



TESTING LABORATORY
CERTIFICATE #4820.01



FCC PART 15.247

TEST REPORT

For

Kichler Lighting

7711 East Pleasant Valley Road, Cleveland, Ohio, United States 44131

FCC ID: YNE-49679

Report Type: Original Report	Product Name: Portable Lantern
Report Number: RDG180201050-00A	
Report Date: 2018-02-08	
Jerry Zhang	
Reviewed By:	EMC Manager
Test Laboratory: Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn	

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan). This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA* or any agency of the Federal Government. * This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk “*”.

TABLE OF CONTENTS

GENERAL INFORMATION.....	4
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
SYSTEM TEST CONFIGURATION.....	6
DESCRIPTION OF TEST CONFIGURATION	6
EQUIPMENT MODIFICATIONS	6
EUT EXERCISE SOFTWARE	6
SUPPORT CABLE LIST AND DETAILS	7
BLOCK DIAGRAM OF TEST SETUP	7
SUMMARY OF TEST RESULTS	8
FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE.....	9
APPLICABLE STANDARD	9
FCC §15.203 - ANTENNA REQUIREMENT.....	10
APPLICABLE STANDARD	10
ANTENNA INFORMATION AND CONNECTOR CONSTRUCTION.....	10
FCC §15.207 (a)– AC LINE CONDUCTED EMISSIONS	11
APPLICABLE STANDARD	11
EUT SETUP	11
EMI TEST RECEIVER SETUP.....	11
TEST PROCEDURE	12
CORRECTED AMPLITUDE & MARGIN CALCULATION	12
TEST EQUIPMENT LIST AND DETAILS.....	12
TEST DATA	13
FCC §15.209, §15.205 , §15.247(d) - SPURIOUS EMISSIONS	15
APPLICABLE STANDARD	15
EUT SETUP	15
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	16
TEST PROCEDURE	16
CORRECTED AMPLITUDE & MARGIN CALCULATION	16
TEST EQUIPMENT LIST AND DETAILS.....	17
TEST DATA	17
FCC §15.247(a) (2) –6 dB EMISSION BANDWIDTH.....	23
APPLICABLE STANDARD	23
TEST PROCEDURE	23
TEST EQUIPMENT LIST AND DETAILS.....	23
TEST DATA	23
FCC §15.247(b) (3) - MAXIMUM PEAK CONDUCTED OUTPUT POWER.....	26
APPLICABLE STANDARD	26
TEST PROCEDURE	26
TEST EQUIPMENT LIST AND DETAILS.....	26

TEST DATA	27
FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE.....	28
APPLICABLE STANDARD	28
TEST PROCEDURE	28
TEST EQUIPMENT LIST AND DETAILS.....	28
TEST DATA	28
FCC §15.247(e) - POWER SPECTRAL DENSITY	30
APPLICABLE STANDARD	30
TEST PROCEDURE	30
TEST EQUIPMENT LIST AND DETAILS.....	30
TEST DATA	30

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:		Portable Lantern
EUT Model:		49679WHRLED(CP182083)
FCC ID:		YNE-49679
Rated Input Voltage:		DC 5V from adapter or DC3.7V form battery
Adapter Information	Model:	HB20-0503004SPA
	Input:	AC 100-240V~ 50/60Hz 0.5A
	Output:	DC 5V , 3000mA
External Dimension:		Length (50 cm)*Width (15 cm)*High (15 cm)
Serial Number:		180201050
EUT Received Date:		2018.01.22

Objective

This report is prepared on behalf of **Kichler Lighting** 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, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

FCC Part 15C DSS submissions with FCC ID: YNE-49679

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 v04.

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: 4.58 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
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)

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 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. : 897218, the FCC Designation No. : CN1220.

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in engineering mode by test software: 'Bluetooth MP Tool.exe'.

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.

