



TESTING LABORATORY  
CERTIFICATE #4820.01



# FCC PART 15.247


## TEST REPORT

For

### MPOW TECHNOLOGY CO.,LIMITED

FLAT/RM 605 6/F FA YUEN COMMERCIAL BUILDING 75-77 FA YUEN STREET MONGKOK KL  
HONG KONG

**FCC ID: 2AMH2-BH452A-1**

<b>Report Type:</b> Original Report	<b>Product Name:</b> TRUE WIRELESS EARBUDS
<b>Report Number:</b>	<u>RDG200525003-00C</u>
<b>Report Date:</b>	<u>2020-06-08</u>
<b>Reviewed By:</b>	Ivan Cao Assistant Manager 
<b>Test Laboratory:</b>	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 <a href="http://www.baclcorp.com.cn">www.baclcorp.com.cn</a>

## TABLE OF CONTENTS

<b>GENERAL INFORMATION.....</b>	<b>4</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	4
OBJECTIVE.....	4
RELATED SUBMITTAL(S)/GRANT(S).....	4
TEST METHODOLOGY.....	4
MEASUREMENT UNCERTAINTY.....	5
TEST FACILITY.....	5
DECLARATIONS.....	5
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>6</b>
DESCRIPTION OF TEST CONFIGURATION.....	6
EQUIPMENT MODIFICATIONS.....	6
EUT EXERCISE SOFTWARE.....	6
BLOCK DIAGRAM OF TEST SETUP.....	8
<b>SUMMARY OF TEST RESULTS.....</b>	<b>9</b>
<b>FCC §15.247 (i) &amp; §1.1310 &amp; §2.1093- RF EXPOSURE.....</b>	<b>10</b>
APPLICABLE STANDARD.....	10
<b>FCC §15.203 - ANTENNA REQUIREMENT.....</b>	<b>11</b>
APPLICABLE STANDARD.....	11
ANTENNA INFORMATION AND CONNECTOR CONSTRUCTION.....	11
<b>FCC §15.209, §15.205, §15.247(d) - SPURIOUS EMISSIONS.....</b>	<b>12</b>
APPLICABLE STANDARD.....	12
EUT SETUP.....	12
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP.....	13
TEST PROCEDURE.....	13
CORRECTED AMPLITUDE & MARGIN CALCULATION.....	13
TEST EQUIPMENT LIST AND DETAILS.....	14
TEST DATA.....	14
<b>FCC §15.247(a) (2) –6 dB EMISSION BANDWIDTH.....</b>	<b>21</b>
APPLICABLE STANDARD.....	21
TEST PROCEDURE.....	21
TEST EQUIPMENT LIST AND DETAILS.....	21
TEST DATA.....	21
<b>FCC §15.247(b) (3) - MAXIMUM PEAK CONDUCTED OUTPUT POWER.....</b>	<b>26</b>
APPLICABLE STANDARD.....	26
TEST PROCEDURE.....	26
TEST EQUIPMENT LIST AND DETAILS.....	26
TEST DATA.....	26
<b>FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE.....</b>	<b>28</b>
APPLICABLE STANDARD.....	28
TEST PROCEDURE.....	28
TEST EQUIPMENT LIST AND DETAILS.....	28
TEST DATA.....	28
<b>FCC §15.247(e) - POWER SPECTRAL DENSITY.....</b>	<b>31</b>
APPLICABLE STANDARD.....	31
TEST PROCEDURE.....	31

TEST EQUIPMENT LIST AND DETAILS.....31  
TEST DATA .....31

## GENERAL INFORMATION

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

<b>EUT Name:</b>	TRUE WIRELESS EARBUDS
<b>EUT Model:</b>	BH452A
<b>Operation Frequency:</b>	2402-2480MHz
<b>Maximum Output Power (Conducted):</b>	2.21dBm
<b>Modulation Type:</b>	GFSK
<b>Rated Input Voltage:</b>	DC 3.8V from battery or charged by Charger Box
<b>Serial Number:</b>	RDG200525003-RF -S1
<b>EUT Received Date:</b>	2020.5.25
<b>EUT Received Status:</b>	Good

### Objective

This report is prepared on behalf of the *MPOW TECHNOLOGY CO., LIMITED* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules

The tests were performed in order to determine the compliance of the EUT with FCC Rules Part 15-Subpart C, section 15.203, 15.205, 15.209, 15.247 rules.

### Related Submittal(s)/Grant(s)

FCC Part 15C DSS submissions with FCC ID: 2AMH2-BH452A-1  
Part of system submissions with FCC ID: 2AMH2-BH452A

### 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 and KDB 558074 D01 DTS Meas Guidance v05r02.

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

## Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	30M~200MHz: 4.55 dB, 200M~1GHz: 5.92 dB, 1G~6GHz: 4.98 dB, 6G~18GHz: 5.89 dB, 18G~26.5G: 5.47 dB, 26.5G~40G: 5.63 dB
Unwanted Emissions, conducted	±1.5 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)

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

## 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.

## Declarations

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol “△”. Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

This report cannot be reproduced except in full, without prior written approval of the Company.

This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA, or any agency of the U.S. Government.

This report may contain data that are not covered by the accreditation scope and shall be marked with an asterisk “★”.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in engineering mode.

For Bluetooth LE mode, 40 channels are provided for testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	...	...
...	...	...	...
...	...	...	...
..	...	38	2478
19	2440	39	2480

EUT was tested with channel 0, 19 and 39.

### Equipment Modifications

No modification was made to the EUT tested.

### EUT Exercise Software

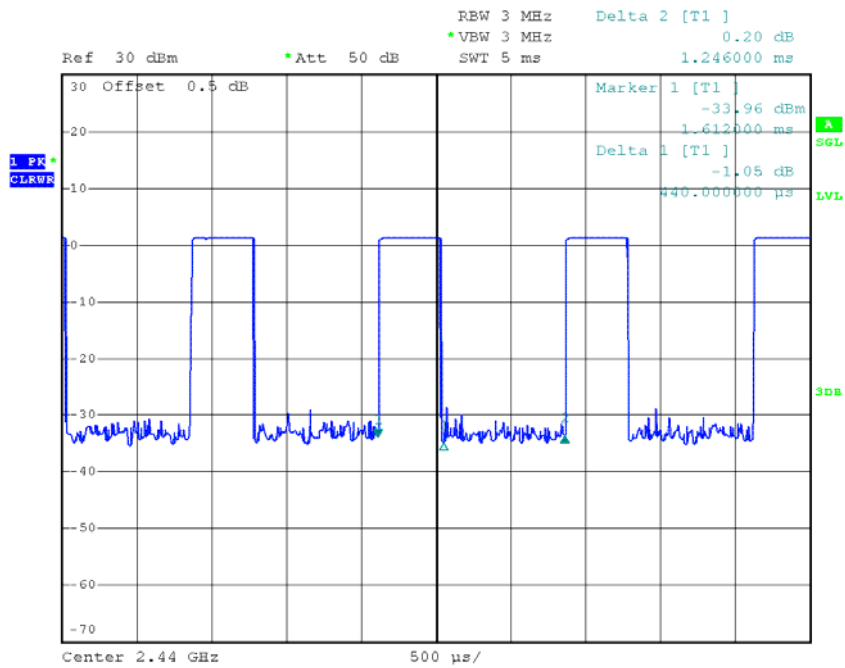
The software 'Airoha.Tool.kit' was used for testing, which was provided by manufacturer and the maximum power was configured as below table:

Mode	Channel	Frequency (MHz)	Power level Setting
LE 1Mbps	Low	2402	54
	Middle	2440	54
	High	2480	54
LE 2Mbps	Low	2402	54
	Middle	2440	54
	High	2480	54

The duty cycle as below:

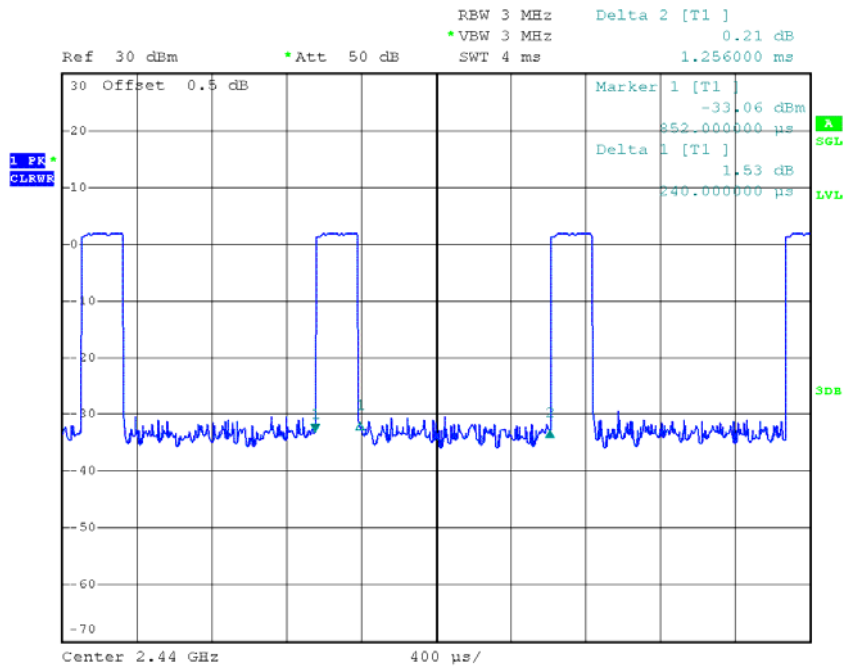
Mode	T <sub>on</sub> (ms)	T <sub>on+off</sub> (ms)	Duty Cycle (%)
LE 1Mbps	0.440	1.246	35.31
LE 2Mbps	0.240	1.256	19.11

