



# FCC PART 15.249

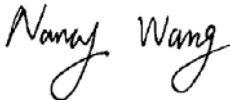
## TEST REPORT

For

### Bytech NY Inc.

2585 West 13th Street, Brooklyn NY 11223

**FCC ID: 2AHN6-KBWS102**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Wireless Keyboard-Black
<b>Report Number:</b> RSZ201116831-00	
<b>Report Date:</b> 2020-12-02	
<b>Reviewed By:</b> Nancy Wang RF Engineer	
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## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

Product	Wireless Keyboard-Black
Tested Model	BY-KB-WS-102-BK
Frequency Range	2402-2480MHz
Maximum Field Strength	87.06dBuV/m@3m
Modulation Technique	GFSK
Antenna Specification	0 dBi
Voltage Range	DC 1.5V*2 from battery
Date of Test	2020-11-19 to 2020-11-26
Sample serial number	RSZ201116831-RF-S1 (Assigned by BAACL, Shenzhen)
Received date	2020-11-16
Sample/EUT Status	Good condition

### Objective

This type approval report is 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.

### 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°C
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

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

Channel 1, Channel 20 and Channel 40 were selected for testing.

### EUT Exercise Software

No software was used.

### Equipment Modifications

No modifications were made to the unit tested.

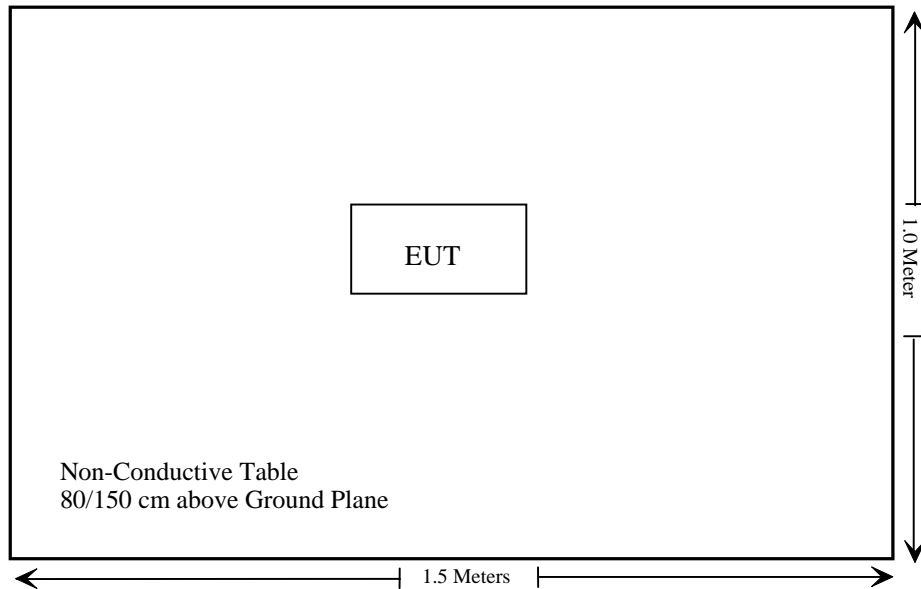
**Support Equipment List and Details**

Manufacturer	Description	Model	Serial Number
/	/	/	/

**Support Cable Descriptions**

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

**Block Diagram of Test Setup**



**SUMMARY OF TEST RESULTS**

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

Not Applicable: The device is battery operated equipment.

**TEST EQUIPMENT LIST**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>Radiated Emission Test</b>					
R&S	EMI Test Receiver	ESR3	102455	2020/08/04	2021/08/03
Sonoma instrument	Pre-amplifier	310 N	186238	2020/08/04	2021/08/03
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	2020/08/04	2021/08/03
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	2020/04/20	2021/04/20
Ducommun Technologies	Horn antenna	ARH-4223-02	1007726-02 1304	2017/12/06	2020/12/05

\* **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).



