Testing Laboratory
3023

Test report No.: 23A0249R-RFUSV09S-A

TEST REPORT

Product Name	GAMING MOUSE
Trademark	ASUS
Model and /or type reference	P520
FCC ID	2AWUFKP520
Applicant´s name / address	DongGuan City Heatmoving Electronic Technology Co.,Ltd. XinLid industrial part Jinyuling road #28 SangYuan Village, Dongcheng Distric,DongGuan, 523119 China
Manufacturer´s name	ASUSTeK COMPUTER INC.
Test method requested, standard	FCC CFR Title 47 Part 15 Subpart C ANSI C63.4: 2014, ANSI C63.10: 2013
Verdict Summary	IN COMPLIANCE
Documented By (Senior Project Specialist / Ida Tung)	Ida Tung
Tested By (Senior Engineer / Bill Lin)	Bill Lin
Approved By (Senior Engineer / Jack Hsu)	Jack Hsu
Date of Receipt	2023/10/12
Date of Issue	2024/01/08
Report Version	V1.0

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Competences and Guarantees

DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

General conditions

1. The test results relate only to the samples tested.
2. 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.
3. This report must not be used to claim product endorsement by TAF or any agency of the government.
4. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.
5. 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.

Revision History

Report No.	Version	Description	Issued Date
23A0249R-RFUSV09S-A	V1.0	Initial issue of report.	2024/01/08

1. General Information

1.1. EUT Description

Product Name	GAMING MOUSE
Trademark	ASUS
Model and /or type reference	P520
EUT Rated Voltage	DC 5V by USB or DC 1.5V by Battery
EUT Test Voltage	DC 5V by USB and DC 1.5V by Battery
Frequency Range	2403-2480MHz
Channel Number	78
Type of Modulation	GFSK
Channel Control	Auto
Battery (1)	PAIRDEER / AA FR6
Battery (2)	PAIRDEER / AAA FR03
WIRELESS DONGLE	ASUS / MPDONGLE1

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	Weiken	P520 PCB Antenna	PIFA	2.35 dBi for 2400 MHz

Note:

1. The antenna of EUT is conforming to FCC 15.203.
2. The antenna gain as by the manufacturer provided.

Center Frequency of Each Channel:

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

Note:

1. The EUT is a GAMING MOUSE with a built-in Bluetooth and 2.4 G wireless transceiver, this report for 2.4G wireless transceiver.
2. Regarding to the operation frequency, the lowest, middle, and highest frequency are selected to perform the test.
3. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.
4. The spectrum plot against conducted item only shows the worst case.
5. These tests are conducted on a sample of the equipment for the purpose of demonstrating compliance of transmitter with Part 15 Subpart C Paragraph 15.249 for spread spectrum devices.

Test Mode	Mode 1	Transmit
	Mode 2	Normal mode

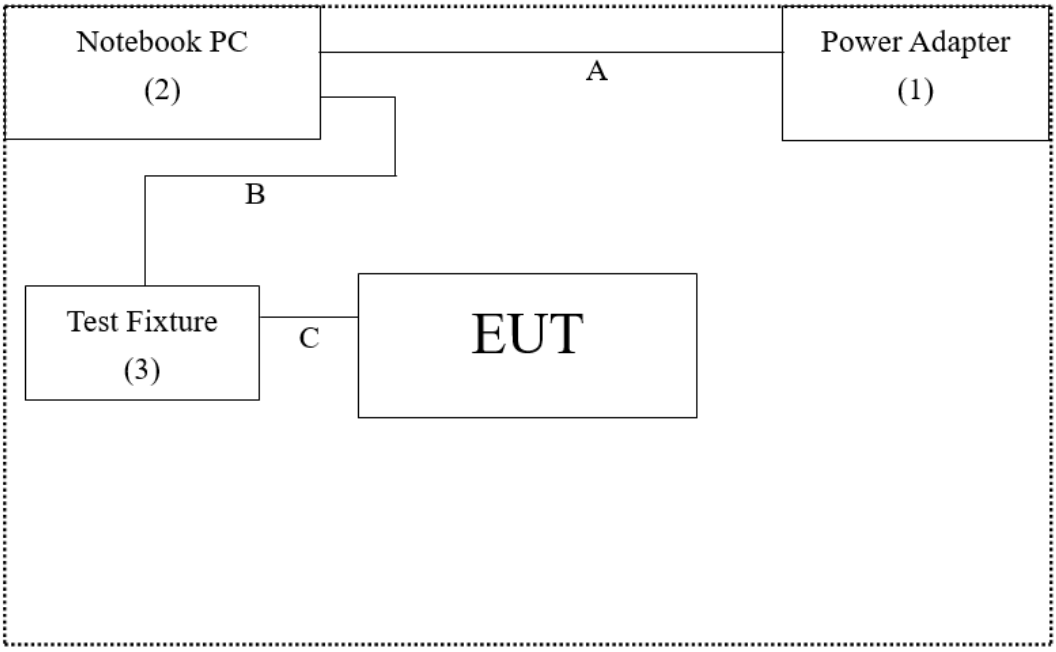
1.2. Tested System Datails

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

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Power Adapter	Dell	DA130PE1-00	N/A	N/A
2	Notebook PC	DELL	Latitude 5501	8JHGL13	N/A
3	Test Fixture	SIMMTECH	USB to TTL	N/A	N/A

Cable Type		Cable Description
A	Power Cable	Non-shielded, 1.8m
B	USB Cable	Shielded, 1.8m
C	Signal Cable	Non-shielded, 0.12m

1.3. Configuration of Test System



1.4. EUT Exercise Software

(1)	Setup the EUT as shown in Section 1.3.
(2)	Execute software “P520 RF bug tool Version 1.17_1” on the Notebook PC.
(3)	Press “OK” to start the continuous transmit.
(4)	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	26.7 °C
	Humidity (%RH)	10~90 %	54.0 %
Radiated Emission	Temperature (°C)	10~40 °C	22.0 °C
	Humidity (%RH)	10~90 %	60.0 %

USA	FCC Registration Number: TW0033
Canada	CAB Identifier Number: TW3023 / Company Number: 26930

Site Description	Accredited by TAF
	Accredited Number: 3023

Test Laboratory	DEKRA Testing and Certification Co., Ltd.
	Linkou Laboratory
Address	No.5-22, Ruishukeng Linkou District, New Taipei City, 24451, Taiwan, R.O.C
Performed Location	No. 26, Huaya 1st Rd., Guishan Dist.,Taoyuan City 333411, Taiwan, R.O.C.
Phone Number	+886-3-275-7255
Fax Number	+886-3-327-8031

1.6. List of Test Equipment

For Conduction measurements /HY-SR01

	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due. Date
V	EMI Test Receiver	R&S	ESR7	101601	2023/06/20	2024/06/19
V	Two-Line V-Network	R&S	ENV216	101306	2023/03/16	2024/03/15
V	Two-Line V-Network	R&S	ENV216	101307	2023/08/17	2024/08/16
V	Coaxial Cable	SUHNER	RG400_BNC	RF001	2023/01/10	2024/01/09

Note:
1. All equipments are calibrated every one year.
2. The test instruments marked with "V" are used to measure the final test results.
3. Test Software version : e3 230303 dekra V9.

For Conducted Measurements / HY-SR02

	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
V	Spectrum Analyzer	R&S	FSV30	103466	2022/12/22	2023/12/21
V	Peak Power Analyzer	KEYSIGHT	8990B	MY51000539	2023/05/15	2024/05/14
V	Power Sensor	KEYSIGHT	N1923A	MY59240002	2023/05/18	2024/05/17
V	Power Sensor	KEYSIGHT	N1923A	MY59240003	2023/05/18	2024/05/17

Note:
1. All equipments are calibrated every one year.
2. The test instruments marked with "V" are used to measure the final test results.
3. Test Software Version: RF Conducted Test Tools R3 V3.0.1.14.

