

FCC Test Report

Product Name	Wireless Mouse
Model No.	GM31W
FCC ID	I4L-GM31W

Applicant	MICRO-STAR INT'L Co., LTD.
Address	No.69, Lide St., Zhonghe Dist., New Taipei City 235, Taiwan (R.O.C.)

Date of Receipt	Feb. 06, 2022
Issued Date	Apr. 13, 2022
Report No.	2220009R-RFUSOTHV06-A
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: Apr. 13, 2022

Report No.: 2220009R-RFUSOTHV06-A



Product Name	Wireless Mouse
Applicant	MICRO-STAR INT'L Co., LTD.
Address	No.69, Lide St., Zhonghe Dist., New Taipei City 235, Taiwan (R.O.C.)
Manufacturer	CHUAND ELECTRONIC & TECHNOLOGY, LTD
Model No.	GM31W
FCC ID	I4L-GM31W
EUT Rated Voltage	DC 5V (Power by USB) or DC 3.7V (Power by Battery)
EUT Test Voltage	DC 5V (Power by USB)
Trade Name	msi
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By

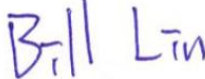
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(Senior Project Specialist / Genie Chang)

Tested By

:



(Senior Engineer / Bill Lin)

Approved By

:



(Senior Engineer / Alan Chen)

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Appendix 1: EUT Test Photographs

Appendix 2: Product Photos: Please refer to the file: 2220009R-Product Photos-Wireless Mouse

Revision History

Report No.	Version	Description	Issued Date
2220009R-RFUSOTHV06-A	V1.0	Initial issue of report.	2022-04-13

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Wireless Mouse
Trade Name	msi
Model No.	GM31W
FCC ID	I4L-GM31W
Frequency Range	2422 – 2478MHz
Channel Number	8CH
Type of Modulation	GFSK
Antenna Type	PCB Printed Antenna
Antenna Gain	Refer to the table “Antenna List”
Channel Control	Auto
Charge	MFR: msi, M/N: GM31WC
USB Cable	Non-Shielded, 2.1m
Antenna Gain	Refer to the table “Antenna List”

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	CHUAND ELECTRONIC & TECHNOLOGY,LTD	GM31W	PCB Printed Antenna	1.67dBi 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: 2422MHz		Channel 02: 2425MHz		Channel 03: 2446MHz		Channel 04: 2449MHz	
Channel 05: 2452MHz		Channel 06: 2472MHz		Channel 07: 2475MHz		Channel 08: 2478MHz	

Note:

1. The EUT is a Wireless Mouse with a built-in 2.4GHz wireless transceiver.
2. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
3. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.
4. 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: Charge Mode
	Mode 3: Normal mode

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	Inspiron 15 3000	GT5JPJ2	N/A

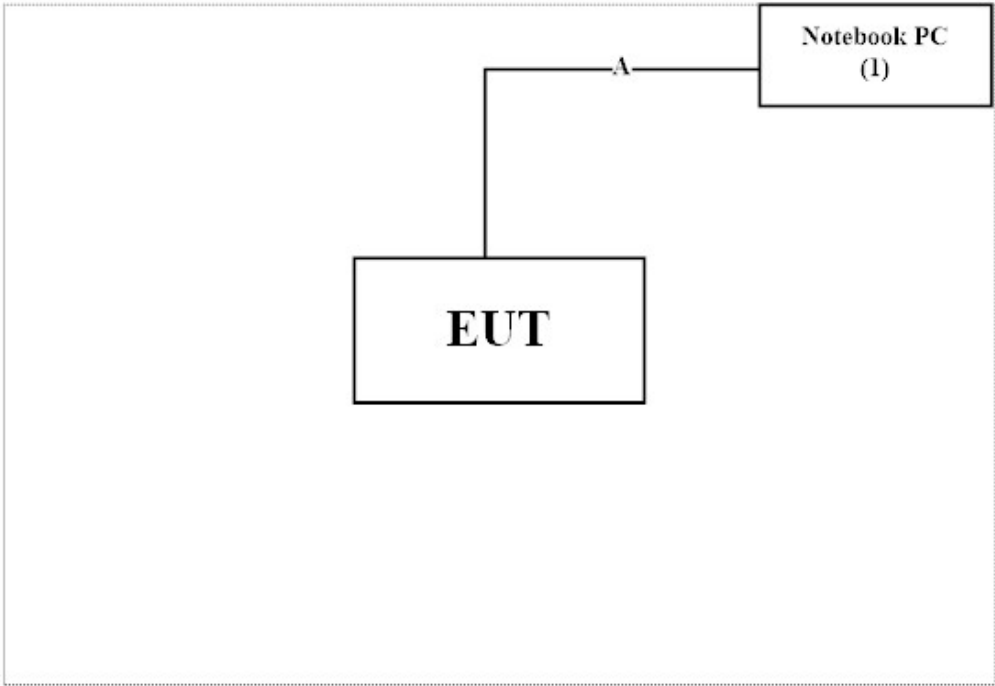
Signal Cable Type		Signal cable Description
A	USB Cable	Non-shielded, 2.1m

Charge mode:

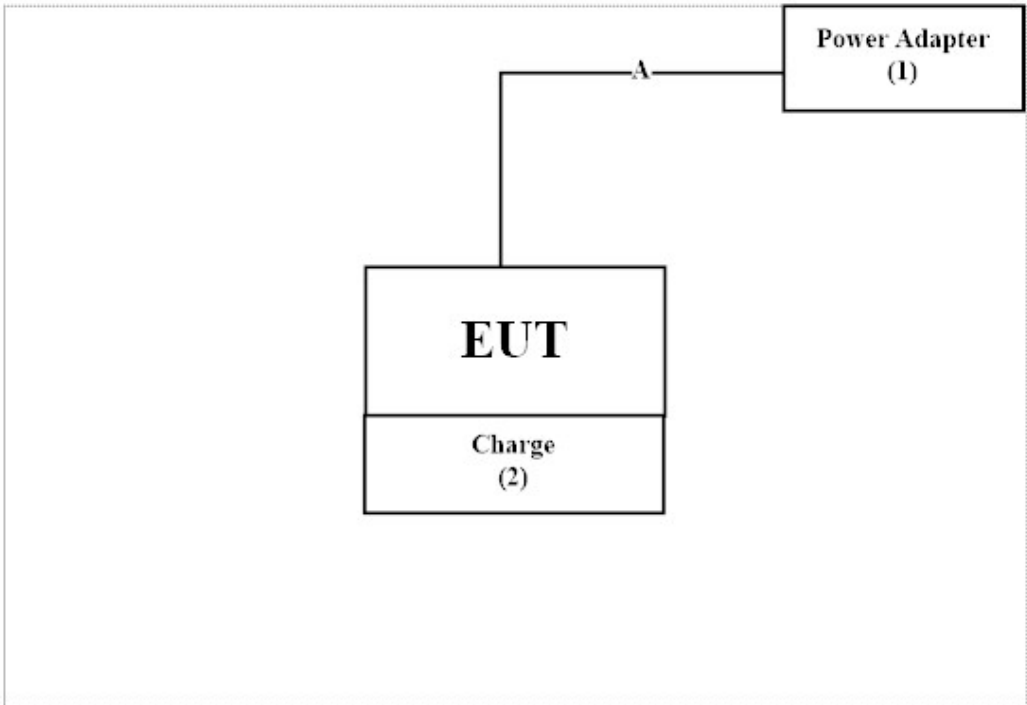
Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Power Adapter	Apple	A1385	N/A	N/A
2	Charge	msi	GM31WC	N/A	N/A

Signal Cable Type		Signal cable Description
A	USB Cable	Non-shielded, 2.1m

1.3. Configuration of Test System



Charge mode



1.4. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.3.
- (2) Execute “GM31W-Mouse.bat” program 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	22.1°C
	Humidity (%RH)	10~90 %	67.7%
Radiated Emission	Temperature (°C)	10~40 °C	21°C
	Humidity (%RH)	10~90 %	60%

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
Address : No. 5-22, Ruishukeng Linkou District, New Taipei City,
24451, Taiwan

Performed Location : No. 26, Huaya 1st Rd., Guishan Dist., Taoyuan City
333411, Taiwan, R.O.C.

