dekra.com)  
Website : <http://www.dekra.com.tw>



## 1.6. List of Test Equipment

### For Conduction measurements /SH1

	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due. Date
X	EMI Test Receiver	R&S	ESR7	101601	2021.01.04	2022.01.03
X	Two-Line V-Network	R&S	ENV216	101306	2021.04.08	2022.04.07
X	Two-Line V-Network	R&S	ENV216	101307	2021.05.04	2022.05.03
X	Coaxial Cable	DEKRA	RG400_BNC	RF001	2021.05.24	2022.05.23

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : DEKRA Testing System V2.0

### For Conducted measurements /SH2

	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due. Date
X	Spectrum Analyzer	R&S	FSV30	103466	2020.12.28	2021.12.27
X	Peak Power Analyzer	Anritsu	ML2496A	1548002	2021.02.24	2022.02.23
X	Wideband Power Sensor	Anritsu	MA2411B	1531023	2021.02.24	2022.02.23
X	Wideband Power Sensor	Anritsu	MA2411B	1531022	2021.02.24	2022.02.23

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 Conduction Test System V9.0.5.

### For Radiated measurements /966-1

	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due. Date
X	Loop Antenna	AMETEK	HLA6121	56736	2021.04.14	2022.04.13
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-678	2021.09.04	2022.09.03
X	Horn Antenna	ETS-Lindgren	3117	00203761	2020.11.23	2021.11.22
	Horn Antenna	Com-Power	AH-840	101087	2021.06.18	2022.06.17
X	Pre-Amplifier	EMCI	EMC001330	980302	2021.07.26	2022.07.25
X	Pre-Amplifier	EMCI	EMC051835SE	980312	2021.02.24	2022.02.23
	Pre-Amplifier	EMCI	EMC05820SE	980308	2020.09.18	2021.09.17
	Pre-Amplifier	EMCI	EMC184045SE	980369	2021.04.27	2022.04.26
X	Filter	MICRO TRONICS	BRM50702	G251	2020.09.17	2021.09.16
	Filter	MICRO TRONICS	BRM50716	G188	2020.09.17	2021.09.16
X	EMI Test Receiver	R&S	ESR7	102793	2020.12.17	2021.12.16
	Spectrum Analyzer	R&S	FSV3044	101115	2021.02.03	2022.02.02
X	Coaxial Cable	SGH, EMCI	HA800 , SGH18	HY2103-001C	2021.03.03	2022.03.02
X	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2021.06.25	2022.06.24

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.  
Test Software version : DEKRA Testing System V2.0

## 1.7. Uncertainty

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

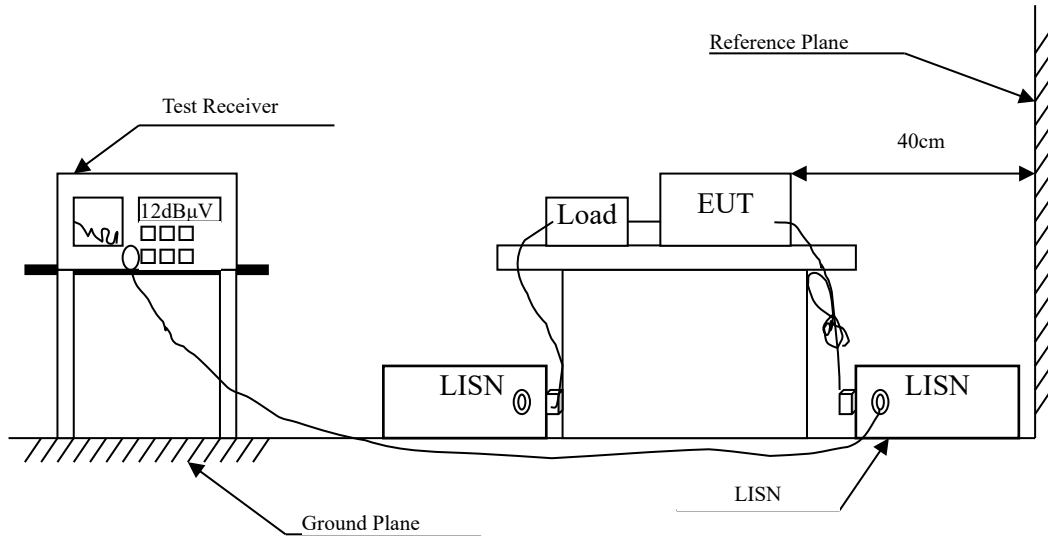
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95%.

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

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

## 2. Conducted Emission

### 2.1. Test Setup



### 2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dB $\mu$ V) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

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

### **2.3. Test Procedure**

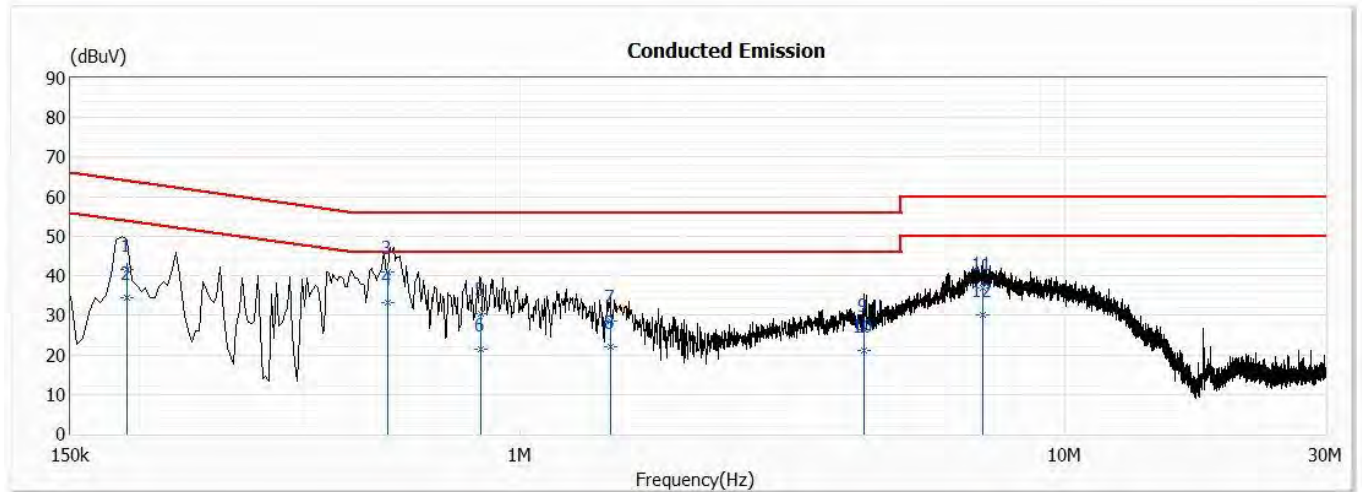
The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

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

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

### 2.4. Test Result of Conducted Emission

Model No	ASUSDONGLEL	Site	ASR1-1
Test Voltage	DC 5V	Test Date	2021/9/2
Test Mode	Mode 1: Transmit	Engineer	Yulin Chen
Phase	L1	Temperature (°C)	27.1
Test Condition	--	Humidity (%RH)	61.8
Note	CE-TX		

