

FCC PART 15.249

TEST REPORT

For

Shenzhen Qianhai Patuoxun Network & Technology co.,ltd

Wuhe RD 49#, Bantian District B-202, 6th Building, Shenzhen, Guangdong, China

FCC ID: 2AOXY-HM393A-1

Report Type: Original Report	Product Name: Remote Control
Report Number: RDG190521004-00	
Report Date: 2019-06-03	
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* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk “*” .

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	Remote Control
EUT Model:	HM393A
Rated Input Voltage:	3VDC from battery
Highest Operation Frequency:	2480 MHz
External Dimension:	125mm(L)*46.8mm(W)*22mm(H)
Serial Number:	190521004
EUT Received Date:	2019/5/22

Objective

This type approval report is prepared on behalf of **Shenzhen Qianhai Patuoxun Network & Technology co.,ltd** 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 Rules Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.249 rules.

Related Submittal(s)/Grant(s)

Part of system submittal with FCC ID: 2AOXY-HM393A

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 emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
Unwanted Emissions, radiated	30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical 1G~6GHz: 4.45 dB, 6G~26.5GHz: 5.23 dB
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in engineering mode. The device employs 65 Channels as below table:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2404	34	2443
2	2405	35	2444
3	2406	36	2445
4	2407	37	2446
5	2408	38	2450
6	2409	39	2451
7	2410	40	2452
8	2411	41	2453
9	2412	42	2454
10	2413	43	2455
11	2414	44	2456
12	2418	45	2457
13	2419	46	2458
14	2420	47	2459
15	2421	48	2460
16	2422	49	2461
17	2423	50	2462
18	2424	51	2466
19	2425	52	2467
20	2426	53	2468
21	2427	54	2469
22	2428	55	2470
23	2429	56	2471
24	2430	57	2472
25	2434	58	2473
26	2435	59	2474
27	2436	60	2475
28	2437	61	2476
29	2438	62	2477
30	2439	63	2478
31	2440	64	2479
32	2441	65	2480
33	2442	/	/

EUT was tested with 2404 MHz, 2442 MHz, 2480 MHz.

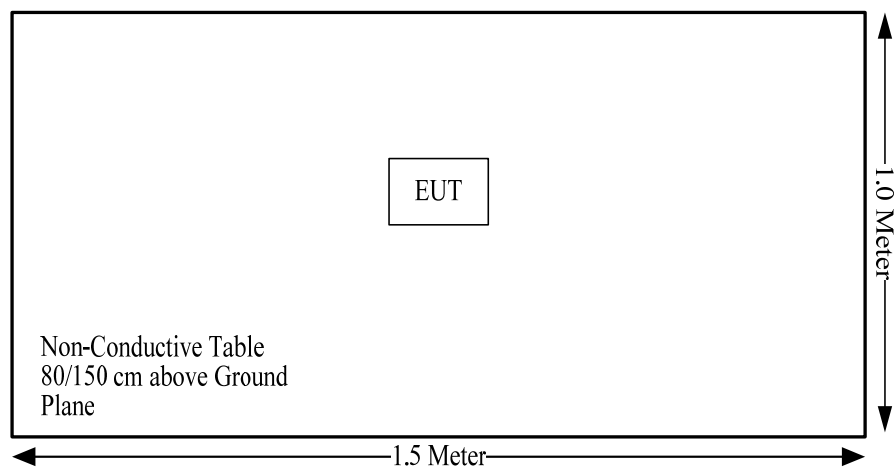
EUT Exercise Software

No software was used in test.

Equipment Modifications

No modifications were made to the EUT.

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	Radiated Emissions	Compliance
§15.215 (c)	20 dB Bandwidth	Compliance

Note: the device was powered by battery

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used.

Antenna Connector Construction

The EUT has one internal antenna arrangement, and the antenna gain is -7.2 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant.