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## **FCC§15.203 - ANTENNA REQUIREMENT**

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### **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 0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

**Result:** Compliance.

## **FCC§15.205, §15.209 & §15.249(a)(c)(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:

<b>Fundamental frequency</b>	<b>Field strength of fundamental (millivolts/meter)</b>	<b>Field strength of harmonics (microvolts/meter)</b>
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.

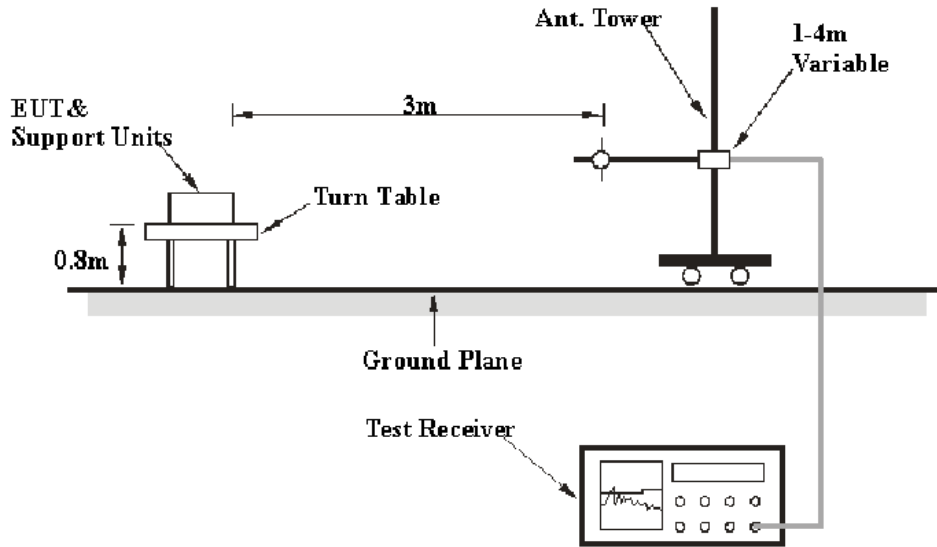
### **Test Equipment Setup**

The system was investigated from 30 MHz to 25 GHz.

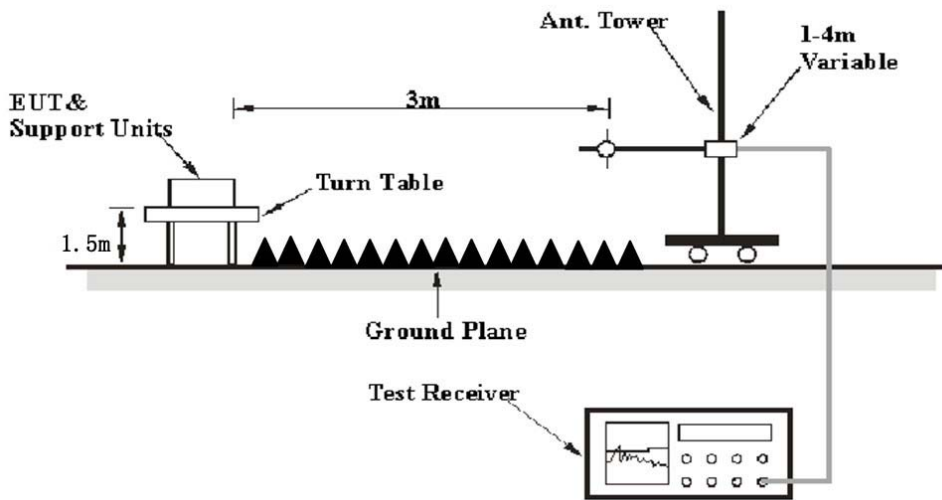
<b>Frequency Range</b>	<b>RBW</b>	<b>Video B/W</b>	<b>IF B/W</b>	<b>Measurement</b>
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	/	Average

**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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Results Summary