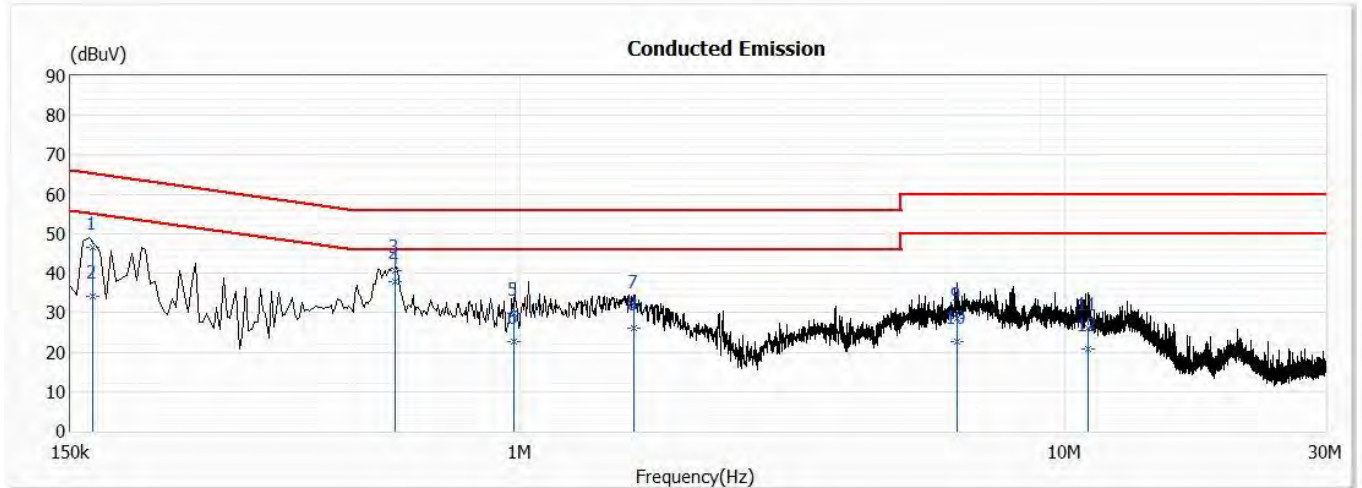


No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	0.190	41.47	64.03	-22.56	31.78	9.69	QP
2	0.190	34.35	54.03	-19.68	24.66	9.69	AV
3	0.574	41.08	56.00	-14.92	31.38	9.70	QP
*4	0.574	33.07	46.00	-12.93	23.37	9.70	AV
5	0.847	30.52	56.00	-25.48	20.79	9.73	QP
6	0.847	21.52	46.00	-24.48	11.79	9.73	AV
7	1.465	28.61	56.00	-27.39	18.83	9.78	QP
8	1.465	22.01	46.00	-23.99	12.23	9.78	AV
9	4.279	26.23	56.00	-29.77	15.63	10.60	QP
10	4.279	21.06	46.00	-24.94	10.46	10.60	AV
11	7.073	36.93	60.00	-23.07	26.09	10.84	QP
12	7.073	30.07	50.00	-19.93	19.23	10.84	AV

Note:

1. “ \* “ means this data is the worst emission level.
2. Emission Level = Reading Level + Correct Factor.
3. Margin = Emission Level – Limit.
4. Correct Factor = LISN insertion loss + Cable loss.

Model No	ASUSDONGLEL	Site	ASR1-1
Test Voltage	DC 5V	Test Date	2021/9/2
Test Mode	Mode 1: Transmit	Engineer	Yulin Chen
Phase	N	Temperature (°C)	27.1
Test Condition	--	Humidity (%RH)	61.8
Note	CE-TX		



No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	0.164	46.40	65.24	-18.84	36.69	9.71	QP
2	0.164	34.02	55.24	-21.22	24.31	9.71	AV
3	0.589	40.54	56.00	-15.46	30.82	9.72	QP
*4	0.589	38.00	46.00	-8.00	28.28	9.72	AV
5	0.976	29.66	56.00	-26.34	19.92	9.74	QP
6	0.976	22.78	46.00	-23.22	13.04	9.74	AV
7	1.619	31.73	56.00	-24.27	21.92	9.81	QP
8	1.619	26.19	46.00	-19.81	16.38	9.81	AV
9	6.329	28.66	60.00	-31.34	17.81	10.85	QP
10	6.329	22.52	50.00	-27.48	11.67	10.85	AV
11	11.025	26.17	60.00	-33.83	15.31	10.86	QP
12	11.025	20.85	50.00	-29.15	9.99	10.86	AV

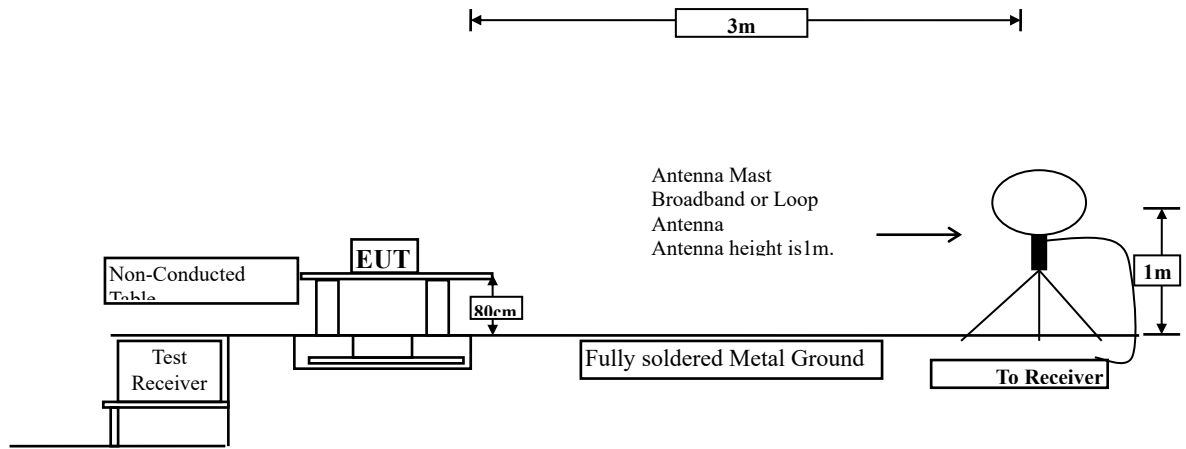
Note:

1. “ \* “ means this data is the worst emission level.
2. Emission Level = Reading Level + Correct Factor.
3. Margin = Emission Level – Limit.
4. Correct Factor = LISN insertion loss + Cable loss.