FCC§15.205, §15.209&§15.249- 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:

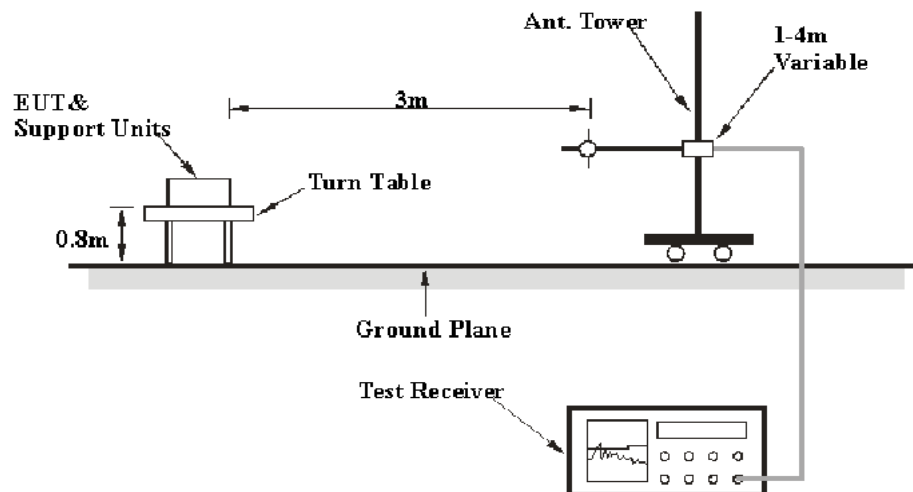
Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

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

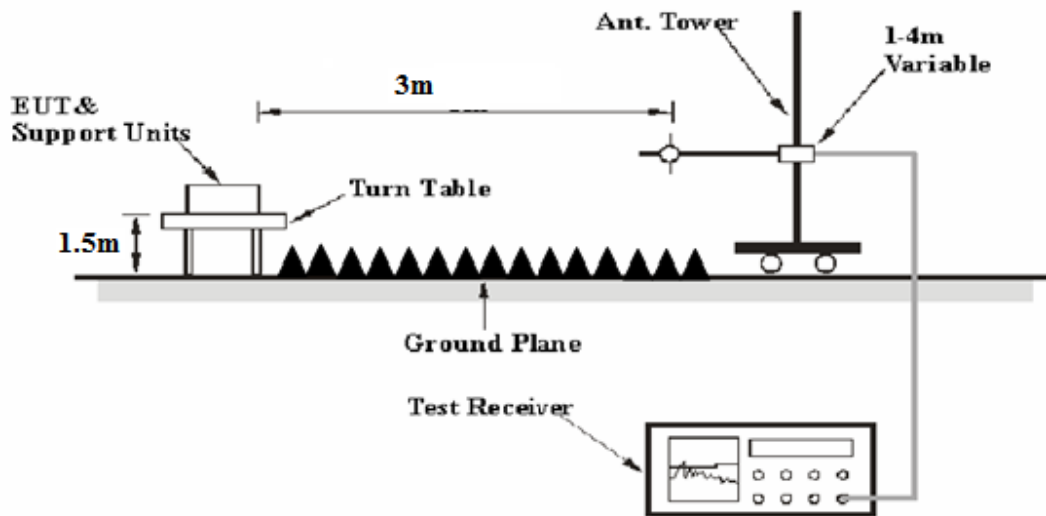
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission below 1GHz tests were performed in the 10 meters chamber test site, above 1GHz tests were performed in the 3 meters chamber test site B, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.249 limits.

Test Equipment Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

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

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

Test Procedure

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

All data was recorded in the Quasi-peak detection mode from 30 MHz to 1GHz, peak and average detection mode above 1 GHz.

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2018-12-10	2019-12-10
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Sunol Sciences	Antenna	JB3	A060611-3	2017-07-21	2019-07-21
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2018-09-05	2019-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-02	2018-09-05	2019-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0530-01	2018-09-24	2019-09-24
Sonoma	Amplifier	310N	185914	2018-10-13	2019-10-13
Agilent	Spectrum Analyzer	E4440A	SG43360054	2019-01-04	2020-01-04
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2016-11-18	2019-11-18
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2018-09-05	2019-09-05
Unknown	Coaxial Cable	C-2.4J2.4J-50	C-0700-02	2018-06-27	2019-06-27
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2018-09-05	2019-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2018-06-27	2019-06-27
E-Microwave	Band-stop Filters	OBSF-2400-2483.5-S	OE01601525	2018-06-16	2019-06-16
Micro-tronics	High Pass Filter	HPM50111	S/N-G217	2018-06-16	2019-06-16