For Radiated measurements /HY-CB01

	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due. Date
V	Loop Antenna	AMETEK	HLA6121	56736	2023/05/23	2024/05/24
V	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-0675	2023/08/09	2025/08/08
V	Horn Antenna	RF SPIN	DRH18-E	210802A18ES	2023/03/23	2024/03/22
V	Horn Antenna	Com-Power	AH-840	101100	2023/10/02	2025/10/01
V	Pre-Amplifier	SGH	0301	20211007-7	2023/01/10	2024/01/09
V	Pre-Amplifier	EMCI	EMC051845SE	980632	2023/01/10	2024/01/09
V	Pre-Amplifier	EMCI	EMC05820SE	980362	2023/01/10	2024/01/09
V	Pre-Amplifier	EMCI	EMC184045SE	980369	2023/01/10	2024/01/09
	Coaxial Cable	EMCI	EMC102-KM-KM-600	1160314		
	Coaxial Cable	EMCI	EMC102-KM-KM-7000	170242		
V	Filter	MICRO TRONICS	BRM50702	G251	2023/01/05	2024/01/04
	Filter	MICRO TRONICS	BRM50716	067	2023/01/05	2024/01/04
V	EMI Test Receiver	R&S	ESR3	102792	2022/12/29	2023/12/28
V	Spectrum Analyzer	R&S	FSV3044	101115	2023/01/06	2024/01/05
V	Coaxial Cable	SUHNER	SUCOFLEX 106	25450/6	2023/01/10	2024/01/09
	Coaxial Cable	SGH	HA800	GD20110222-8		
	Coaxial Cable	SGH	SGH18	2021003-8		
	Coaxial Cable	EMCI	EMC106	151113		

Note:
1. Bi-Log Antenna and Horn Antenna(AH-840) is calibrated every two years, the other equipments are calibrated every one year.
2. The test instruments marked with "V" are used to measure the final test results.
3. Test Software Version: e3 230303 dekra V9.

1.7. Uncertainty

Uncertainties have been calculated according to the DEKRA internal document.

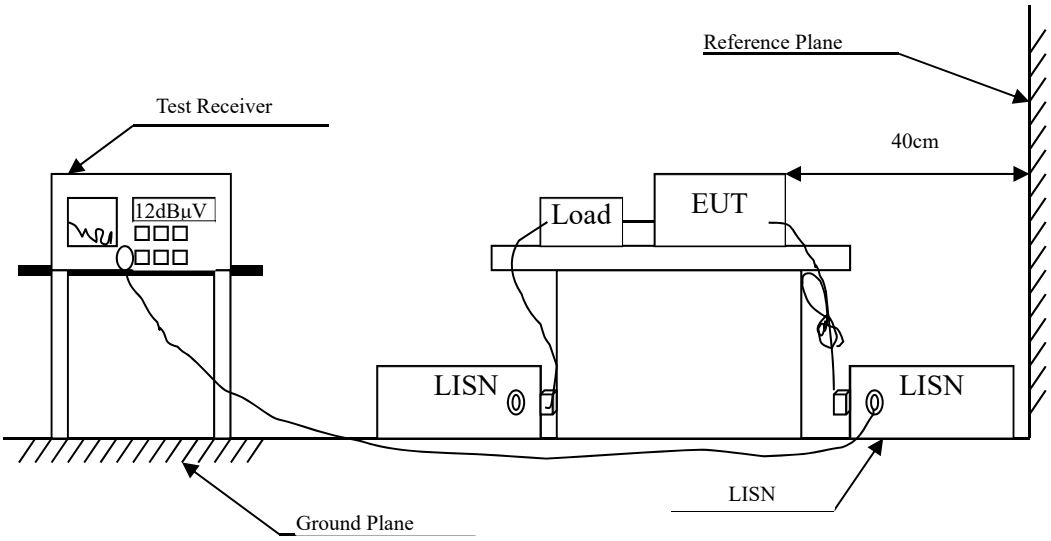
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

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	±3.50 dB
Radiated Emission	9 kHz~30 MHz: ±3.88 dB 30 MHz~1 GHz: ±4.42 dB 1 GHz~18 GHz: ±4.28 dB 18 GHz~40 GHz: ±3.90 dB
Band Edge	9 kHz~30 MHz: ±3.88 dB 30 MHz~1 GHz: ±4.42 dB 1 GHz~18 GHz: ±4.28 dB 18 GHz~40 GHz: ±3.90 dB
Duty Cycle	±0.53 %

2. Conducted Emission

2.1. Test Setup



2.2. Limits

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

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

2.3. Test Procedure

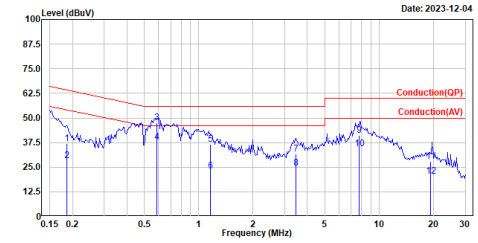
The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling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

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

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

2.4. Test Result of Conducted Emission

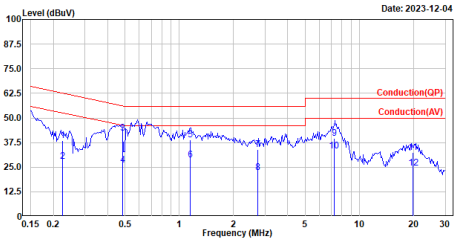
Site :HY-SR01
Condition :Line
Mode :wireless_2440MHz_TX
test by :Shane



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.186	36.83	64.20	-27.37	27.15	9.68	QP
2	0.186	28.12	54.20	-26.08	18.44	9.68	Average
3	0.586	47.43	56.00	-8.57	37.74	9.69	QP
4	0.586	37.74	46.00	-8.26	28.05	9.69	Average
5	1.163	36.76	56.00	-19.24	27.03	9.73	QP
6	1.163	23.20	46.00	-22.80	13.47	9.73	Average
7	3.454	31.80	56.00	-24.20	21.49	10.31	QP
8	3.454	24.70	46.00	-21.30	14.39	10.31	Average
9	7.746	41.25	60.00	-18.75	30.43	10.82	QP
10	7.746	34.36	50.00	-15.64	23.54	10.82	Average
11	19.229	27.95	60.00	-32.05	17.26	10.69	QP
12	19.229	20.48	50.00	-29.52	9.79	10.69	Average

Note:
1. Level = Read Level + Factor
2. Factor = LISN insertion loss + Cable loss
3. Over Limit = Level - Limit Line

Site :HY-SR01
Condition :Neutral
Mode :wireless_2440MHz_TX
test by :Shane



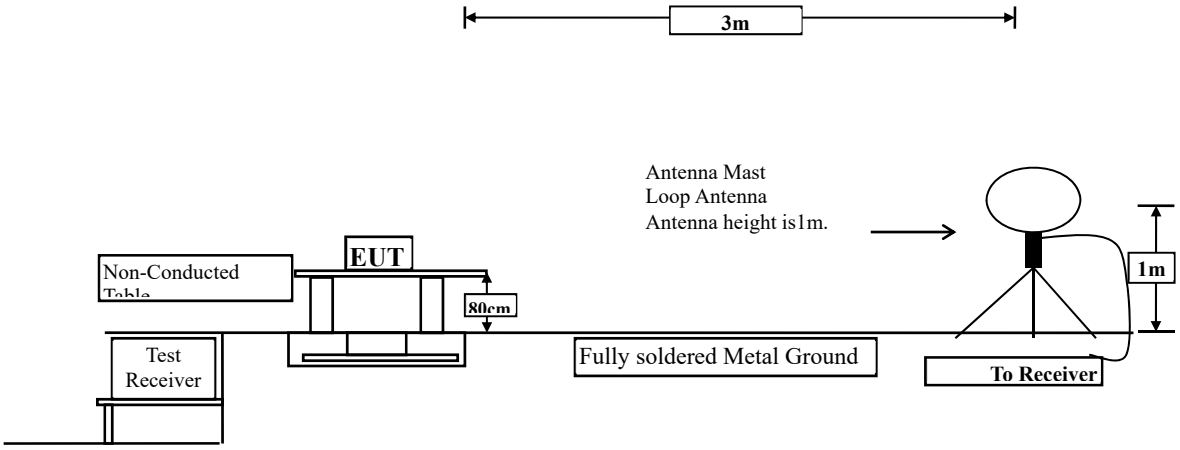
No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.226	38.39	62.61	-24.22	28.73	9.66	QP
2	0.226	27.82	52.61	-24.79	18.16	9.66	Average
3	0.484	42.10	56.27	-14.17	32.44	9.66	QP
4	0.484	26.01	46.27	-20.26	16.35	9.66	Average
5	1.155	38.86	56.00	-17.14	29.15	9.71	QP
6	1.155	28.81	46.00	-17.19	19.10	9.71	Average
7	2.731	33.80	56.00	-22.20	23.76	10.04	QP
8	2.731	22.20	46.00	-23.80	12.16	10.04	Average
9	7.214	39.81	60.00	-20.19	29.00	10.81	QP
10	7.214	33.25	50.00	-16.75	22.44	10.81	Average
11	19.812	32.38	60.00	-27.62	21.61	10.77	QP
12	19.812	24.63	50.00	-25.37	13.86	10.77	Average