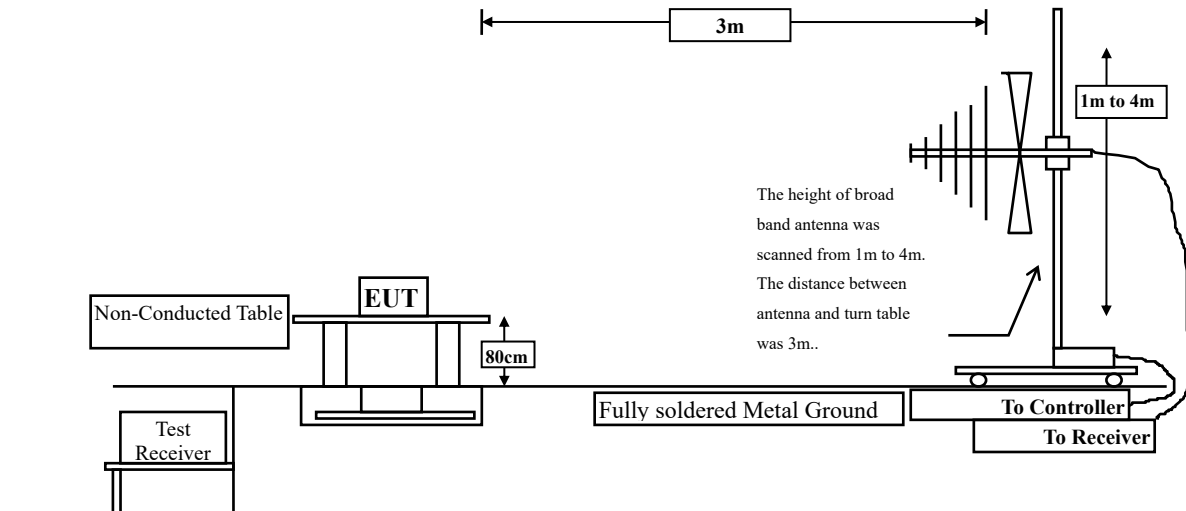
### 3. Radiated Emission

#### 3.1. Test Setup

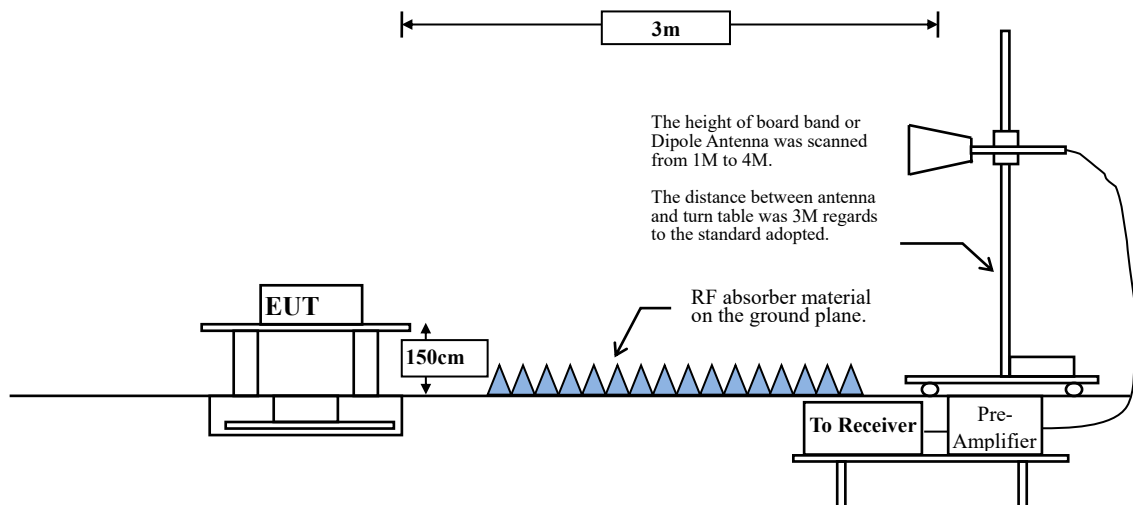
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



### 3.2. Limits

#### ➤ Fundamental and Harmonics Emission Limits

<b>FCC Part 15 Subpart C Paragraph 15.249 Limits</b>				
Frequency MHz	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m @3m)	(dB $\mu$ V /m @3m)	(uV/m @3m)	(dB $\mu$ V /m @3m)
902-928	50	94	500	54
2400-2483.5	50	94	500	54
5725-5875	50	94	500	54
24000-24250	250	108	2500	68

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

#### ➤ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

<b>FCC Part 15 Subpart C Paragraph 15.209(a) Limits</b>		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remarks: E field strength (dB $\mu$ V /m) = 20 log E field strength (uV/m)



### 3.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested compliance to FCC 47CFR 15.249 requirements.

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

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

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

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level.

This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

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

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

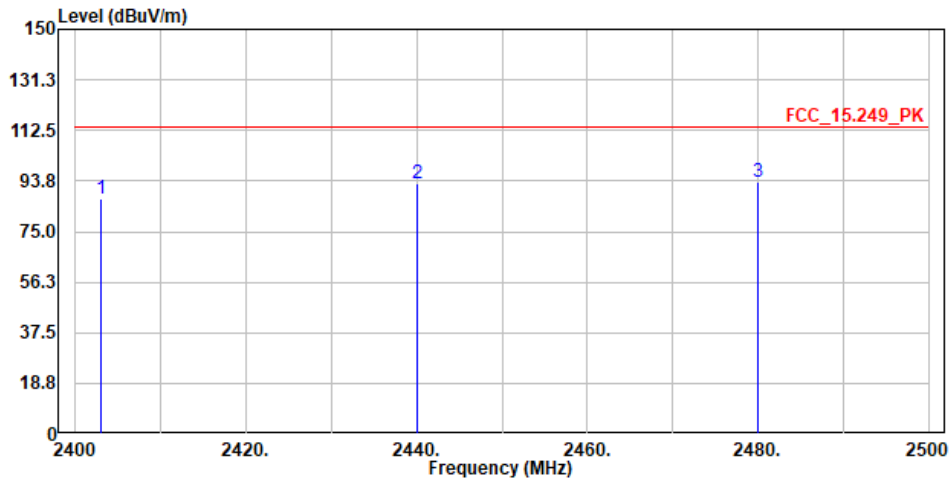
The measurement is divided into the Preliminary Measurement and the Final Measurement.

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

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

### 3.4. Test Result of Radiated Emission

Site :966-1  
 Condition :Horizontal  
 EUT :ASUSDONGLE  
 Mode :2.4GHz Wireless  
 PLANE :X  
 TEST BY :Caster



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2403.000	87.41	114.00	-26.59	77.06	10.35	Peak
2	2440.000	92.69	114.00	-21.31	82.17	10.52	Peak
3	2480.000	93.62	114.00	-20.38	82.81	10.81	Peak

Note:

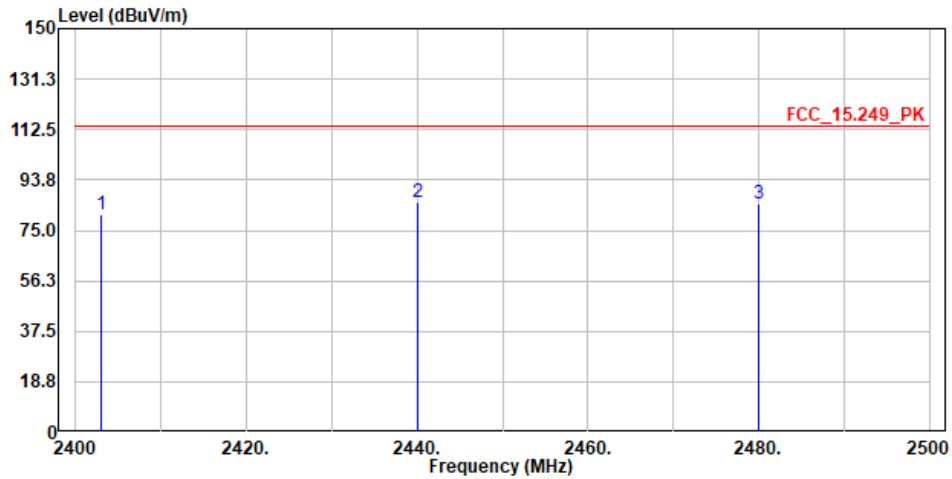
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2403.000	87.410	-43.098	44.312	-49.688	94.000
2440.000	92.690	-43.098	49.592	-44.408	94.000
2480.000	93.620	-43.098	50.522	-43.478	94.000

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 7.