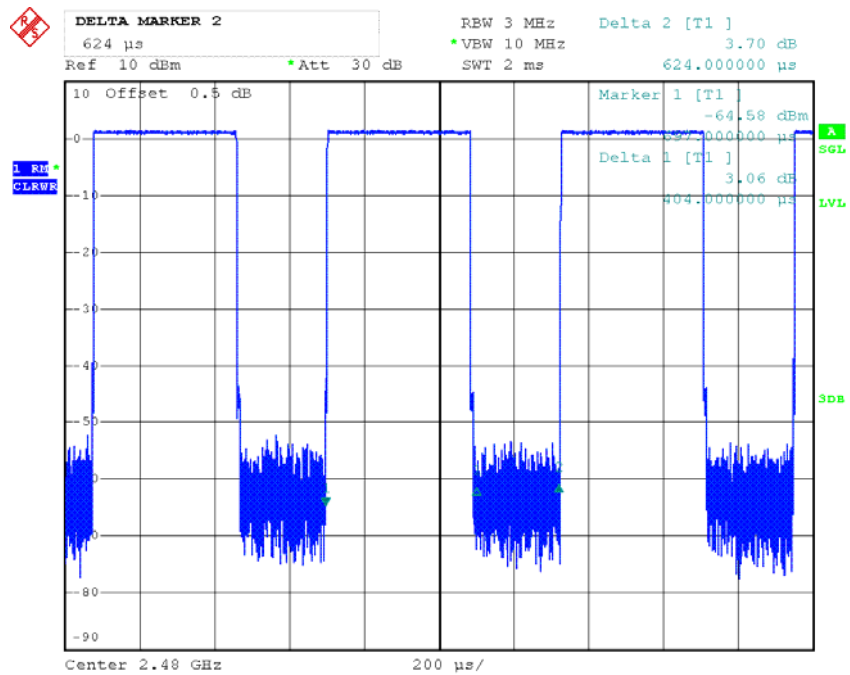
EUT Exercise Software

The test software 'Bluetooth MP Tool.exe' configured the maximum power level as below setting:

Test Software Version	Bluetooth MP Tool.exe		
Test Frequency	2402MHz	2440MHz	2480MHz
GFSK	7	7	7

The duty cycle as below:

Test mode	T _{on} (ms)	T _{on+off} (ms)	Duty Cycle (%)
BLE	0.404	0.624	64.7

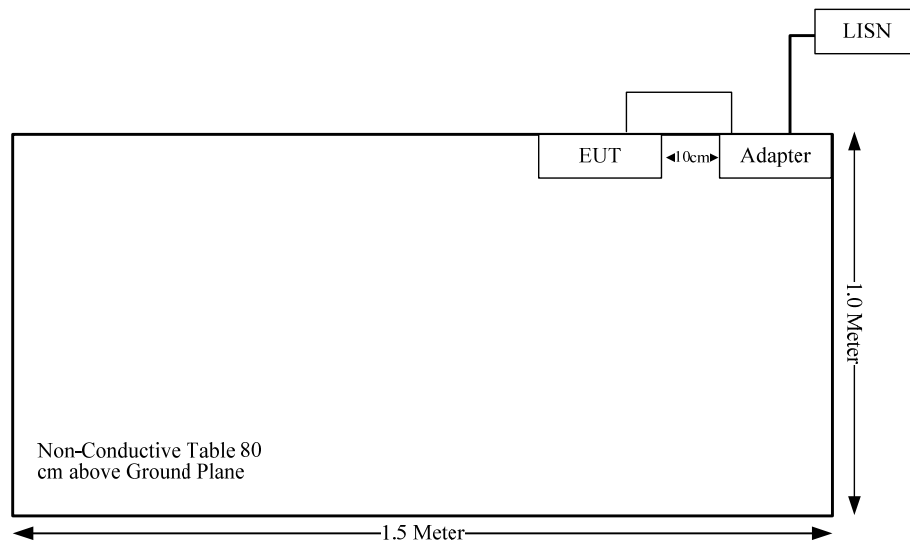


Date: 5.FEB.2018 13:29:53

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From	To
DC Cable	No	No	1.6	Adapter	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i) & §1.1310 & §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Bandwidth	Compliance
§15.247(b)(3)	Maximum Conducted Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

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 ≤ 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 ≤ 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 ≤ 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 -5.5 dBm (0.28 mW).

