



FCC PART 15.249

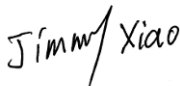
TEST REPORT

For

Bytech NY Inc.

2585 West 13th Street, Brooklyn NY 11223

FCC ID:2AHN6-DE

Report Type: Original Report	Product Type: Wireless Ergo Mouse-Black USB Dongle
Report Number: RSZ200306832-00	
Report Date: 2020-04-17	
Reviewed By: RF Engineer Jimmy Xiao 	
Prepared By: Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn	

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Wireless Ergo Mouse-Black USB Dongle
Tested Model	BY-MS-WS-110-DE
Frequency Range	2402-2480MHz
Maximum Field Strength	91.82dBuV/m@3m
Modulation Technique	GFSK
Antenna Specification	-1.52dBi
Voltage Range	DC 5V from USB port
Date of Test	2020-03-20 to 2020-04-07
Sample serial number	RSZ200306832-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, 15.207, 15.209 and 15.249 rules.

Related Submittal(s)/Grant(s)

The FCC Part15.249 DXX related submittal(s)/Grant(s) with FCC ID: 2AHN6-MSWS110.

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		$\pm 5\%$
RF Output Power with Power meter		$\pm 0.73\text{dB}$
RF conducted test with spectrum		$\pm 1.6\text{dB}$
AC Power Lines Conducted Emissions		$\pm 1.95\text{dB}$
Emissions, Radiated	Below 1GHz	$\pm 4.75\text{dB}$
	Above 1GHz	$\pm 4.88\text{dB}$
Temperature		$\pm 1\text{ }^{\circ}\text{C}$
Humidity		$\pm 6\%$
Supply voltages		$\pm 0.4\%$

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 (MHz)	Channel	Frequency (MHz)
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.

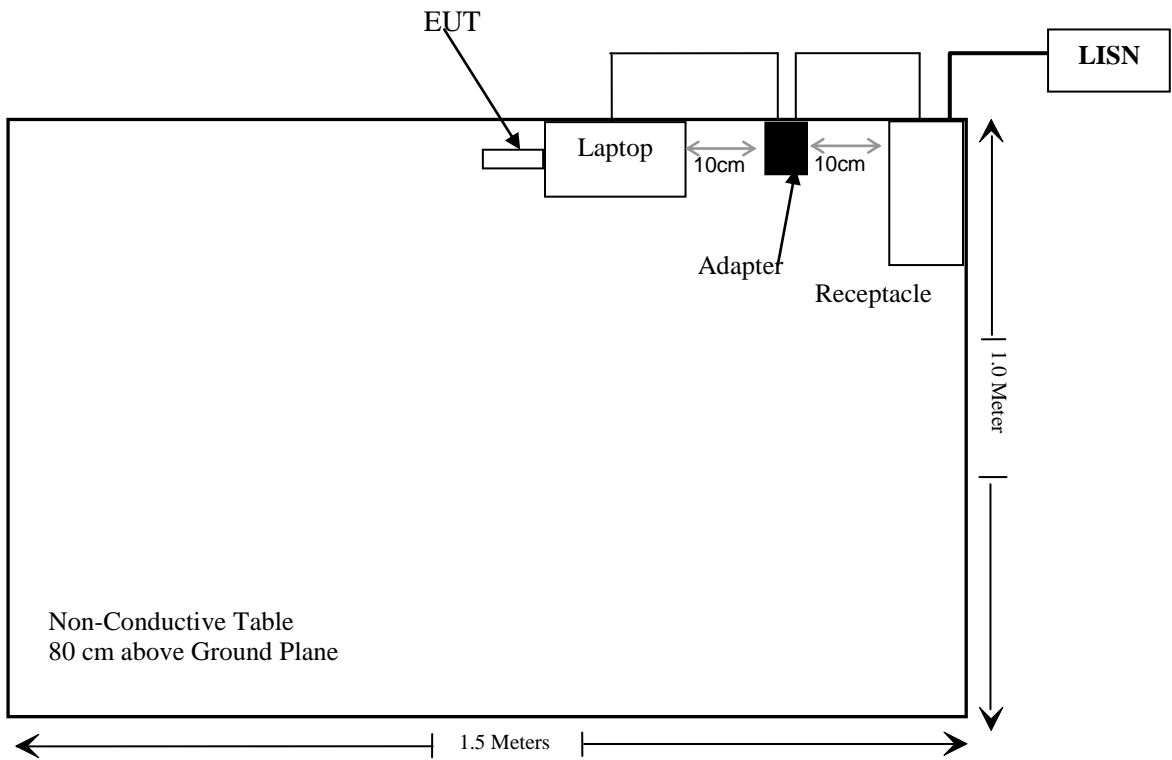
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
TOSHIBA	Laptop	C600	PSC2NQ-00G006

Support Cable Descriptions

Cable Description	Length (m)	From/Port	To
Cable	1.2	adapter	Laptop

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	Compliance
15.205, §15.209, §15.249(d)	Radiated Emissions& Outside of Band Emission	Compliance
§15.215 (c)	20 dB Bandwidth	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2019/7/9	2020/7/8
Rohde & Schwarz	LISN	ENV216	101613	2020/1/22	2021/1/21
Rohde & Schwarz	Transient Limitor	ESH3Z2	DE25985	2019/11/29	2020/11/28
Unknown	CE Cable	CE Cable	UF A210B-1-0720-504504	2019/11/29	2020/11/28
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Radiated Emission Test					
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 Technologies	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 -1.52dBi, fulfill the requirement of this section. Please refer to the EUT photos.