Site :966-1  
 Condition :Vertical  
 EUT :ASUSDONGLE  
 Mode :2.4GHz Wireless  
 PLANE :X  
 TEST BY :Caster



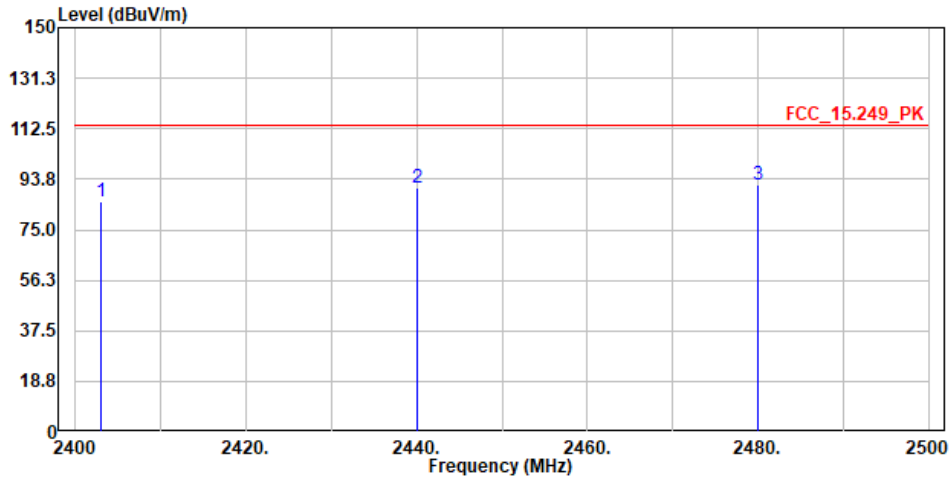
No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	Limit	Level	dB	
1	2403.000	81.11	114.00	-32.89	70.76	10.35	Peak
2	2440.000	85.67	114.00	-28.33	75.15	10.52	Peak
3	2480.000	84.63	114.00	-29.37	73.82	10.81	Peak

Note:  
 1. Level = Read Level + Factor  
 2. Factor = Antenna- Factor + Cable Loss - Preamp Factor  
 3. Over Limit = Level - Limit Line

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2403.000	81.110	-43.098	38.012	-55.988	94.000
2440.000	85.670	-43.098	42.572	-51.428	94.000
2480.000	84.630	-43.098	41.532	-52.468	94.000

Note:  
 1. Average Measurement=Peak Measurement + Duty Cycle Factor  
 2. The Duty Cycle is refer to section 7.

Site :966-1  
 Condition :Horizontal  
 EUT :ASUSDONGLE  
 Mode :2.4GHz Wireless  
 PLANE :Y  
 TEST BY :Caster



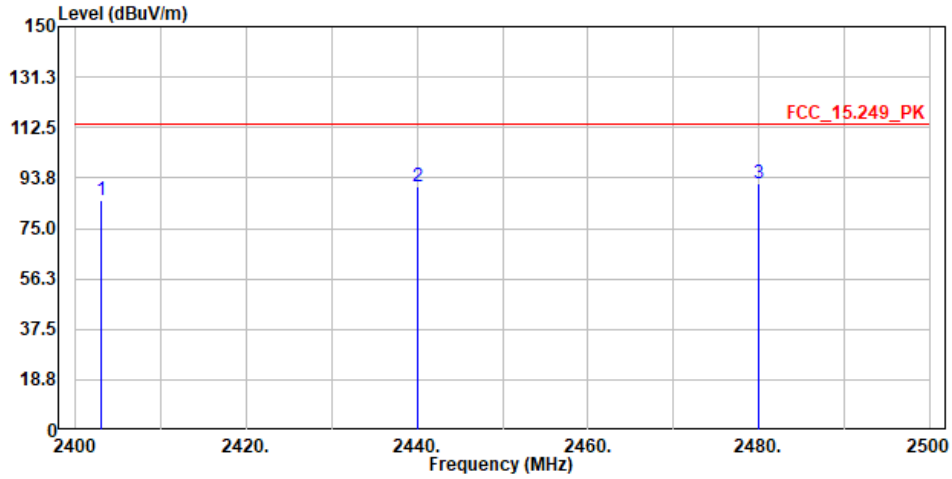
No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2403.000	85.60	114.00	-28.40	75.25	10.35	Peak
2	2440.000	90.62	114.00	-23.38	80.10	10.52	Peak
3	2480.000	91.46	114.00	-22.54	80.65	10.81	Peak

Note:  
 1. Level = Read Level + Factor  
 2. Factor = Antenna- Factor + Cable Loss - Preamp Factor  
 3. Over Limit = Level - Limit Line

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2403.000	85.600	-43.098	42.502	-51.498	94.000
2440.000	90.620	-43.098	47.522	-46.478	94.000
2480.000	91.460	-43.098	48.362	-45.638	94.000

Note:  
 1. Average Measurement=Peak Measurement + Duty Cycle Factor  
 2. The Duty Cycle is refer to section 7.

Site :966-1  
 Condition :Horizontal  
 EUT :ASUSDONGLE  
 Mode :2.4GHz Wireless  
 PLANE :Y  
 TEST BY :Caster



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2403.000	85.60	114.00	-28.40	75.25	10.35	Peak
2	2440.000	90.62	114.00	-23.38	80.10	10.52	Peak
3	2480.000	91.46	114.00	-22.54	80.65	10.81	Peak

Note:

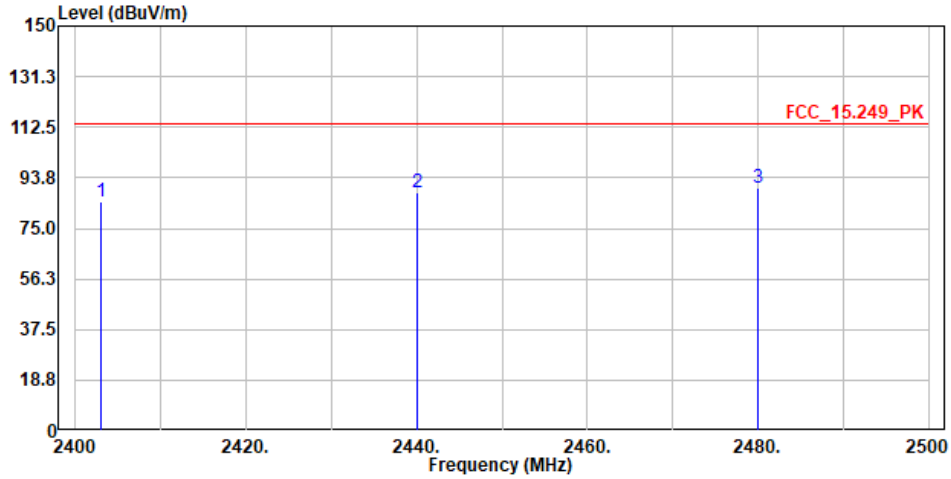
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2403.000	85.700	-43.098	42.602	-51.398	94.000
2440.000	89.780	-43.098	46.682	-47.318	94.000
2480.000	91.660	-43.098	48.562	-45.438	94.000

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 7.

Site :966-1  
 Condition :Horizontal  
 EUT :ASUSDONGLE  
 Mode :2.4GHz Wireless  
 PLANE :Z  
 TEST BY :Caster



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2403.000	85.07	114.00	-28.93	74.72	10.35	Peak
2	2440.000	88.28	114.00	-25.72	77.76	10.52	Peak
3	2480.000	90.00	114.00	-24.00	79.19	10.81	Peak

Note:

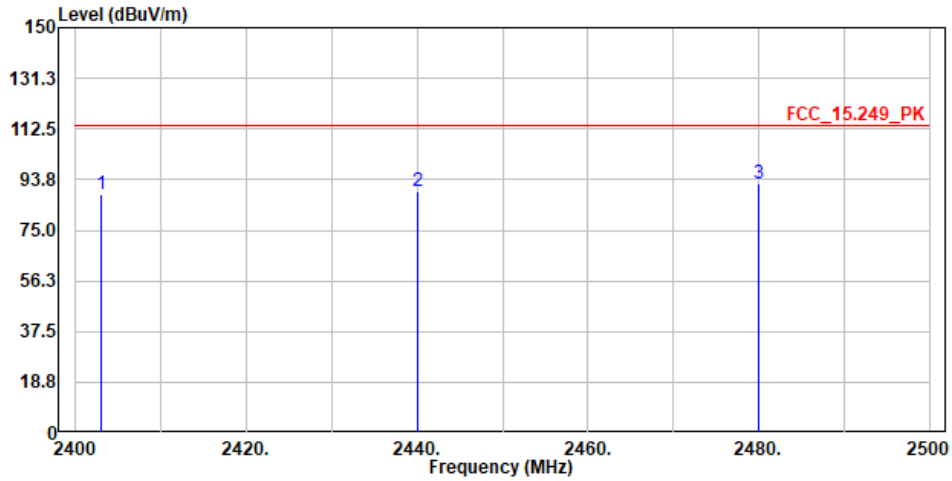
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2403.000	85.070	-43.098	41.972	-52.028	94.000
2440.000	88.280	-43.098	45.182	-48.818	94.000
2480.000	90.000	-43.098	46.902	-47.098	94.000

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 7.