### 1Mbps



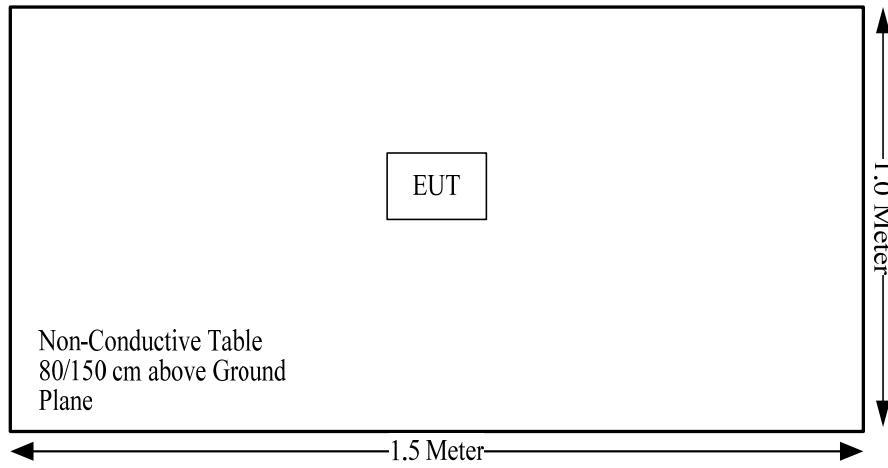
Date: 29.MAY.2020 14:03:13

### 2Mbps



Date: 29.MAY.2020 14:01:42

### Block Diagram of Test Setup





**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
FCC§15.247 (i) & §1.1310 & §2.1093	RF Exposure	Compliance
FCC §15.203	Antenna requirement	Compliance
FCC §15.207(a)	AC line conducted emissions	Not Applicable
FCC §15.205, §15.209, §15.247(d)	Spurious emissions	Compliance
FCC §15.247(a)(2)	6 dB emission bandwidth	Compliance
FCC §15.247(b)(3)	Maximum conducted output power	Compliance
FCC §15.247(d)	100 kHz Bandwidth of frequency band edge	Compliance
FCC §15.247(e)	Power spectral density	Compliance

Not Applicable: the device was powered by battery when operating.

## **FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE**

### **Applicable Standard**

According to §15.247(i) and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB447498 D01 General RF Exposure Guidance v06:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$  for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR, where

- $f(\text{GHz})$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

### **Measurement Result**

The max conducted power including tune-up tolerance is 3.0 dBm (2.0 mW).

$[(\text{max. power of channel, mW})/(\text{min. test separation distance, mm})][\sqrt{f(\text{GHz})}]$   
 $= 2/5 * (\sqrt{2.480}) = 0.6 < 3.0$

**So the stand-alone SAR evaluation is not necessary.**

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

### **Applicable Standard**

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 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 user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.
- c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

### **Antenna Information And Connector Construction**

The EUT has one internal antenna arrangement, fulfill the requirement of this section. Please refer to below information and the EUT photos:

<b>Antenna Type</b>	<b>input impedance (Ohm)</b>	<b>Antenna Gain /Frequency Range</b>
Chip	50	0 dBi/2.4~2.5GHz

**Result:** Compliance.

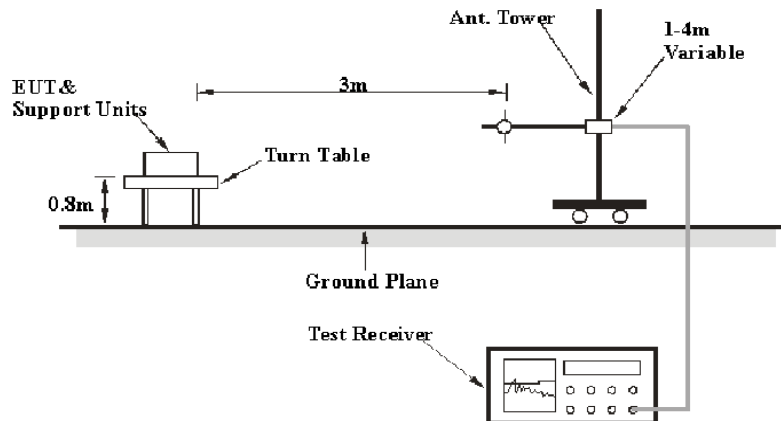
## FCC §15.209, §15.205, §15.247(a) - SPURIOUS EMISSIONS

### Applicable Standard

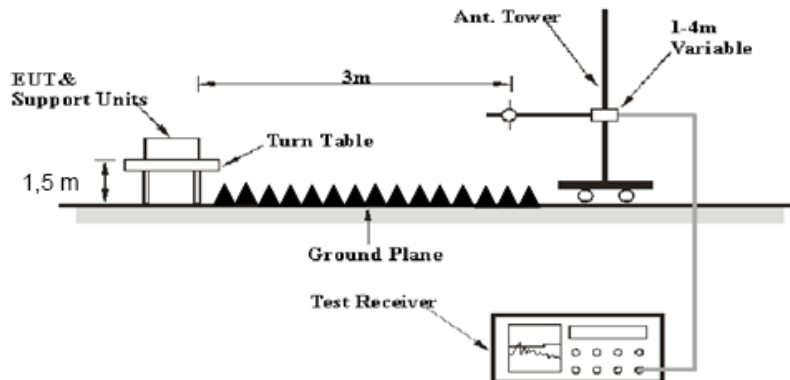
FCC §15.247 (d); §15.209; §15.205

### EUT Setup

#### Below 1GHz:



#### Above 1GHz:



The radiated emission below 1GHz tests were performed in the 3 meters chamber A, above 1GHz tests were performed in the 3 meters chamber B, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

## EMI Test Receiver & Spectrum Analyzer 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:

30MHz-1000MHz:

Measurement	RBW	Video B/W	IF B/W
QP	120 kHz	300 kHz	120kHz

1GHz- 25GHz:

Measurement	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
AV	>98%	1MHz	10 Hz
	<98%	1MHz	1/T

Note: T is minimum transmission duration

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.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies 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
Radiation Below 1GHz					
R&S	EMI Test Receiver	ESCI	100035	2019-08-03	2020-08-03
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Sunol Sciences	Antenna	JB3	A060611-2	2017-08-25	2020-08-25
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-02	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0530-01	2019-09-24	2020-09-24
Sonoma	Amplifier	310N	185914	2019-10-13	2020-10-13
Radiation Above 1GHz					
Agilent	Spectrum Analyzer	E4440A	SG43360054	2020-05-09	2021-05-09
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1304	2019-11-18	2022-11-18
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-2.4J2.4J-50	C-0700-02	2019-06-27	2020-06-27
Mini-Circuit	Amplifier	ZVA-213-S+	54201245	2019-09-05	2020-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2019-06-27	2020-06-27
E-Microwave	Band-stop Filters	OBSF-2400-2483.5-S	OE01601525	2019-06-16	2020-06-16
Micro-tronics	High Pass Filter	HPM50111	S/N-G217	2019-06-16	2020-06-16

\* **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**

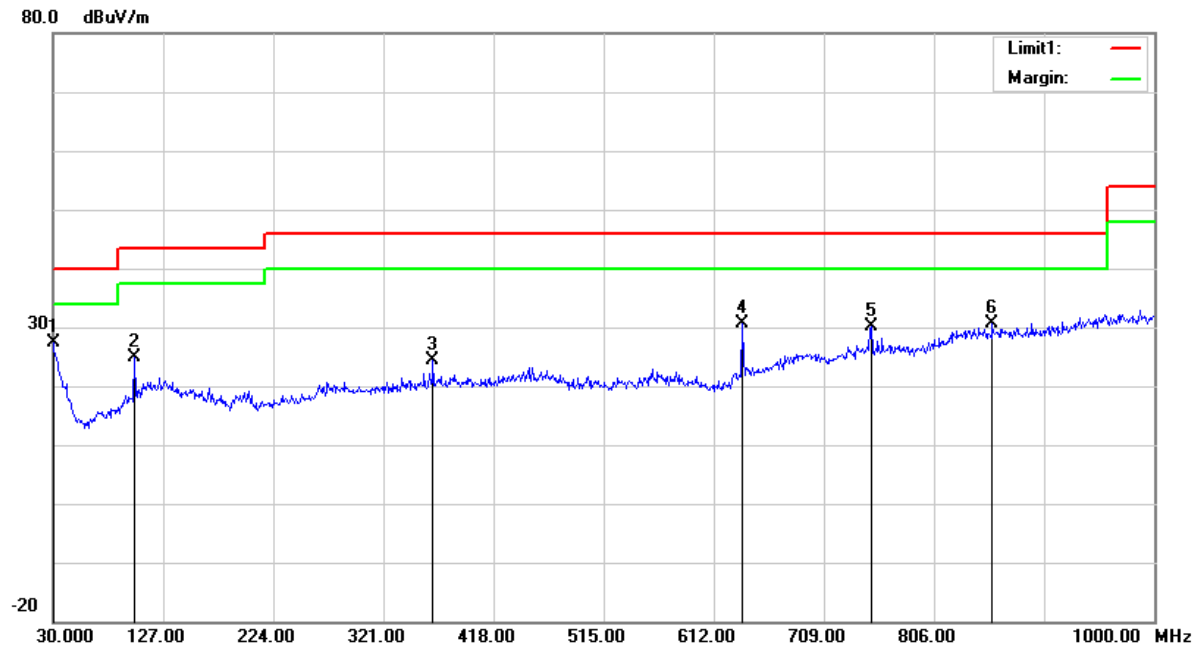
Test Items	Radiation Below 1GHz	Radiation Above 1GHz
Temperature:	25.1°C	25.1°C
Relative Humidity:	53%	53%
ATM Pressure:	100.6kPa	100.6kPa
Tester:	Joker Chen	Jalon Liu
Test Date:	2020-05-28	2020-05-28