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

Test Data**Environmental Conditions**

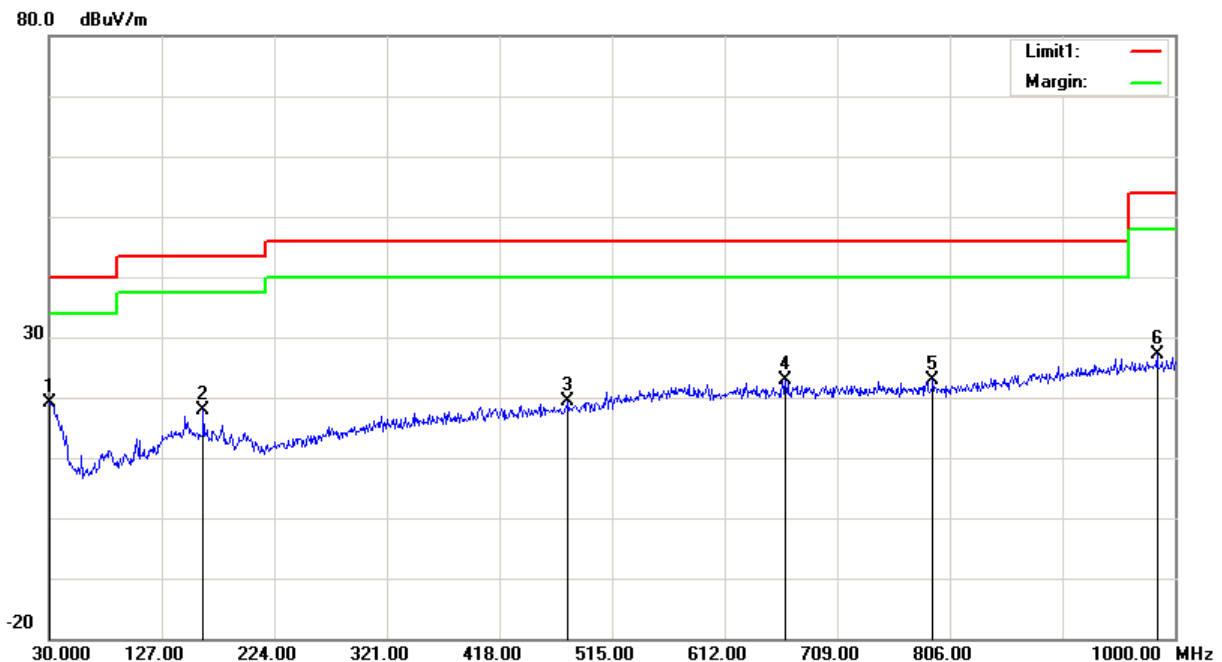
Temperature:	24.3~24.6 °C
Relative Humidity:	53~54 %
ATM Pressure:	100.3~101.1 kPa

The testing was performed by Neil Liao on 2019-05-28 & 2019-05-30.

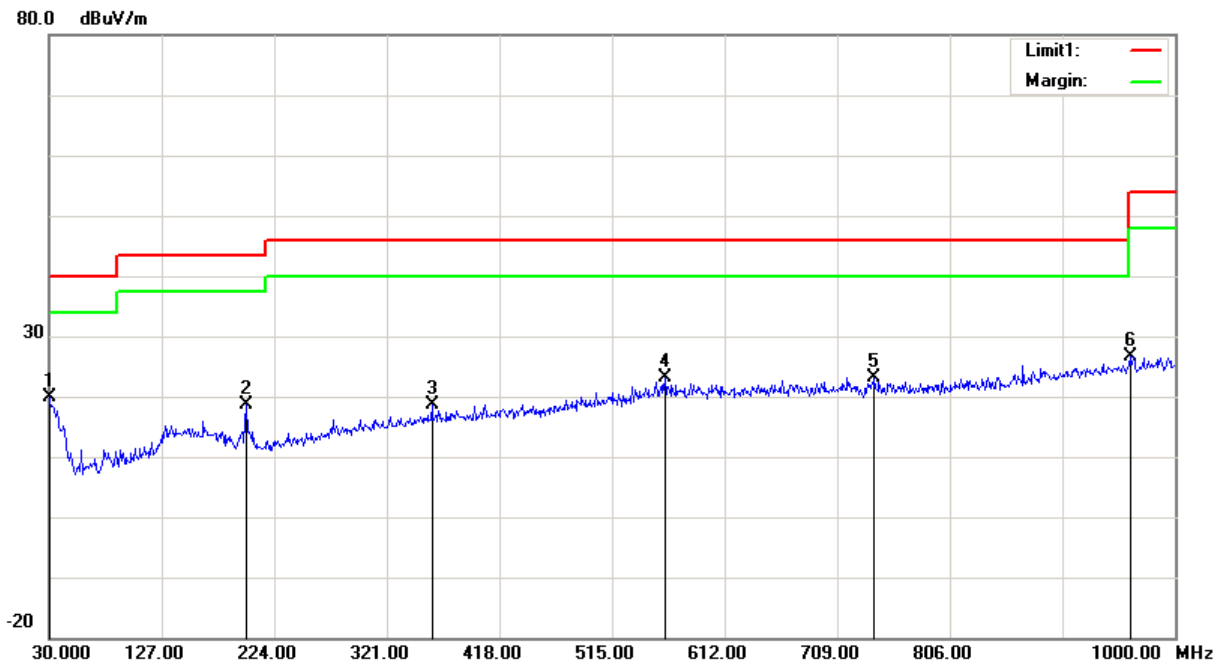
Test Mode: Transmitting

1) 30MHz-1GHz(Middle channel is the worst):

