FCC PART 15.249

TEST REPORT

For

Bytech NY Inc.

2585 West 13th Street,Brooklyn NY 11223

FCC ID:2AHN6-MSWS110

Report Type:	**Product Type:**
Original Report	Wireless Ergo Mouse-Black

Report Number:	RSZ200306831-00
Report Date:	2020-04-17
Reviewed By:	Jimmy Xiao RF Engineer
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Wireless Ergo Mouse-Black
Tested Model	BY-MS-WS-110-BK
Frequency Range	2402-2480MHz
Maximum Field Strength	83.71dBuV/m@3m
Modulation Technique	GFSK
Antenna Specification	-2.10dBi
Voltage Range	DC 1.5V*2 AAA batteries
Date of Test	2020-03-22 to 2020-04-07
Sample serial number	RSZ200306831-RF-S1 (Assigned by BACL, Shenzhen)
Received date	2020-03-06
Sample/EUT Status	Good condition

Objective

This type approval report is prepared on behalf of ***Bytech NY Inc.*** in accordance with Part 2-Subpart J, and Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.249 rules.

Related Submittal(s)/Grant(s)

The FCC Part15.249 DXX related system with FCC ID: 2AHN6-DE.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF Output Power with Power meter		±0.73dB
RF conducted test with spectrum		±1.6dB
AC Power Lines Conducted Emissions		±1.95dB
Emissions, Radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
Temperature		±1℃
Humidity		±6%
Supply voltages		±0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing by manufacturer, and the power level is default.

Frequency List

2.Channel frequency

1CH	2402 MHz	**21CH**	2442 MHz
2CH	2404 MHz	**22CH**	2444 MHz
3CH	2406 MHz	**23CH**	2446 MHz
4CH	2408 MHz	**24CH**	2448 MHz
5CH	2410 MHz	**25CH**	2450 MHz
6CH	2412 MHz	**26CH**	2452 MHz
7CH	2414 MHz	**27CH**	2454 MHz
8CH	2416 MHz	**28CH**	2456 MHz
9CH	2418 MHz	**29CH**	2458 MHz
10CH	2420 MHz	**30CH**	2460 MHz
11CH	2422 MHz	**31CH**	2462 MHz
12CH	2424 MHz	**32CH**	2464 MHz
13CH	2426 MHz	**33CH**	2466 MHz
14CH	2428 MHz	**34CH**	2468 MHz
15CH	2430 MHz	**35CH**	2470 MHz
16CH	2432 MHz	**36CH**	2472 MHz
17CH	2434 MHz	**37CH**	2474 MHz
18CH	2436 MHz	**38CH**	2476 MHz
19CH	2438 MHz	**39CH**	2478 MHz
20CH	2440 MHz	**40CH**	2480 MHz

Each Dongle work in the 16 channels, these 16 channels from 40 randomly generated。

Channel 1, 20, 40 were tested.

EUT Exercise Software

No software was used.

Equipment Modifications

No modifications were made to the unit tested.

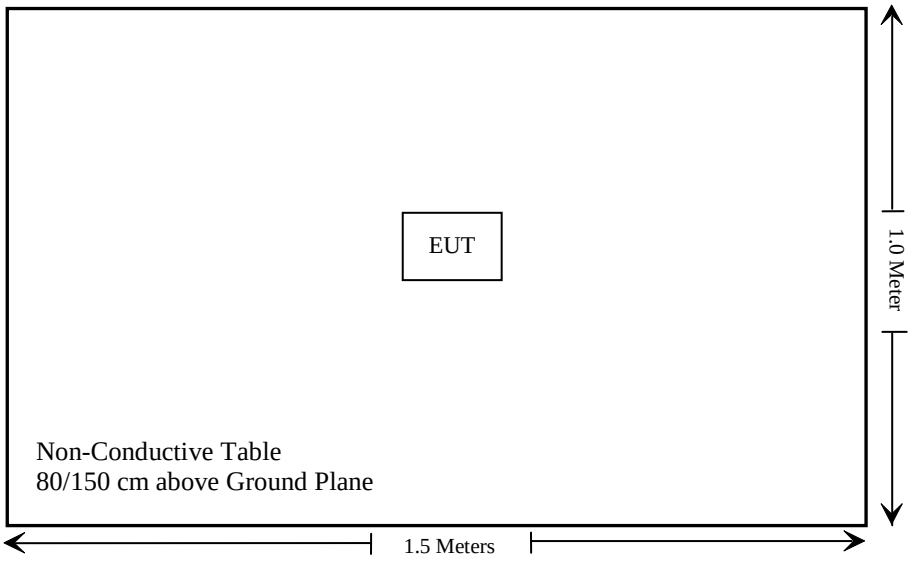
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	/	/	/

Support Cable Descriptions

Cable Description	Length (m)	From/Port	To
/	/	/	/

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207(a)	Conduction Emissions	Not Applicable
15.205, §15.209, §15.249(d)	Radiated Emissions& Outside of Band Emission	Compliance
§15.215 (c)	20 dB Bandwidth	Compliance