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

## Test Data

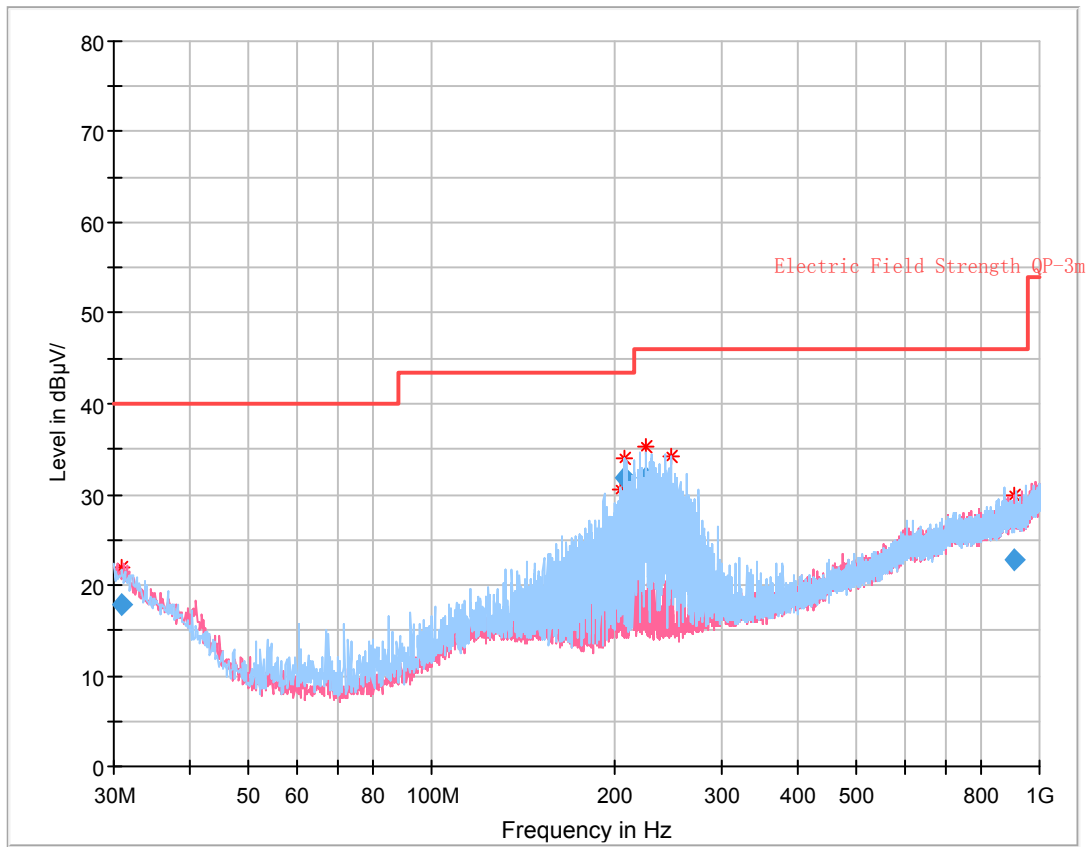
### Environmental Conditions

<b>Temperature:</b>	27~27.4 °C
<b>Relative Humidity:</b>	46~53 %
<b>ATM Pressure:</b>	101.0kPa

*The testing was performed by Holland Yang on 2020-11-19 for below 1GHz and Alan He on 2020-11-25 for above 1GHz.*

*Test Mode: Transmitting*

**30MHz – 1 GHz (worst case is High channel):**



**Final Result**

Frequency (MHz)	QuasiPeak (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.855125	17.82	40.00	22.18	192.0	V	254.0	-5.0
204.727750	26.50	43.50	17.00	109.0	H	15.0	-10.7
207.321750	31.77	43.50	11.73	165.0	H	0.0	-10.7
225.016625	31.85	46.00	14.15	152.0	H	0.0	-10.8
247.703250	26.46	46.00	19.54	133.0	H	0.0	-10.8
906.887500	22.82	46.00	23.18	133.0	V	104.0	1.5