Site :966-1  
 Condition :Vertical  
 EUT :ASUSDONGLE  
 Mode :2.4GHz Wireless  
 PLANE :Z  
 TEST BY :Caster



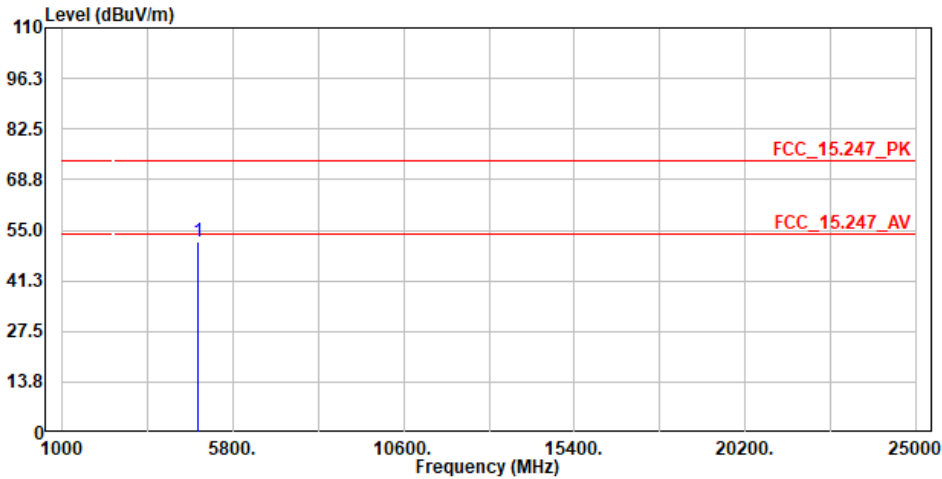
No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2403.000	88.11	114.00	-25.89	77.76	10.35	Peak
2	2440.000	89.63	114.00	-24.37	79.11	10.52	Peak
3	2480.000	92.44	114.00	-21.56	81.63	10.81	Peak

- Note:
1. Level = Read Level + Factor
  2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
  3. Over Limit = Level - Limit Line

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2403.000	88.110	-43.098	45.012	-48.988	94.000
2440.000	89.630	-43.098	46.532	-47.468	94.000
2480.000	92.440	-43.098	49.342	-44.658	94.000

- Note:
1. Average Measurement=Peak Measurement + Duty Cycle Factor
  2. The Duty Cycle is refer to section 7.

Site :966-1  
 Condition :HORIZONTAL  
 EUT :ASUSDONGLE  
 Mode :2.4GHz Wireless\_TX\_2403MHz  
 PLANE :X  
 TEST BY :Caster



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	4808.000	51.94	74.00	-22.06	55.39	-3.45	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

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

**Average Detector:**

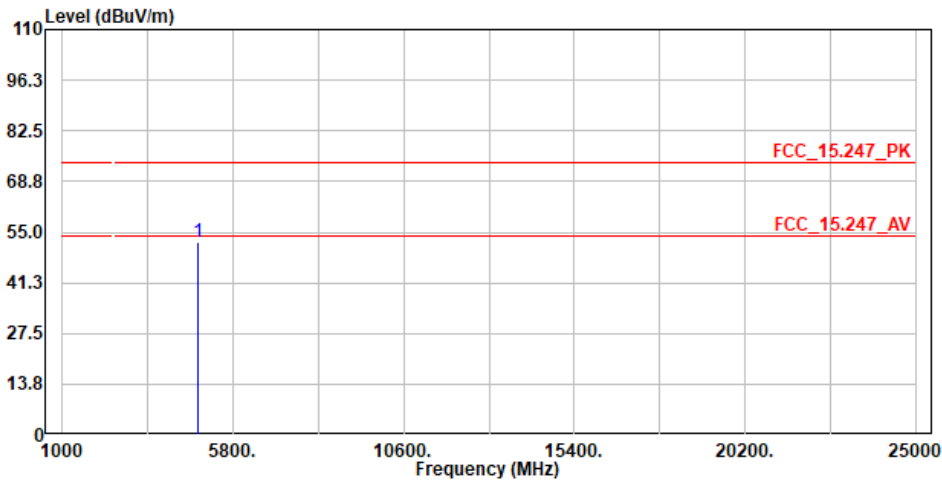
--	--	--	--	--	74.000	54.000
----	----	----	----	----	--------	--------

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 7.



Site :966-1  
 Condition :VERTICAL  
 EUT :ASUSDONGLE  
 Mode :2.4GHz Wireless\_TX\_2403MHz  
 PLANE :X  
 TEST BY :Caster



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	4808.000	52.35	74.00	-21.65	55.80	-3.45	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

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

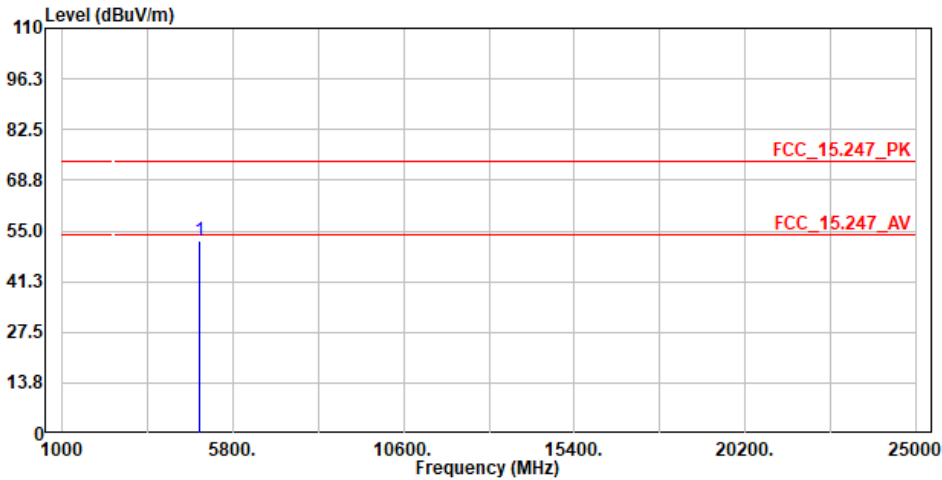
**Average Detector:**

--	--	--	--	--	74.000	54.000
----	----	----	----	----	--------	--------

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 7.

Site :966-1  
 Condition :HORIZONTAL  
 EUT :ASUSDONGLE  
 Mode :2.4GHz Wireless\_TX\_2440MHz  
 PLANE :X  
 TEST BY :Caster



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	4876.000	52.36	74.00	-21.64	55.73	-3.37	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

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

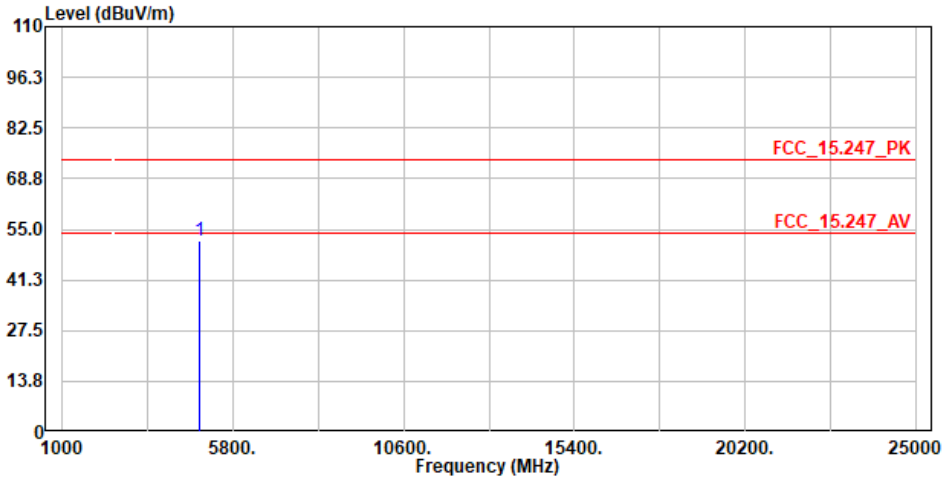
**Average Detector:**

--	--	--	--	--	74.000	54.000
----	----	----	----	----	--------	--------

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 7.