*Test Mode: Transmitting*

*Test Result: Compliance. Please refer to the following table and plots.*

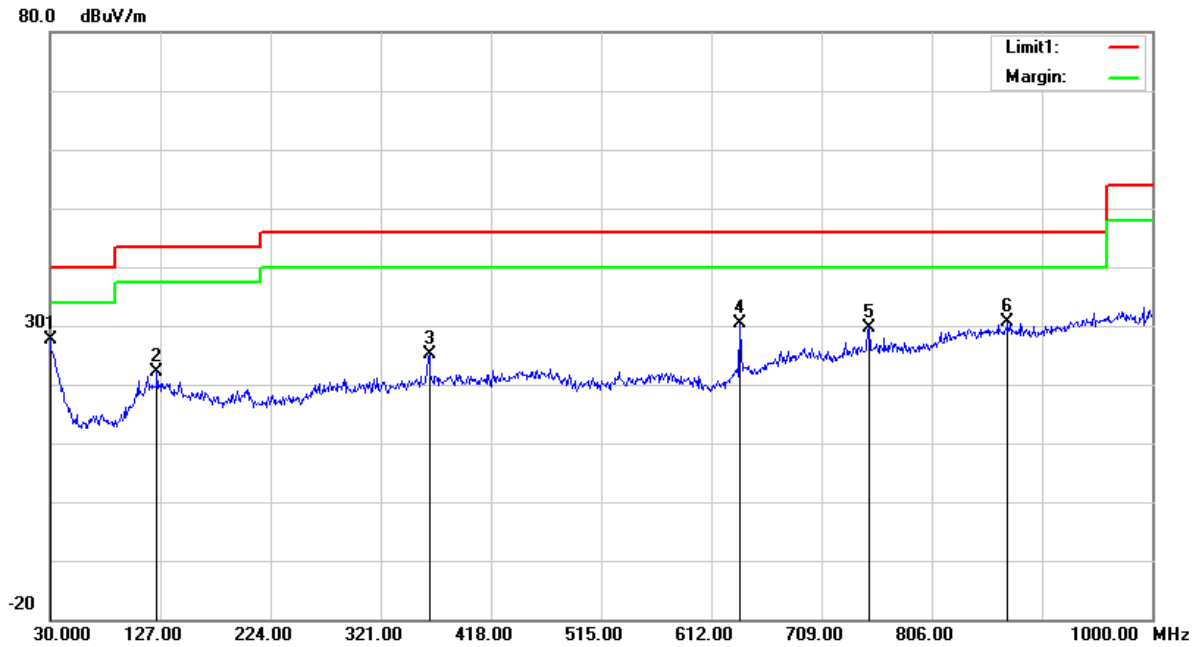
1) 30MHz-1GHz (Low Channel was the worst):

Horizontal:



Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.0000	25.74	peak	1.72	27.46	40.00	12.54
101.7800	33.23	peak	-8.34	24.89	43.50	18.61
364.6500	27.12	peak	-2.82	24.30	46.00	21.70
637.2200	28.32	peak	2.20	30.52	46.00	15.48
750.7100	26.49	peak	3.66	30.15	46.00	15.85
857.4100	25.50	peak	5.16	30.66	46.00	15.34

**Vertical:**



Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30.0000	26.01	peak	1.72	27.73	40.00	12.27
124.0900	26.64	peak	-4.56	22.08	43.50	21.42
363.6800	27.91	peak	-2.81	25.10	46.00	20.90
637.2200	28.21	peak	2.20	30.41	46.00	15.59
750.7100	25.91	peak	3.66	29.57	46.00	16.43
872.9300	25.21	peak	5.46	30.67	46.00	15.33



## 2) 1-25GHz:

## BLE 1Mbps:

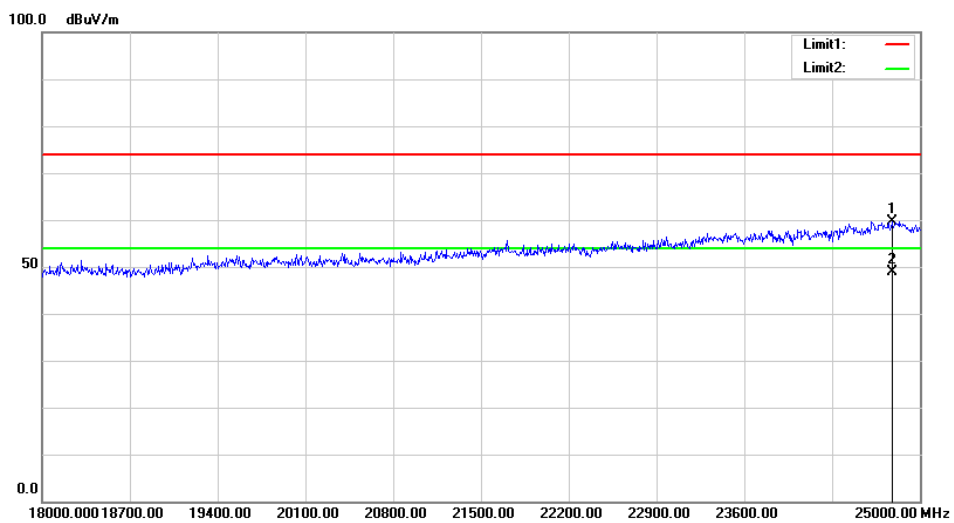
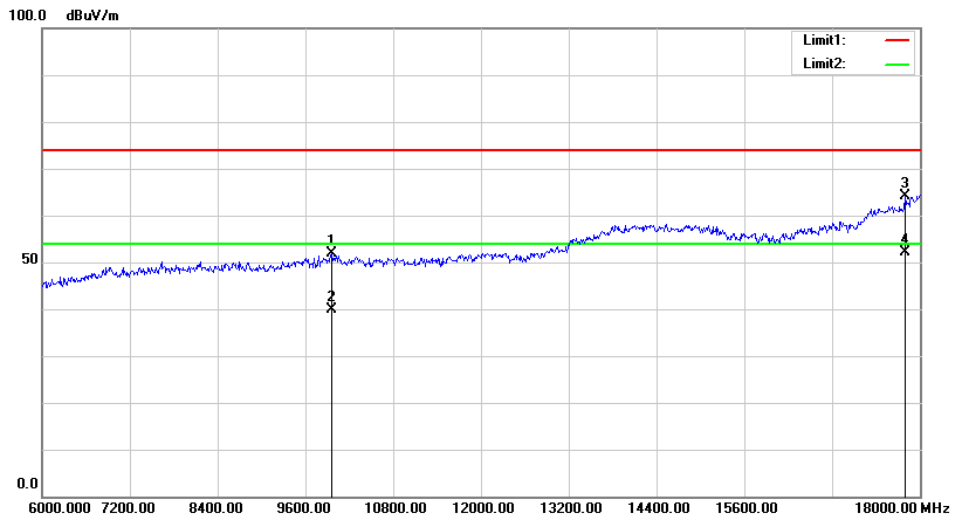
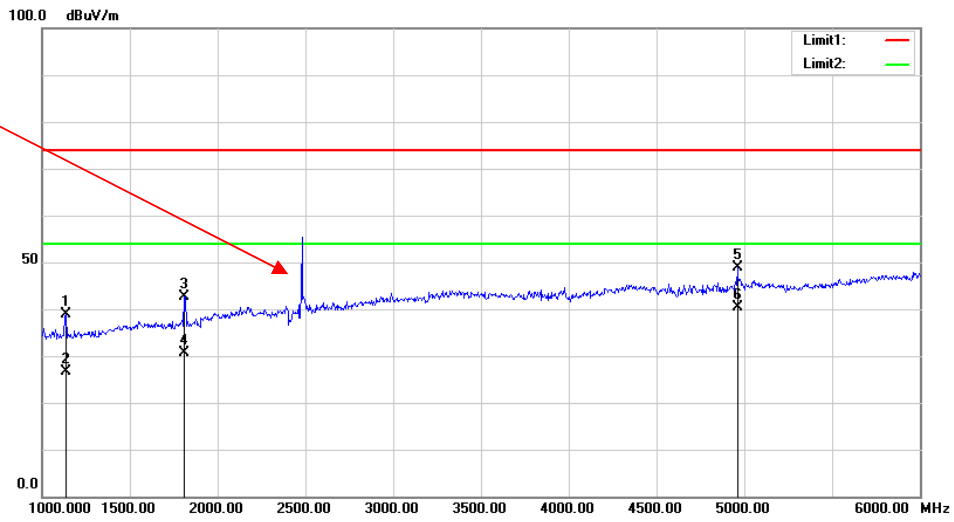
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Remark	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz 1M									
2402.00	67.39	PK	H	28.10	1.80	0.00	97.29	N/A	N/A
2402.00	66.02	AV	H	28.10	1.80	0.00	95.92	N/A	N/A
2402.00	62.50	PK	V	28.10	1.80	0.00	92.40	N/A	N/A
2402.00	62.34	AV	V	28.10	1.80	0.00	92.24	N/A	N/A
2390.00	25.95	PK	H	28.08	1.80	0.00	55.83	74.00	18.17
2390.00	14.39	AV	H	28.08	1.80	0.00	44.27	54.00	9.73
4804.00	37.07	PK	H	32.91	3.17	25.60	47.55	74.00	26.45
4804.00	28.19	AV	H	32.91	3.17	25.60	38.67	54.00	15.33
7206.00	34.58	PK	H	35.74	4.82	25.60	49.54	74.00	24.46
7206.00	23.24	AV	H	35.74	4.82	25.60	38.20	54.00	15.80
Middle Channel: 2440 MHz 1M									
2440.00	68.33	PK	H	28.18	1.82	0.00	98.33	N/A	N/A
2440.00	67.72	AV	H	28.18	1.82	0.00	97.72	N/A	N/A
2440.00	64.09	PK	V	28.18	1.82	0.00	94.09	N/A	N/A
2440.00	64.01	AV	V	28.18	1.82	0.00	94.01	N/A	N/A
4880.00	37.15	PK	H	33.06	3.27	25.66	47.82	74.00	26.18
4880.00	29.45	AV	H	33.06	3.27	25.66	40.12	54.00	13.88
7320.00	36.05	PK	H	36.03	4.62	25.72	50.98	74.00	23.02
7320.00	23.65	AV	H	36.03	4.62	25.72	38.58	54.00	15.42
High Channel: 2480 MHz 1M									
2480.00	69.81	PK	H	28.26	1.84	0.00	99.91	N/A	N/A
2480.00	69.35	AV	H	28.26	1.84	0.00	99.45	N/A	N/A
2480.00	65.17	PK	V	28.26	1.84	0.00	95.27	N/A	N/A
2480.00	65.03	AV	V	28.26	1.84	0.00	95.13	N/A	N/A
2483.50	29.09	PK	H	28.27	1.84	0.00	59.20	74.00	14.80
2483.50	19.87	AV	H	28.27	1.84	0.00	49.98	54.00	4.02
4960.00	37.94	PK	H	33.22	3.23	25.63	48.76	74.00	25.24
4960.00	29.53	AV	H	33.22	3.23	25.63	40.35	54.00	13.65
7440.00	34.69	PK	H	36.34	4.41	25.85	49.59	74.00	24.41
7440.00	23.45	AV	H	36.34	4.41	25.85	38.35	54.00	15.65