**1 GHz - 25 GHz:**

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dB $\mu$ V/m)	FCC Part 15.249&15.209	
	Reading (dB $\mu$ V)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dB $\mu$ V/m)	Margin (dB)
<b>Low Channel (2402 MHz)</b>									
2402.00	54.03	PK	157	1.9	H	31.87	85.90	94	8.10
2402.00	46.15	PK	342	1.5	V	31.87	78.02	94	15.98
2346.27	29.27	PK	109	1.9	H	31.64	60.91	74	13.09
2400.00	29.38	PK	109	1.9	H	31.87	61.25	74	12.75
2484.06	28.65	PK	109	1.9	H	32.13	60.78	74	13.22
4804.00	56.41	PK	46	1.9	H	5.40	61.81	74	12.19
7206.00	50.74	PK	27	2.3	H	12.02	62.76	74	11.24
9608.00	45.67	PK	133	1.1	H	14.39	60.06	74	13.94
<b>Middle Channel (2440MHz)</b>									
2440.00	53.51	PK	350	1.8	H	31.97	85.48	94	8.52
2440.00	45.91	PK	33	1.1	V	31.97	77.88	94	16.12
4880.00	57.24	PK	311	1.5	H	6.43	63.67	74	10.33
7320.00	52.52	PK	76	1.2	H	11.17	63.69	74	10.31
9760.00	46.72	PK	205	1.7	H	16.78	63.50	74	10.50
<b>High Channel (2480 MHz)</b>									
2480.00	54.93	PK	178	2.0	H	32.13	87.06	94	6.94
2480.00	46.27	PK	340	2.2	V	32.13	78.40	94	15.6
2324.16	28.58	PK	54	1.6	H	31.64	60.22	74	13.78
2396.05	28.87	PK	54	1.6	H	31.87	60.74	74	13.26
2483.61	30.04	PK	54	1.6	H	32.13	62.17	74	11.83
4960.00	56.53	PK	120	1.2	H	6.95	63.48	74	10.52
7440.00	53.98	PK	30	2.5	H	12.31	66.29	74	7.71
9920.00	50.40	PK	56	2.0	H	18.16	68.56	74	5.44

**Note: For the fundamental, the peak value can meet the limit of the average value.**

Field Strength of Average Emission							
Frequency (MHz)	Peak Measurement @3m (dBµV/m)	Polar (H/V)	Duty Cycle Correction Factor (dB)	Corrected Amplitude (dBµV/m)	FCC Part 15.249&15.209		
					Limit (dBµV/m)	Margin (dB)	Comment
<b>Low Channel (2402 MHz)</b>							
2346.27	60.91	H	-34.80	26.11	54	27.89	Spurious
2400.00	61.25	H	-34.80	26.45	54	27.55	Spurious
2484.06	60.78	H	-34.80	25.98	54	28.02	Spurious
4804.00	61.81	H	-34.80	27.01	54	26.99	Spurious
7206.00	62.76	H	-34.80	27.96	54	26.04	Spurious
9608.00	60.06	H	-34.80	25.26	54	28.74	Spurious
<b>Middle Channel (2440MHz)</b>							
4880.00	63.67	H	-34.80	28.87	54	25.13	Spurious
7320.00	63.69	H	-34.80	28.89	54	25.11	Spurious
9760.00	63.50	H	-34.80	28.70	54	25.30	Spurious
<b>High Channel (2480 MHz)</b>							
2324.16	60.22	H	-34.80	25.42	54	28.58	Spurious
2396.05	60.74	H	-34.80	25.94	54	28.06	Spurious
2483.61	62.17	H	-34.80	27.37	54	26.63	Spurious
4960.00	63.48	H	-34.80	28.68	54	25.32	Spurious
7440.00	66.29	H	-34.80	31.49	54	22.51	Spurious
9920.00	68.56	H	-34.80	33.76	54	20.24	Spurious