Note:
1. Level = Read Level + Factor
2. Factor = LISN insertion loss + Cable loss
3. Over Limit = Level - Limit Line

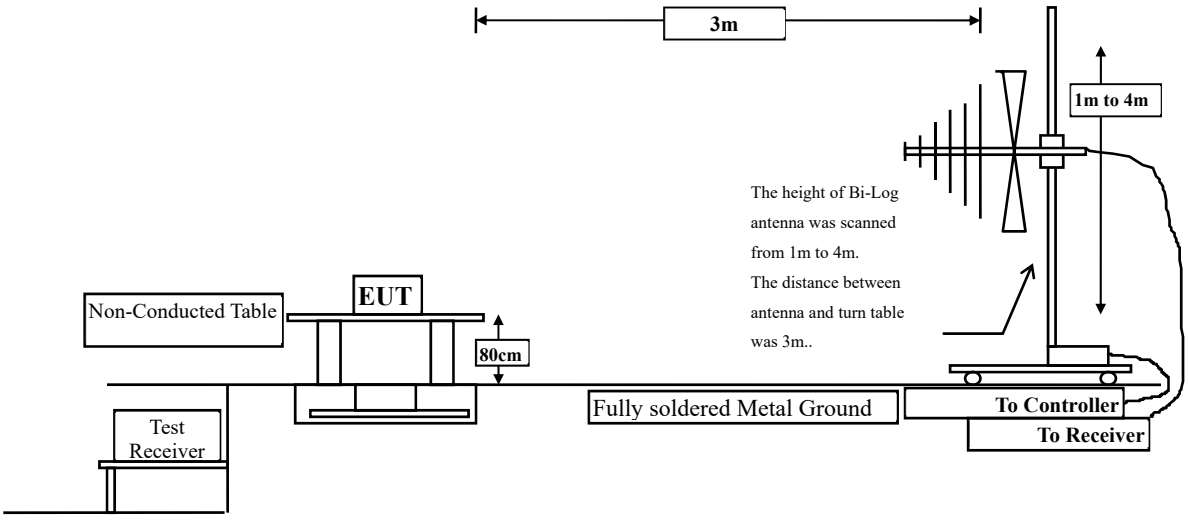
3. Radiated Emission

3.1. Test Setup

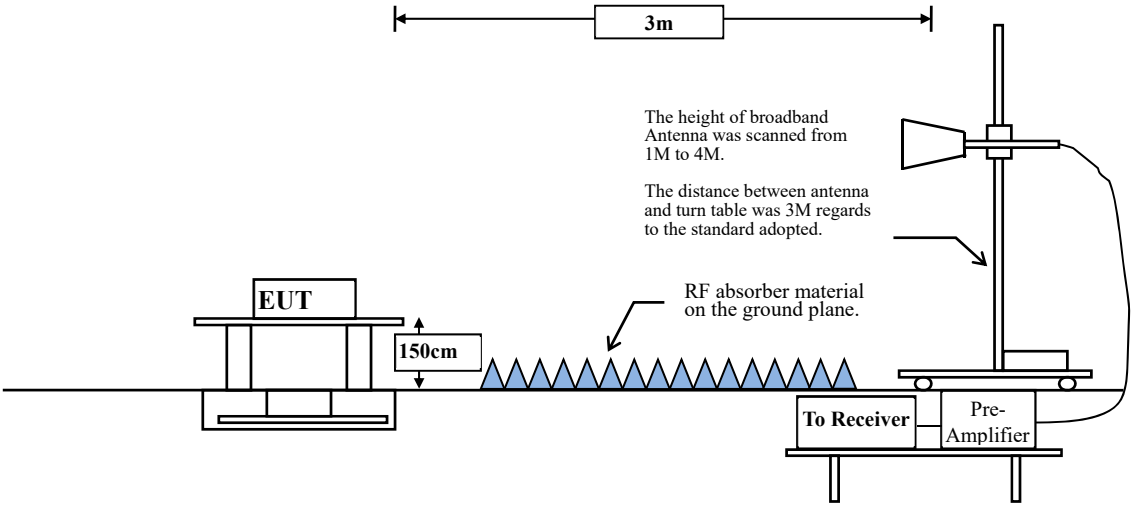
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



3.2. Limits

➢ **Fundamental and Harmonics Emission Limits**

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

Remarks : 1. RF Voltage (dBμV /m) = 20 log RF Voltage (uV/m)

2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

➢ **General Radiated Emission Limits**

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

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

Remarks: E field strength (dBμV /m) = 20 log E field strength (uV/m)

As shown in 15.35(b), on any frequency above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

3.3. Test Procedure

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

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

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

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

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

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

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

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

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

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

3.4. Test Result of Radiated Emission

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Site       :HY-CB01
Condition  :3m    ,Horizontal
Mode       :TX_Fundamantal_X軸
TEST BY    :Caster
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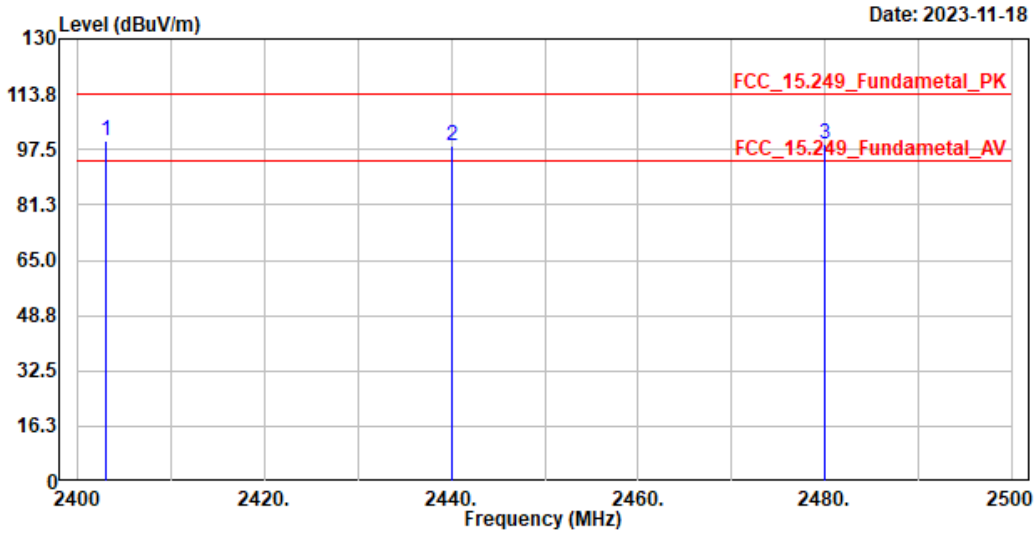


No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2403.000	99.85	113.97	-14.12	94.22	5.63	Peak
2	2440.000	98.63	113.97	-15.34	93.03	5.60	Peak
3	2480.000	99.16	113.97	-14.81	93.49	5.67	Peak

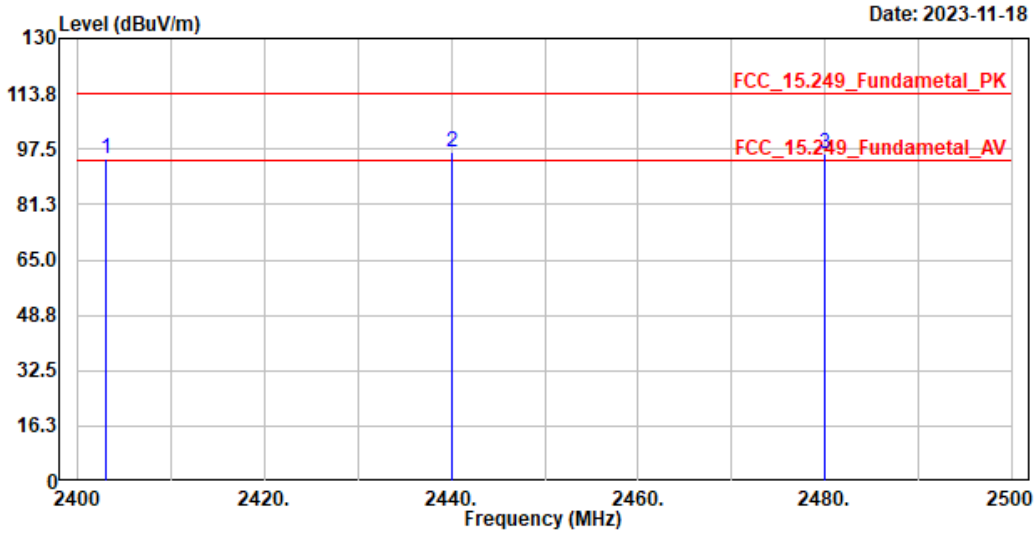
Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2403	99.85	-23.098	76.752	-17.248	94.000
2440	98.63	-23.098	75.532	-18.468	94.000
2480	99.16	-23.098	76.062	-17.938	94.000