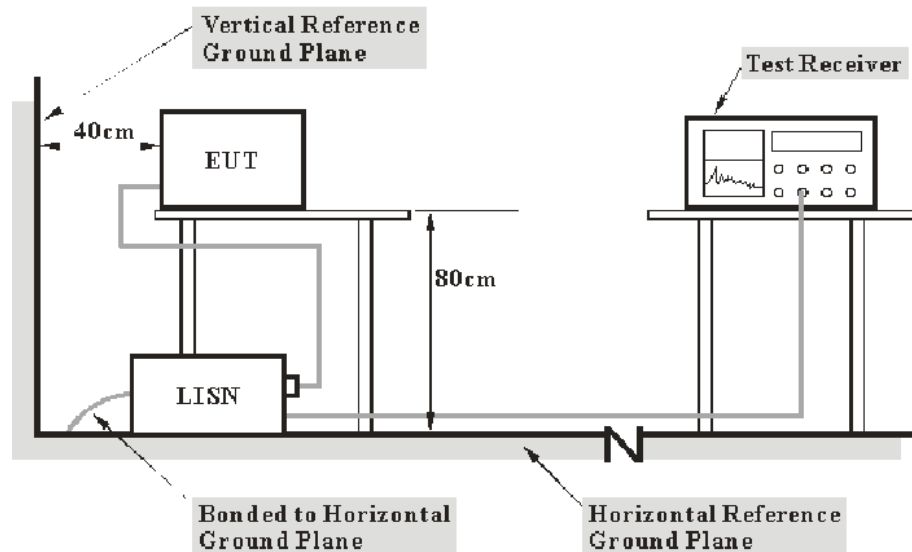
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB 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 15.207,

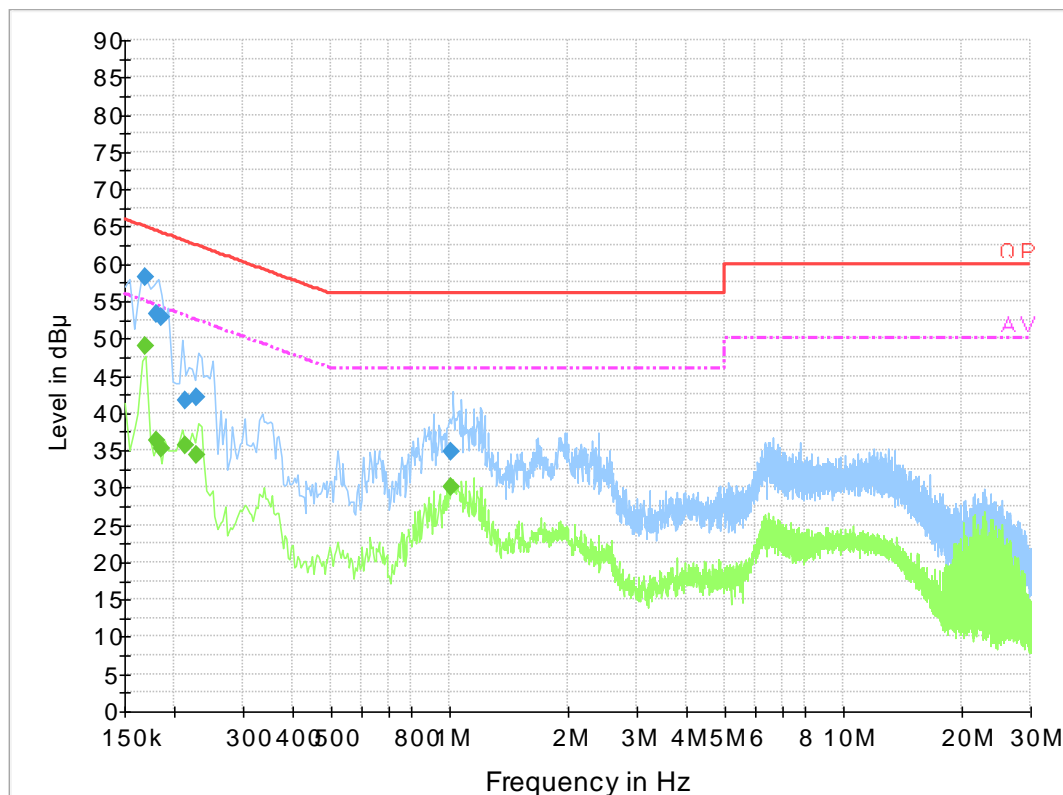
Test Data

Environmental Conditions

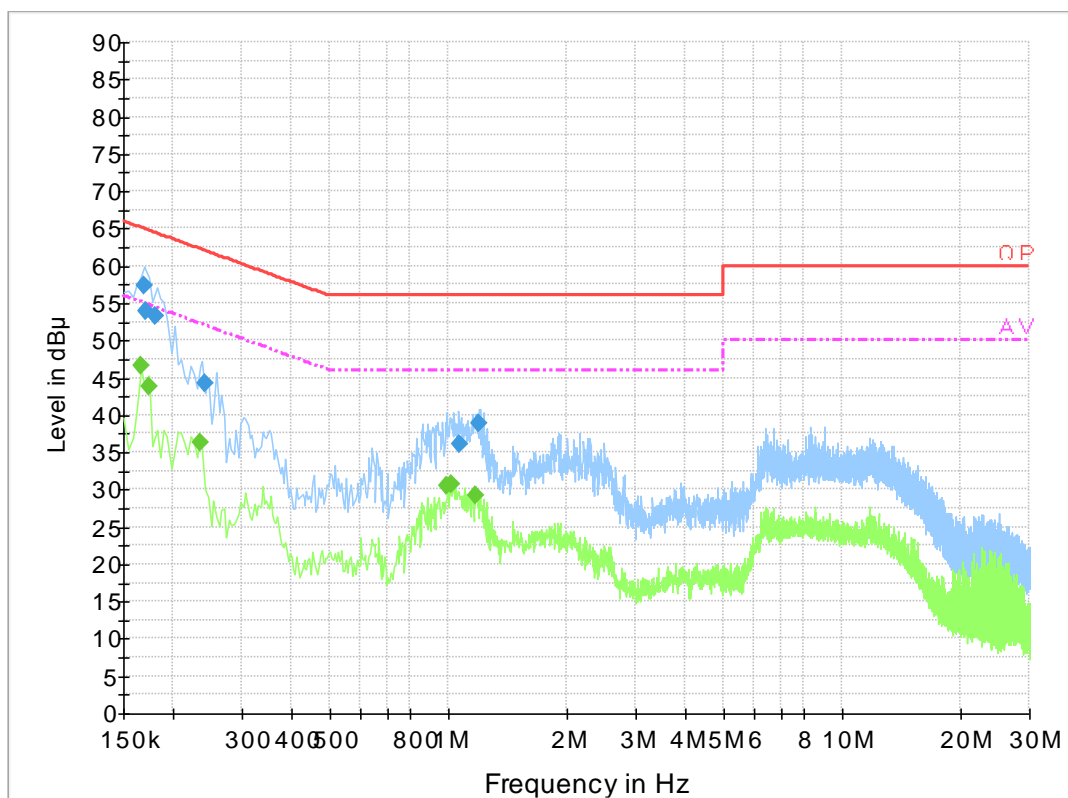
Temperature:	25 °C
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa

The testing was performed by Haiguo Li on 2020-03-20.