Phone number : +886-3-275-7255
Fax number : +866-3-327-8031
Email address : 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	2021/06/19	2022/06/18
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 : AUDIX e3 V9.

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	9168-0675	2021/08/11	2022/08/10
X	Pre-Amplifier	SGH	EM330	60736	2021/08/11	2022/08/10
X	Filter	MICRO TRONICS	BRM50702	G251	2021/09/16	2022/09/15
	Filter	MICRO TRONICS	BRM50716	G188	2021/09/16	2022/09/15
X	EMI Test Receiver	R&S	ESR3	102792	2021/12/15	2022/12/14
X	Spectrum Analyzer	R&S	FSV3044	101115	2022/01/10	2023/01/09
X	Coaxial Cable	SUHNER	SUCOFLEX 106	25450/6	2022/03/05	2023/03/04
	Coaxial Cable	SGH	HA800	GD20110222-8		
	Coaxial Cable	SGH	SGH18	2021003-8		
	Coaxial Cable	EMCI	EMC106	151113		

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 : AUDIX e3 V9.

For Radiated measurements /966-4

	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due. Date
X	Horn Antenna	ETS-Lindgren	3117	00228113	2021/06/23	2022/06/22
	Pre-Amplifier	SGH	PRAMP118	20200701	2021/08/11	2022/08/10
	Pre-Amplifier	SGH	PRAMP0510	20200703	2021/08/11	2022/08/10
X	Filter	MICRO TRONICS	BRM50702	G251	2021/09/16	2022/09/15
	Filter	MICRO TRONICS	BRM50716	G188	2021/09/16	2022/09/15
X	EMI Test Receiver	R&S	ESR3	102792	2021/12/15	2022/12/14
X	Spectrum Analyzer	R&S	FSV40	101146	2021/03/19	2022/03/18
	Coaxial Cable	SUHNER	SUCOFLEX 106	RF003	2022/03/03	2023/03/02
	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2021/06/10	2022/06/09

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 : AUDIX e3 V9.

1.7. Uncertainty

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

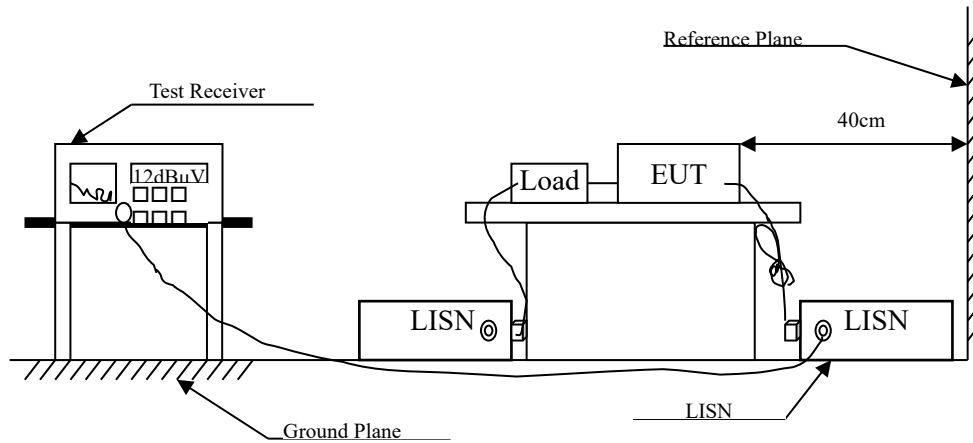
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

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 (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.

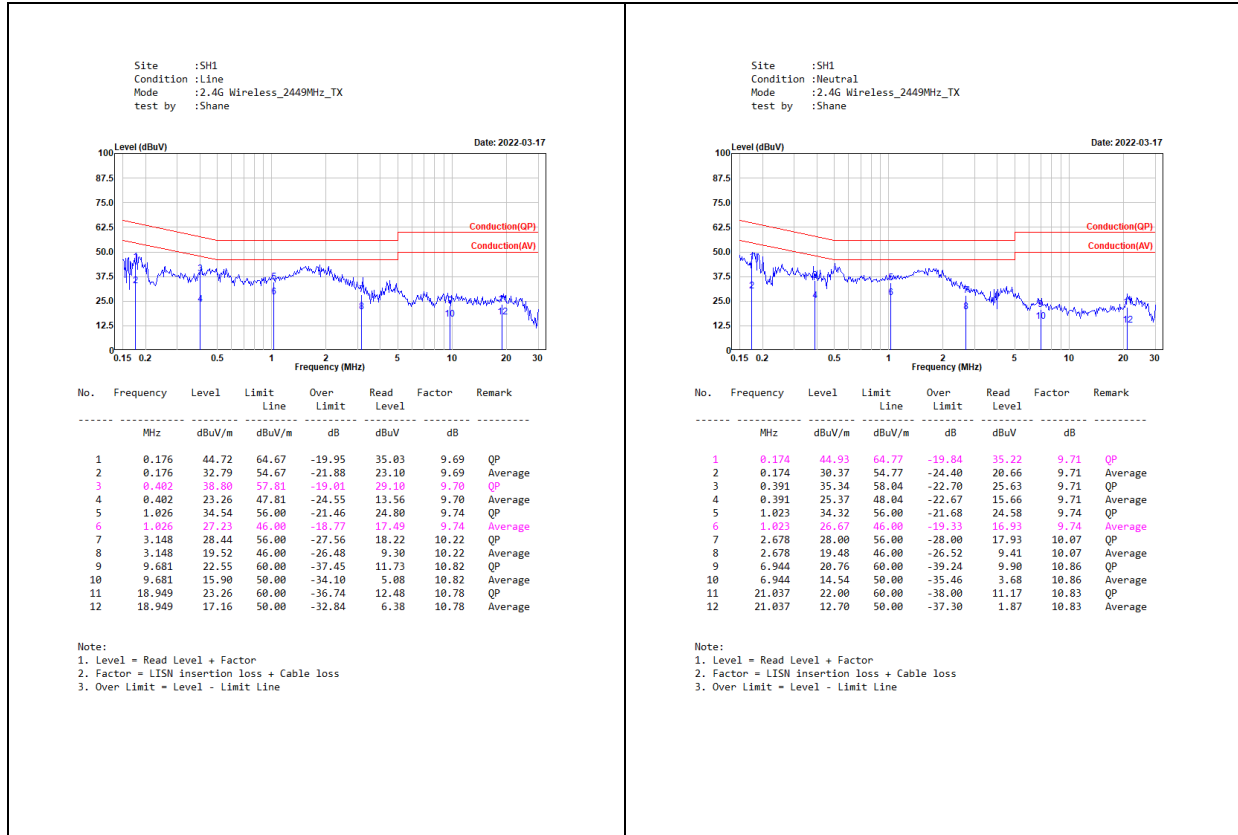
2.3. Test Procedure

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.)