Note:

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

Site :HY-CB01
Condition :3m ,Vertical
Mode :TX_Fundamantal_X軸
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	94.67	113.97	-19.30	89.04	5.63	Peak
2	2440.000	96.86	113.97	-17.11	91.26	5.60	Peak
3	2480.000	96.05	113.97	-17.92	90.38	5.67	Peak

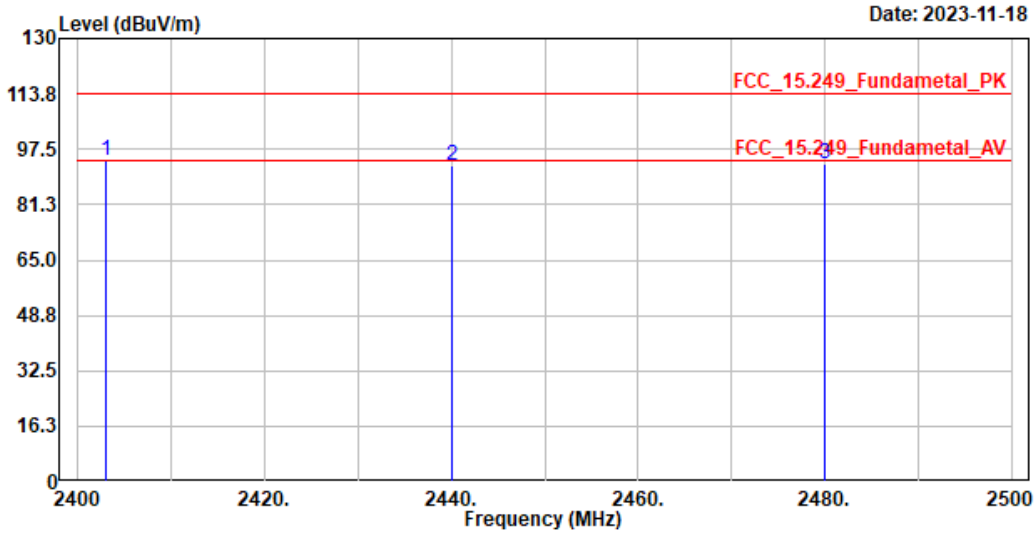
Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2403	94.67	-23.098	71.572	-22.428	94.000
2441	96.86	-23.098	73.762	-20.238	94.000
2480	96.05	-23.098	72.952	-21.048	94.000

Note:

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

Site :HY-CB01
Condition :3m ,Horizontal
Mode :TX_Fundamantal_Y軸
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	93.98	113.97	-19.99	88.35	5.63	Peak
2	2440.000	92.75	113.97	-21.22	87.15	5.60	Peak
3	2480.000	93.25	113.97	-20.72	87.58	5.67	Peak

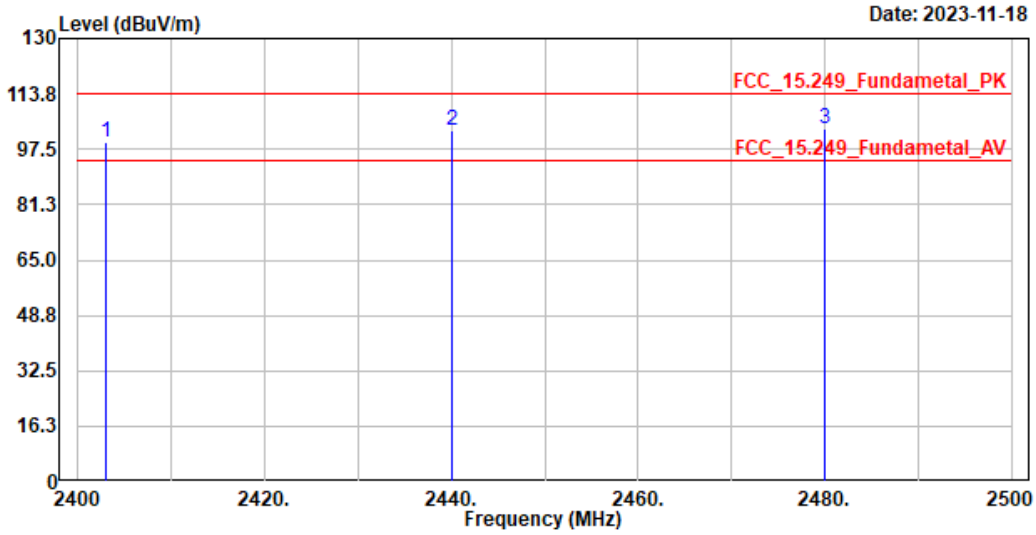
Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2403	93.98	-23.098	70.882	-23.118	94.000
2440	92.75	-23.098	69.652	-24.348	94.000
2480	93.25	-23.098	70.152	-23.848	94.000

Note:

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

Site :HY-CB01
Condition :3m ,Vertical
Mode :TX_Fundamantal_Y軸
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	99.66	113.97	-14.31	94.03	5.63	Peak
2	2440.000	102.95	113.97	-11.02	97.35	5.60	Peak
3	2480.000	103.67	113.97	-10.30	98.00	5.67	Peak

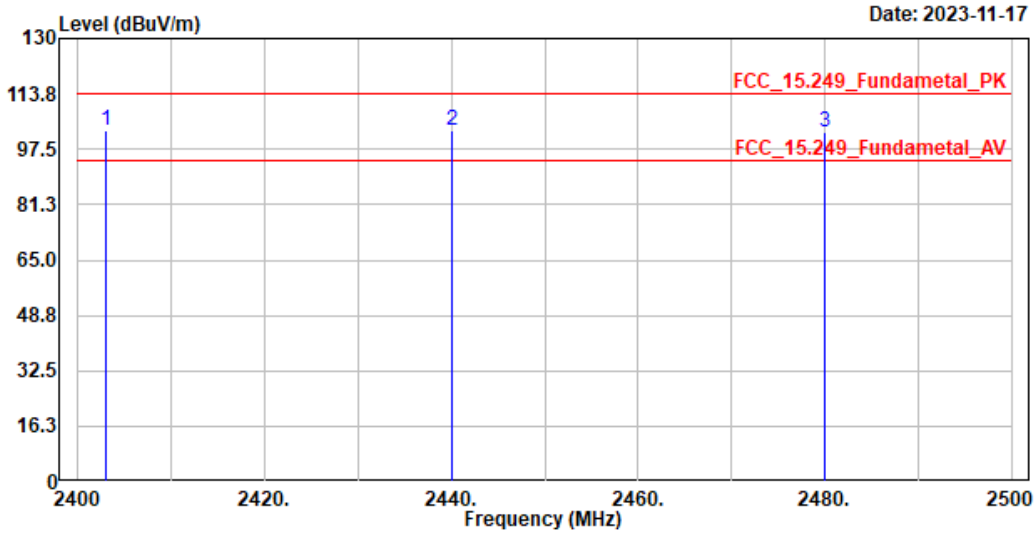
Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2403	99.66	-23.098	76.562	-17.438	94.000
2440	102.95	-23.098	79.852	-14.148	94.000
2480	103.67	-23.098	80.572	-13.428	94.000

Note:

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

Site :HY-CB01
Condition :3m ,Horizontal
Mode :TX_Fundamantal_Z軸
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	103.03	113.97	-10.94	97.40	5.63	Peak
2	2440.000	103.05	113.97	-10.92	97.45	5.60	Peak
3	2480.000	102.37	113.97	-11.60	96.70	5.67	Peak