**BLE 2Mbps:**

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	Reading (dB $\mu$ V)	Remark	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz 2M									
2402.00	67.75	PK	H	28.10	1.80	0.00	97.65	N/A	N/A
2402.00	65.83	AV	H	28.10	1.80	0.00	95.73	N/A	N/A
2402.00	63.60	PK	V	28.10	1.80	0.00	93.50	N/A	N/A
2402.00	62.96	AV	V	28.10	1.80	0.00	92.86	N/A	N/A
2390.00	25.42	PK	H	28.08	1.80	0.00	55.30	74.00	18.70
2390.00	14.93	AV	H	28.08	1.80	0.00	44.81	54.00	9.19
4804.00	37.44	PK	H	32.91	3.17	25.60	47.92	74.00	26.08
4804.00	29.26	AV	H	32.91	3.17	25.60	39.74	54.00	14.26
7206.00	35.12	PK	H	35.74	4.82	25.60	50.08	74.00	23.92
7206.00	23.97	AV	H	35.74	4.82	25.60	38.93	54.00	15.07
Middle Channel: 2440 MHz 2M									
2440.00	68.26	PK	H	28.18	1.82	0.00	98.26	N/A	N/A
2440.00	67.13	AV	H	28.18	1.82	0.00	97.13	N/A	N/A
2440.00	63.88	PK	V	28.18	1.82	0.00	93.88	N/A	N/A
2440.00	63.46	AV	V	28.18	1.82	0.00	93.46	N/A	N/A
4880.00	35.98	PK	H	33.06	3.27	25.66	46.65	74.00	27.35
4880.00	26.38	AV	H	33.06	3.27	25.66	37.05	54.00	16.95
7320.00	35.02	PK	H	36.03	4.62	25.72	49.95	74.00	24.05
7320.00	24.05	AV	H	36.03	4.62	25.72	38.98	54.00	15.02
High Channel: 2480 MHz 2M									
2480.00	69.76	PK	H	28.26	1.84	0.00	99.86	N/A	N/A
2480.00	68.71	AV	H	28.26	1.84	0.00	98.81	N/A	N/A
2480.00	65.84	PK	V	28.26	1.84	0.00	95.94	N/A	N/A
2480.00	65.32	AV	V	28.26	1.84	0.00	95.42	N/A	N/A
2483.50	36.74	PK	H	28.27	1.84	0.00	66.85	74.00	7.15
2483.50	20.95	AV	H	28.27	1.84	0.00	51.06	54.00	2.94
4960.00	36.86	PK	H	33.22	3.23	25.63	47.68	74.00	26.32
4960.00	28.12	AV	H	33.22	3.23	25.63	38.94	54.00	15.06
7440.00	35.05	PK	H	36.34	4.41	25.85	49.95	74.00	24.05
7440.00	23.99	AV	H	36.34	4.41	25.85	38.89	54.00	15.11

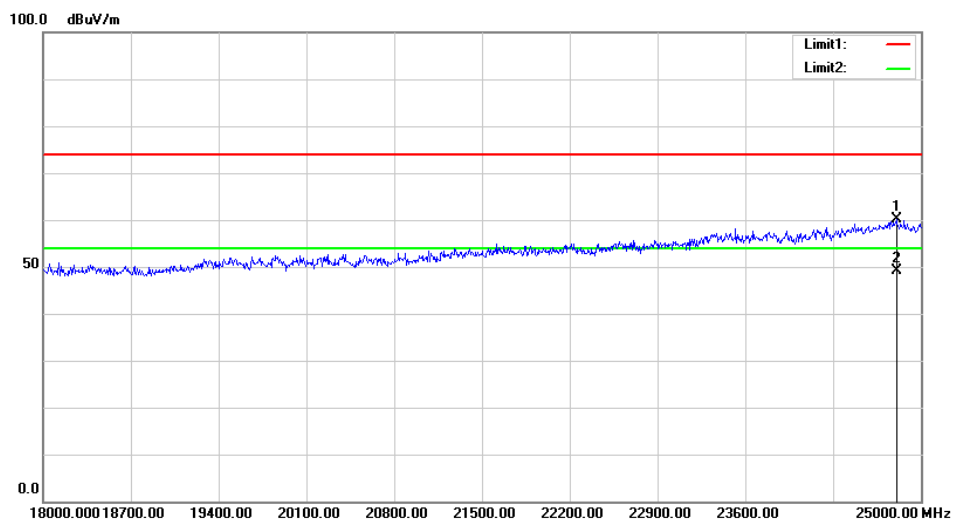
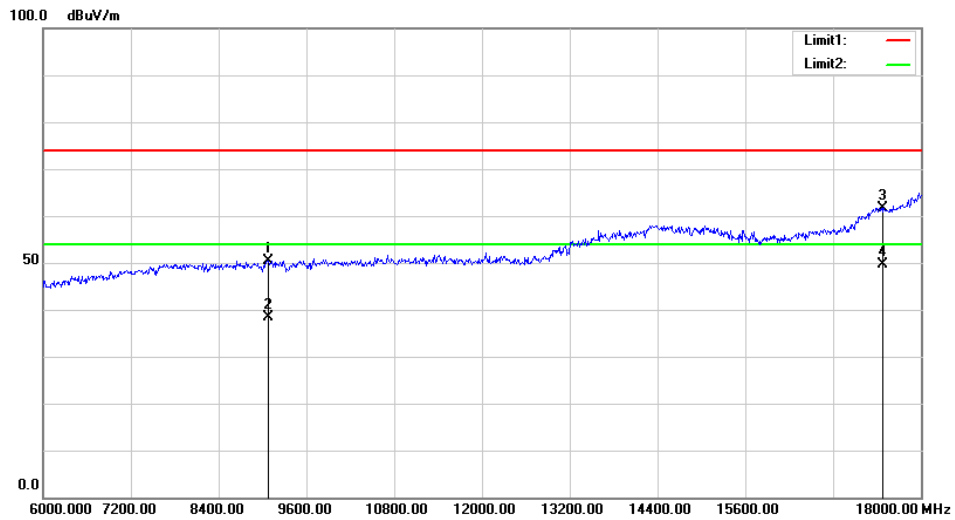
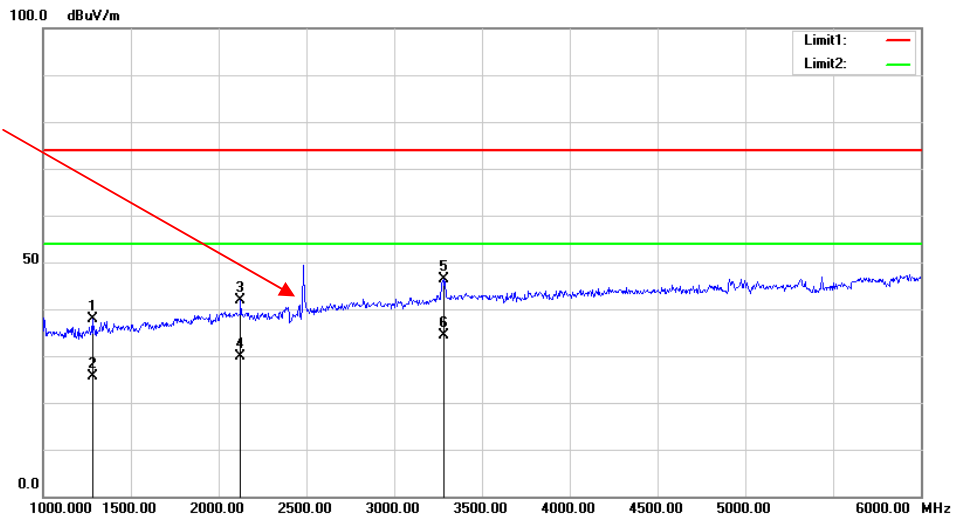
### Worst plots (2Mbps High Channel) Horizontal