Horizontal:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.9700	27.52	peak	-8.40	19.12	40.00	20.88
162.8900	30.87	peak	-12.88	17.99	43.50	25.51
477.1700	25.96	peak	-6.68	19.28	46.00	26.72
664.3800	25.22	peak	-2.35	22.87	46.00	23.13
791.4500	23.69	peak	-0.82	22.87	46.00	23.13
984.4800	24.67	peak	2.51	27.18	54.00	26.82

Vertical:

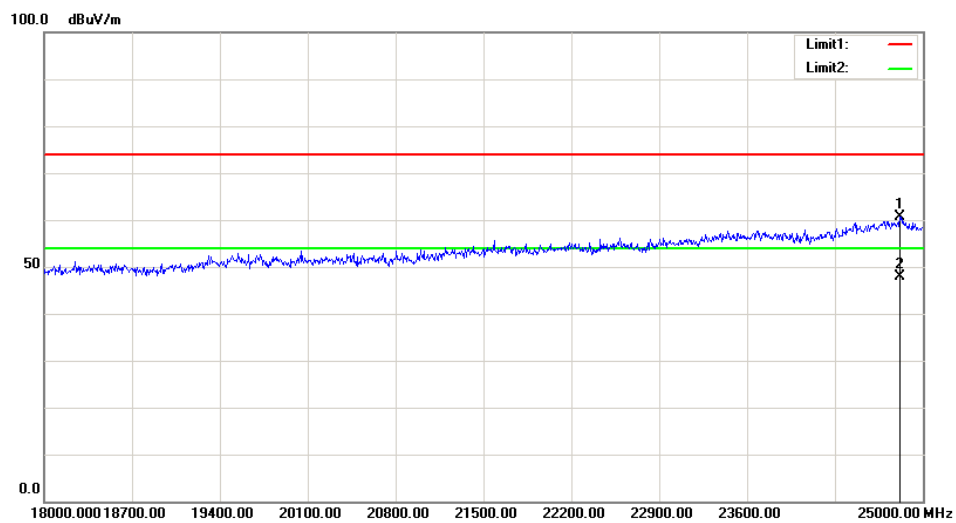
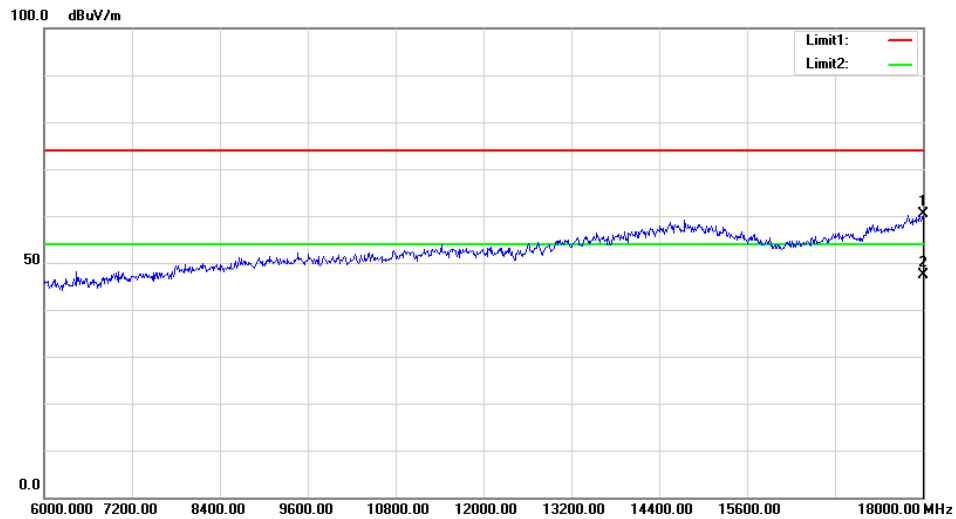
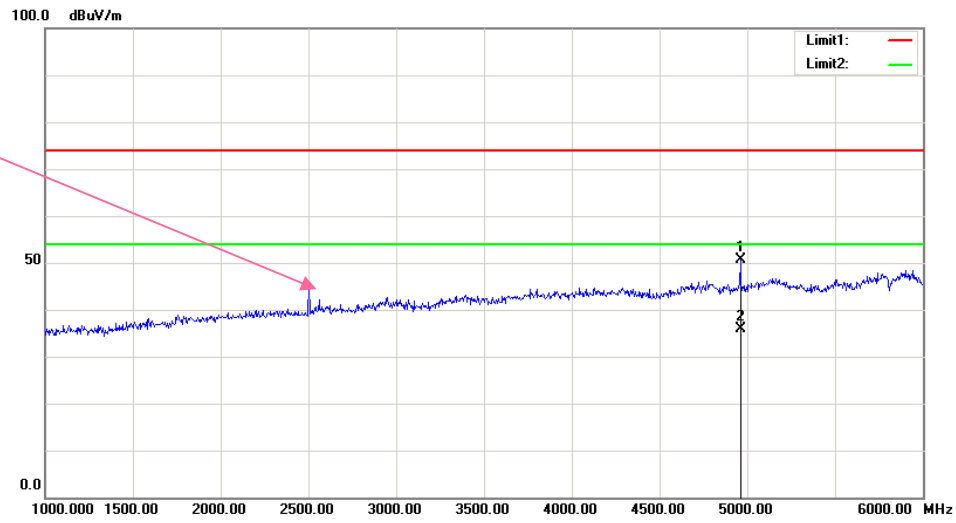
Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.0000	27.71	peak	-7.95	19.76	40.00	20.24
199.7500	31.50	peak	-12.80	18.70	43.50	24.80
359.8000	27.88	peak	-9.14	18.74	46.00	27.26
560.5900	27.04	peak	-3.86	23.18	46.00	22.82
741.0100	24.51	peak	-1.35	23.16	46.00	22.84
961.2000	24.69	peak	1.90	26.59	54.00	27.41