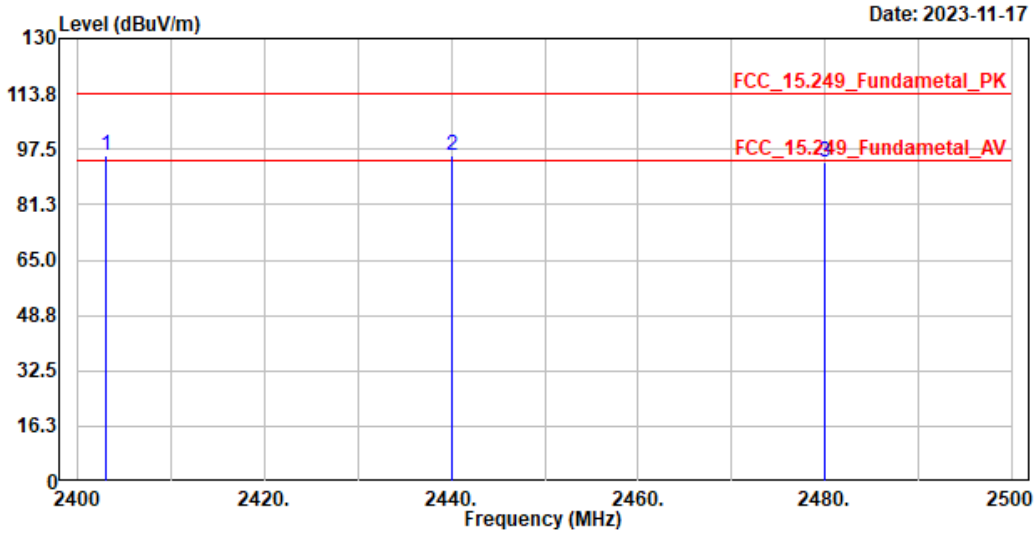
Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)
2403	103.03	-23.098	79.932	-14.068	94.000
2441	103.05	-23.098	79.952	-14.048	94.000
2480	102.37	-23.098	79.272	-14.728	94.000

Note:

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

Site :HY-CB01
Condition :3m ,Vertical
Mode :TX_Fundamantal_Z軸
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	95.61	113.97	-18.36	89.98	5.63	Peak
2	2440.000	95.54	113.97	-18.43	89.94	5.60	Peak
3	2480.000	93.89	113.97	-20.08	88.22	5.67	Peak

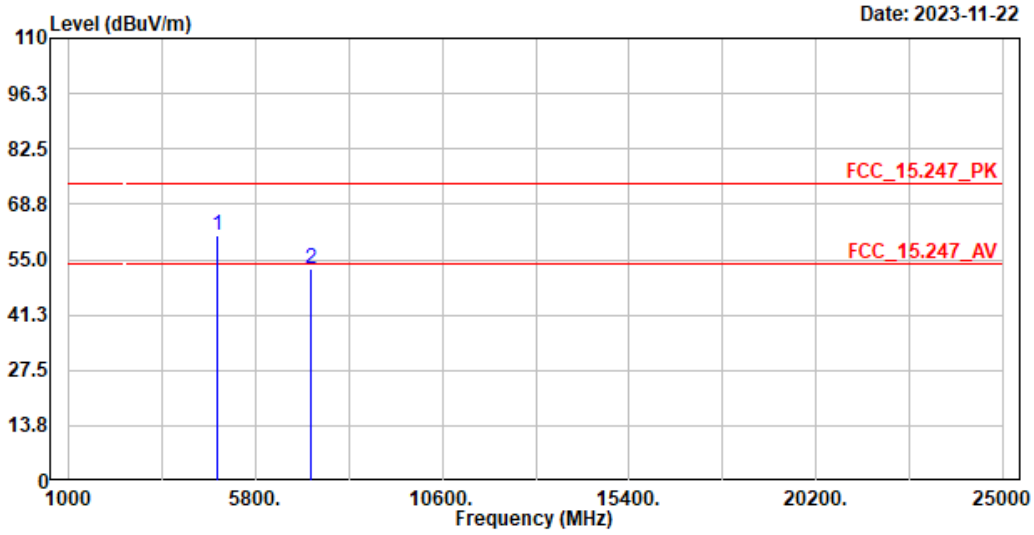
Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)
2403	95.61	-23.098	72.512	-21.488	94.000
2441	95.54	-23.098	72.442	-21.558	94.000
2480	93.89	-23.098	70.792	-23.208	94.000

Note:

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

Site :HY-CB01
Condition :3m ,HORIZONTAL
Mode :TX_wireless_2403MHz
TEST BY :Sam



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	4806.000	60.89	74.00	-13.11	74.41	-13.52	Peak
2	7209.000	52.70	74.00	-21.30	62.16	-9.46	Peak

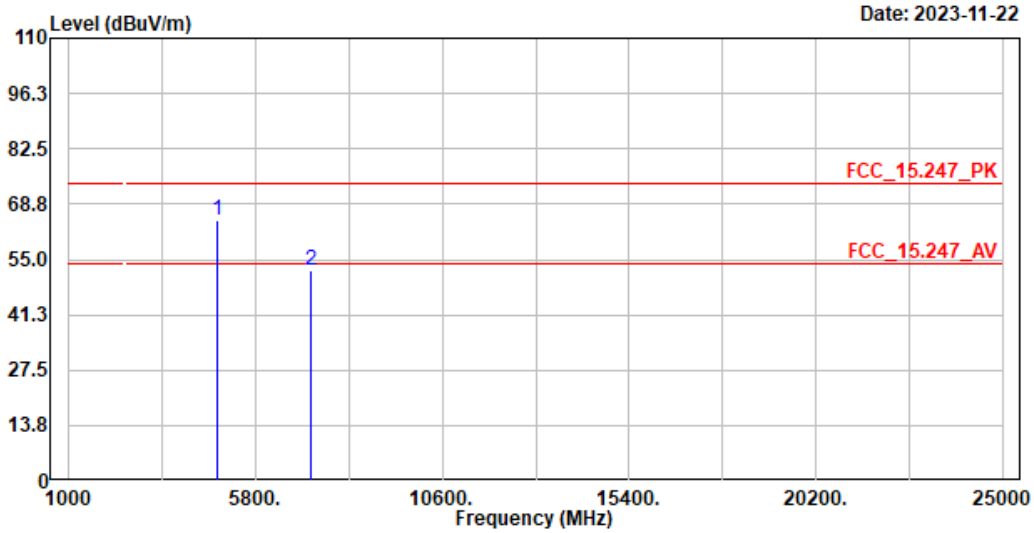
Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)
4806	60.89	-23.098	37.792	-16.208	54.000

Note:

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

Site :HY-CB01
Condition :3m ,VERTICAL
Mode :TX_wireless_2403MHz
TEST BY :Sam



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	4806.000	64.84	74.00	-9.16	78.36	-13.52	Peak
2	7209.000	52.14	74.00	-21.86	61.60	-9.46	Peak

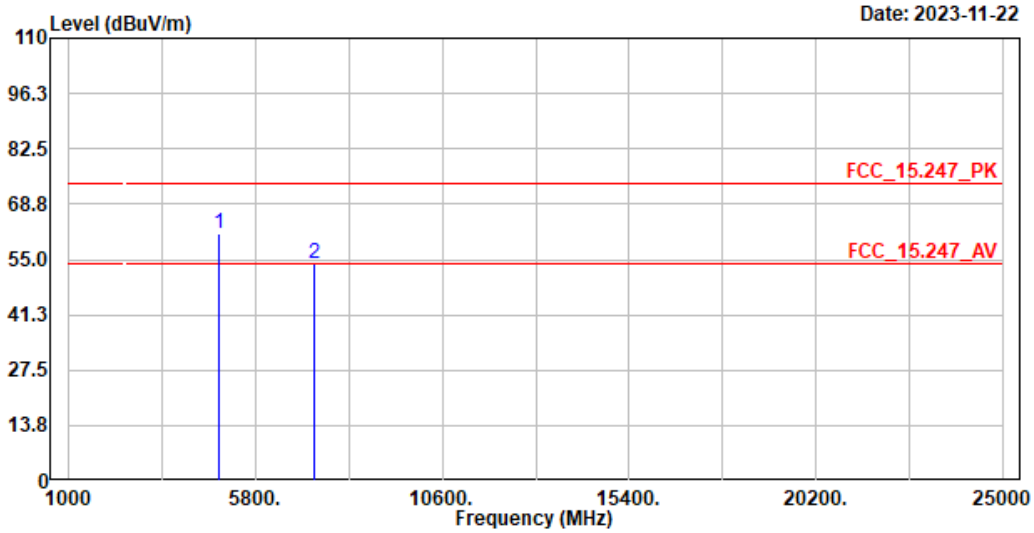
Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)
4806	64.84	-23.098	41.742	-12.258	54.000