Fundamental  
Test with Band  
Rejection Filter



Vertical

Fundamental Test with Band Rejection Filter



## FCC §15.247(a) (2) –6 dB EMISSION BANDWIDTH

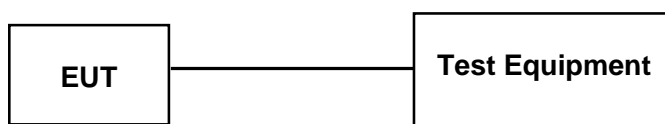
### Applicable Standard

According to FCC §15.247(a) (2)

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### Test Procedure

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40	101474	2020-01-09	2021-01-09
Unknown	Coaxial Cable	C-SJ00-0010	C0010/02	Each time	N/A

\* **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

<b>Temperature:</b>	26.5°C
<b>Relative Humidity:</b>	66%
<b>ATM Pressure:</b>	100.3kPa
<b>Tester:</b>	Rita Huang
<b>Test Date:</b>	2020-05-29

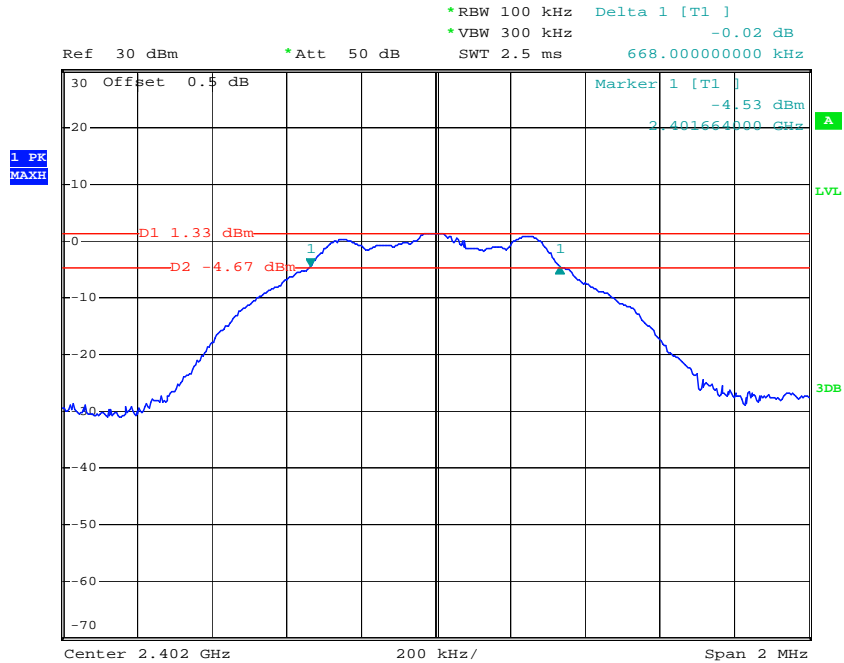
*Test Mode: Transmitting*

Test Result: Compliance. Please refer to the following table and plots.

Mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
LE 1Mbps	Low	2402	0.668	≥0.5
	Middle	2440	0.676	≥0.5
	High	2480	0.676	≥0.5
LE 2Mbps	Low	2402	1.144	≥0.5
	Middle	2440	1.152	≥0.5
	High	2480	1.160	≥0.5

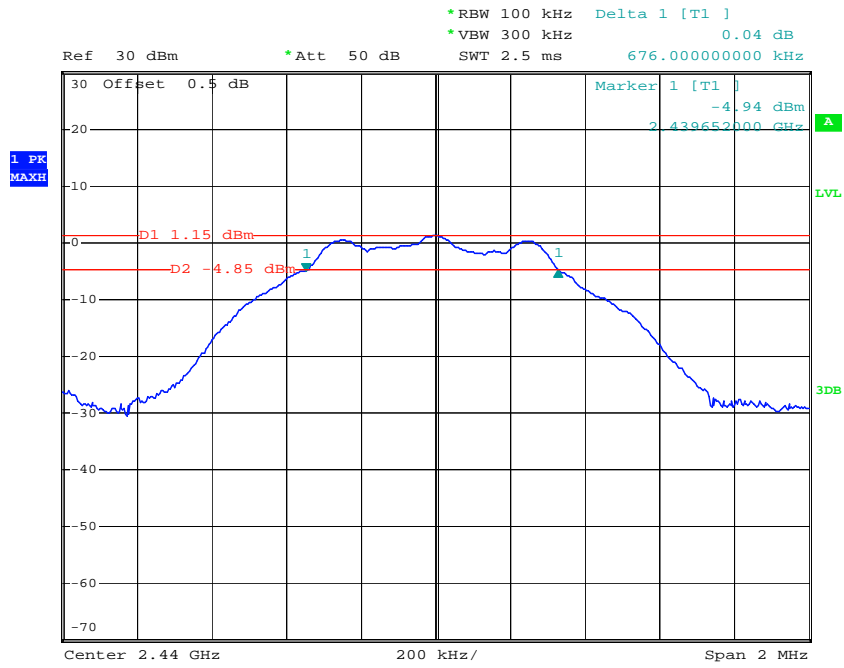
1Mbps:

Low Channel



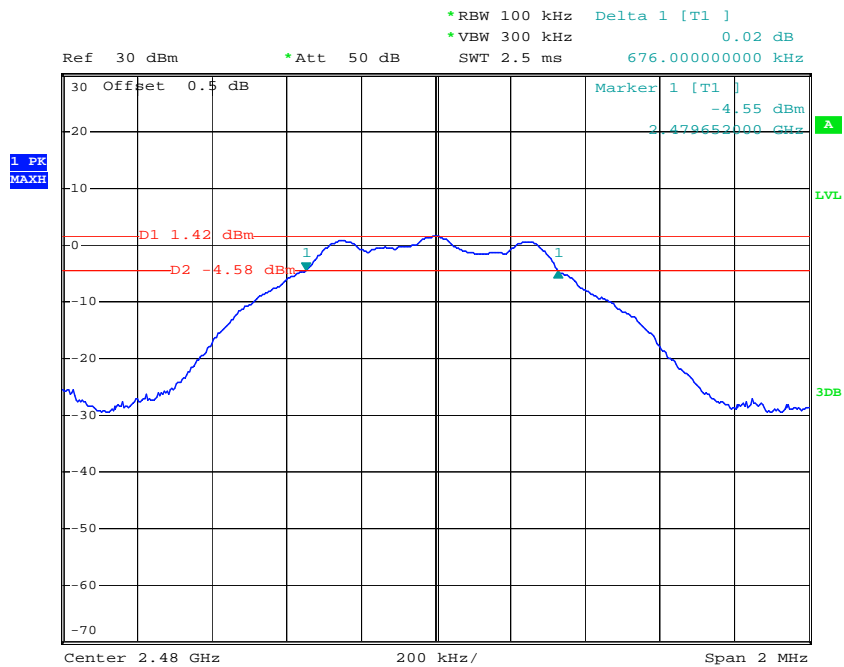
Date: 29.MAY.2020 13:46:29

### Middle Channel



Date: 29.MAY.2020 13:50:10

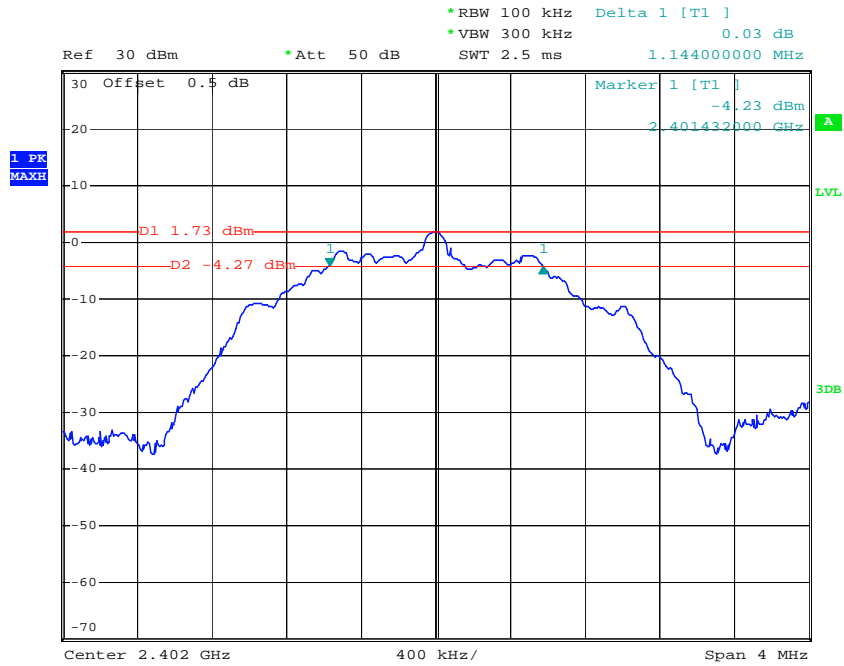
### High Channel



Date: 29.MAY.2020 13:48:03

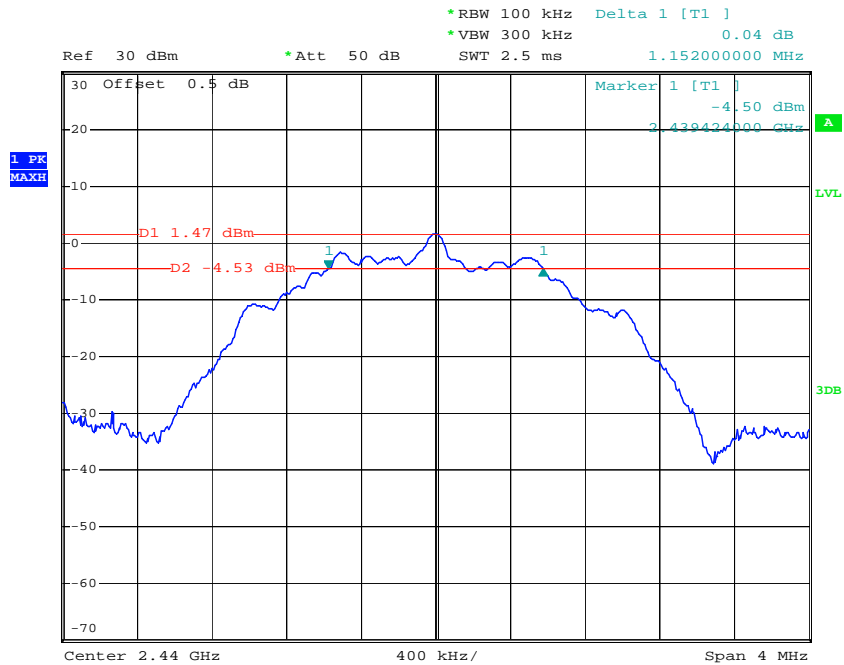
2Mbps:

Low Channel



Date: 29.MAY.2020 13:53:15

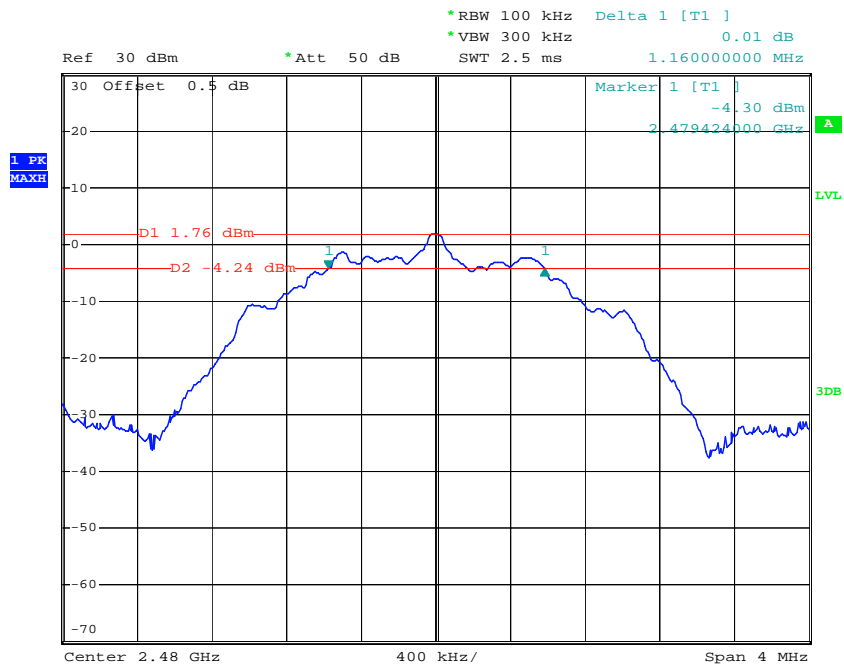
Middle Channel



Date: 29.MAY.2020 13:51:34



### High Channel



Date: 29.MAY.2020 13:55:32

## **FCC §15.247(b) (3) - MAXIMUM PEAK CONDUCTED OUTPUT POWER**

### **Applicable Standard**

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

### **Test Procedure**

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to test equipment.
3. Add a correction factor to the display.

### **Test Equipment List and Details**

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
Unknown	Coaxial Cable	C-SJ00-0010	C0010/03	Each time	N/A
Agilent	USB Wideband Power Sensor	U2021XA	MY5425009	2020-05-09	2021-05-09

\* **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**

<b>Temperature:</b>	26.5°C
<b>Relative Humidity:</b>	66%
<b>ATM Pressure:</b>	100.3kPa
<b>Tester:</b>	Rita Huang
<b>Test Date:</b>	2020-5-29

*Test Mode: Transmitting*

*Test Result: Compliance. Please refer to the following table.*

Mode	Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)	Limit (dBm)
1Mbps	Low	2402	1.63	30
	Middle	2440	1.44	30
	High	2480	1.75	30
2Mbps	Low	2402	2.02	30
	Middle	2440	1.99	30
	High	2480	2.21	30

## **FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE**

### **Applicable Standard**

According to FCC§15.247(d):In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### **Test Procedure**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

### **Test Equipment List and Details**

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
R&S	Spectrum Analyzer	FSV40	101474	2020-01-09	2021-01-09
Unknown	Coaxial Cable	C-SJ00-0010	C0010/02	Each time	N/A

\* **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).

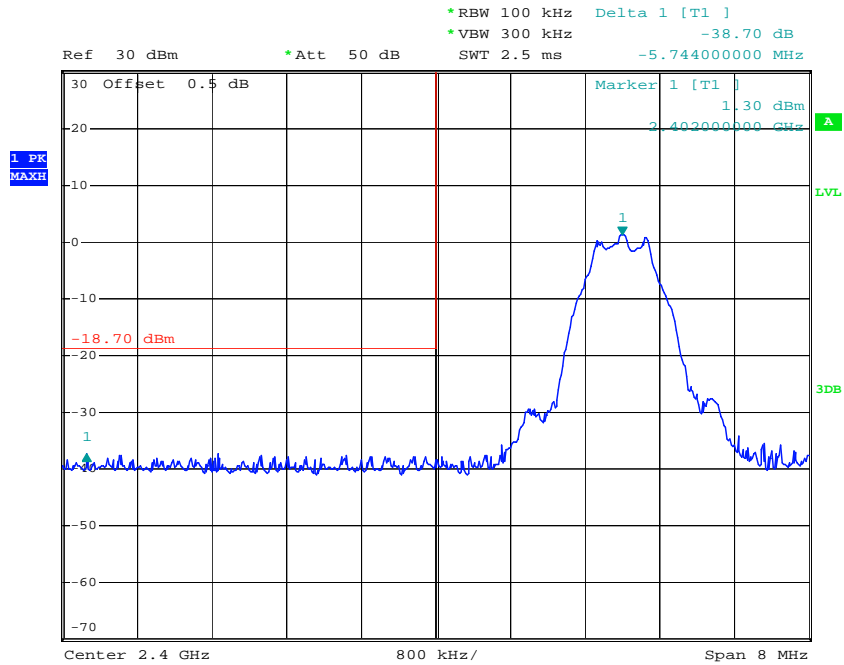
### **Test Data**

#### **Environmental Conditions**

<b>Temperature:</b>	26.5°C
<b>Relative Humidity:</b>	66%
<b>ATM Pressure:</b>	100.3kPa
<b>Tester:</b>	Rita Huang
<b>Test Date:</b>	2020-5-29