Not Applicable: The EUT was powered by battery.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESR3	102455	2019/7/9	2020/7/8
Sonoma instrument	Pre-amplifier	310 N	186238	2019/4/20	2020/4/20
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017/12/22	2020/12/21
Unknown	Cable 2	RF Cable 2	F-03-EM197	2019/11/29	2020/11/28
Unknown	Cable	Chamber Cable 1	F-03-EM236	2019/11/29	2020/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2019/7/22	2020/07/21
COM-POWER	Pre-amplifier	PA-122	181919	2019/11/29	2020/11/28
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2019/11/29	2020/11/28
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017/12/22	2020/12/21
Insulted Wire Inc.	RF Cable	SPS-2503-3150	02222010	2019/11/29	2020/11/28
Unknown	RF Cable	W1101-EQ1 OUT	F-19-EM005	2019/11/29	2020/11/28
SNSD	Band Reject filter	BSF2402-2480MN-0898-001	2.4G filter	2019/4/20	2020/4/20
Ducommun Technolagies	Horn antenna	ARH-4223-02	1007726-02 1304	2017/12/6	2020/12/5

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to FCC §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Antenna Connector Construction

The EUT has one internal PCB antenna which was permanently attached and the antenna gain is -2.1dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

FCC §15.205, §15.209 & §15.249(d) - RADIATED EMISSIONS

Applicable Standard

As per FCC §15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per FCC §15.249 (c), Field strength limits are specified at a distance of 3 meters.

As per FCC §15.249 (d), Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

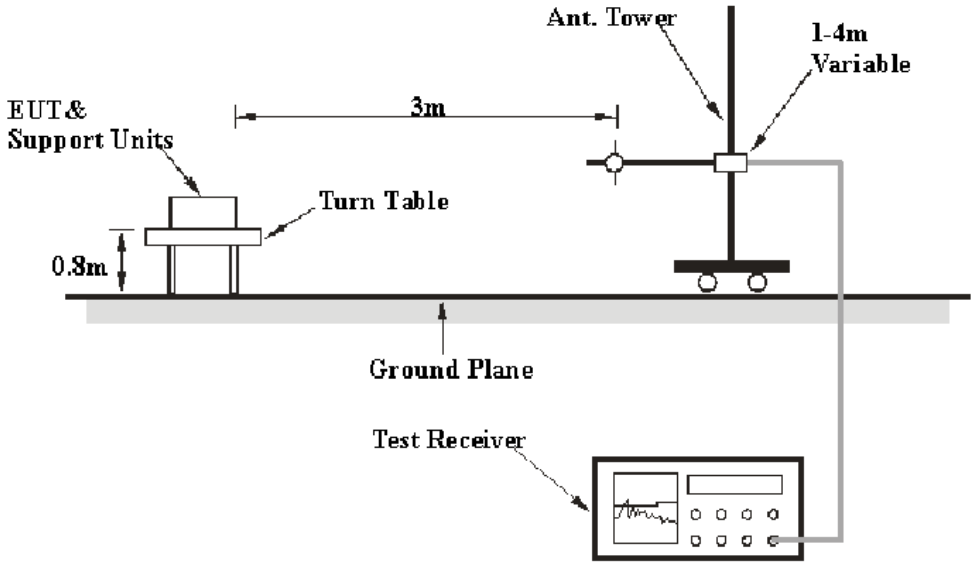
Test Equipment Setup

The system was investigated from 30 MHz to 25 GHz.

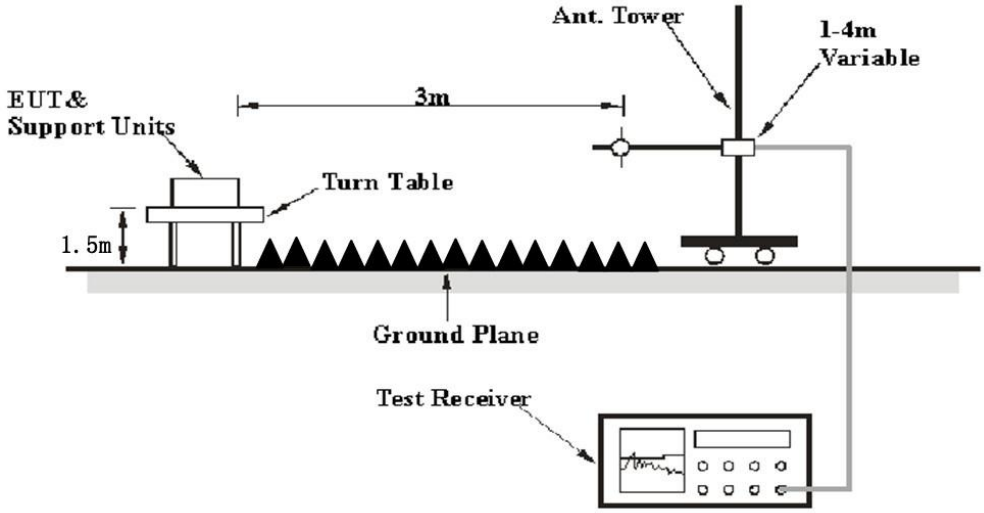
Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	/	Average

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission and out of band emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209/15.205 and FCC 15.249 limits.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 mete, and the EUT is placed on a turntable, which is 0.8 meter above ground plane for below 1GHz or 1.5 meter for above 1GHz, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the EUT complied with the FCC Part 15.205, 15.209 & §15.249