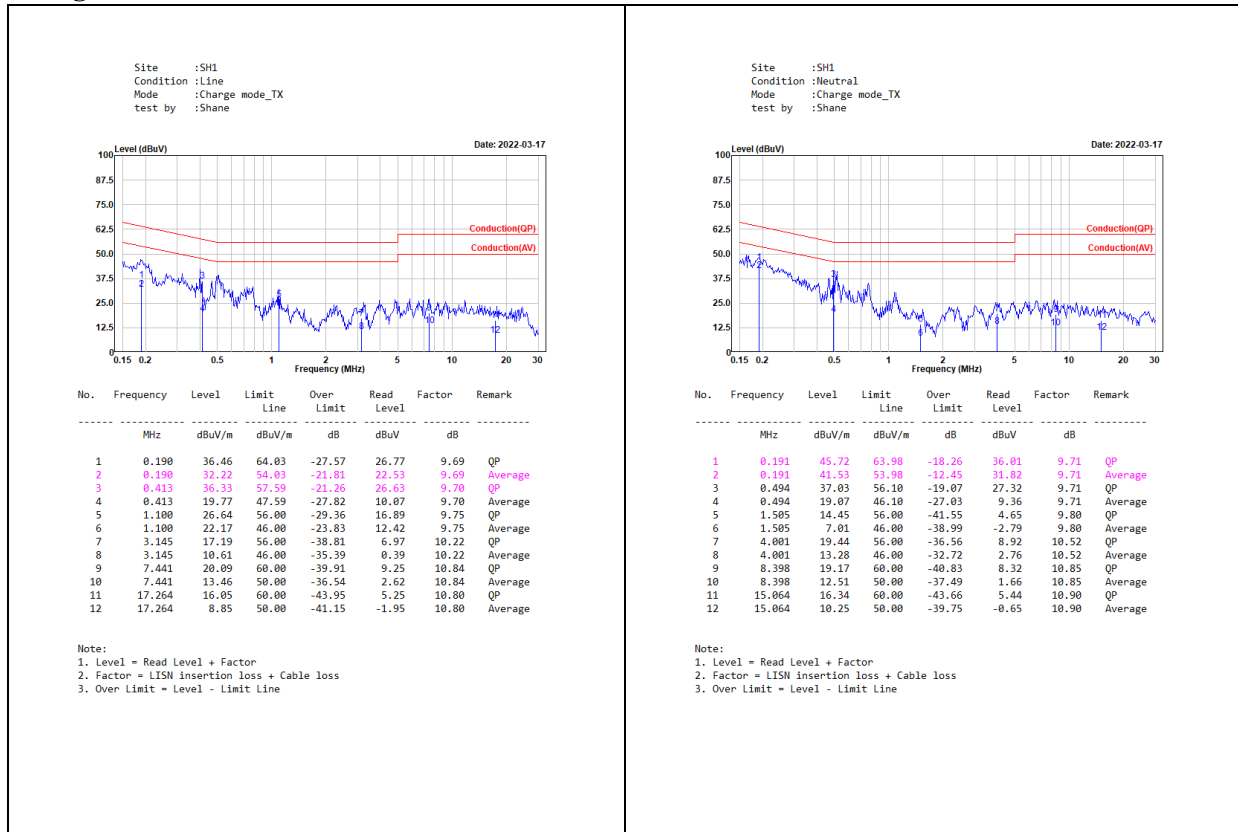
Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