EUT operation mode: Transmitting at high channel

AC 120V/60 Hz, Line

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.169500	58.2	19.9	65.0	6.8	QP
0.181500	53.3	19.9	64.4	11.1	QP
0.185500	52.9	19.8	64.2	11.3	QP
0.214501	41.6	19.8	63.0	21.4	QP
0.229500	42.1	19.8	62.5	20.4	QP
1.014670	34.8	19.9	56.0	21.2	QP
0.169500	48.9	19.9	55.0	6.1	Ave.
0.181500	36.2	19.9	54.4	18.2	Ave.
0.185500	35.1	19.8	54.2	19.1	Ave.
0.214501	35.6	19.8	53.0	17.4	Ave.
0.229500	34.4	19.8	52.5	18.1	Ave.
1.014670	30.0	19.9	46.0	16.0	Ave.

AC 120V/60 Hz, Neutral

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.169500	57.3	19.8	65.0	7.7	QP
0.170501	54.0	19.8	64.9	10.9	QP
0.181500	53.4	19.8	64.4	11.0	QP
0.241500	44.3	19.8	62.0	17.7	QP
1.074010	36.0	19.8	56.0	20.0	QP
1.203970	39.0	19.8	56.0	17.0	QP
0.166000	46.6	19.8	55.2	8.6	Ave.
0.174000	43.8	19.8	54.8	11.0	Ave.
0.234000	36.3	19.8	52.3	16.0	Ave.
0.998000	30.5	19.8	46.0	15.5	Ave.
1.022000	30.8	19.8	46.0	15.2	Ave.
1.178000	29.1	19.8	46.0	16.9	Ave.

Note:

- 1) Correction Factor = LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

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.

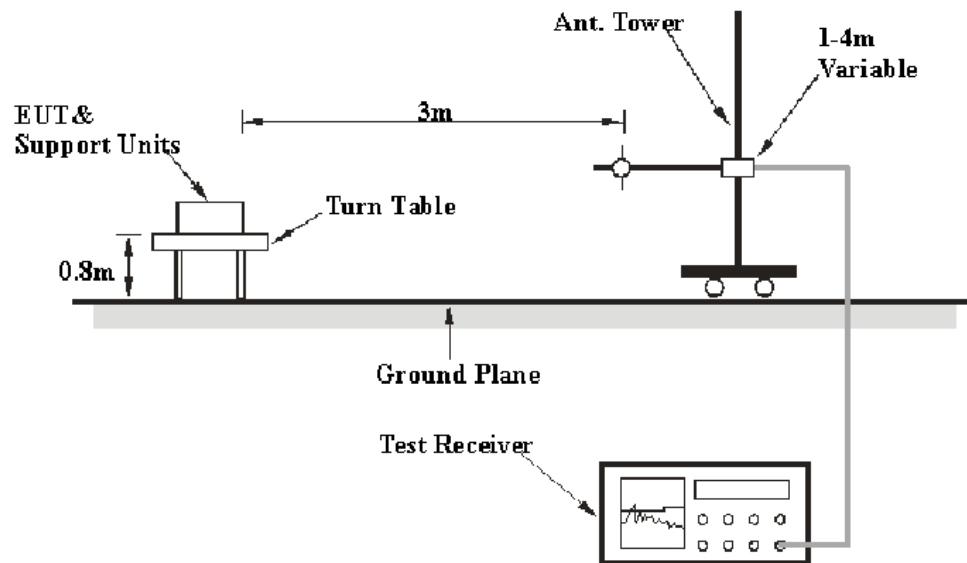
Test Equipment Setup

The system was investigated from 30 MHz to 25 GHz.

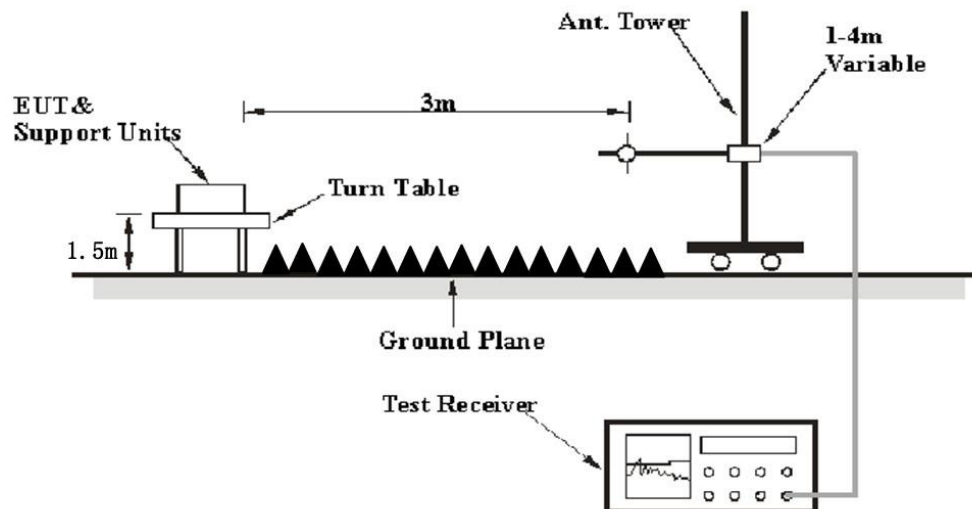
Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	/	Average

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:

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

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

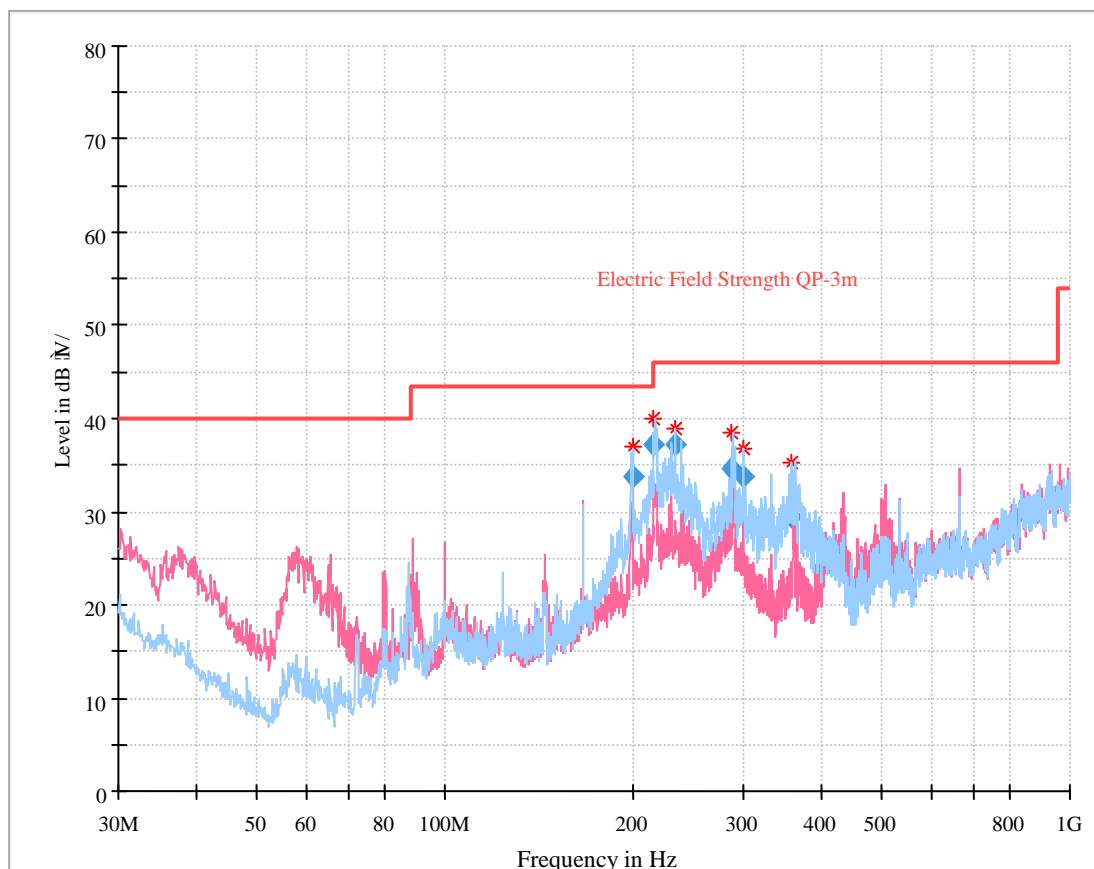
Test Data

Environmental Conditions

Temperature:	23 °C
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 (dB μ V/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dB μ V/m)	Margin (dB)
199.900250	33.76	159.0	H	108.0	-13.8	43.50	9.74
216.052125	37.29	135.0	H	95.0	-13.9	46.00	8.71
233.300875	37.23	139.0	H	282.0	-14.0	46.00	8.77
288.060875	34.59	111.0	H	276.0	-11.4	46.00	11.41
299.994000	33.78	113.0	H	342.0	-10.6	46.00	12.22
358.322250	29.36	109.0	H	348.0	-10.7	46.00	16.64

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	56.98	PK	169	1.0	H	31.87	88.85	114	25.15
2402.00	45.72	Ave.	169	1.0	H	31.87	77.59	94	16.41
2402.00	51.88	PK	274	1.3	V	31.87	83.75	114	30.25
2402.00	42.69	Ave.	274	1.3	V	31.87	74.56	94	19.44
2388.94	28.29	PK	129	1.3	H	31.87	60.16	74	13.84
2388.94	14.36	Ave.	129	1.3	H	31.87	46.23	54	7.77
2400.00	29.34	PK	247	2.3	H	31.87	61.21	74	12.79
2400.00	14.56	Ave.	247	2.3	H	31.87	46.43	54	7.57
2483.57	27.79	PK	266	1.5	H	32.13	59.92	74	14.08
2483.57	14.83	Ave.	266	1.5	H	32.13	46.96	54	7.04
4804.00	49.39	PK	67	1.8	H	6.28	55.67	74	18.33
4804.00	33.65	Ave.	67	1.8	H	6.28	39.93	54	14.07
Middle Channel (2440MHz)									
2440.00	59.06	PK	263	2.3	H	31.97	91.03	114	22.97
2440.00	56.86	Ave.	263	2.3	H	31.97	88.83	94	5.17
2440.00	53.42	PK	44	2.4	V	31.97	85.39	114	28.61
2440.00	51.34	Ave.	44	2.4	V	31.97	83.31	94	10.69
4880.00	47.90	PK	344	1.7	H	6.76	54.66	74	19.34
4880.00	31.56	Ave.	344	1.7	H	6.76	38.32	54	15.68
High Channel (2480 MHz)									
2480.00	59.69	PK	238	1.4	H	32.13	91.82	114	22.18
2480.00	57.28	Ave.	238	1.4	H	32.13	89.41	94	4.59
2480.00	54.93	PK	290	1.7	V	32.13	87.06	114	26.94
2480.00	52.67	Ave.	290	1.7	V	32.13	84.80	94	9.2
2388.63	28.06	PK	33	1.0	H	31.87	59.93	74	14.07
2388.63	14.35	Ave.	33	1.0	H	31.87	46.22	54	7.78
2483.66	38.30	PK	334	2.2	H	32.13	70.43	74	3.57
2483.66	15.68	Ave.	334	2.2	H	32.13	47.81	54	6.19
4960.00	46.80	PK	231	1.3	H	6.80	53.60	74	20.40
4960.00	30.26	Ave.	231	1.3	H	6.80	37.06	54	16.94

Note:

Corrected Amplitude = Corrected Factor + Reading

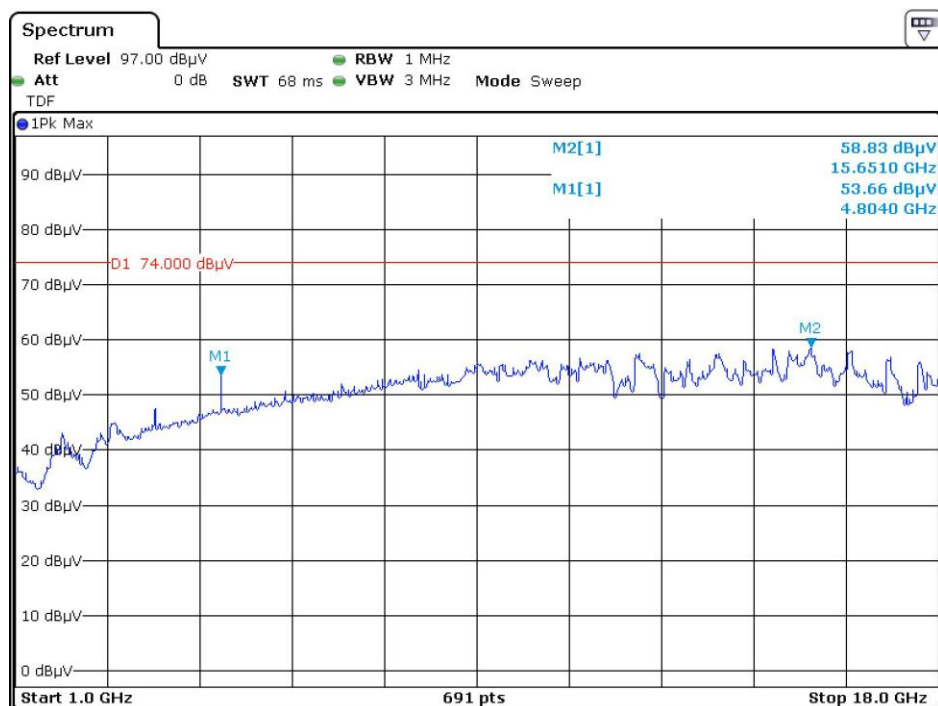
Corrected Factor=Antenna factor (RX) +cable loss – amplifier factor

Margin = Limit- Corr. Amplitude

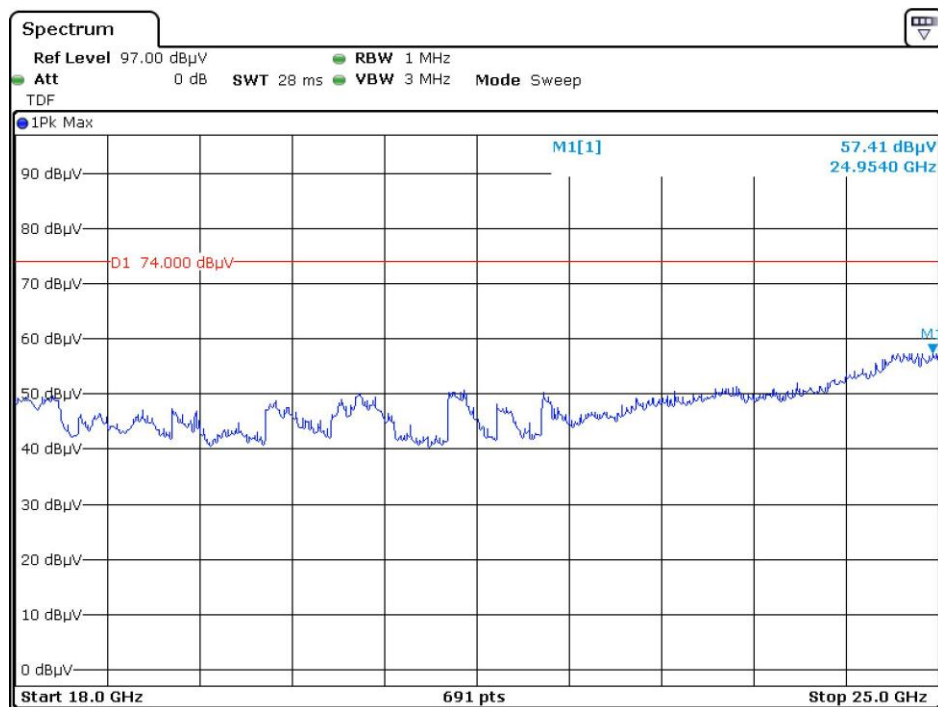
The emission more than 20dB below the limit was not required to be recorded.