Test Data

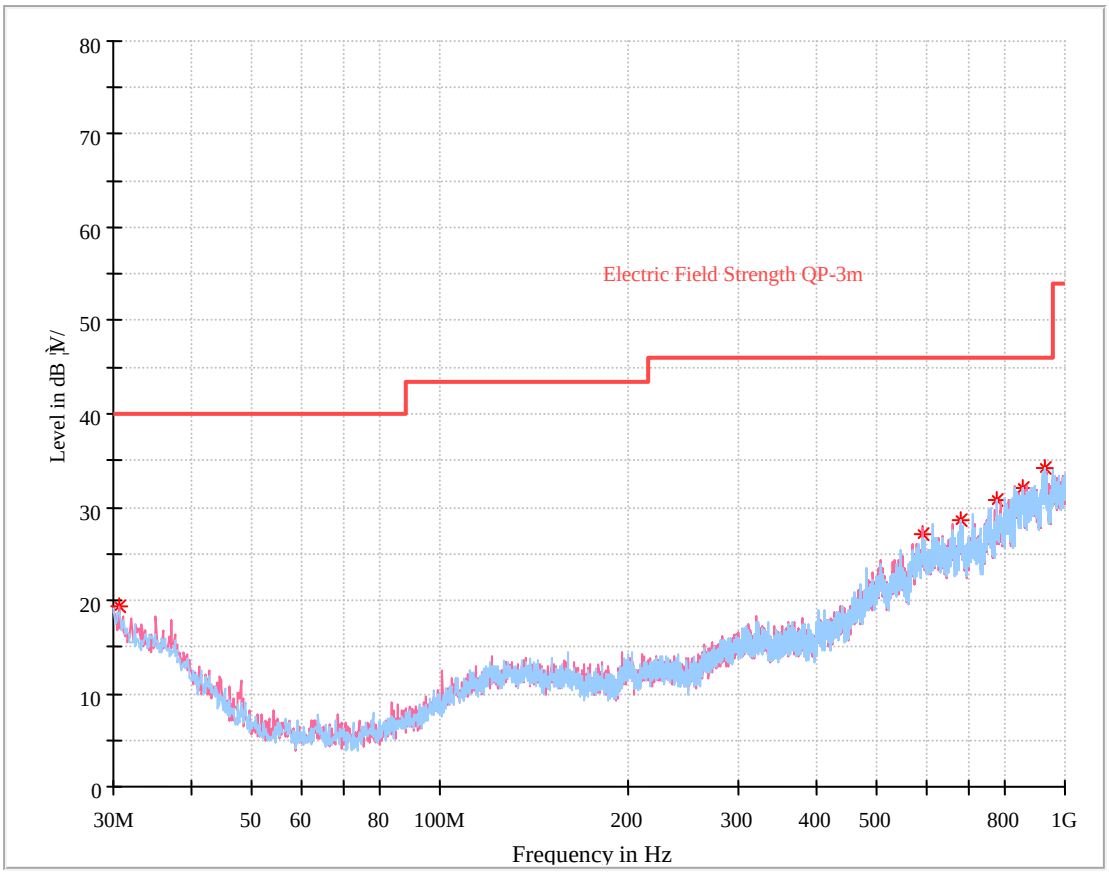
Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	65 %
ATM Pressure:	101.0kPa

The testing was performed by Holland Yan on 2020-03-22 for Below 1GHz and Leo Huang on 2020-04-07 for Above 1GHz

Test Mode: Transmitting

30MHz – 1 GHz: Worst case at High Channel



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
30.606250	19.36	205.0	V	37.0	-8.0	40.00	20.64
590.175000	27.00	390.0	H	135.0	-2.1	46.00	19.88
680.991250	28.61	390.0	H	169.0	-1.4	46.00	17.39
777.142500	30.76	205.0	H	273.0	0.8	46.00	15.24
858.137500	31.97	390.0	V	90.0	3.3	46.00	14.03
932.221250	34.19	105.0	H	0.0	4.8	46.00	11.81