$[(\text{max. power of channel, mW})/(\text{min. test separation distance, mm})][\sqrt{f(\text{GHz})}]$
 $= 0.28/5 \cdot (\sqrt{2.480}) = 0.1 < 3.0$

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 PCB antenna arrangement for BT, and the antenna gain is 1.2 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

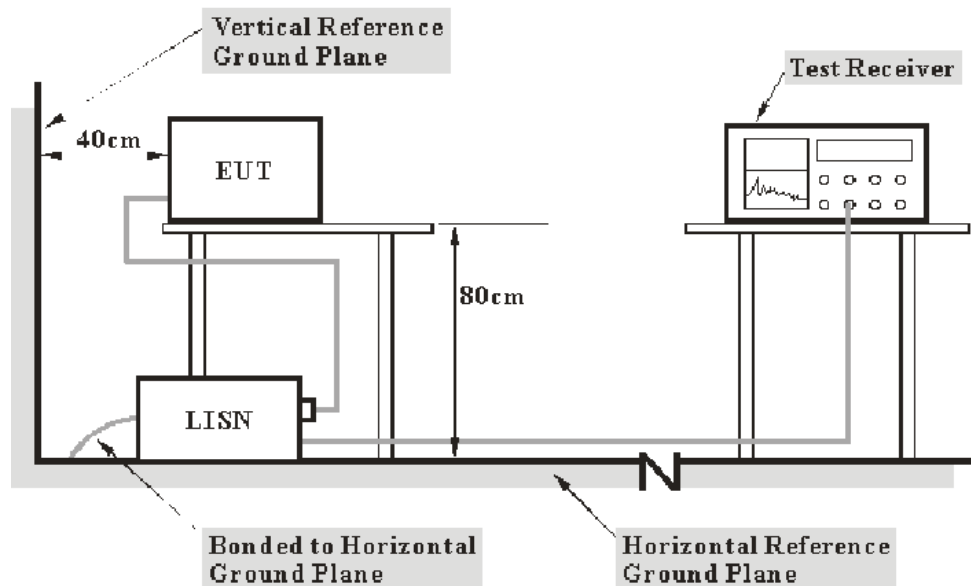
Result: Compliance.

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 setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207.

The spacing between the peripherals was 10 cm.

The adapter was connected to the main LISN with a 120 V/60 Hz AC power source.

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 first LISN.

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

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

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

Herein,

V_C : corrected voltage amplitude

V_R : reading voltage amplitude

A_C : attenuation caused by cable loss

VDF: voltage division factor of AMN or ISN

The “**Margin**” column of the following data tables indicates the degree of compliance within 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	ESCS 30	830245/006	2017-12-11	2018-12-11
N/A	Coaxial Cable	C-NJNJ-50	C-0200-01	2017-9-5	2018-9-5
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
R&S	Two-line V-network	ENV 216	101614	2017-12-8	2018-12-8
R&S	L.I.S.N	ESH2-Z5	892107/021	2017-9-25	2018-9-25

* **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).