Pre-scan with low channel Peak

Horizontal

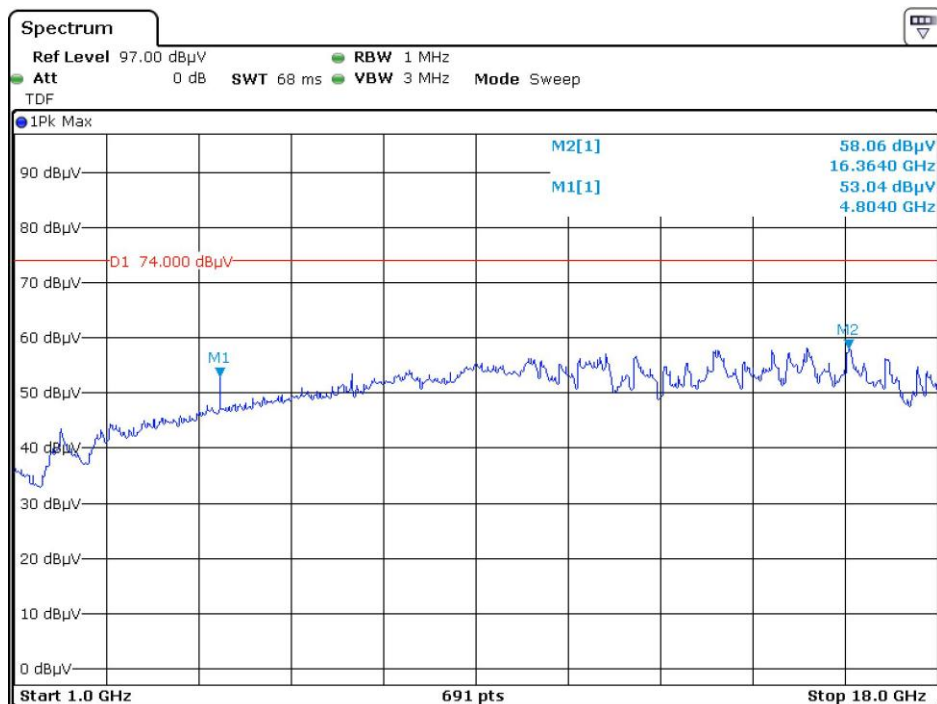


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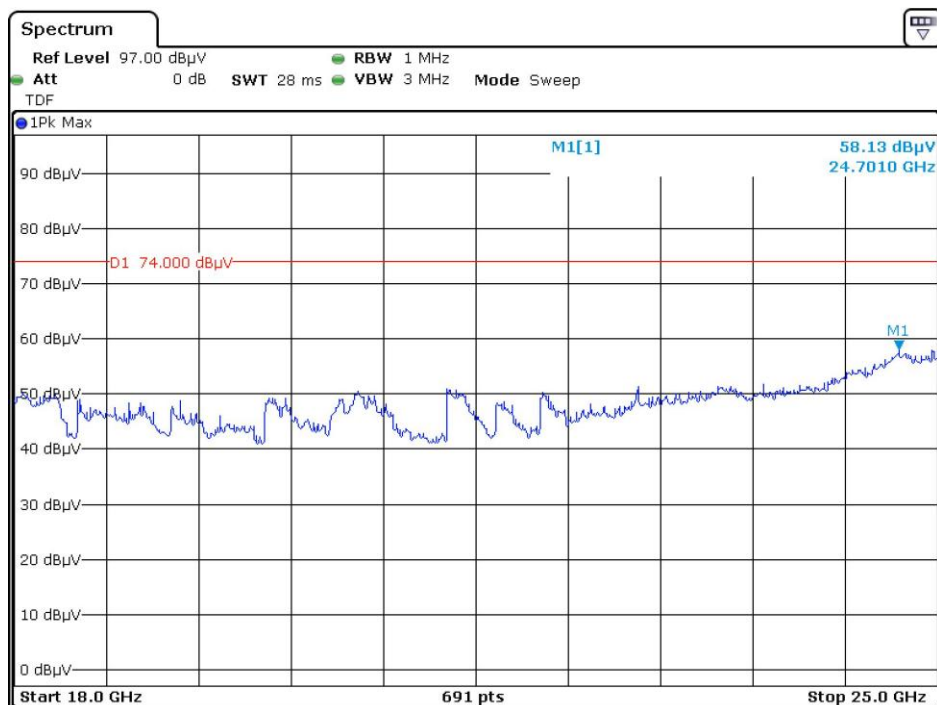


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Vertical



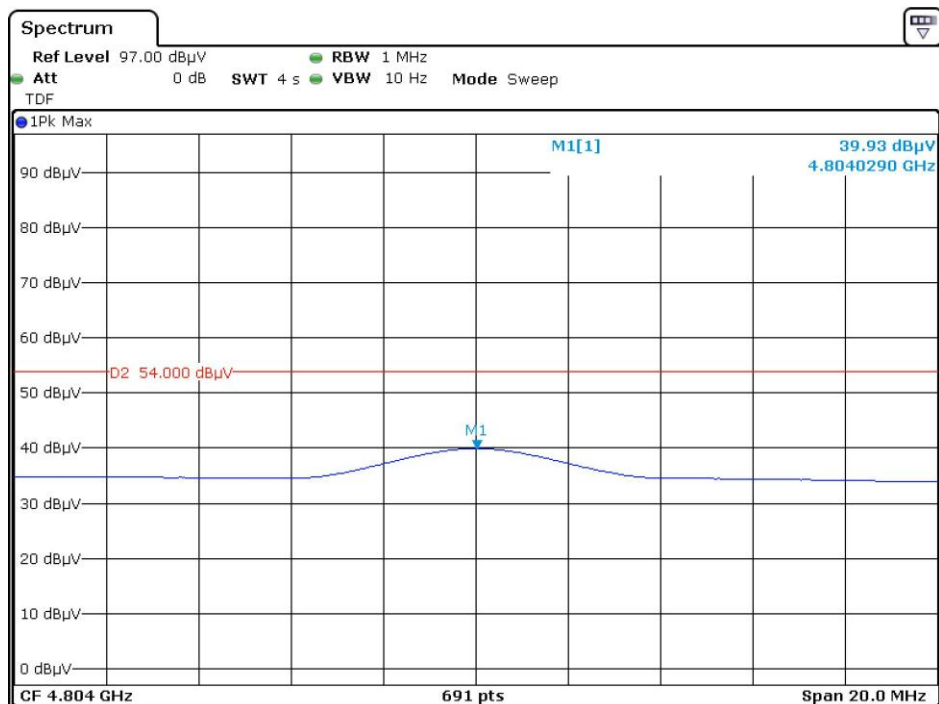
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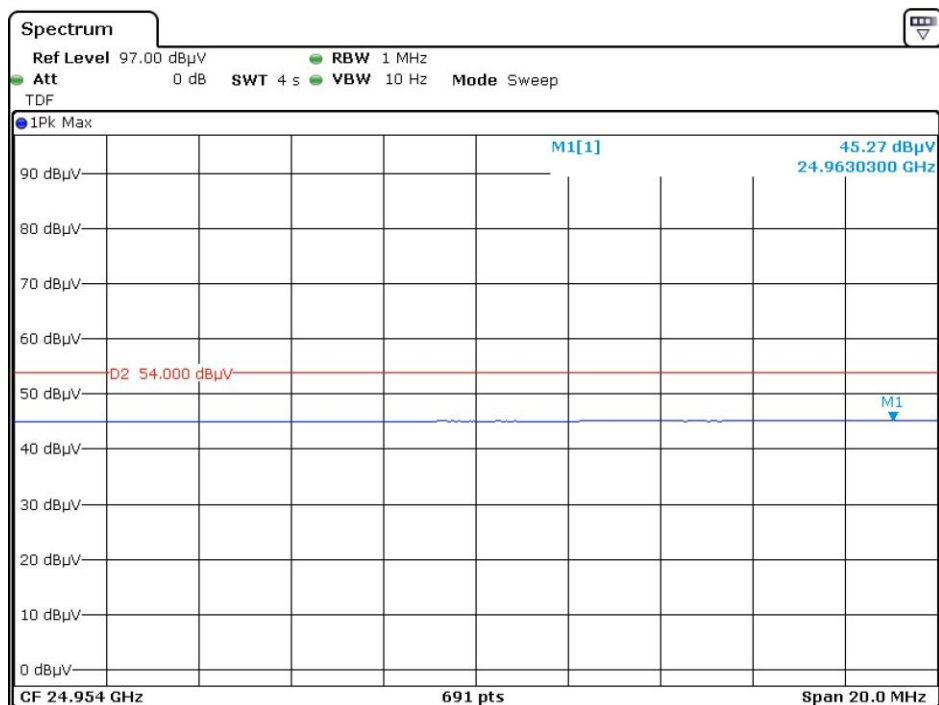
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Average value for the peak point at pre-scan