Note:

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

Site :HY-CB01
Condition :3m ,HORIZONTAL
Mode :TX_wireless_2440MHz
TEST BY :Sam



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	4880.000	61.33	74.00	-12.67	74.68	-13.35	Peak
2	7320.000	54.01	74.00	-19.99	63.22	-9.21	Peak

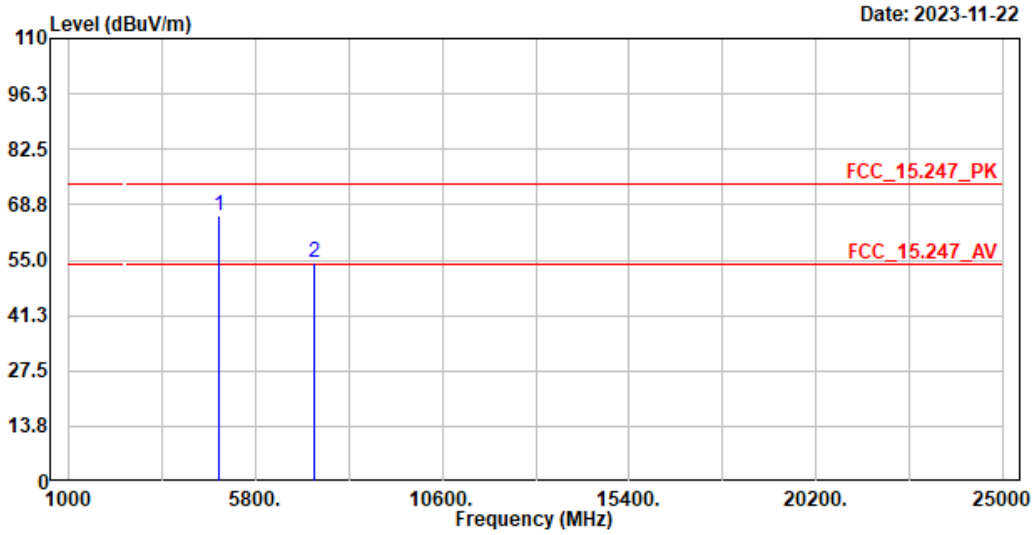
Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
4880	61.33	-23.098	38.232	-15.768	54.000
7320	54.01	-23.098	30.912	-23.088	54.000

Note:

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

```
Site       :HY-CB01
Condition  :3m    ,VERTICAL
Mode       :TX_wireless_2440MHz
TEST BY    :Sam
```



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	4880.000	66.05	74.00	-7.95	79.40	-13.35	Peak
2	7320.000	54.29	74.00	-19.71	63.50	-9.21	Peak

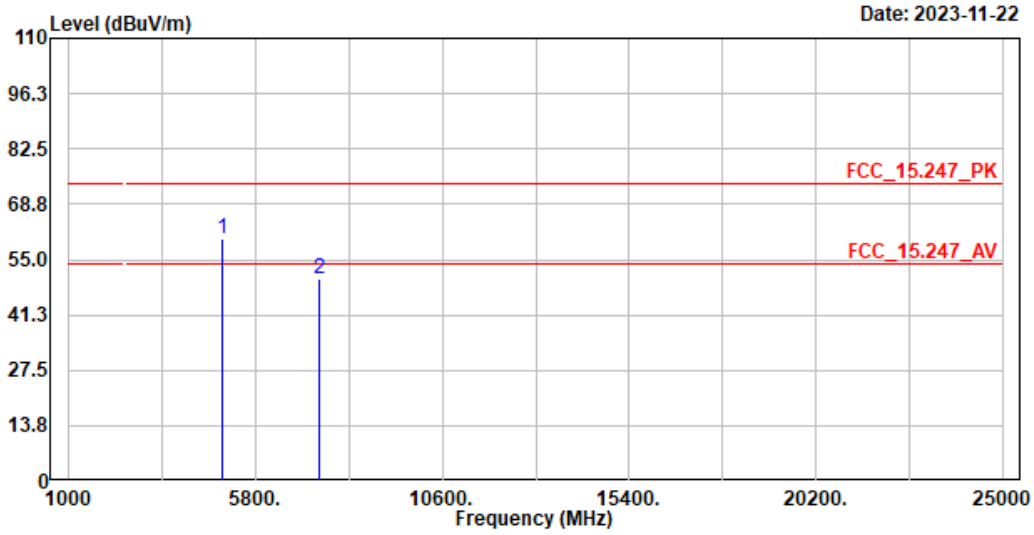
Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)
4880	66.05	-23.098	42.952	-11.048	54.000
7320	54.29	-23.098	31.192	-22.808	54.000

Note:

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

Site :HY-CB01
Condition :3m ,HORIZONTAL
Mode :TX_wireless_2480MHz
TEST BY :Sam



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	4960.000	60.29	74.00	-13.71	73.49	-13.20	Peak
2	7440.000	50.37	74.00	-23.63	59.61	-9.24	Peak

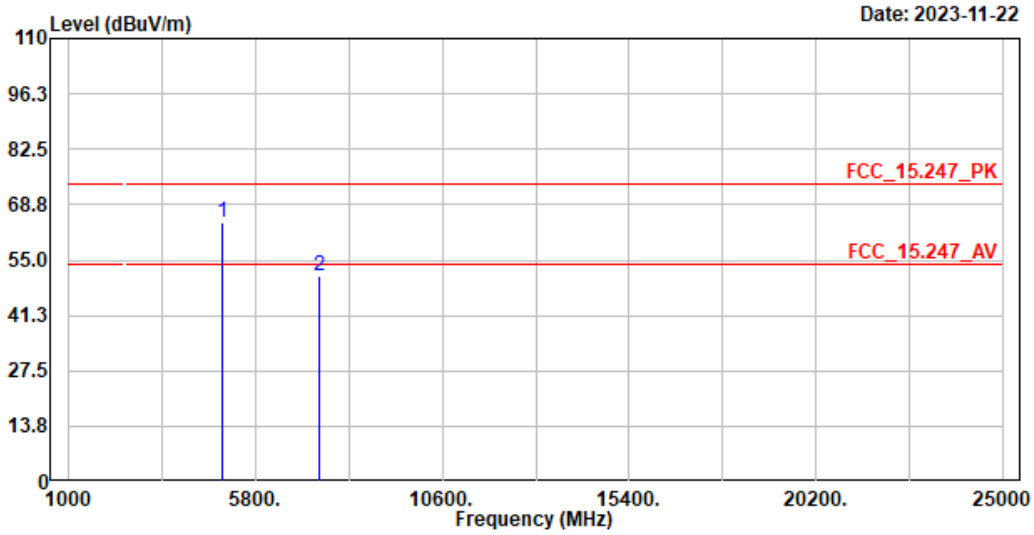
Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)
4960	60.29	-23.098	37.192	-16.808	54.000

Note:

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

Site :HY-CB01
Condition :3m ,VERTICAL
Mode :TX_wireless_2480MHz
TEST BY :Sam



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	4960.000	64.46	74.00	-9.54	77.66	-13.20	Peak
2	7440.000	50.99	74.00	-23.01	60.23	-9.24	Peak

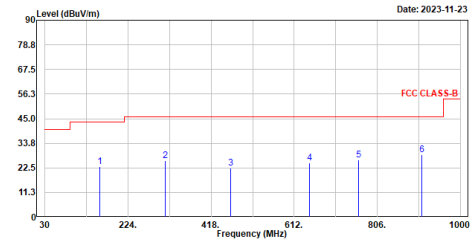
Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)
4960	64.46	-23.098	41.362	-12.638	54.000

Note:

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

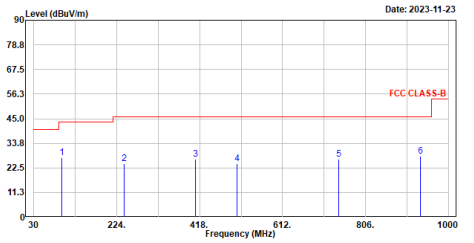
Site :HY-CB01
Condition :3m ,HORIZONTAL
Mode :TX_wireless_2440MHz
TEST BY :Caster



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	159.010	23.26	43.50	-20.24	46.80	-23.54	QP
2	310.330	25.72	46.00	-20.28	48.29	-22.57	QP
3	464.560	22.47	46.00	-23.53	40.85	-18.38	QP
4	647.890	24.82	46.00	-21.18	39.58	-14.76	QP
5	762.350	26.01	46.00	-19.99	38.83	-12.82	QP
6	909.790	28.60	46.00	-17.40	39.91	-11.31	QP

Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission under 30MHz was not included since the emission levels are very low against the limit.