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

2.4. Test Result of Conducted Emission



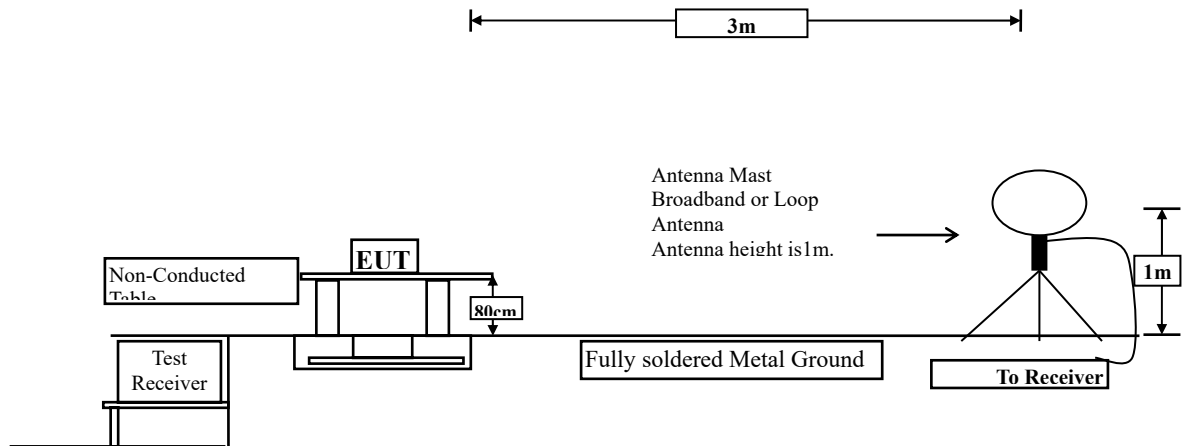
Charge Mode



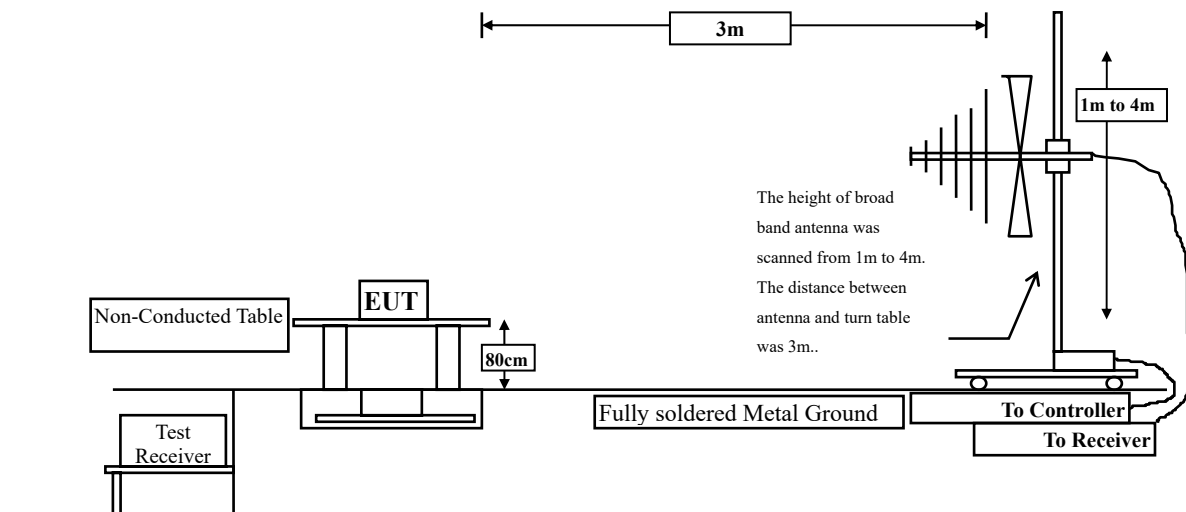
3. Radiated Emission

3.1. Test Setup

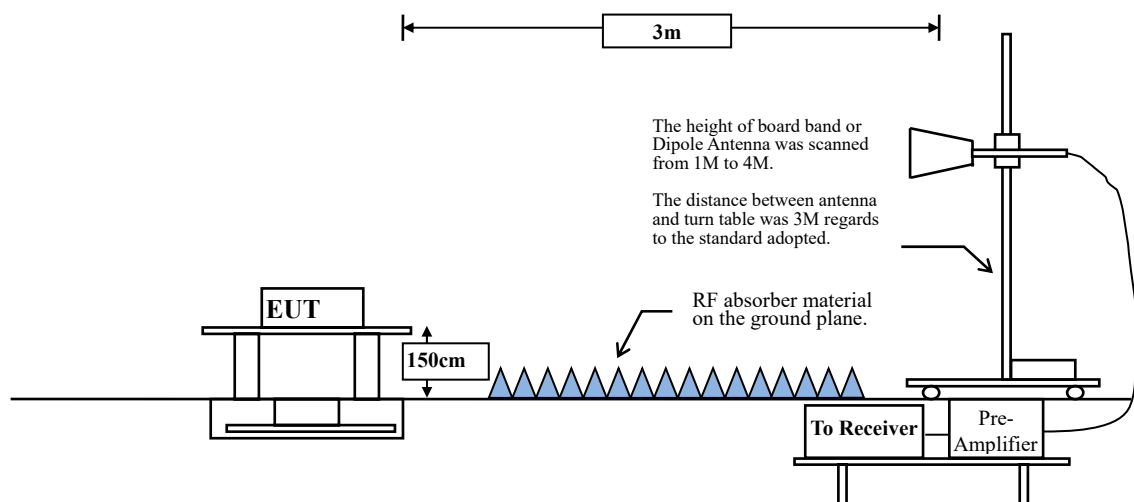
Radiated Emission Under 30MHz



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)

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.

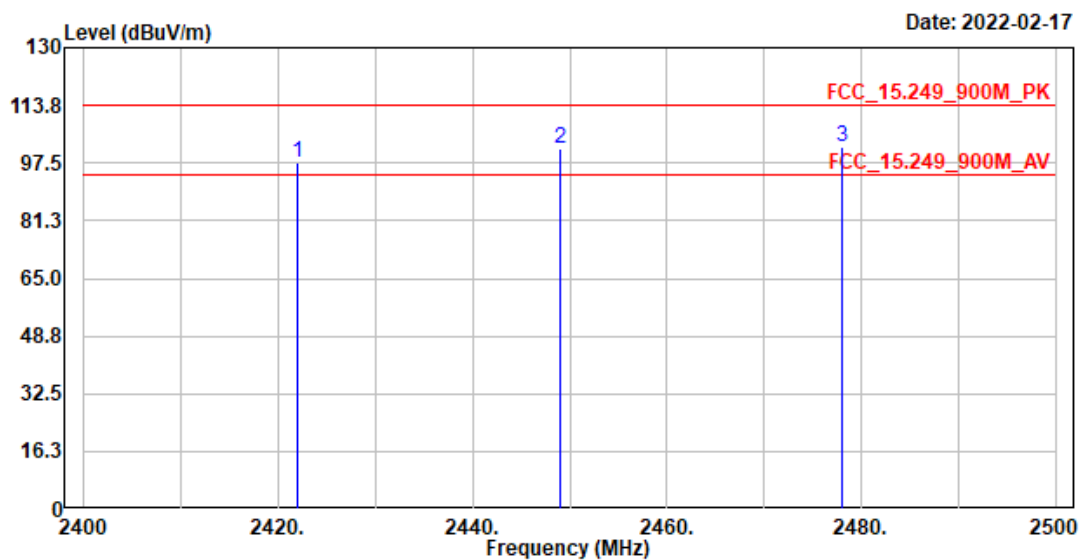
The measurement is divided into the Preliminary Measurement and the Final Measurement.

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 :966-4
 Condition :3m ,Horizontal
 mode :TX_wireless_X
 Test by :Caster



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2422.000	97.59	113.97	-16.38	84.85	12.74	Peak
2	2449.000	101.48	113.97	-12.49	88.72	12.76	Peak
3	2478.000	102.01	113.97	-11.96	89.21	12.80	Peak

Note:

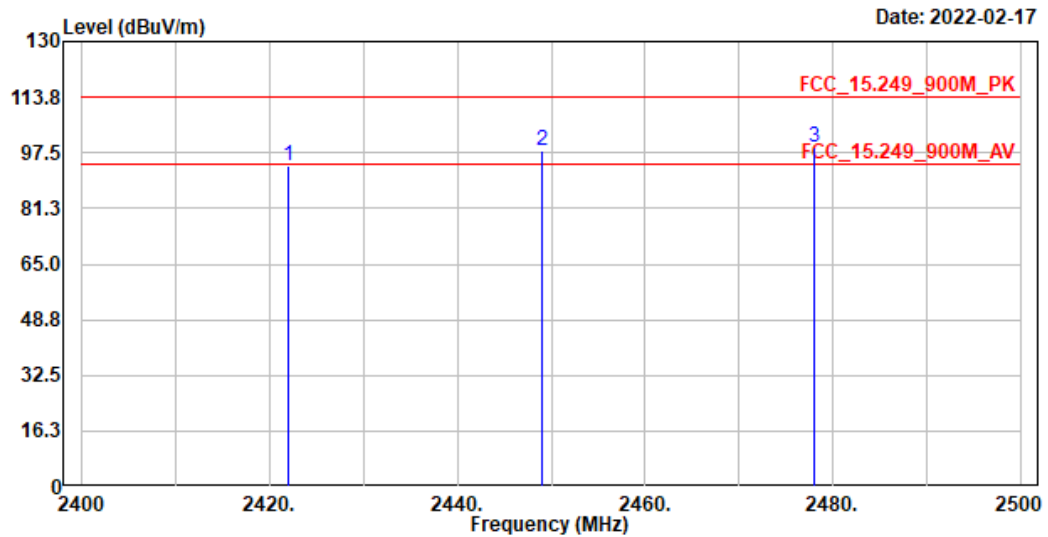
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2422	97.59	-35.193	62.397	-31.573	93.970
2449	101.48	-35.193	66.287	-27.683	93.970
2478	102.01	-35.193	66.817	-27.153	93.970

Note:

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

Site :966-4
 Condition :3m ,Vertical
 mode :TX_wireless_X
 Test by :Caster



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2422.000	93.51	113.97	-20.46	81.09	12.42	Peak
2	2449.000	98.00	113.97	-15.97	85.61	12.39	Peak
3	2478.000	98.96	113.97	-15.01	86.55	12.41	Peak

Note:

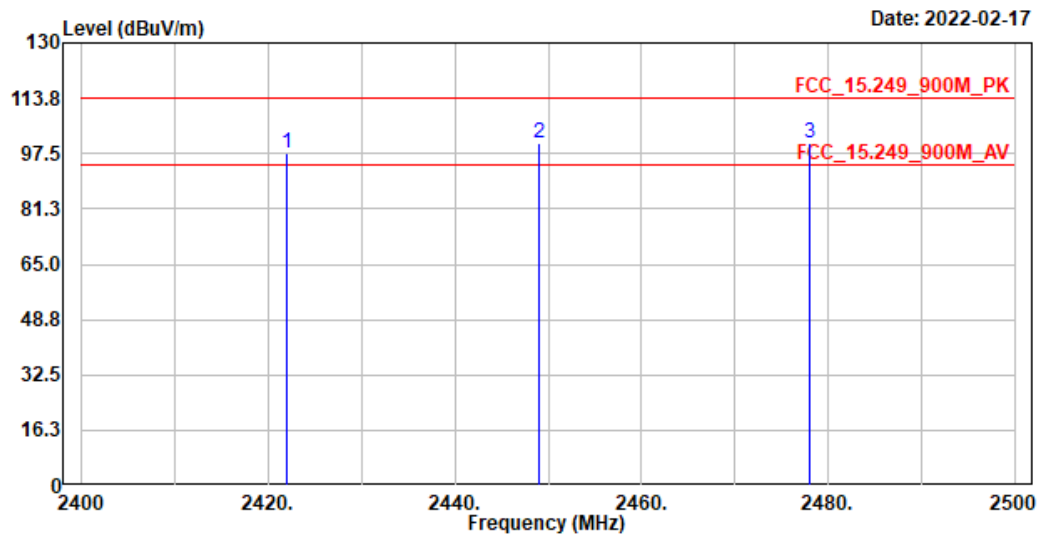
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2422	93.51	-35.193	58.317	-35.653	93.970
2449	98	-35.193	62.807	-31.163	93.970
2478	98.96	-35.193	63.767	-30.203	93.970