Horizontal

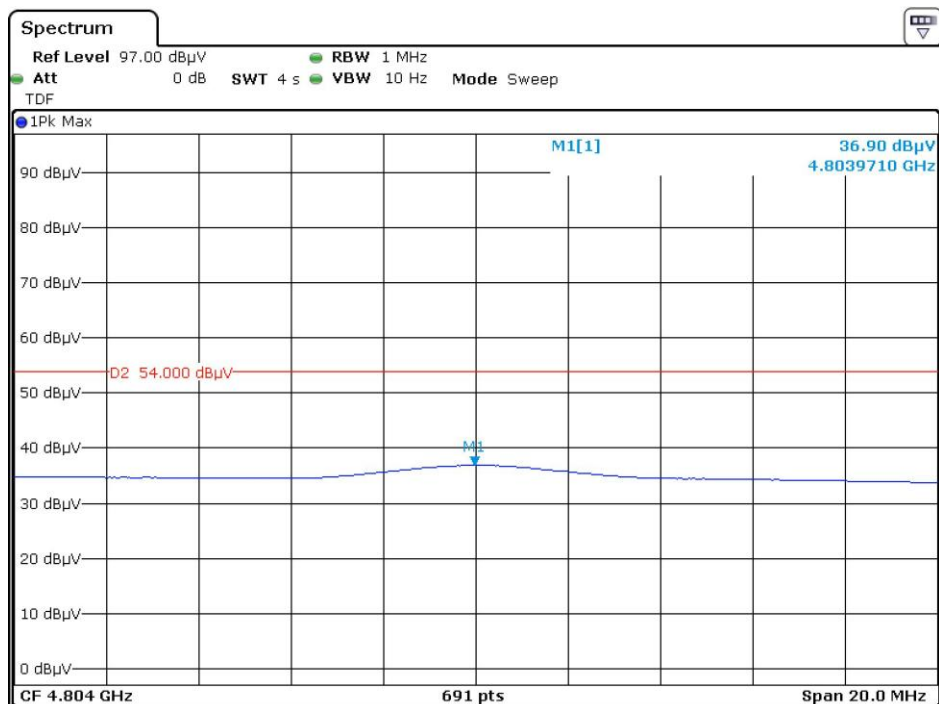


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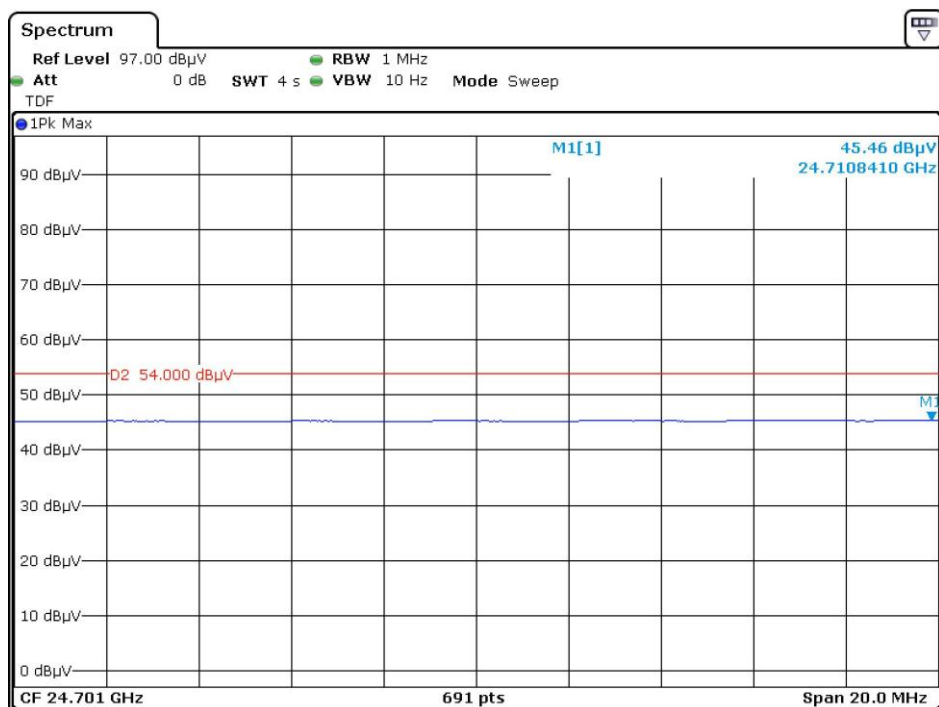


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Vertical



Date: 7.APR.2020 16:29:18



Date: 7.APR.2020 17:01:54

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 °C
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa

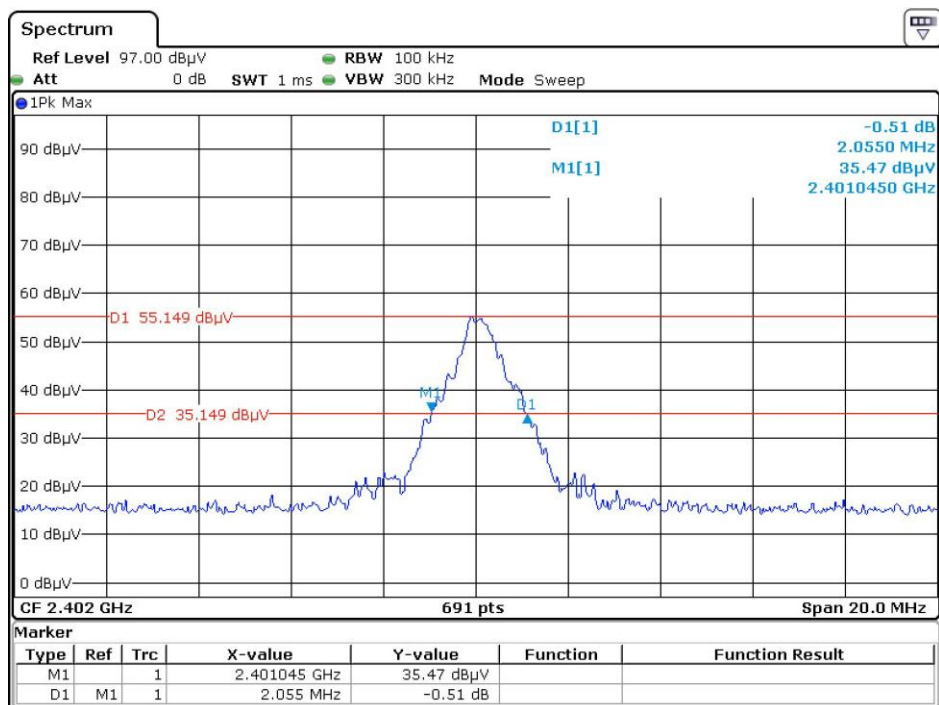
The testing was performed by Leo Huang on 2020-04-07.

Test Mode: Transmitting

Please refer to the following table and plots.

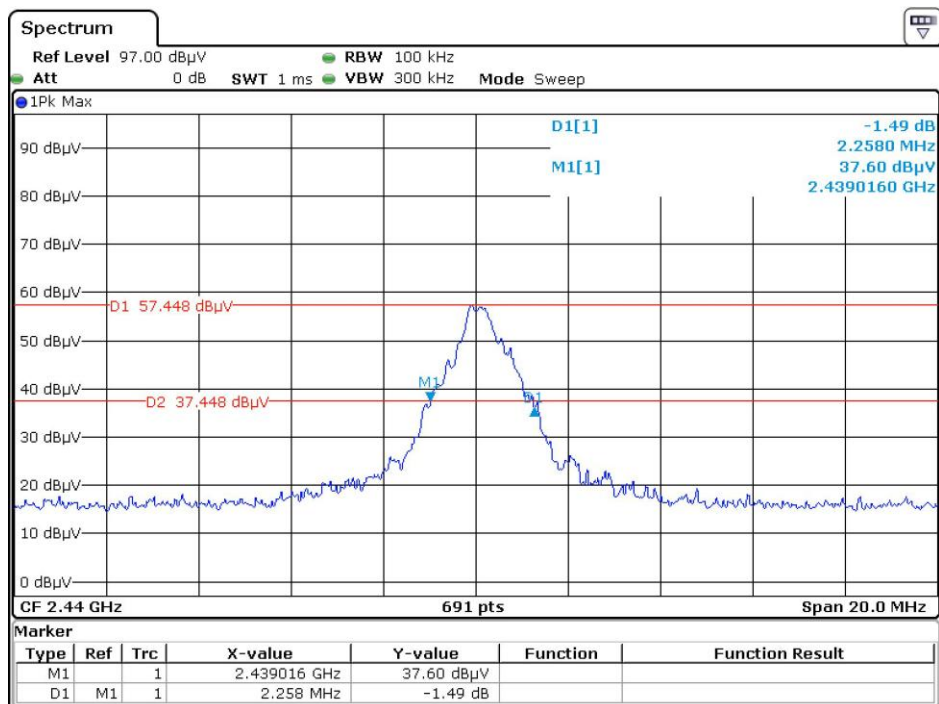
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
Low	2402	2.055
Middle	2440	2.258
High	2480	2.200

Low Channel



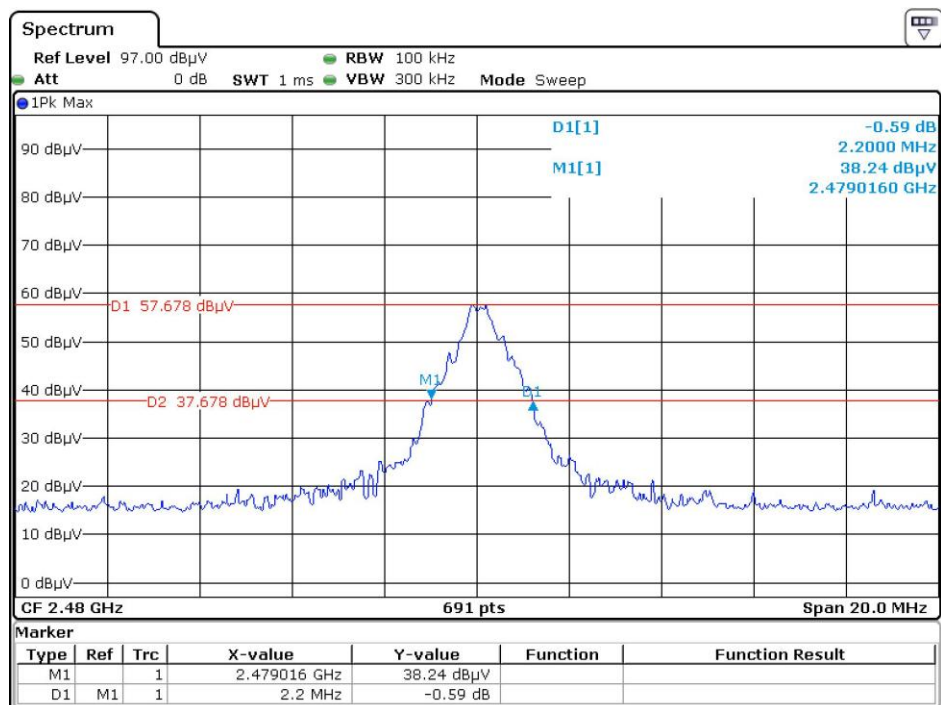
Date: 7.APR.2020 15:09:19

Middle Channel



Date: 7.APR.2020 15:11:57

High Channel



Date: 7.APR.2020 15:34:07

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