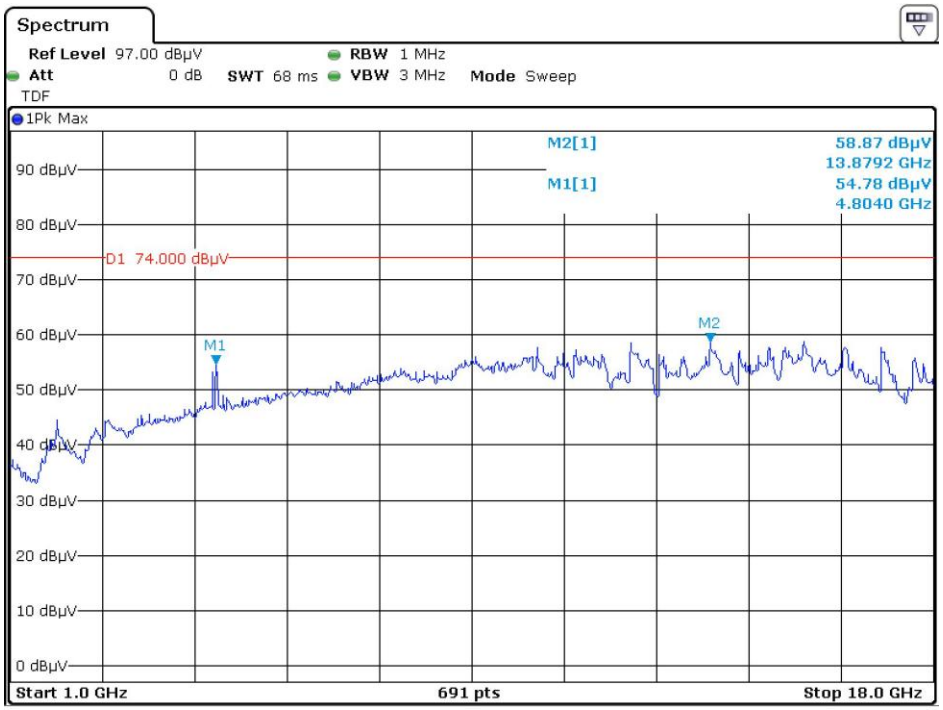
1 GHz - 25 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.249&15.209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2402 MHz)									
2402.00	54.38	PK	70	2.1	H	31.87	86.25	114	27.75
2402.00	43.87	Ave.	70	2.1	H	31.87	75.74	94	18.26
2402.00	49.65	PK	74	2.2	V	31.87	81.52	114	32.48
2402.00	39.89	Ave.	74	2.2	V	31.87	71.76	94	22.24
2388.94	28.64	PK	46	1.3	H	31.87	60.51	74	13.49
2388.94	13.42	Ave.	46	1.3	H	31.87	45.29	54	8.71
2400.00	29.68	PK	71	1.4	H	31.87	61.55	74	12.45
2400.00	14.13	Ave.	71	1.4	H	31.87	46.00	54	8.00
2483.57	28.73	PK	208	1.8	H	32.13	60.86	74	13.14
2483.57	13.72	Ave.	208	1.8	H	32.13	45.85	54	8.15
4804.00	51.53	PK	234	1.8	H	6.28	57.81	74	16.19
4804.00	36.66	Ave.	234	1.8	H	6.28	42.94	54	11.06
Middle Channel (2440MHz)									
2440.00	51.74	PK	258	1.8	H	31.97	83.71	114	30.29
2440.00	50.64	Ave.	258	1.8	H	31.97	82.61	94	11.39
2440.00	44.42	PK	16	1.9	V	31.97	76.39	114	37.61
2440.00	43.22	Ave.	16	1.9	V	31.97	75.19	94	18.81
4880.00	50.13	PK	46	2.4	H	6.76	56.89	74	17.11
4880.00	35.28	Ave.	46	2.4	H	6.76	42.04	54	11.96
High Channel (2480 MHz)									
2480.00	50.91	PK	328	1.0	H	32.13	83.04	114	30.96
2480.00	49.75	Ave.	328	1.0	H	32.13	81.88	94	12.12
2480.00	46.55	PK	36	1.7	V	32.13	78.68	114	35.32
2480.00	44.67	Ave.	36	1.7	V	32.13	76.80	94	17.2
2389.21	27.63	PK	290	2.0	H	31.87	59.50	74	14.50
2389.21	14.63	Ave.	290	2.0	H	31.87	46.50	54	7.50
2483.66	31.44	PK	177	1.0	H	32.13	63.57	74	10.43
2483.66	16.79	Ave.	177	1.0	H	32.13	48.92	54	5.08
4960.00	49.69	PK	320	2.2	H	6.80	56.49	74	17.51
4960.00	34.25	Ave.	320	2.2	H	6.80	41.05	54	12.95

Note:
Corrected Amplitude = Corrected Factor + Reading
Corrected Factor=Antenna factor (RX) +cable loss – amplifier factor
Margin = Limit- Corr. Amplitude
The emission more than20dB below the limit was not required to be recorded.

Pre-scan with low channel Peak

Horizontal



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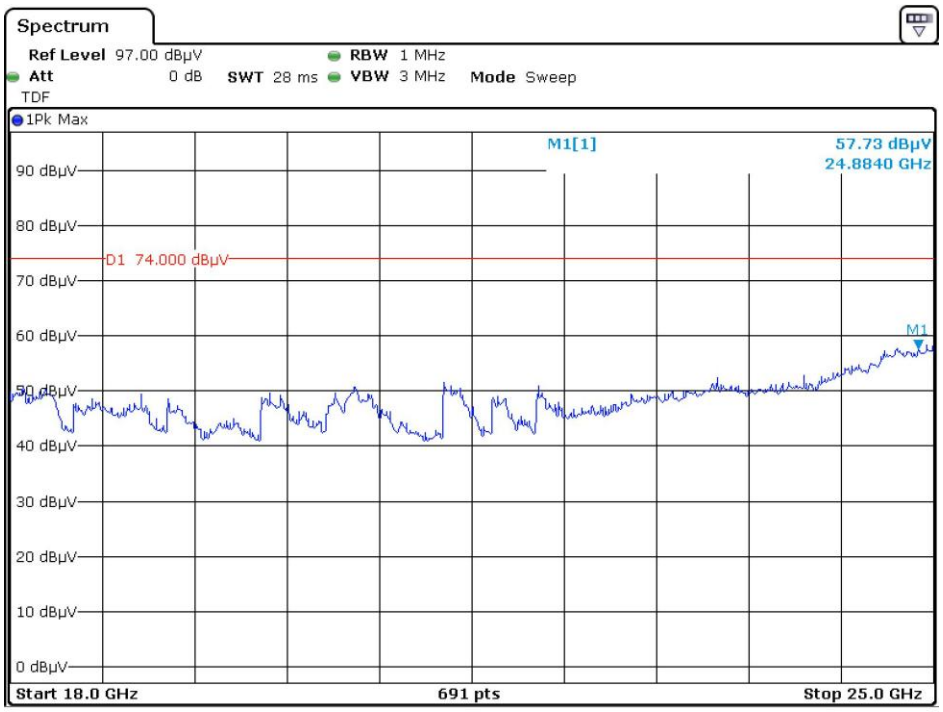