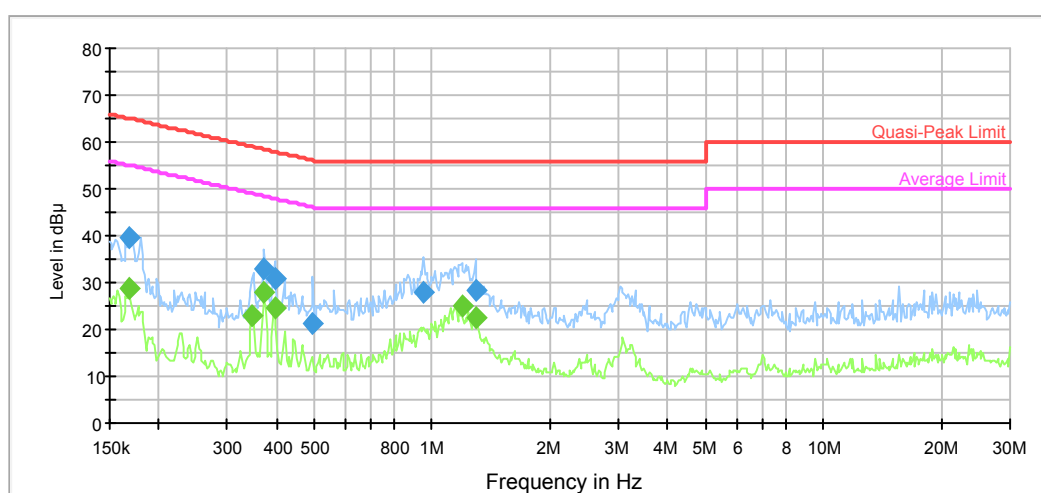
Test Data**Environmental Conditions**

Temperature:	18.5 °C
Relative Humidity:	26 %
ATM Pressure:	101.3 kPa

The testing was performed by Jim Zhang on 2018-02-05.

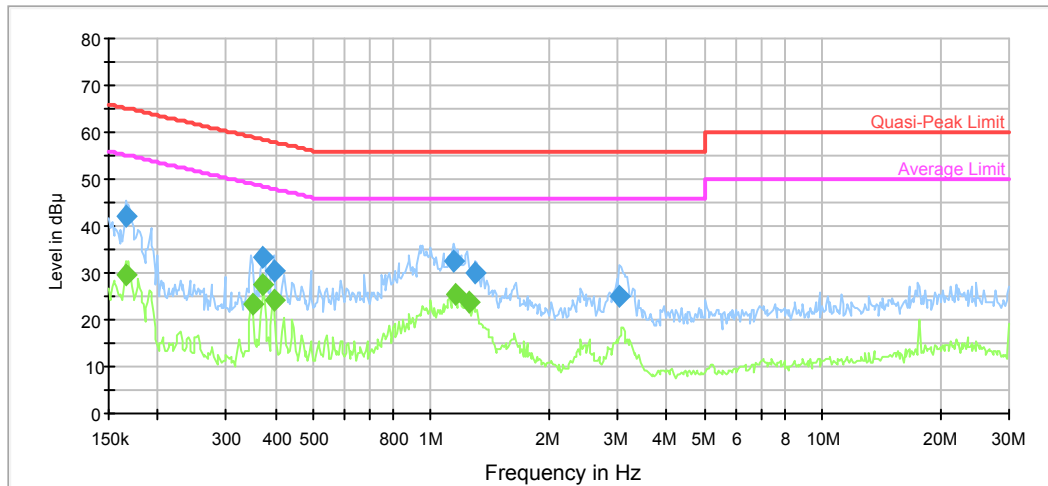
Test Mode: Transmitting

AC120V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.167702	39.4	9.000	L1	10.9	25.7	65.1	Compliance
0.372042	32.8	9.000	L1	10.0	25.7	58.5	Compliance
0.396530	30.7	9.000	L1	10.0	27.2	57.9	Compliance
0.495646	21.1	9.000	L1	9.9	35.0	56.1	Compliance
0.952654	27.8	9.000	L1	9.8	28.2	56.0	Compliance
1.289541	28.4	9.000	L1	9.8	27.6	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.167702	28.9	9.000	L1	10.9	26.2	55.1	Compliance
0.346296	23.0	9.000	L1	10.0	26.0	49.1	Compliance
0.372042	27.8	9.000	L1	10.0	20.7	48.5	Compliance
0.396530	24.4	9.000	L1	10.0	23.5	47.9	Compliance
1.190776	25.1	9.000	L1	9.8	20.9	46.0	Compliance
1.289541	22.5	9.000	L1	9.8	23.5	46.0	Compliance