Note:

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

Site :966-4
 Condition :3m ,Horizontal
 mode :TX_wireless_Y
 Test by :Caster



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2422.000	97.55	113.97	-16.42	84.81	12.74	Peak
2	2449.000	100.50	113.97	-13.47	87.74	12.76	Peak
3	2478.000	100.42	113.97	-13.55	87.62	12.80	Peak

Note:

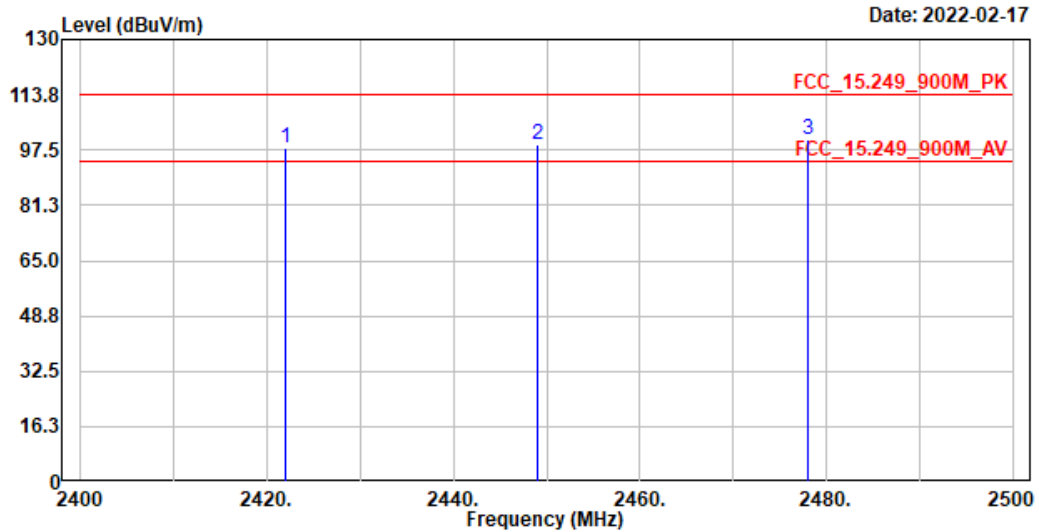
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2422	97.55	-35.193	62.357	-31.613	93.970
2449	100.5	-35.193	65.307	-28.663	93.970
2478	100.42	-35.193	65.227	-28.743	93.970

Note:

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

Site :966-4
 Condition :3m ,VERTICAL
 mode :TX_wireless_Y
 Test by :Caster



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2422.000	98.20	113.97	-15.77	85.75	12.45	Peak
2	2449.000	99.13	113.97	-14.84	86.74	12.39	Peak
3	2478.000	100.42	113.97	-13.55	88.01	12.41	Peak

Note:

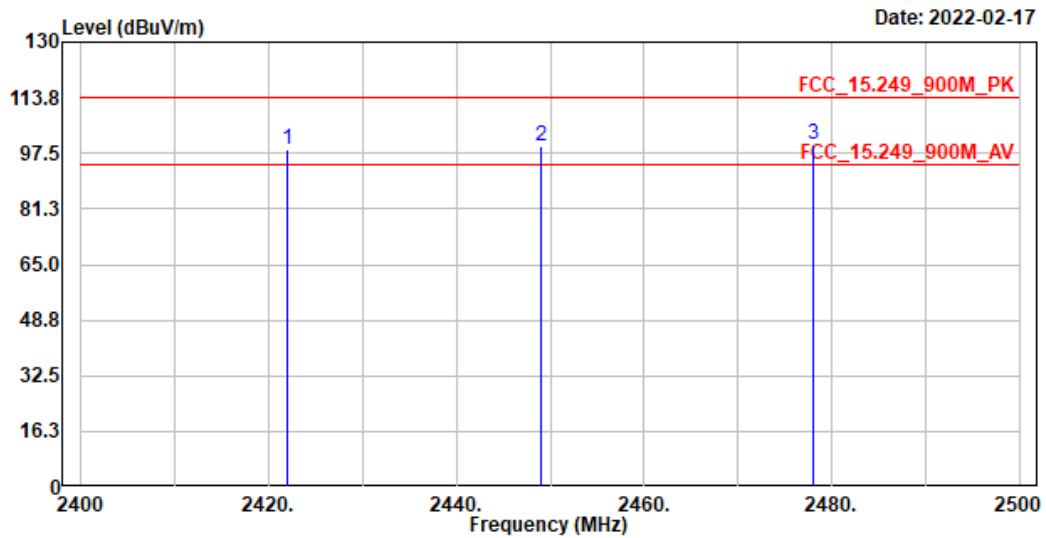
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2422	98.2	-35.193	63.007	-30.963	93.970
2449	99.13	-35.193	63.937	-30.033	93.970
2478	100.42	-35.193	65.227	-28.743	93.970

Note:

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

Site :966-4
 Condition :3m ,Horizontal
 mode :TX_wireless_Z
 Test by :Caster



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2422.000	98.65	113.97	-15.32	85.91	12.74	Peak
2	2449.000	99.37	113.97	-14.60	86.61	12.76	Peak
3	2478.000	100.30	113.97	-13.67	87.50	12.80	Peak

Note:

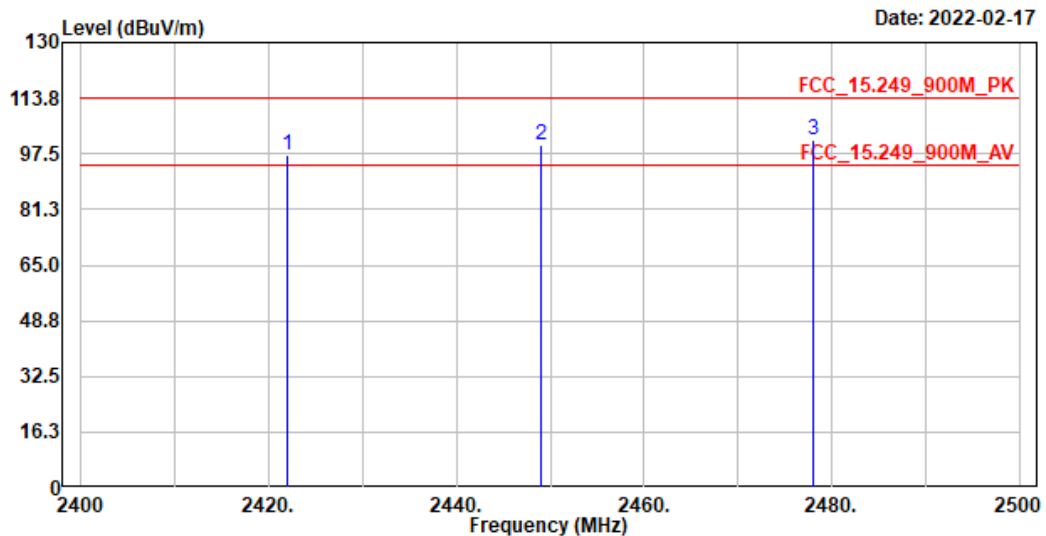
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
2422	98.65	-35.193	63.457	-30.513	93.970
2449	99.37	-35.193	64.177	-29.793	93.970
2478	100.3	-35.193	65.107	-28.863	93.970