**Note:**

Corrected Amplitude = Corrected Factor + Reading

Corrected Factor=Antenna factor (RX) +cable loss – amplifier factor

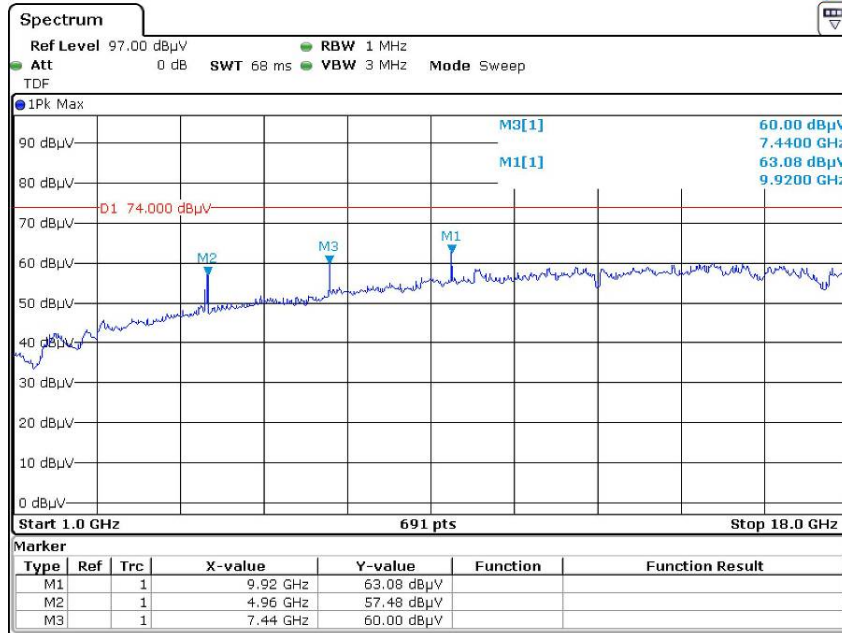
Margin = Limit- Corr. Amplitude

Duty Cycle: Ton1 =0.077ms, Tp = 4.2364 ms

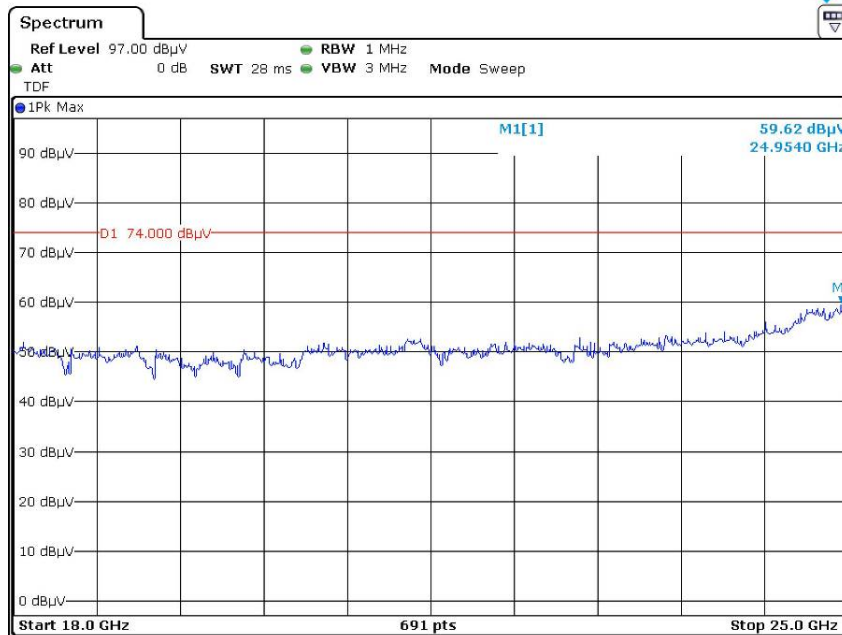
Duty Cycle = Ton/Tp = 0.077/4.2364=0.0182