Site :HY-CB01
Condition :3m ,VERTICAL
Mode :TX_wireless_2440MHz
TEST BY :Caster



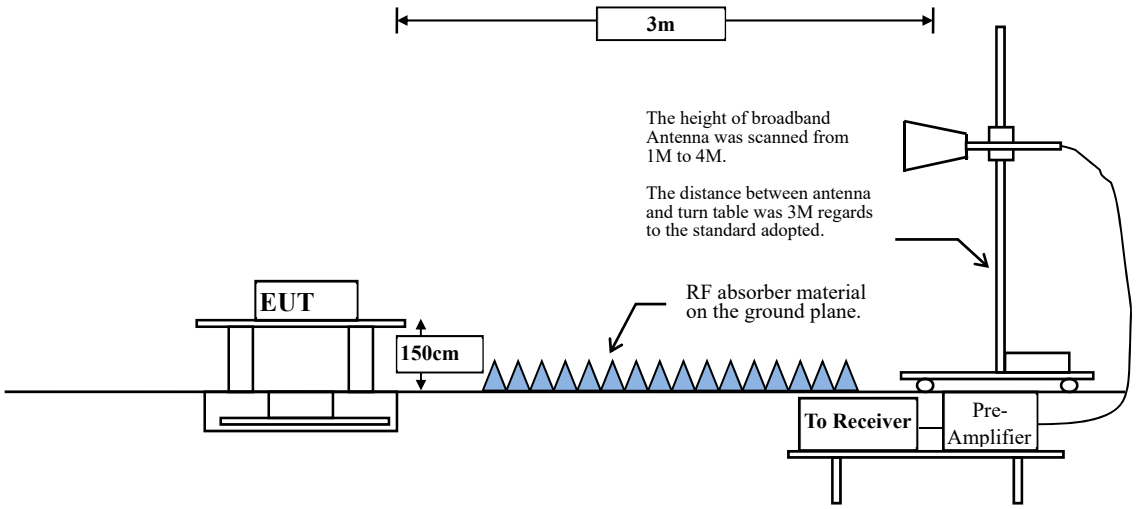
No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	94.990	27.16	43.50	-16.34	55.99	-28.83	QP
2	241.460	24.48	46.00	-21.52	49.34	-24.86	QP
3	408.300	26.34	46.00	-19.66	46.23	-19.89	QP
4	506.270	24.59	46.00	-21.41	42.27	-17.68	QP
5	742.950	26.64	46.00	-19.36	39.74	-13.10	QP
6	934.040	27.89	46.00	-18.11	38.75	-10.86	QP

Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission under 30MHz was not included since the emission levels are very low against the limit.

4. Band Edge

4.1. Test Setup

RF Radiated Measurement:



4.2. Limits

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

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

Remarks: E field strength (dBμV /m) = 20 log E field strength (uV/m)

4.3. Test Procedure

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

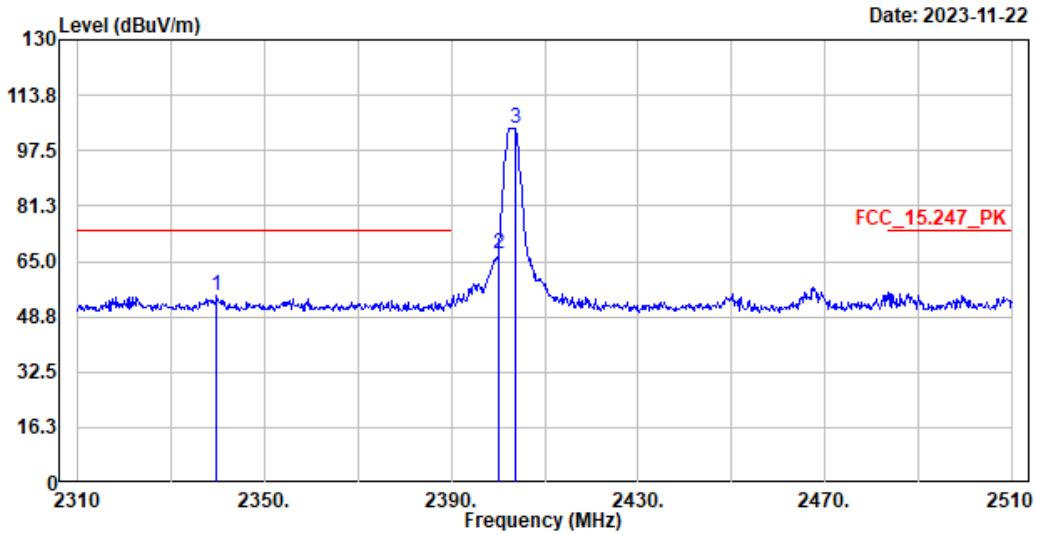
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

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

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

4.4. Test Result of Band Edge

```
Site       :HY-CB01
Condition  :3m    ,HORIZONTAL
Mode       :TX_wireless_2403MHz
TEST BY    :Caster
```



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	2339.800	54.90	74.00	-19.10	49.14	5.76	Peak
2	2400.000	67.41	------	------	61.78	5.63	Peak
3	2403.600	103.97	------	------	98.34	5.63	Peak

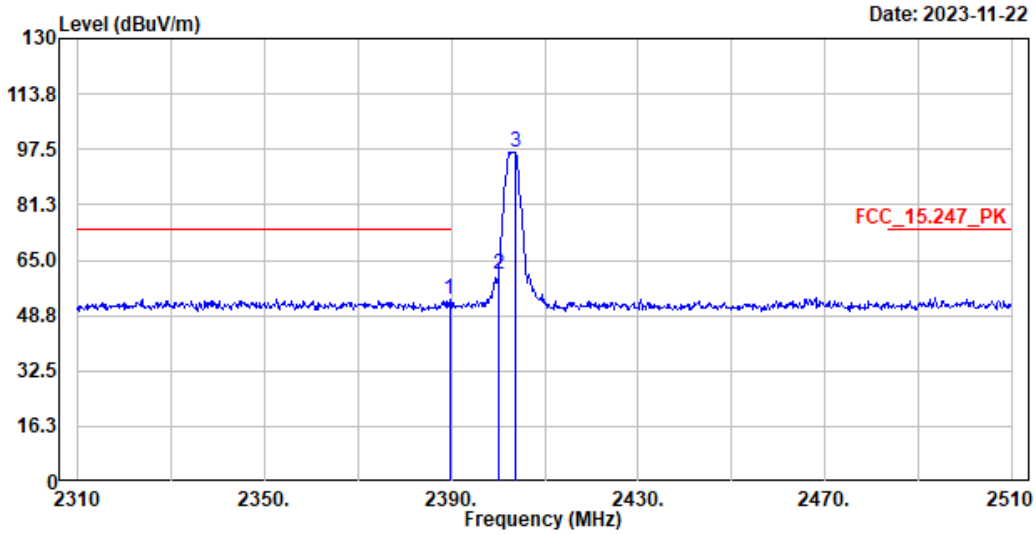
```
Note:
1. Level = Read Level + Factor
2. Factor = Antenna  Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit
   and not show in test report.
```

Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)	Result
2339.8	54.9	-23.098	31.802	-22.198	54.000	Pass
2400	67.41	-23.098	44.312	-9.688	54.000	Pass
2403.6	103.97	-23.098	80.872	--	--	Pass

Note:

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

```
Site       :HY-CB01
Condition  :3m    ,Vertical
Mode       :TX_wireless_2403MHz
TEST BY    :Caster
```