Note:

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

Site :966-4
 Condition :3m ,VERTICAL
 mode :TX_wireless_Z
 Test by :Caster



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	2422.000	97.00	113.97	-16.97	84.55	12.45	Peak
2	2449.000	100.20	113.97	-13.77	87.81	12.39	Peak
3	2478.000	101.49	113.97	-12.48	89.08	12.41	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)
2422	97	-35.193	61.807	-32.163	93.970
2449	100.2	-35.193	65.007	-28.963	93.970
2478	101.49	-35.193	66.297	-27.673	93.970

Note:

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



Horizontal

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
7266	59.51	-35.193	24.317	-29.683	54.000	Pass
9688	54.02	-35.193	18.827	-35.173	54.000	Pass

Note:

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

Vertical

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
7266	63.33	-35.193	28.137	-25.863	54.000	Pass

Note:

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



Horizontal

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
7347	57.51	-35.193	22.317	-31.683	54.000	Pass

Note:

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

Vertical

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
7347	58.81	-35.193	23.617	-30.383	54.000	Pass

Note:

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



Horizontal

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
7434	61.37	-35.193	26.177	-27.823	54.000	Pass

Note:

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

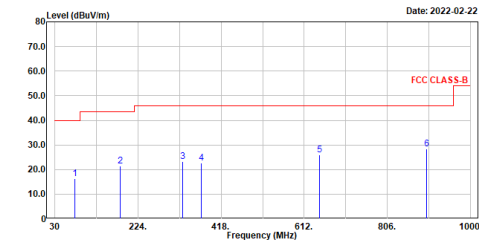
Vertical

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
7434	63.72	-35.193	28.527	-25.473	54.000	Pass

Note:

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

Site :966-1
Condition :3m ,HORIZONTAL
Mode :TX_2.4G Wireless_2449Mhz
TEST BY :Caster

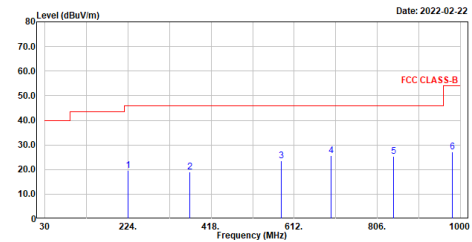


No.	Frequency MHz	Level dBuV/m	Limit dBuV/m	Over Limit dB	Read Level dBuV	Factor dB	Remark
1	76.560	16.16	40.00	-23.84	39.73	-23.57	QP
2	183.260	21.56	43.50	-21.94	42.97	-21.41	QP
3	327.790	23.15	46.00	-22.85	41.52	-18.37	QP
4	372.410	22.51	46.00	-23.49	39.97	-17.46	QP
5	647.890	26.06	46.00	-19.94	37.51	-11.45	QP
6	898.150	28.23	46.00	-17.77	36.58	-8.35	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 :966-1
Condition :3m ,VERTICAL
Mode :TX_2.4G Wireless_2449Mhz
TEST BY :Caster



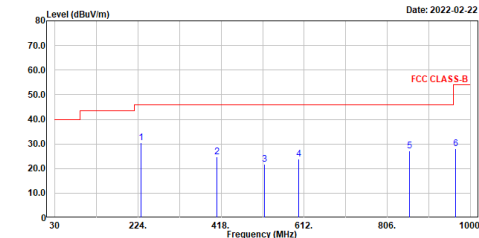
No.	Frequency MHz	Level dBuV/m	Limit dBuV/m	Over Limit dB	Read Level dBuV	Factor dB	Remark
1	224.970	19.71	46.00	-26.29	41.96	-22.25	QP
2	368.530	18.87	46.00	-27.13	36.43	-17.56	QP
3	581.930	23.57	46.00	-22.43	36.20	-12.63	QP
4	698.330	25.56	46.00	-20.44	36.37	-10.81	QP
5	844.800	25.40	46.00	-20.60	34.36	-8.96	QP
6	981.570	27.27	54.00	-26.73	34.74	-7.47	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.

Charge Mode

Site :966-1
Condition :3m ,HORIZONTAL
Mode :TX_2.4G Wireless Charge mode
TEST BY :Caster

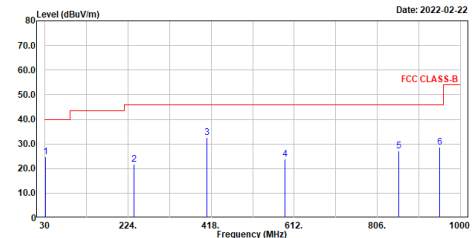


No.	Frequency MHz	Level dBuV/m	Limit dBuV/m	Over Limit dB	Read Level dBuV	Factor dB	Remark
1	230.790	30.36	46.00	-15.64	52.11	-21.75	QP
2	408.300	24.75	46.00	-21.25	41.44	-16.69	QP
3	519.850	21.81	46.00	-24.19	35.85	-14.04	QP
4	599.390	23.99	46.00	-22.01	36.04	-12.05	QP
5	857.410	27.30	46.00	-18.70	36.19	-8.89	QP
6	965.000	28.07	54.00	-25.93	35.66	-7.59	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 :966-1
Condition :3m ,VERTICAL
Mode :TX_2.4G Wireless Charge mode
TEST BY :Caster



No.	Frequency MHz	Level dBuV/m	Limit dBuV/m	Over Limit dB	Read Level dBuV	Factor dB	Remark
1	30.970	24.67	40.00	-15.33	45.79	-21.12	QP
2	237.580	21.82	46.00	-24.18	43.02	-21.20	QP
3	408.300	32.47	46.00	-13.53	49.16	-16.69	QP
4	590.660	23.74	46.00	-22.26	36.07	-12.33	QP
5	855.470	27.24	46.00	-18.76	36.10	-8.86	QP
6	952.470	28.64	46.00	-17.36	36.39	-7.75	QP

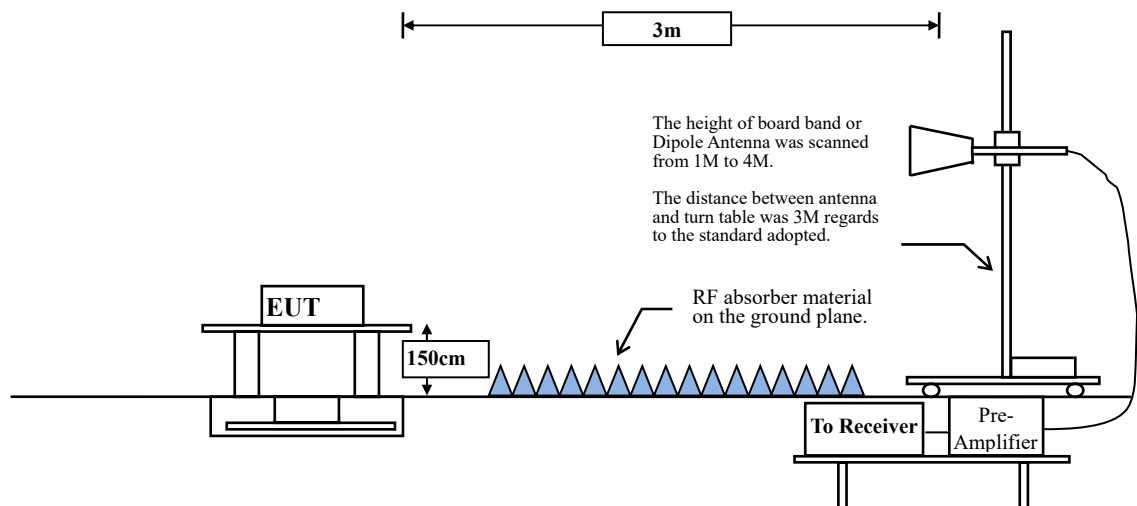
Note:

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.