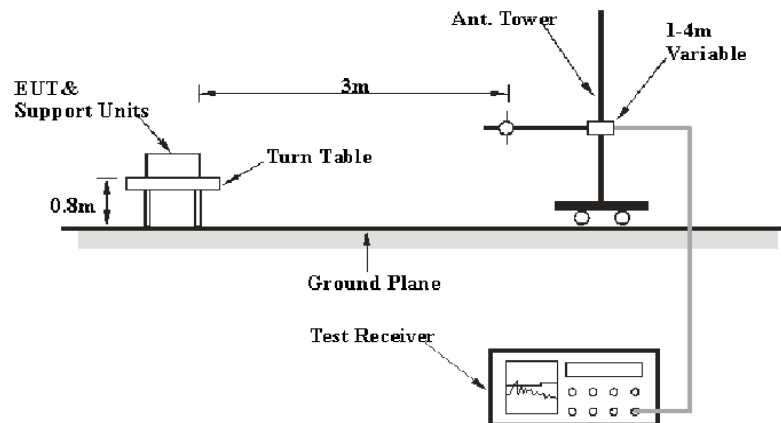
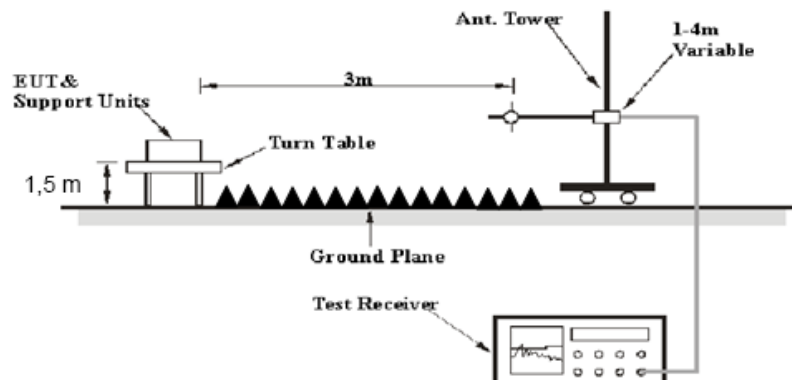
AC120V, 60 Hz, Neutral:

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.166371	42.3	9.000	N	10.9	22.8	65.1	Compliance
0.372042	33.3	9.000	N	10.0	25.2	58.5	Compliance
0.396530	30.6	9.000	N	10.0	27.3	57.9	Compliance
1.144267	32.4	9.000	N	9.8	23.6	56.0	Compliance
1.299858	30.0	9.000	N	9.8	26.0	56.0	Compliance
3.024908	24.9	9.000	N	9.8	31.1	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.166371	29.5	9.000	N	10.9	25.6	55.1	Compliance
0.349066	23.4	9.000	N	10.0	25.6	49.0	Compliance
0.372042	27.5	9.000	N	10.0	21.0	48.5	Compliance
0.396530	24.4	9.000	N	10.0	23.5	47.9	Compliance
1.153421	25.6	9.000	N	9.8	20.4	46.0	Compliance
1.249088	23.5	9.000	N	9.8	22.5	46.0	Compliance

FCC §15.209, §15.205 , §15.247(d) - SPURIOUS EMISSIONS**Applicable Standard**

FCC §15.247 (d); §15.209; §15.205

EUT Setup**Below 1GHz:****Above 1GHz:**

The radiated 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, and FCC 15.247 limits.