Duty Cycle Corrected Factor = 20lg (Duty cycle) = 20lg (0.0182) = -34.80

### Pre-scan with high channel Peak Horizontal



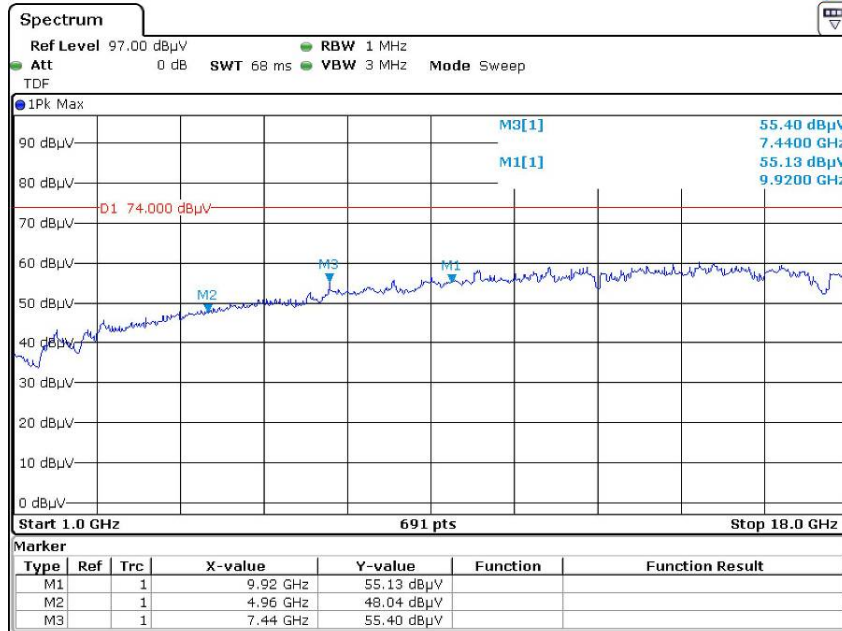
Date: 25.NOV.2020 18:11:46



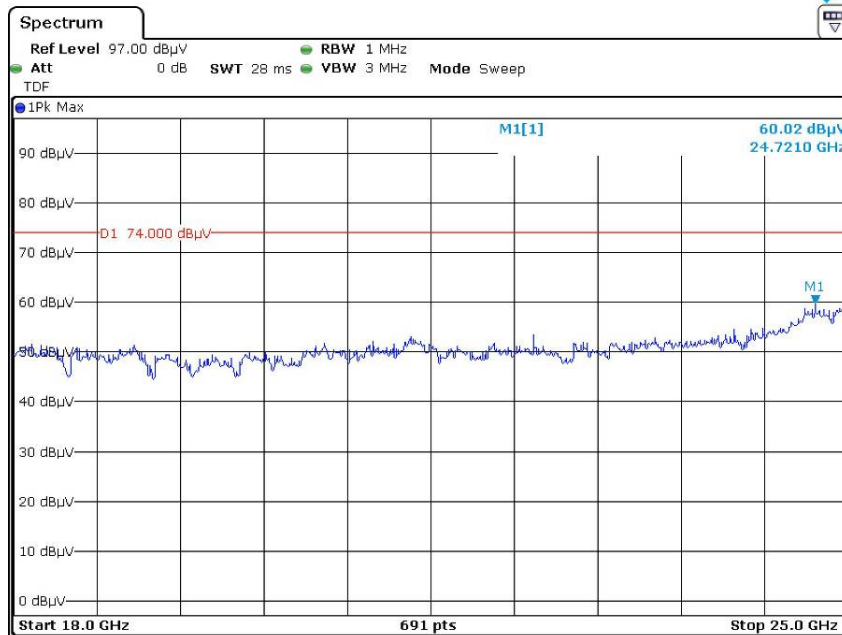
Date: 25.NOV.2020 18:48:17



Vertical

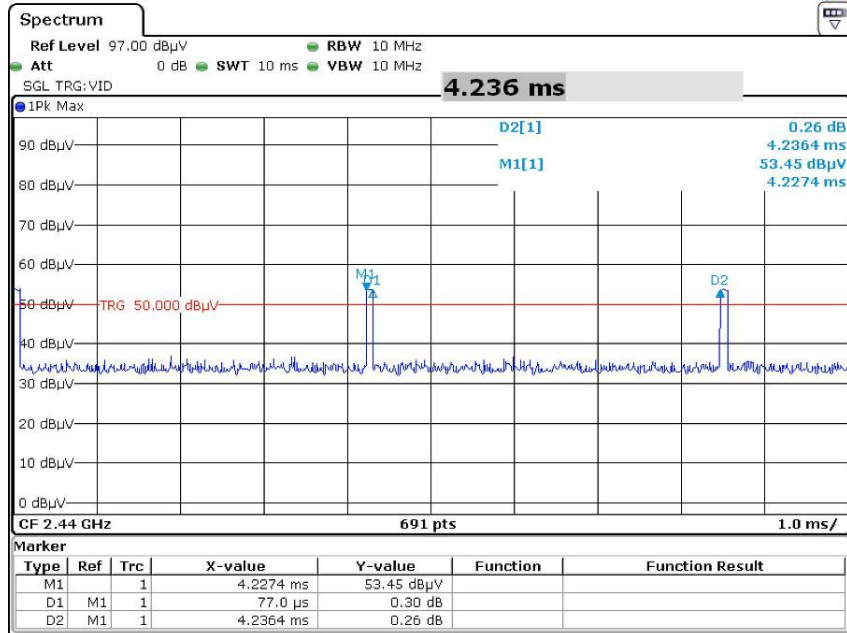


Date: 25.NOV.2020 18:17:38