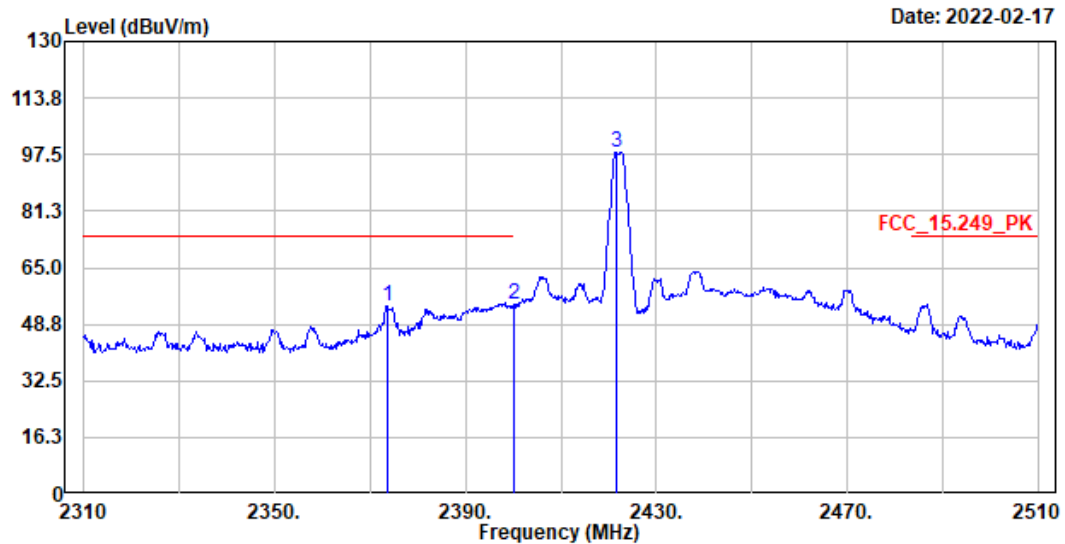
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

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 : 966-4
 Condition : 3m , Horizontal
 mode : TX_wireless_2422Mhz
 Test by : Caster



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	Line	Limit	Level		
			dBuV/m	dB	dBuV	dB	
1	2373.600	54.05	74.00	-19.95	41.38	12.67	Peak
2	2400.000	54.29	74.00	-19.71	41.58	12.71	Peak
3	2421.600	98.16	-----	-----	85.43	12.73	Peak

Note:

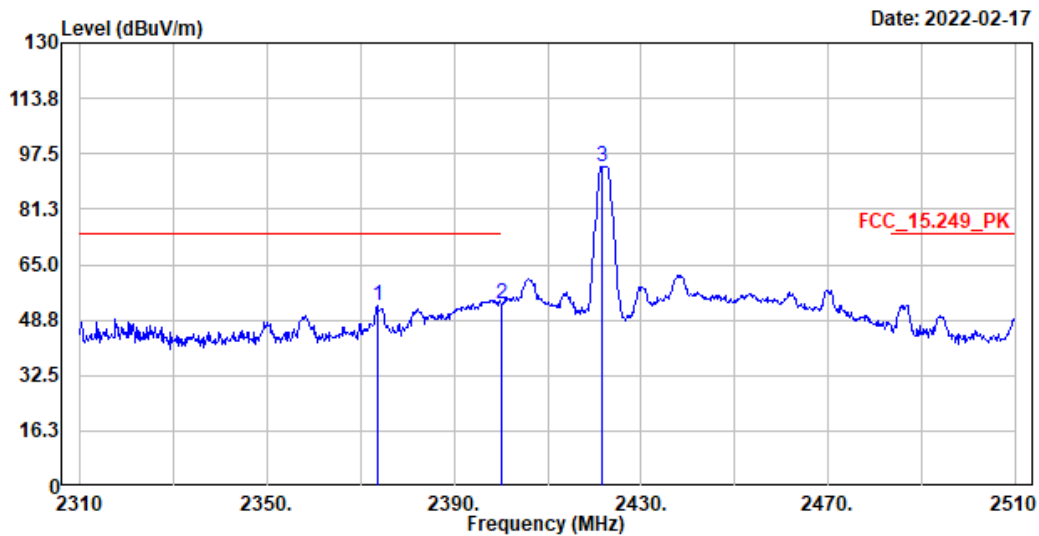
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
2373.6	54.05	-35.193	18.857	-35.143	54.000	Pass
2400	54.29	-35.193	19.097	-34.903	54.000	Pass
2421.6	98.16	-35.193	62.967	--	--	Pass

Note:

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

Site :966-4
 Condition :3m ,VERTICAL
 mode :TX_wireless_2422Mhz
 Test by :Caster



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	Line	Limit	Level		
			dBuV/m	dB	dBuV	dB	
1	2373.600	52.79	74.00	-21.21	40.34	12.45	Peak
2	2400.000	53.68	74.00	-20.32	41.21	12.47	Peak
3	2421.600	93.79	-----	-----	81.35	12.44	Peak

Note:

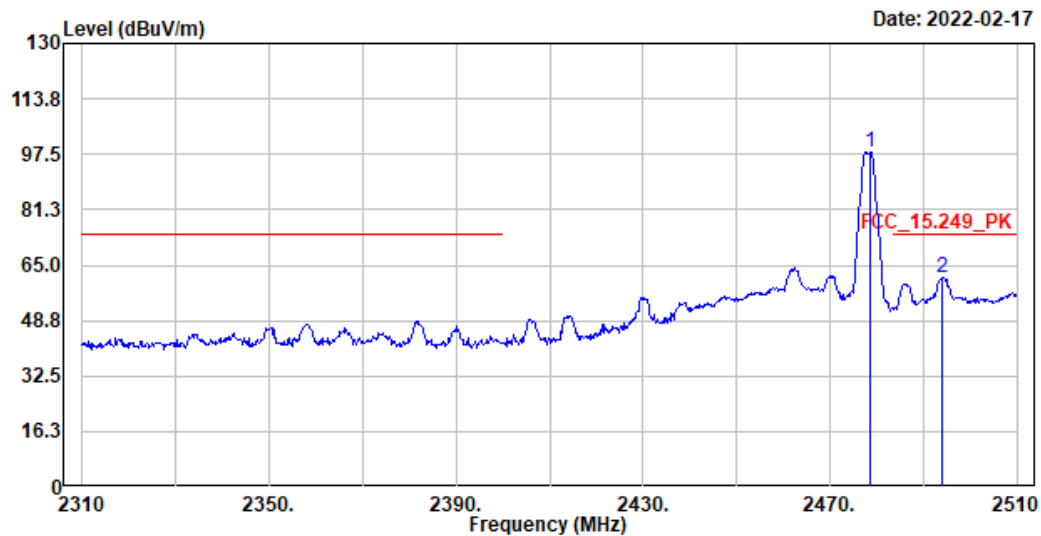
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
2373.6	52.79	-35.193	17.597	-36.403	54.000	Pass
2400	53.68	-35.193	18.487	-35.513	54.000	Pass
2421.6	93.79	-35.193	58.597	--	--	Pass