2) 1GHz-25GHz(per pre-test X,Y,Z axis, the worst is Y axis)

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)					
Low Channel: 2404 MHz									
2404.00	53.72	PK	H	28.11	1.80	0.00	83.63	113.98	30.35
2404.00	37.45	AV	H	28.11	1.80	0.00	67.36	93.98	26.62
2404.00	60.66	PK	V	28.11	1.80	0.00	90.57	113.98	23.41
2404.00	44.00	AV	V	28.11	1.80	0.00	73.91	93.98	20.07
2400.00	36.66	PK	V	28.10	1.80	0.00	66.56	74.00	7.44
2400.00	13.37	AV	V	28.10	1.80	0.00	43.27	54.00	10.73
4808.00	55.91	PK	V	32.92	3.17	37.20	54.80	74.00	19.20
4808.00	40.74	AV	V	32.92	3.17	37.20	39.63	54.00	14.37
7212.00	45.36	PK	V	35.75	4.81	37.24	48.68	74.00	25.32
7212.00	33.14	AV	V	35.75	4.81	37.24	36.46	54.00	17.54
Middle Channel: 2442 MHz									
2442.00	55.21	PK	H	28.18	1.82	0.00	85.21	113.98	28.77
2442.00	39.47	AV	H	28.18	1.82	0.00	69.47	93.98	24.51
2442.00	62.16	PK	V	28.18	1.82	0.00	92.16	113.98	21.82
2442.00	46.36	AV	V	28.18	1.82	0.00	76.36	93.98	17.62
4884.00	56.53	PK	V	33.07	3.28	37.21	55.67	74.00	18.33
4884.00	41.26	AV	V	33.07	3.28	37.21	40.40	54.00	13.60
7326.00	46.32	PK	V	36.05	4.61	37.38	49.60	74.00	24.40
7326.00	33.23	AV	V	36.05	4.61	37.38	36.51	54.00	17.49
High Channel: 2480 MHz									
2480.00	62.83	PK	H	28.26	1.84	0.00	92.93	113.98	21.05
2480.00	36.71	AV	H	28.26	1.84	0.00	66.81	93.98	27.17
2480.00	60.22	PK	V	28.26	1.84	0.00	90.32	113.98	23.66
2480.00	43.99	AV	V	28.26	1.84	0.00	74.09	93.98	19.89
2483.50	36.53	PK	V	28.27	1.84	0.00	66.64	74.00	7.36
2483.50	13.90	AV	V	28.27	1.84	0.00	44.01	54.00	9.99
4960.00	57.43	PK	V	33.22	3.23	37.25	56.63	74.00	17.37
4960.00	41.96	AV	V	33.22	3.23	37.25	41.16	54.00	12.84
7440.00	45.62	PK	V	36.34	4.41	37.52	48.85	74.00	25.15
7440.00	33.26	AV	V	36.34	4.41	37.52	36.49	54.00	17.51