Site :966-1  
 Condition :VERTICAL  
 EUT :ASUSDONGLE  
 Mode :2.4GHz Wireless\_TX\_2440MHz  
 PLANE :X  
 TEST BY :Caster



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	4876.000	51.96	74.00	-22.04	55.33	-3.37	Peak

Note:

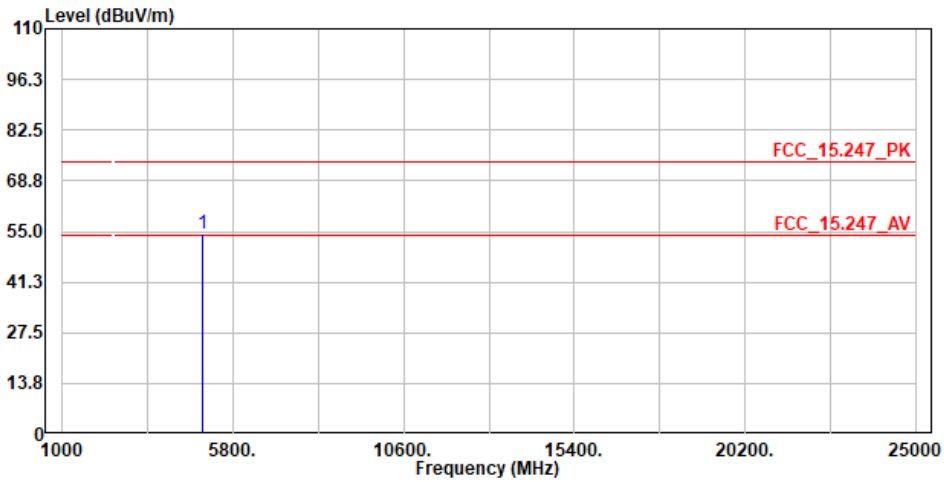
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

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

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 7.

Site :966-1  
 Condition :HORIZONTAL  
 EUT :ASUSDONGLE  
 Mode :2.4GHz Wireless\_TX\_2480MHz  
 PLANE :X  
 TEST BY :Caster



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	4960.000	53.24	74.00	-20.76	56.42	-3.18	Peak

- Note:
1. Level = Read Level + Factor
  2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
  3. Over Limit = Level - Limit Line

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

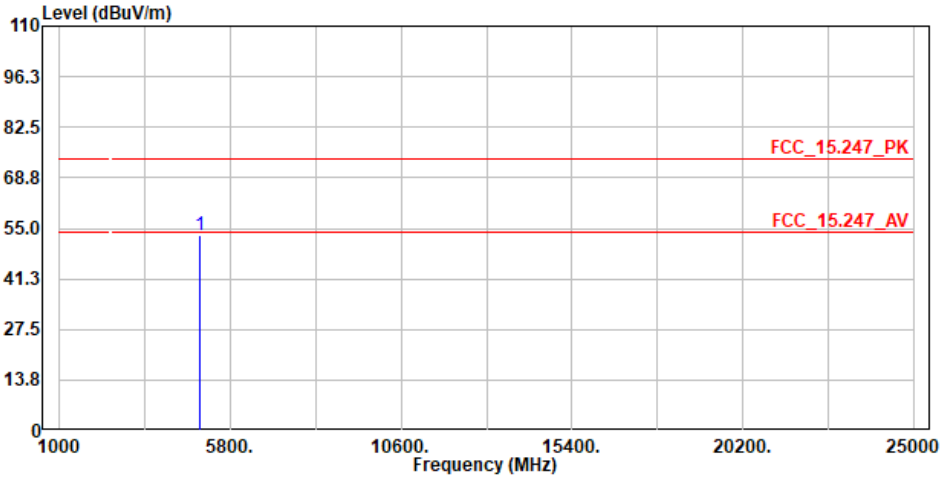
**Average Detector:**

--	--	--	--	--	74.000	54.000
----	----	----	----	----	--------	--------

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 7.

Site :966-1  
 Condition :VERTICAL  
 EUT :ASUSDONGLE  
 Mode :2.4GHz Wireless\_TX\_2480MHz  
 PLANE :X  
 TEST BY :Caster



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	4960.000	53.26	74.00	-20.74	56.44	-3.18	Peak

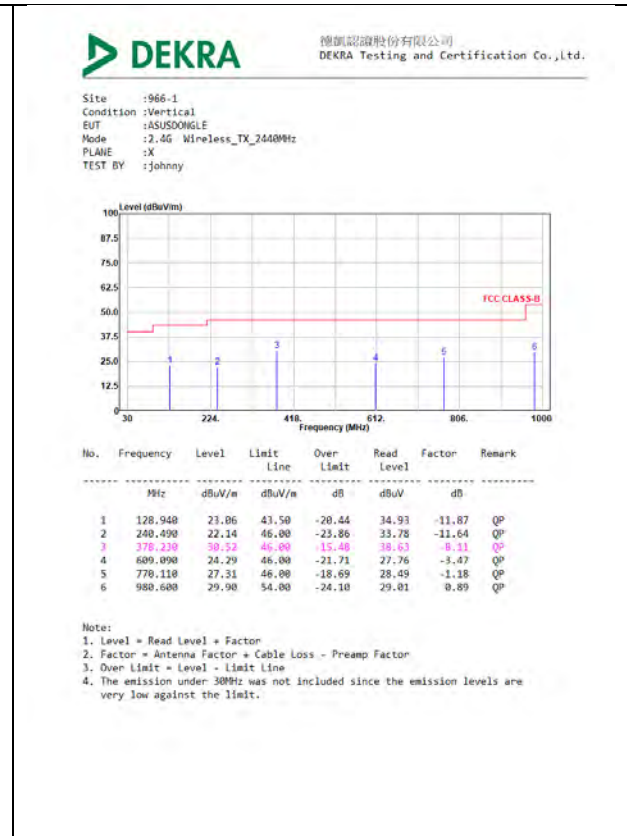
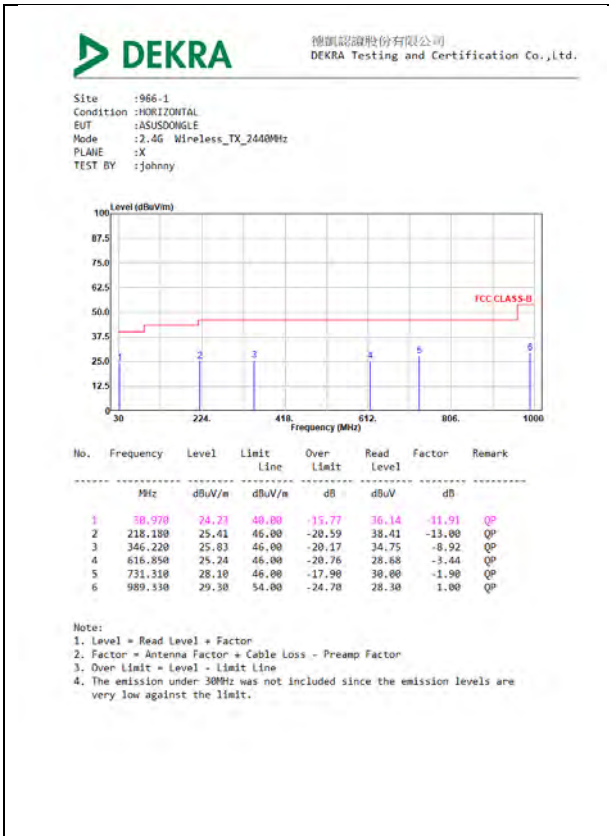
Note:

1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

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

Note:

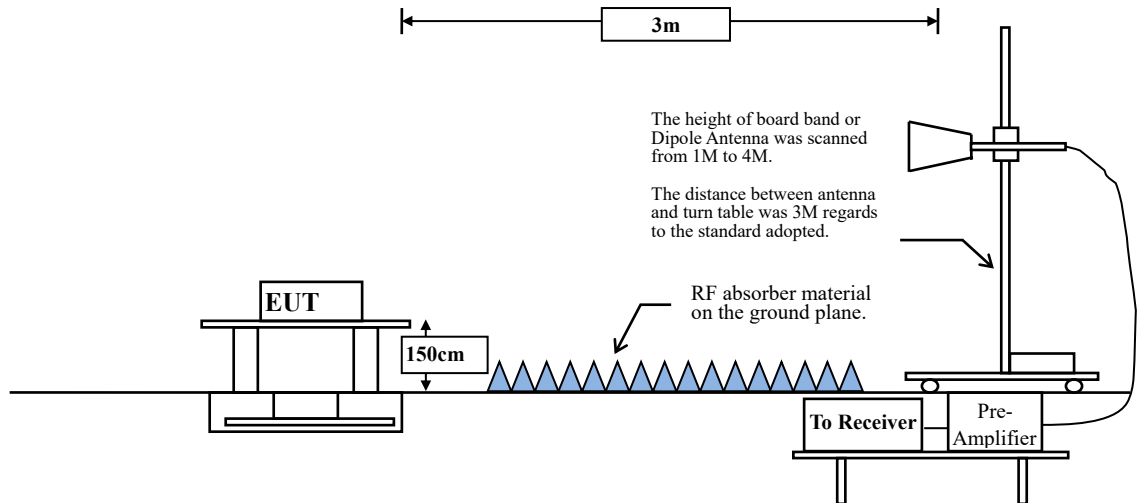
1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 7.



## 4. Band Edge

### 4.1. Test Setup

#### RF Radiated Measurement:



### 4.2. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209(a) Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remarks: E field strength (dB $\mu$ V/m) = 20 log E field strength (uV/m)

### 4.3. Test Procedure

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

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

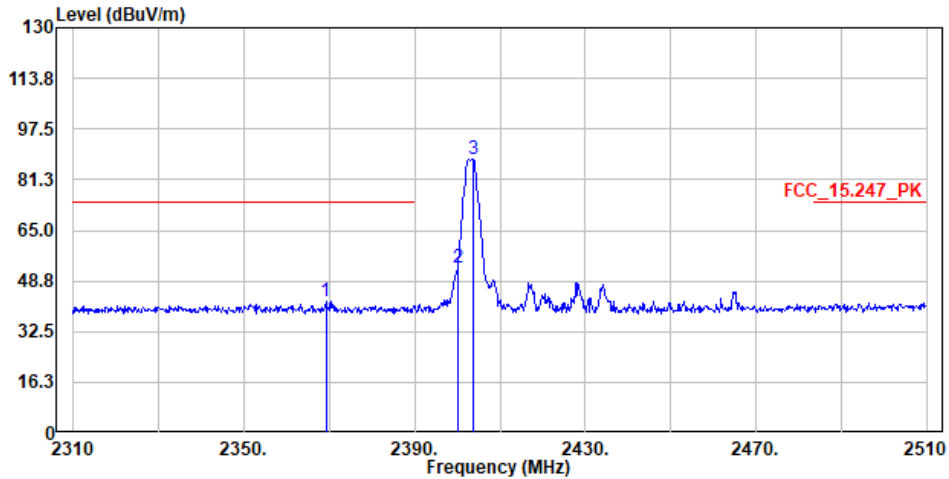
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

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



#### 4.4. Test Result of Band Edge

Site :966-1  
 Condition :Horizontal  
 EUT :ASUSDONGLE  
 Mode :2.4GHz Wireless\_TX\_2403MHz  
 PLANE :X  
 TEST BY :Caster



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2369.200	42.02	74.00	-31.98	31.64	10.38	Peak
2	2400.000	53.04	-----	-----	42.70	10.34	Peak
3	2403.600	87.97	-----	-----	77.62	10.35	Peak

Note:

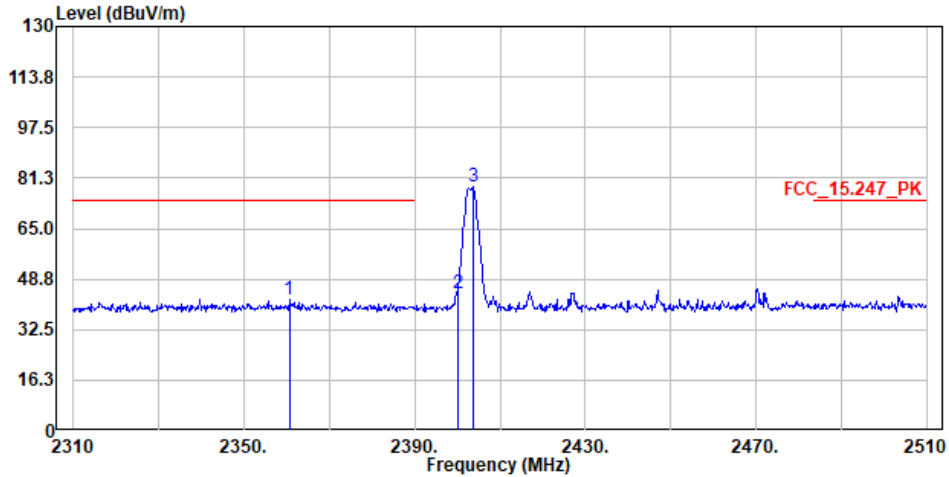
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
2369.200	42.020	-43.098	-1.078	-55.078	54.000	Pass
2400.000	53.040	-43.098	9.942	-44.058	54.000	Pass
2403.600	87.970	-43.098	44.872	--	--	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 7.

Site :966-1  
 Condition :Vertical  
 EUT :ASUSDONGLE  
 Mode :2.4GHz Wireless\_TX\_2403MHz  
 PLANE :X  
 TEST BY :Caster



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2360.600	42.39	74.00	-31.61	32.00	10.39	Peak
2	2400.000	44.39	-----	-----	34.05	10.34	Peak
3	2403.600	78.28	-----	-----	67.93	10.35	Peak

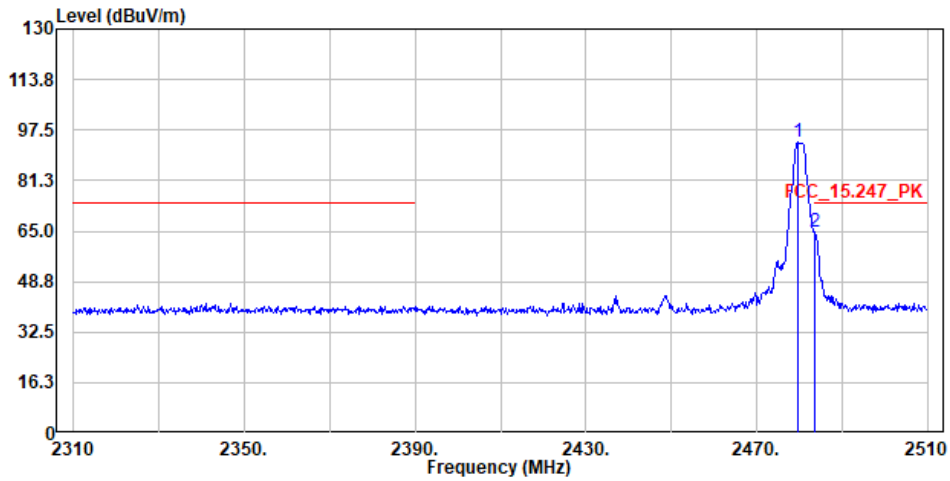
Note:

1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
2360.000	42.390	-43.098	-0.708	-54.708	54.000	Pass
2400.000	44.390	-43.098	1.292	-52.708	54.000	Pass
2403.600	78.280	-43.098	35.182	--	--	Pass

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 7.