Note:

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

Site :966-4
 Condition :3m ,HORIZONTAL
 mode :TX_wireless_2478Mhz
 Test by :Caster



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	Limit	Level	dB	
1	2478.600	98.01	-----	-----	85.21	12.80	Peak
2	2493.800	61.41	74.00	-12.59	48.59	12.82	Peak

Note:

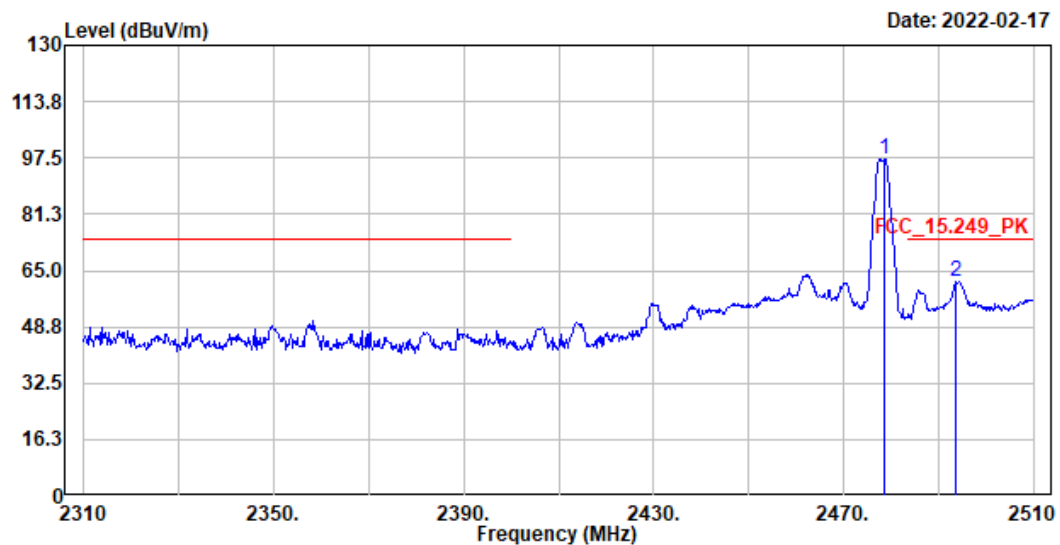
1. Level = Read Level + Factor
2. Factor = Antenna- Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
2478.6	98.01	-35.193	62.817	--	--	Pass
2493.8	61.41	-35.193	26.217	-27.783	54.000	Pass

Note:

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

Site :966-4
 Condition :3m ,VERTICAL
 mode :TX_wireless_2478Mhz
 Test by :Caster



No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	Limit	Level	dB	
1	2478.600	97.08	-----	-----	84.67	12.41	Peak
2	2493.600	62.02	74.00	-11.98	49.60	12.42	Peak

Note:

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

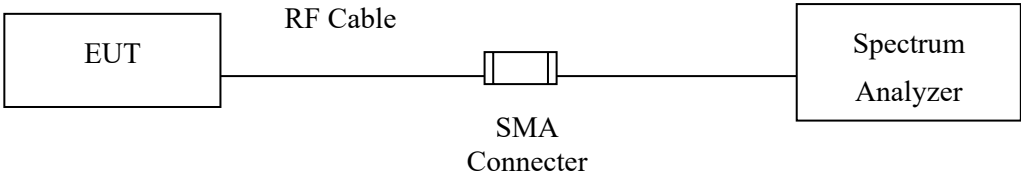
Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)	Result
2478.6	97.08	-35.193	61.887	--	--	Pass
2493.6	62.02	-35.193	26.827	-27.173	54.000	Pass

Note:

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

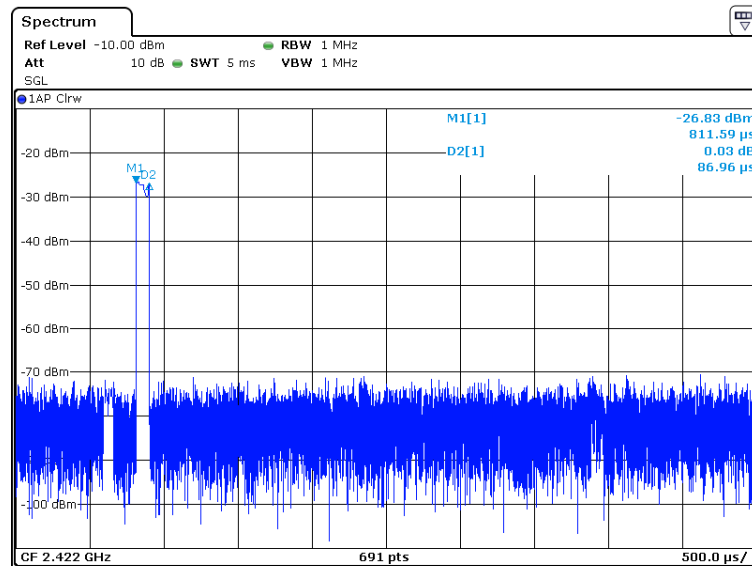
5. Duty Cycle

5.1. Test Setup

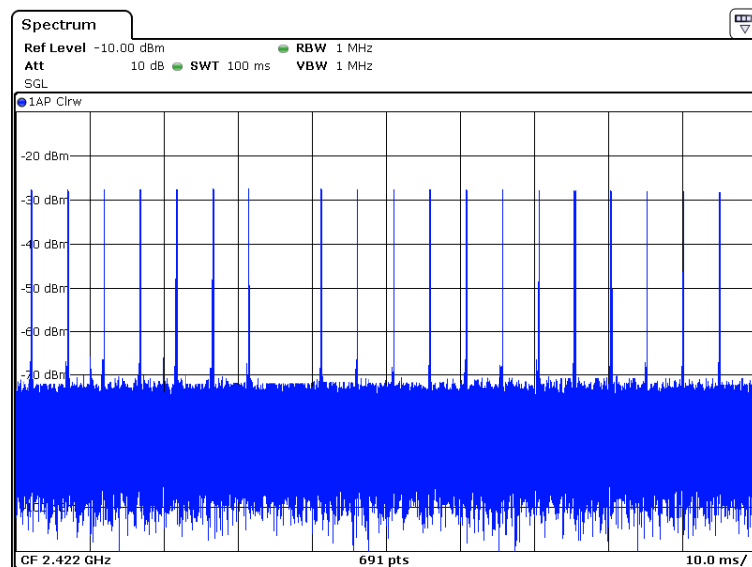


5.2. Test Result of Duty Cycle

Product : Wireless Mouse
 Test Item : Duty Cycle Data
 Test Mode : Mode 3: Normal mode



Date: 1.MAR.2022 09:24:46



Date: 1.MAR.2022 09:25:17

Time on of 100ms= 86.96us*20= 1.739ms

Duty Cycle= $\frac{1.739\text{ms}}{100\text{ms}}$ = 0.017392

Duty Cycle correction factor= $20 \text{ LOG } 0.017392$ = -35.193 dB

Duty Cycle correction factor	-35.193 dB
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6. EMI Reduction Method During Compliance Testing

No modification was made during testing.