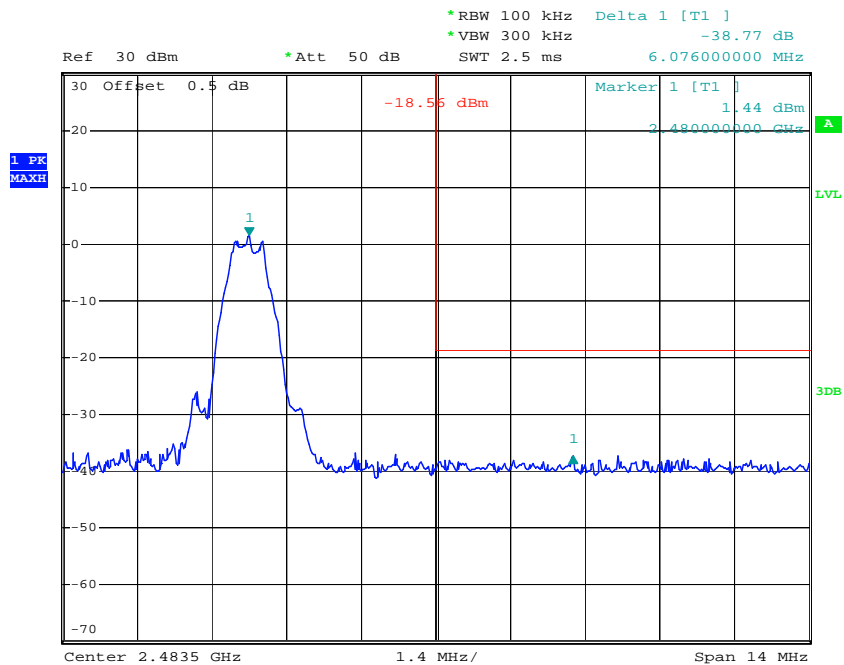
Test mode: Transmitting  
Test Result: Compliance. Please refer to following plots.  
1Mbps:

### Band Edge, Left Side



Date: 29.MAY.2020 13:45:54

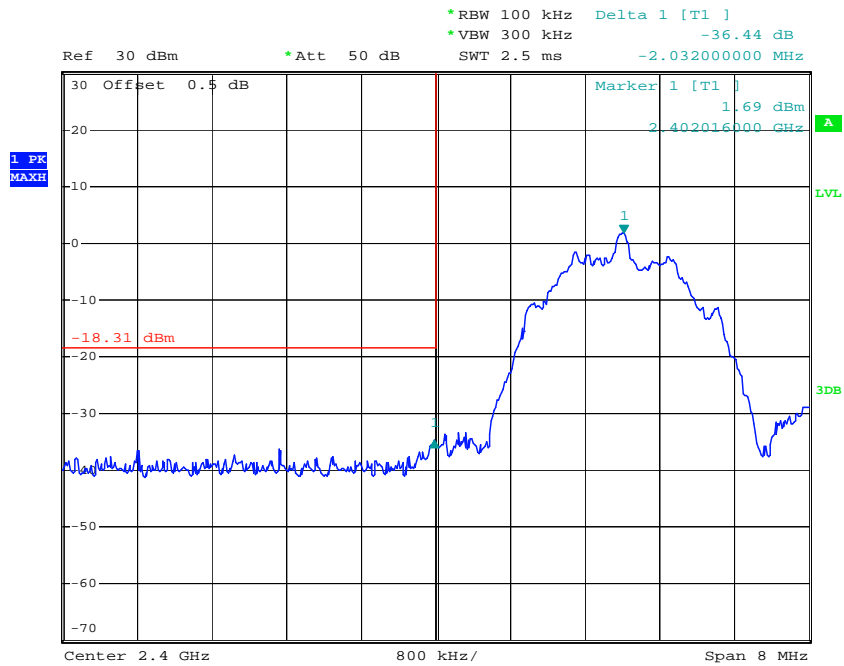
### Band Edge, Right Side



Date: 29.MAY.2020 13:49:12

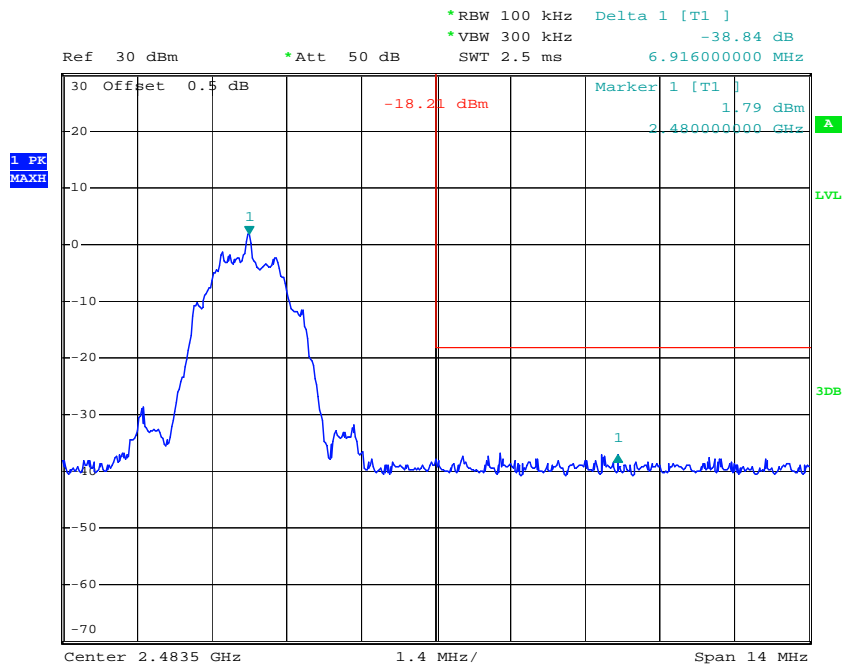
2Mbps:

### Band Edge, Left Side



Date: 29.MAY.2020 13:54:45

### Band Edge, Right Side



Date: 29.MAY.2020 13:56:38

## FCC §15.247(e) - POWER SPECTRAL DENSITY

### Applicable Standard

According to FCC§15.247(e):For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

### Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the RBW = 3 kHz, VBW = 10 kHz, Set the span to 1.5 times the DTS bandwidth.
4. Use the peak marker function to determine the maximum amplitude level.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40	101474	2020-01-09	2021-01-09
Unknown	Coaxial Cable	C-SJ00-0010	C0010/02	Each time	N/A

\* **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

<b>Temperature:</b>	26.5°C
<b>Relative Humidity:</b>	66%
<b>ATM Pressure:</b>	100.3kPa
<b>Tester:</b>	Rita Huang
<b>Test Date:</b>	2020-5-29

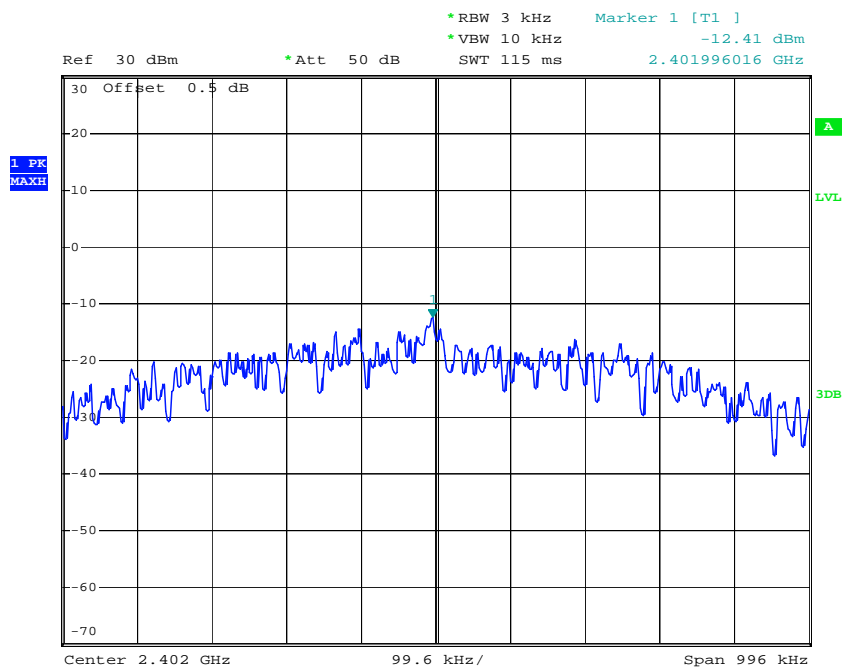
*Test Mode: Transmitting*

*Test Result: Compliance. Please refer to the following table and plots*

Mode	Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
1Mbps	Low	2402	-12.41	≤8
	Middle	2440	-12.65	≤8
	High	2480	-12.40	≤8
2Mbps	Low	2402	-12.69	≤8
	Middle	2440	-12.81	≤8
	High	2480	-12.59	≤8

1Mbps:

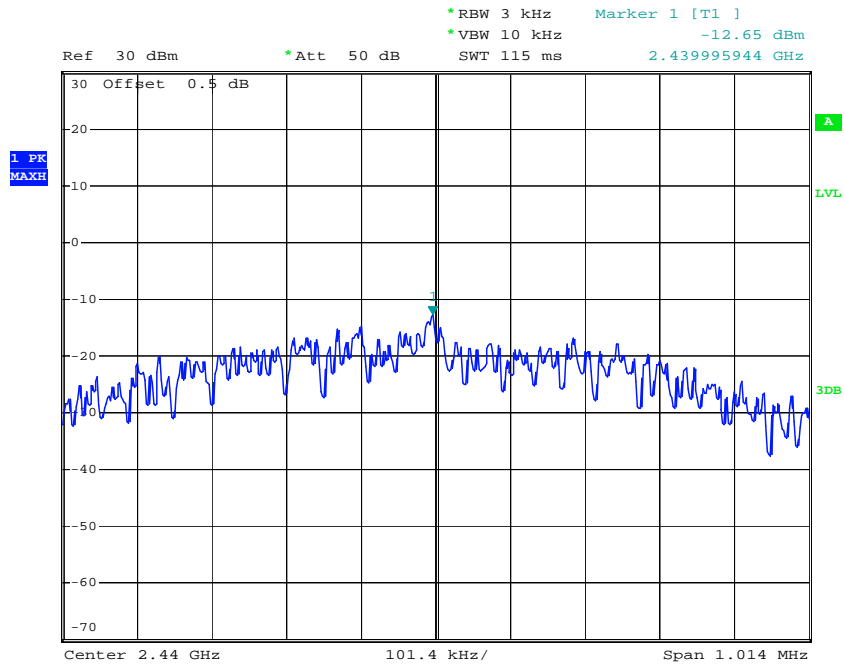
Power Spectral Density, Low Channel



Date: 29.MAY.2020 13:45:38

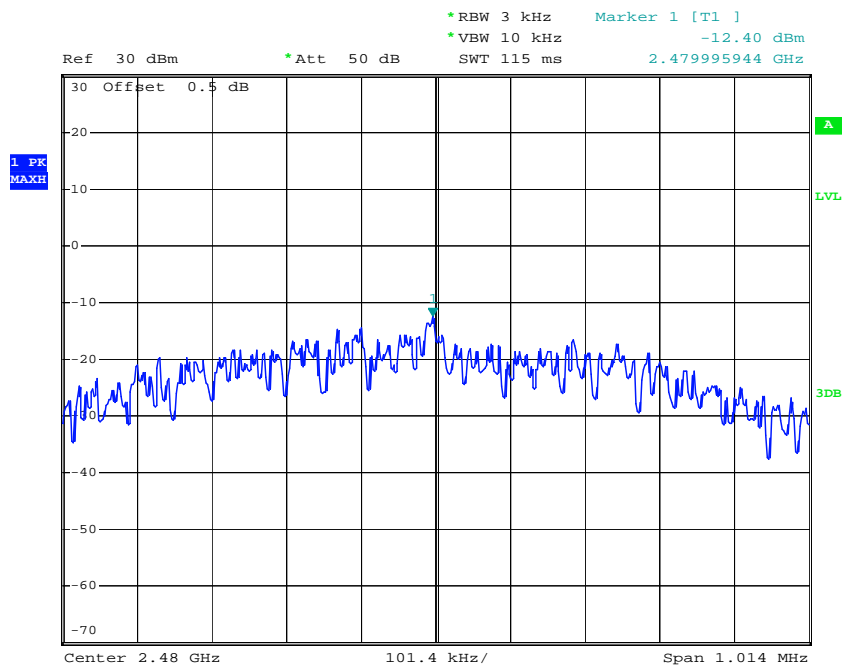


### Power Spectral Density, Middle Channel



Date: 29.MAY.2020 13:51:00

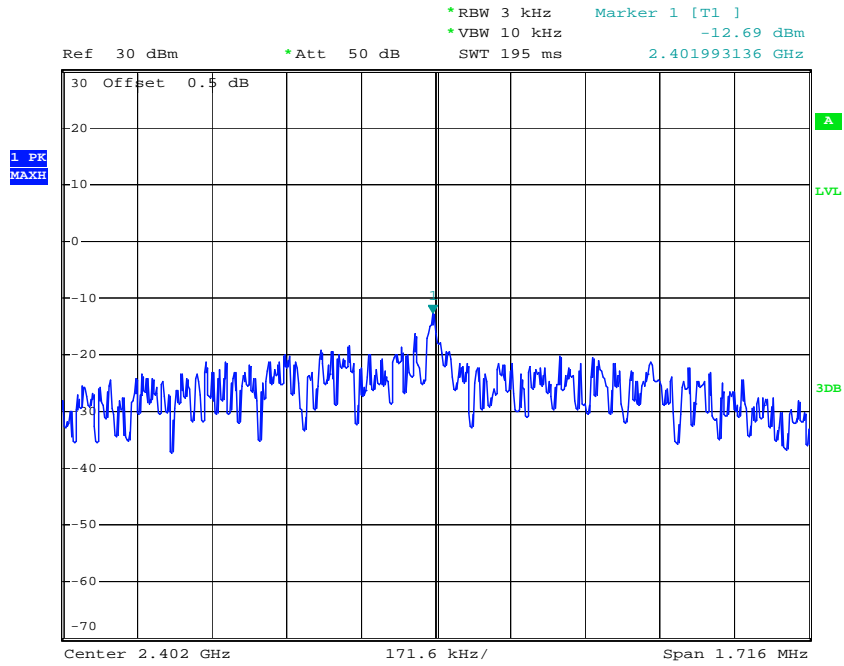
### Power Spectral Density, High Channel



Date: 29.MAY.2020 13:48:56

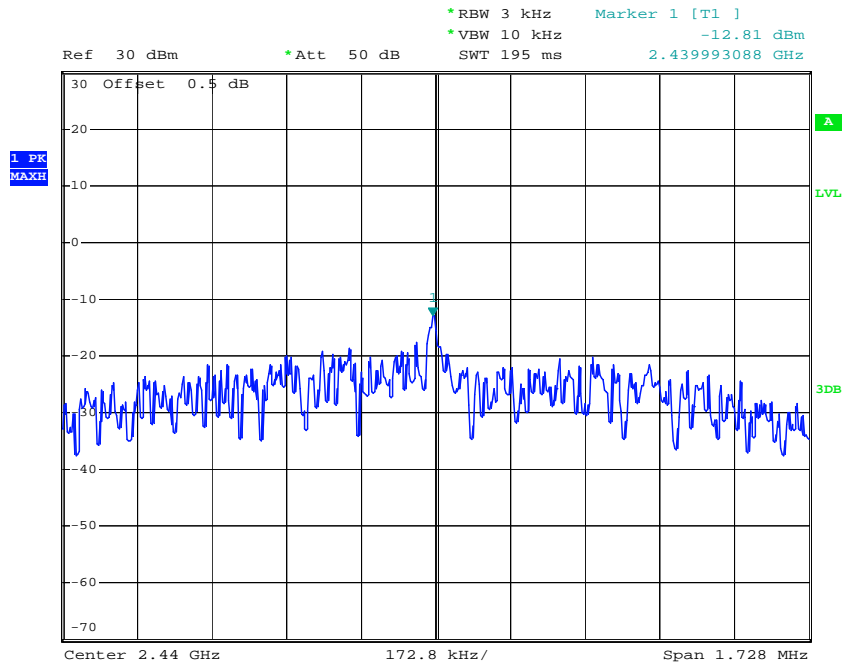
2Mbps:

### Power Spectral Density, Low Channel



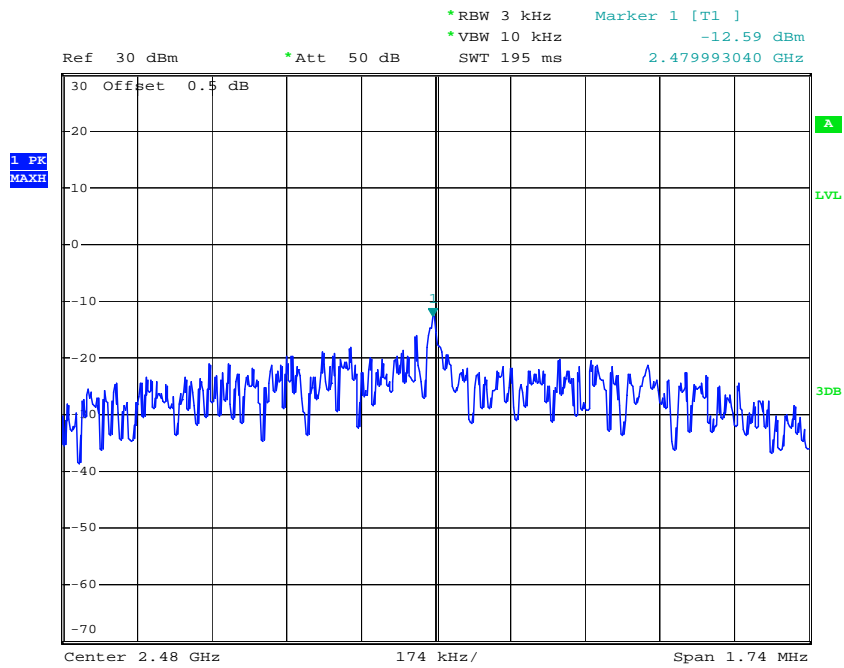
Date: 29.MAY.2020 13:54:09

### Power Spectral Density, Middle Channel



Date: 29.MAY.2020 13:52:36

### Power Spectral Density, High Channel



Date: 29.MAY.2020 13:56:21

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