Site :966-1  
 Condition :Horizontal  
 EUT :ASUSDONGLE  
 Mode :2.4GHz Wireless\_TX\_2480MHz  
 PLANE :X  
 TEST BY :Caster



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2479.800	93.52	-----	-----	82.71	10.81	Peak
2	2483.600	64.60	74.00	-9.40	53.76	10.84	Peak

Note:

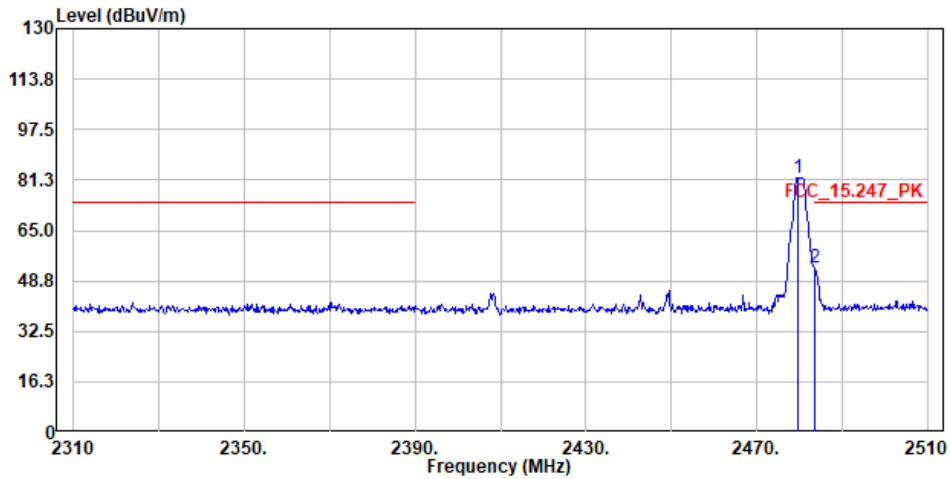
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
2479.800	93.520	-43.098	50.422	--	--	Pass
2483.600	64.600	-43.098	21.502	-32.498	54.000	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 7.

Site :966-1  
 Condition :Vertical  
 EUT :ASUSDONGLE  
 Mode :2.4GHz Wireless\_TX\_2480MHz  
 PLANE :X  
 TEST BY :Caster



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2479.800	82.09	-----	-----	71.28	10.81	Peak
2	2483.600	53.22	74.00	-20.78	42.38	10.84	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

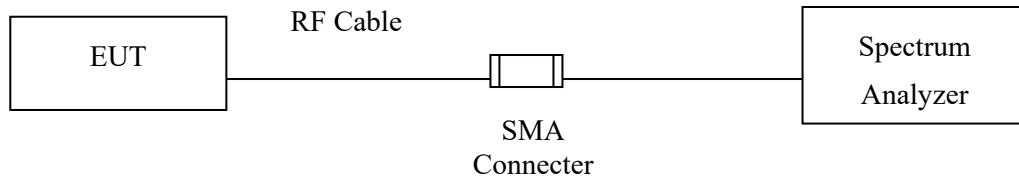
Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
2479.800	82.090	-43.098	38.992	--	--	Pass
2483.600	53.220	-43.098	10.122	-43.878	54.000	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 7.

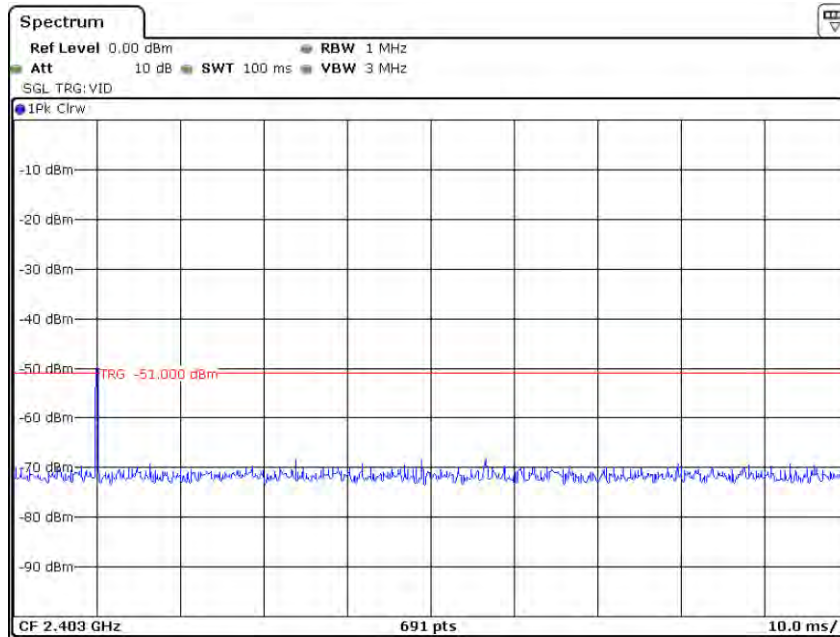
## 5. Duty Cycle

### 5.1. Test Setup

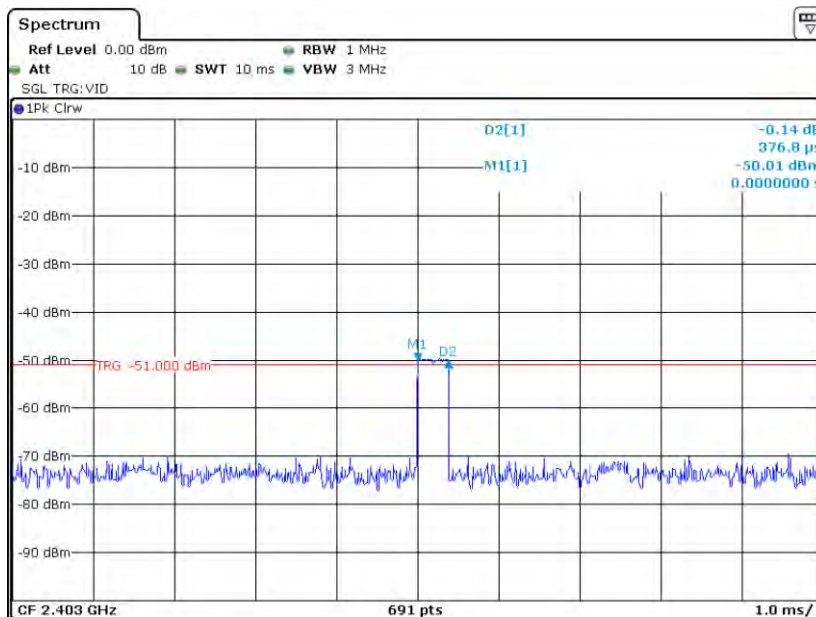


### 5.2. Test Result of Duty Cycle

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



Date: 13.OCT.2021 04:01:57



Date: 13.OCT.2021 04:03:09

Time on of 100ms= 0.376ms

Duty Cycle= 0.376ms / 100ms= 0.00376

Duty Cycle correction factor= 20 LOG 0.00376= -48.496 dB

<b>Duty Cycle correction factor</b>	<b>-48.496 dB</b>
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**6. EMI Reduction Method During Compliance Testing**

No modification was made during testing.