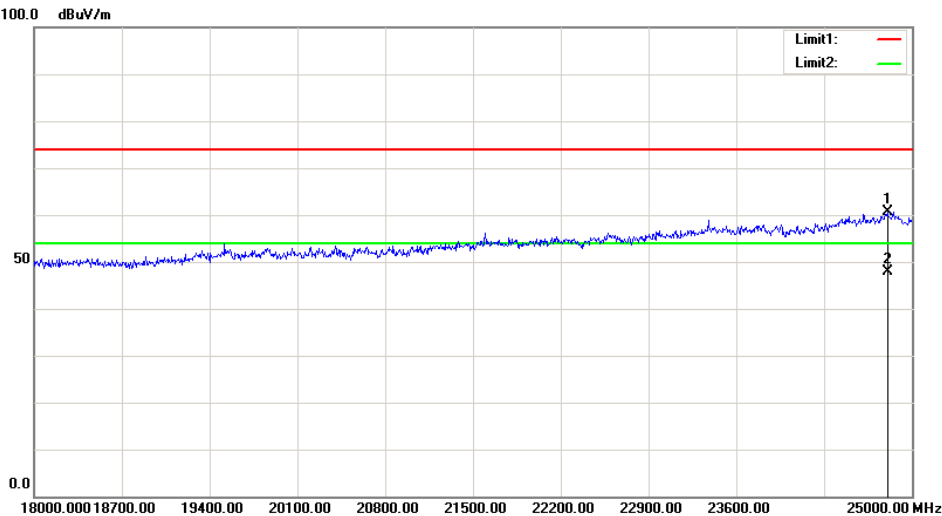
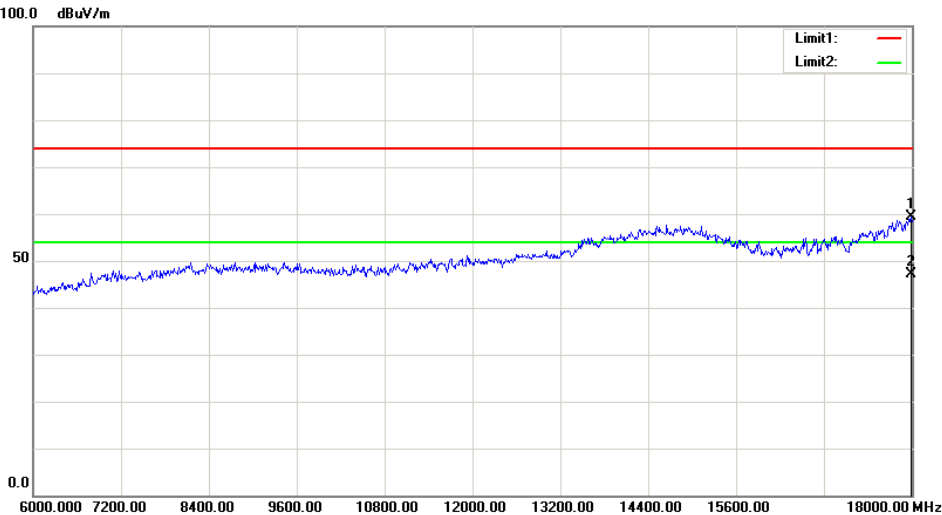
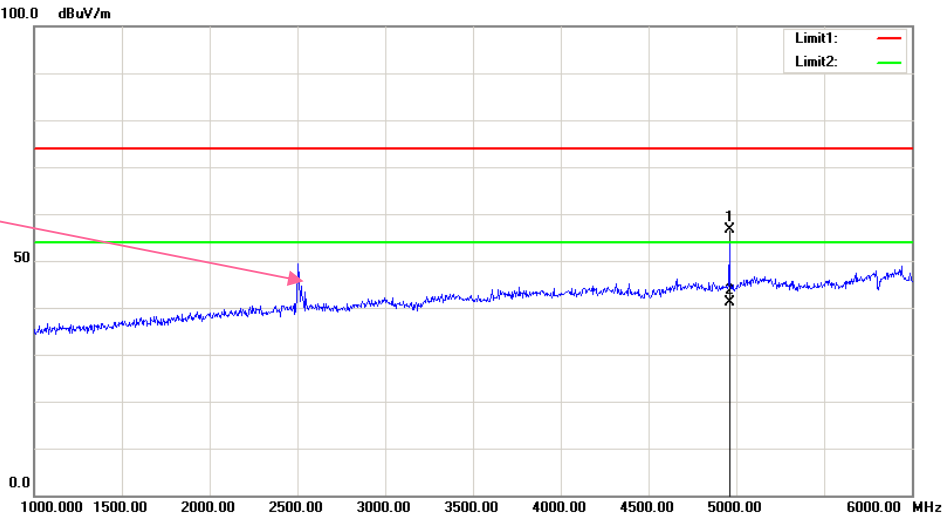
Worst Test plots(High channel) **Horizontal**