Date: 25.NOV.2020 18:52:46

### Duty Cycle



Date: 25.NOV.2020 17:29:19

## 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

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	50 %
<b>ATM Pressure:</b>	101.0 kPa

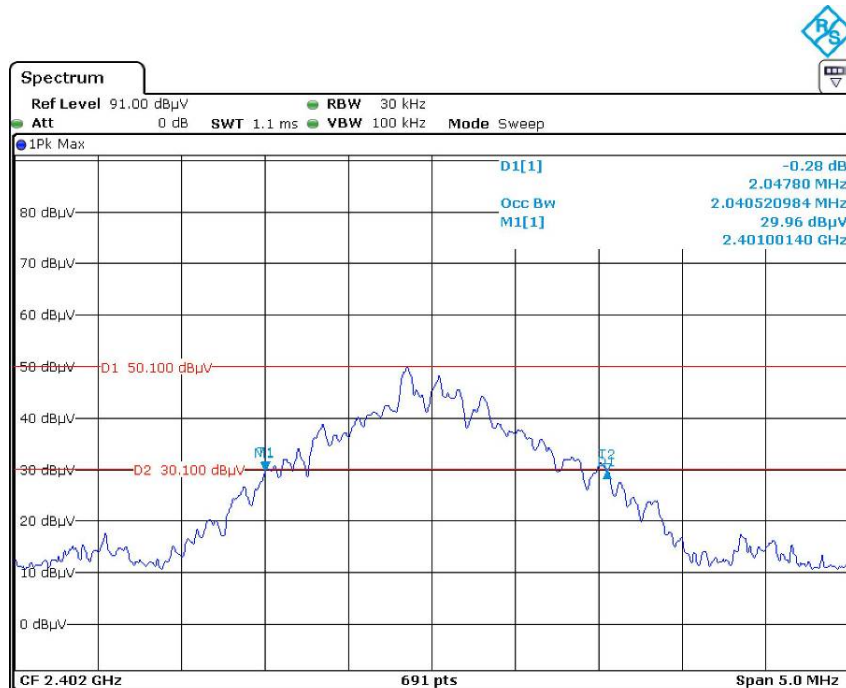
*The testing was performed by Thea Xiao on 2020-11-26.*