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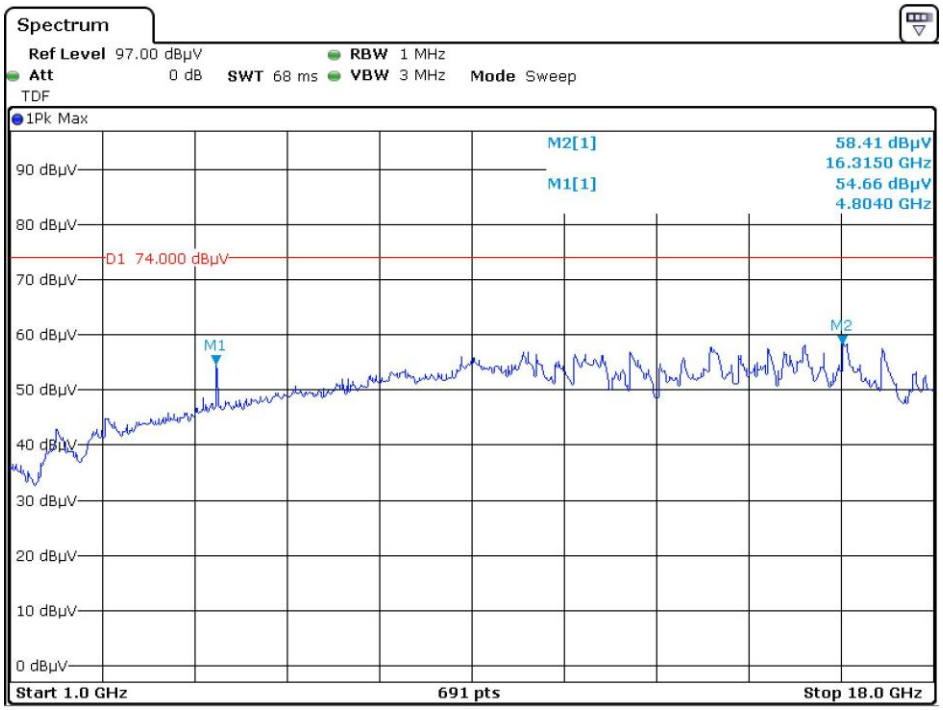
Vertical



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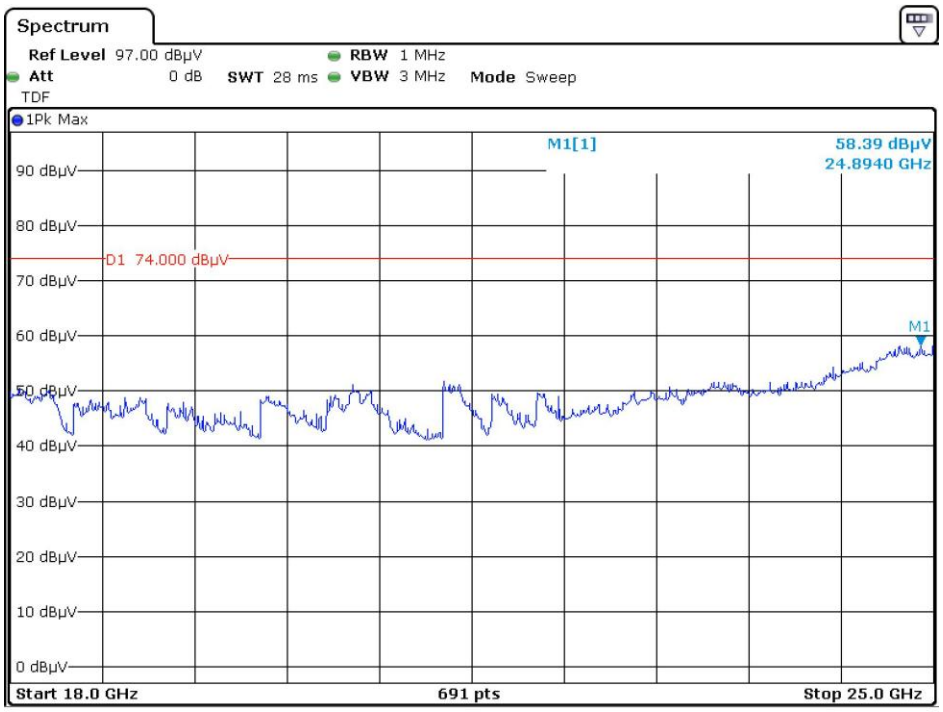