Fundamental
test with Filter



Vertical

Fundamental
test with Filter



FCC §15.215(c) – 20 dB BANDWIDTH TESTING**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

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
3. Repeat above procedures until all frequencies measured were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Spectrum Analyzer	E4440A	SG43360054	2019-01-04	2020-01-04
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2018-09-05	2019-09-05

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

Test Data**Environmental Conditions**

Temperature:	27.6 °C
Relative Humidity:	63 %
ATM Pressure:	101.1 kPa

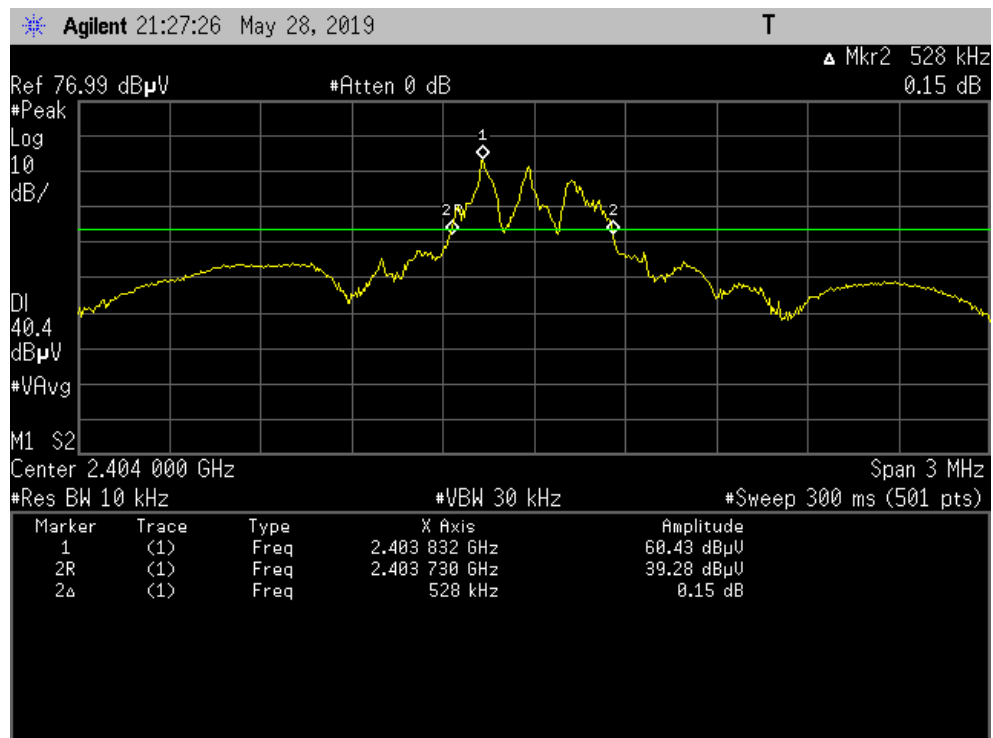
The testing was performed by Carrie He on 2019-05-28

Test Result: Compliant.