*Test Mode: Transmitting*

*Please refer to the following table and plots.*

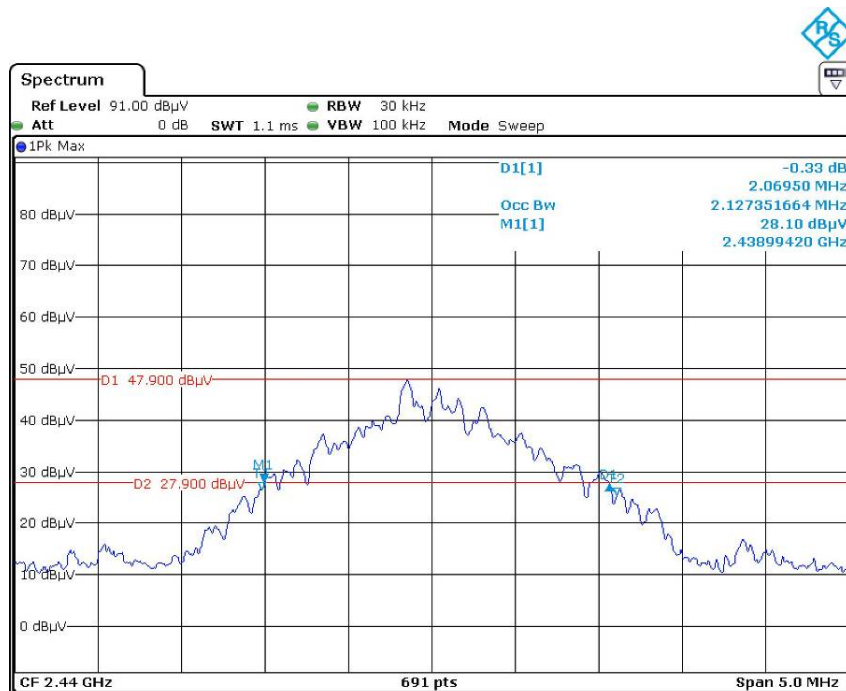
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>20dB Bandwidth (MHz)</b>
Low	2402	2.048
Middle	2440	2.070
High	2480	2.098

Low Channel



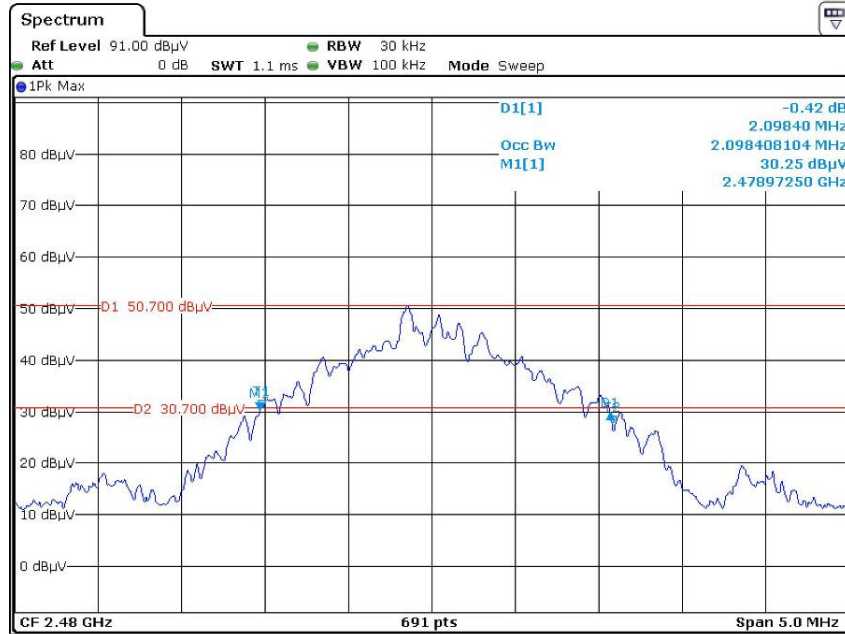
Date: 25.NOV.2020 17:45:37

Middle Channel



Date: 25.NOV.2020 17:32:47

### High Channel



Date: 25.NOV.2020 17:39:59

\*\*\*\*\* END OF REPORT \*\*\*\*\*