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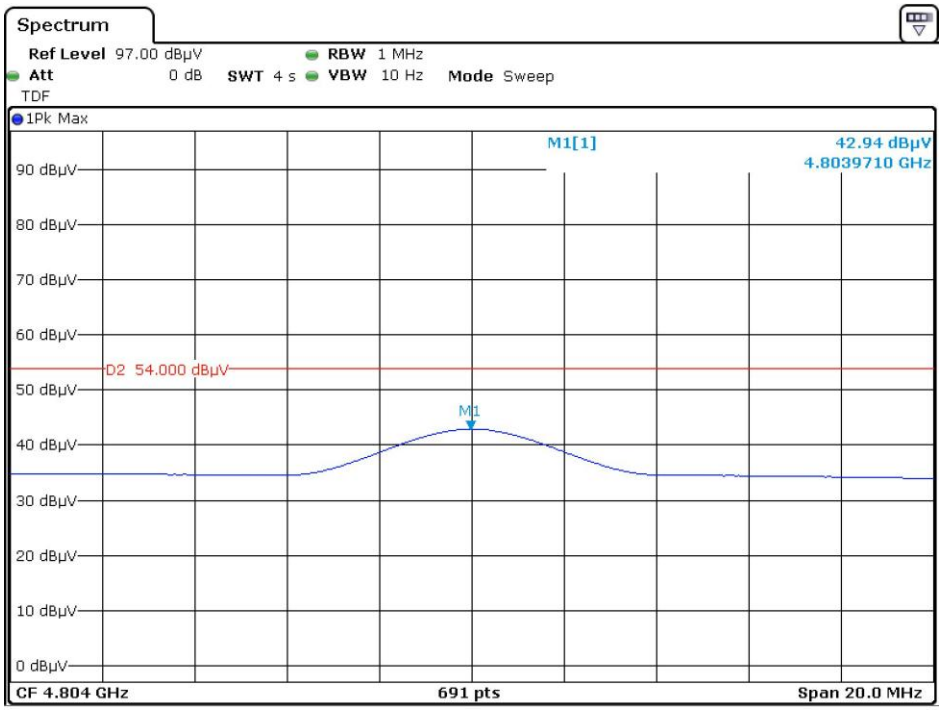
Average value for the peak point at pre-scan

Horizontal



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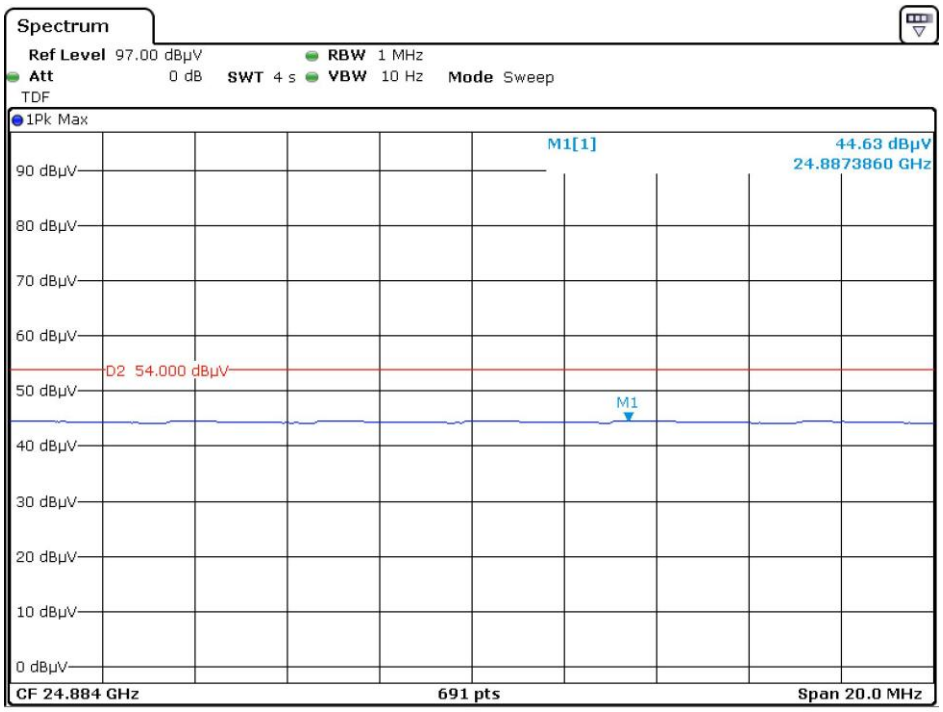