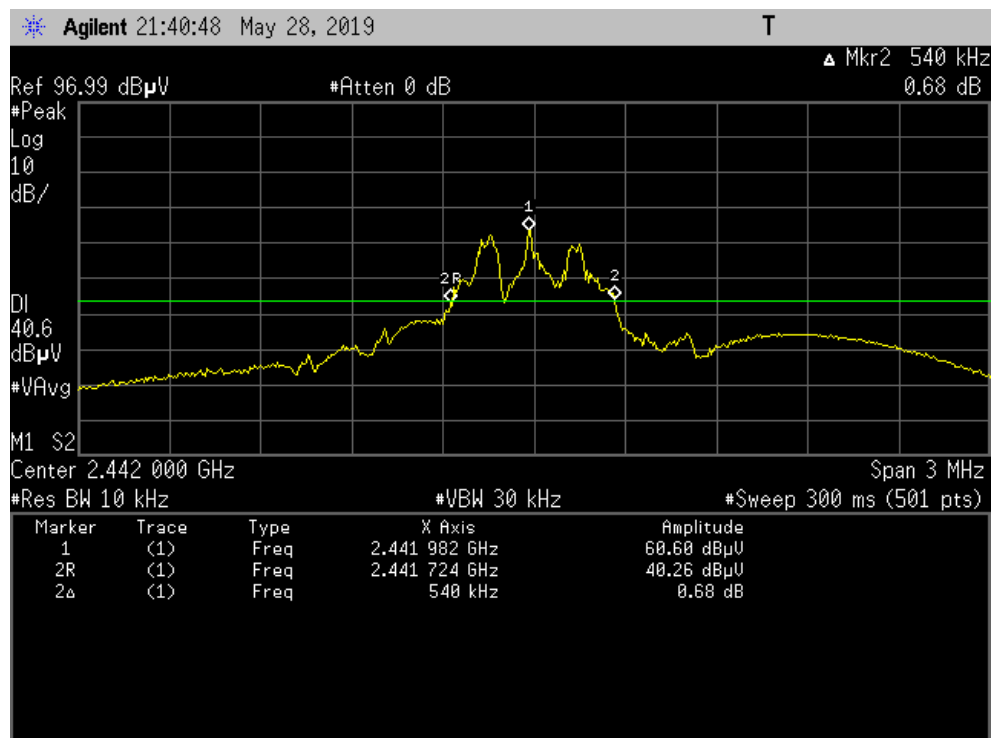
Please refer to following tables and plots

Test Mode: Transmitting

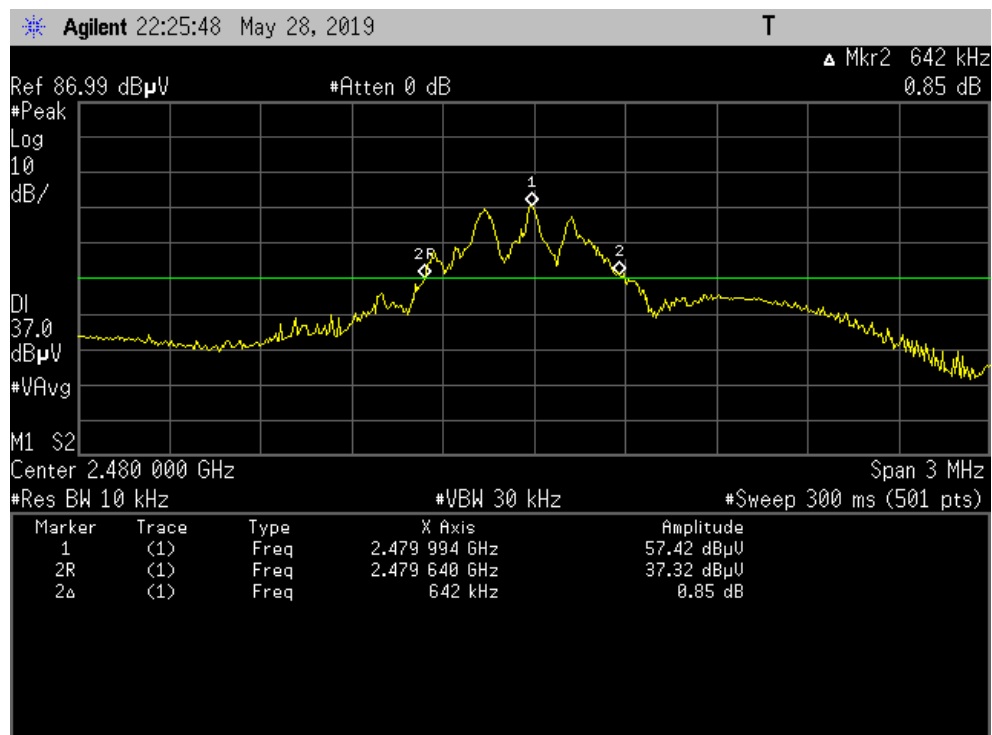
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2404	0.528
Middle	2442	0.540
High	2480	0.642

Low Channel

Middle Channel



High Channel



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