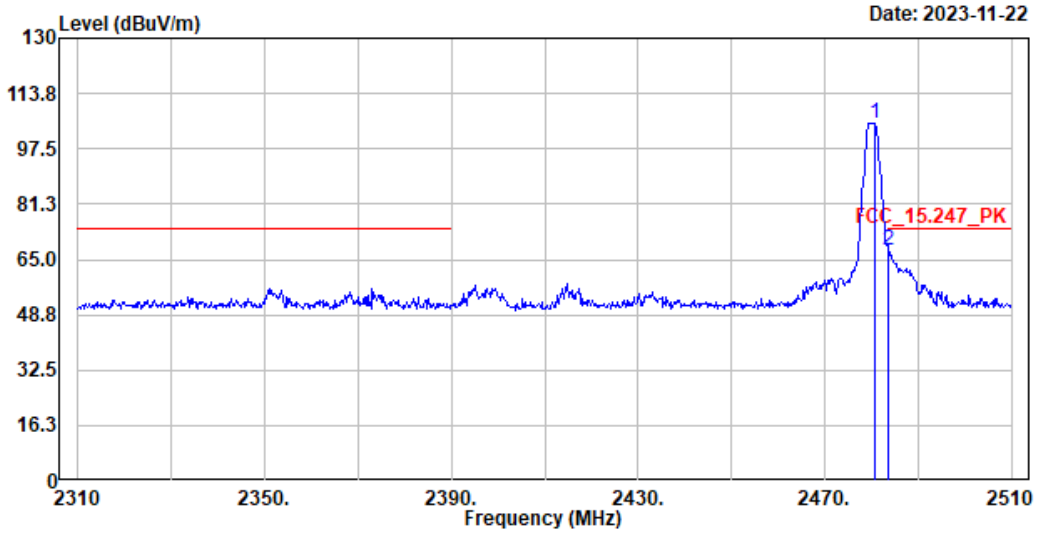
No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	2389.600	53.40	74.00	-20.60	47.74	5.66	Peak
2	2400.000	60.67	------	------	55.04	5.63	Peak
3	2403.600	96.68	------	------	91.05	5.63	Peak

Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)	Result
2389.6	53.4	-23.098	30.302	-23.698	54.000	Pass
2400	60.67	-23.098	37.572	-16.428	54.000	Pass
2403.6	96.68	-23.098	73.582	--	--	Pass

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

Site :HY-CB01
Condition :3m ,HORIZONTAL
Mode :TX_wireless_2480MHz
TEST BY :Caster



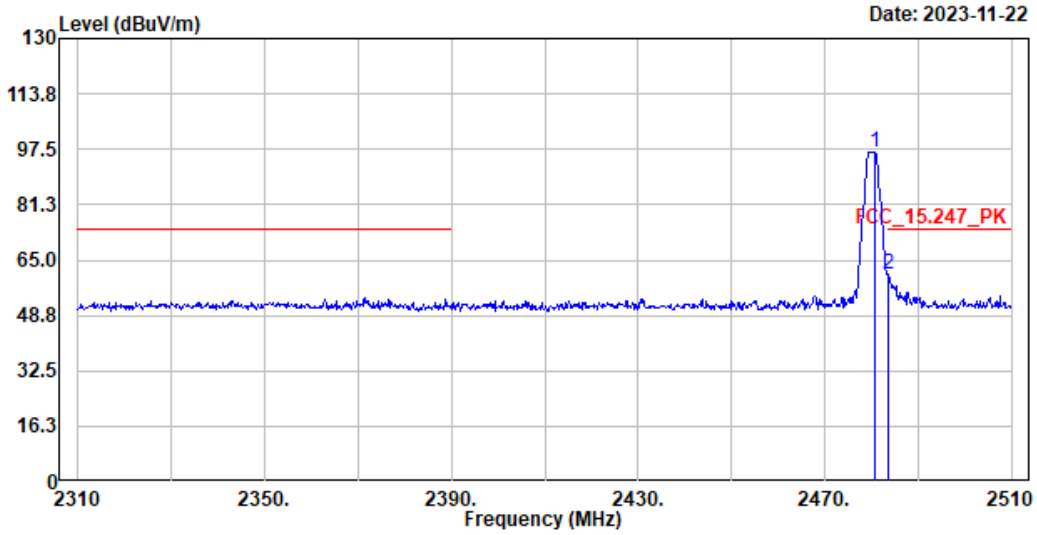
No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	2480.600	104.95	------	------	99.27	5.68	Peak
2	2483.600	67.91	74.00	-6.09	62.22	5.69	Peak

Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)	Result
2480.6	104.95	-23.098	81.852	--	--	Pass
2483.6	67.91	-23.098	44.812	-9.188	54.000	Pass

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

Site :HY-CB01
Condition :3m ,VERTICAL
Mode :TX_wireless_2480MHz
TEST BY :Caster



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	2480.600	96.82	------	------	91.14	5.68	Peak
2	2483.600	60.84	74.00	-13.16	55.15	5.69	Peak

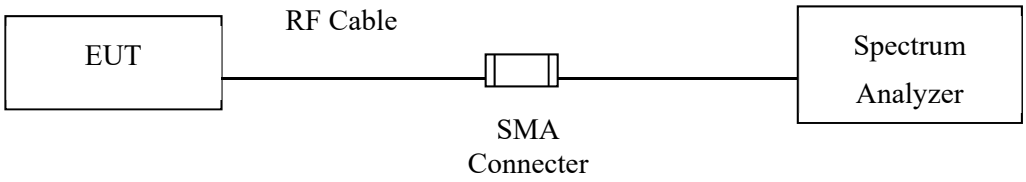
Note:
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)	Result
2480.6	96.82	-23.098	73.722	--	--	Pass
2483.6	60.84	-23.098	37.742	-16.258	54.000	Pass

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

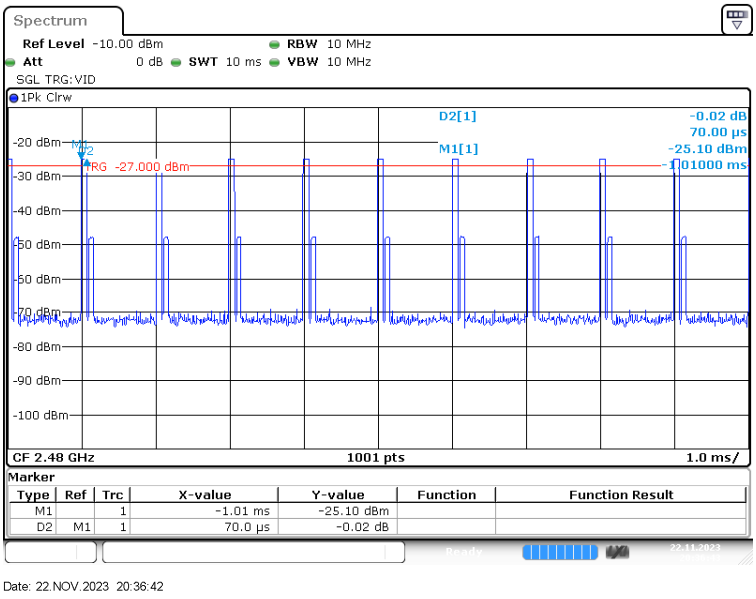
5. Duty Cycle

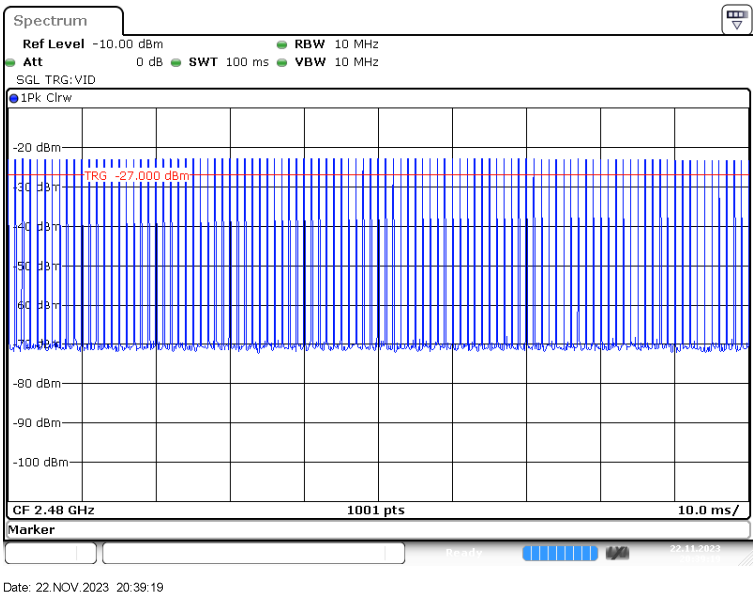
5.1. Test Setup



5.2. Test Result of Duty Cycle

Product : GAMING MOUSE
Test Item : Duty Cycle Data
Test Mode : Transmit





Time on of 100ms = 7.00 ms
Duty Cycle= 7.00 ms / 100ms= 0.07
Duty Cycle correction factor= 20 LOG 0.007= -23.098 dB

Duty Cycle correction factor	**-23.098 dB**