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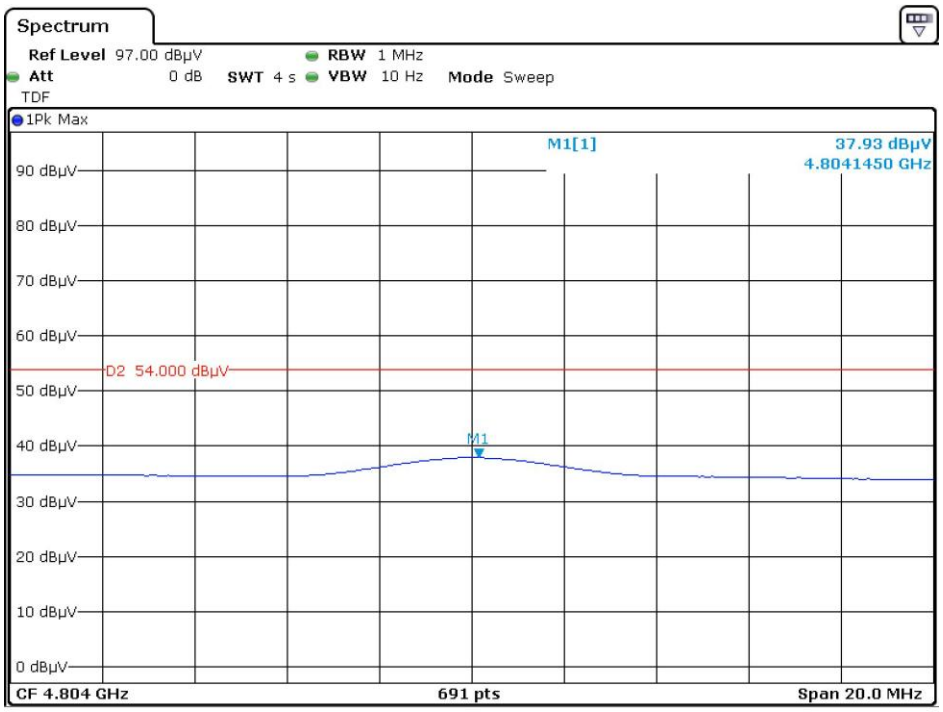
Vertical



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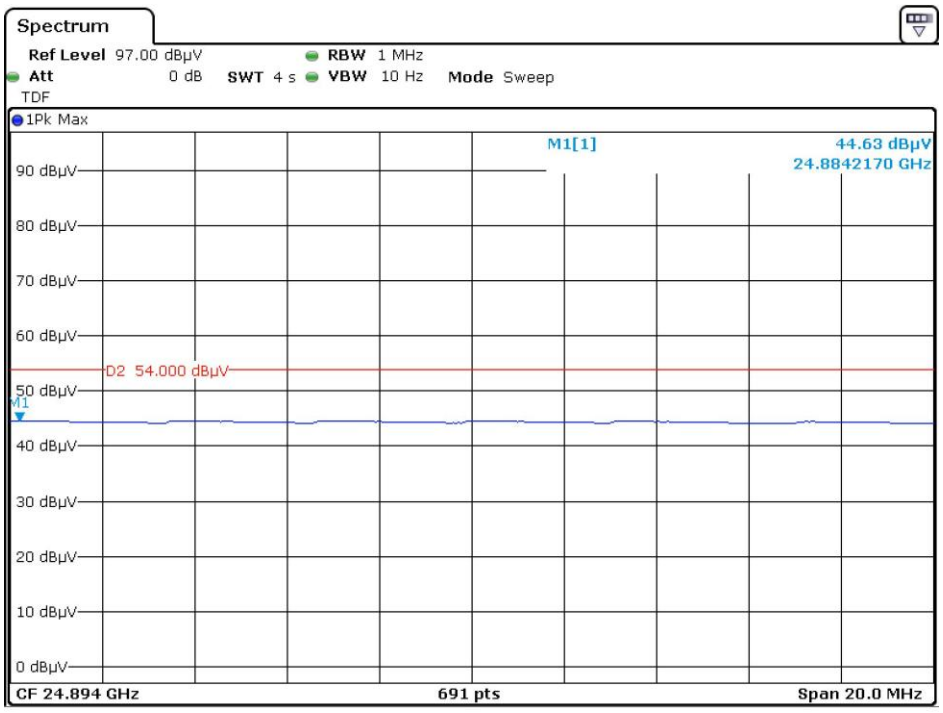

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FCC §15.215(c) - 20dB EMISSION BANDWIDTH

Applicable Standard

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

Test Procedure

Per ANSI C63.10-2013 §6.4 & §6.9.

Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa

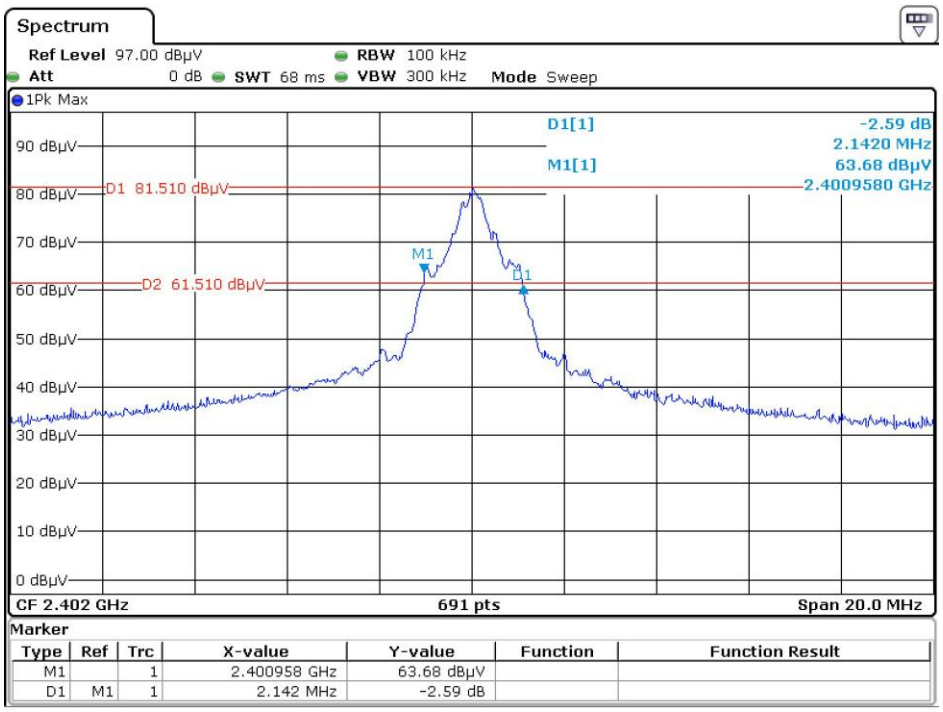
The testing was performed by Leo Huang on 2020-04-07.

Test Mode: Transmitting

Please refer to the following table and plots.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
Low	2402	2.142
Middle	2440	2.142
High	2480	2.200

Low Channel



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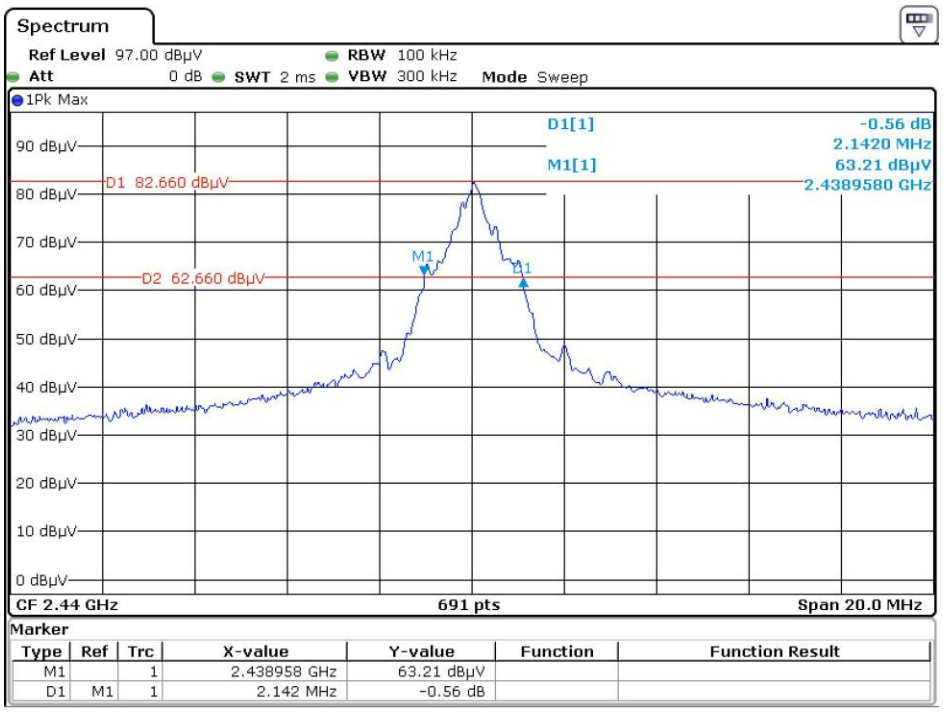
Middle Channel



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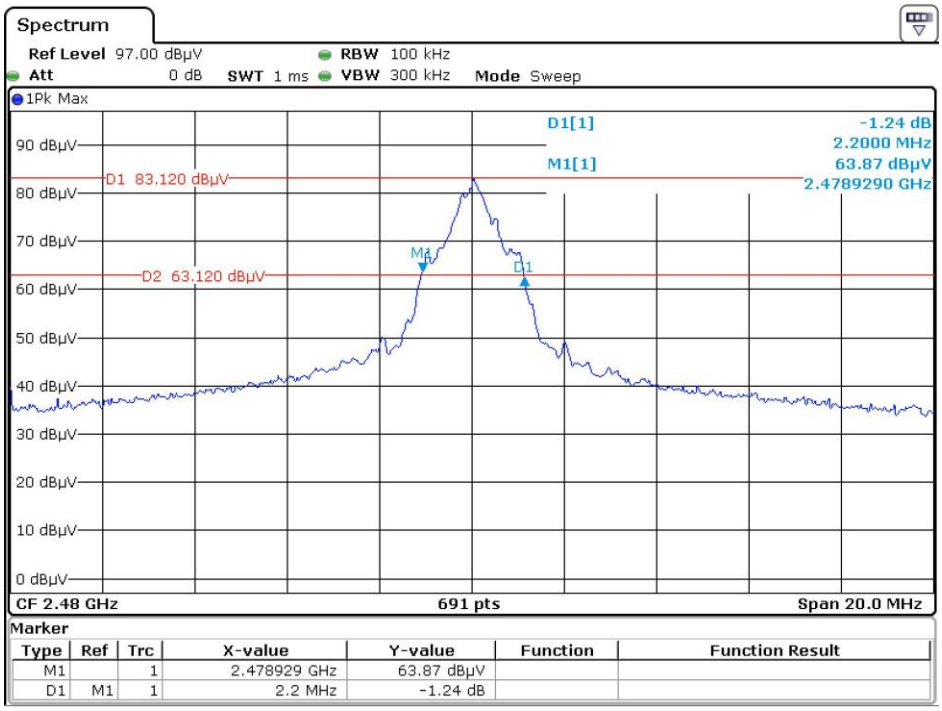
High Channel



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