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
Ave.	>98%	1MHz	10 Hz
	<98%	1MHz	1/T

Note: T is minimum transmission duration

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
R&S	EMI Test Receiver	ESCI	100035	2017-8-4	2018-8-4
Sunol Sciences	Antenna	JB3	A060611-3	2017-7-21	2019-7-21
HP	Amplifier	8447F	2443A01912	2017-9-5	2018-9-5
N/A	Coaxial Cable	C-NJNJ-50	C-0400-02	2017-9-5	2018-9-5
N/A	Coaxial Cable	C-NJNJ-50	C-0075-02	2017-9-5	2018-9-5
N/A	Coaxial Cable	C-NJNJ-50	C-2200-01	2017-9-5	2018-9-5
Agilent	Spectrum Analyzer	E4440A	SG43360054	2017-12-8	2018-12-8
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-5	2019-1-4
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2017-09-5	2018-9-5
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-02 1304	2016-11-18	2019-11-18
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2017-6-27	2018-6-27
Chengdu Ouli	Band Rejection Filter	2400-2483.5	002	2017-9-5	2018-9-5
N/A	Coaxial Cable	C-SJSJ-50	C-0800-01	2017-9-5	2018-9-5
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	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**

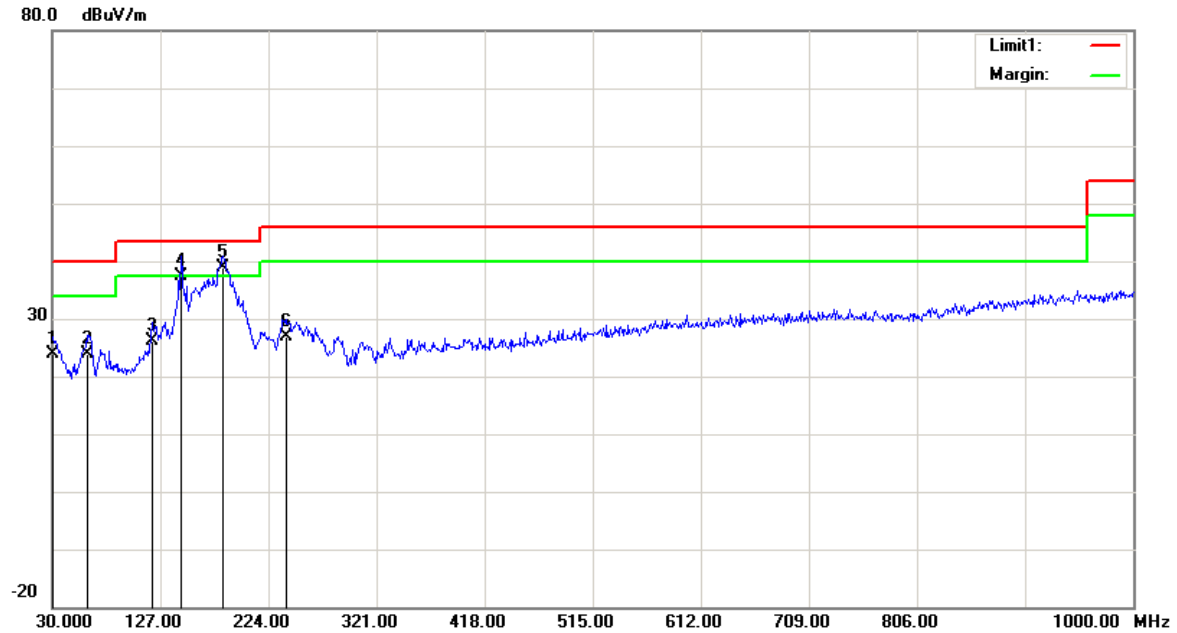
Temperature:	15.2~24.1 °C
Relative Humidity:	41~50 %
ATM Pressure:	100.8~101.3 kPa

The testing was performed by Steven Zuo & Vern Shen from 2018-01-23 to 2018-02-05

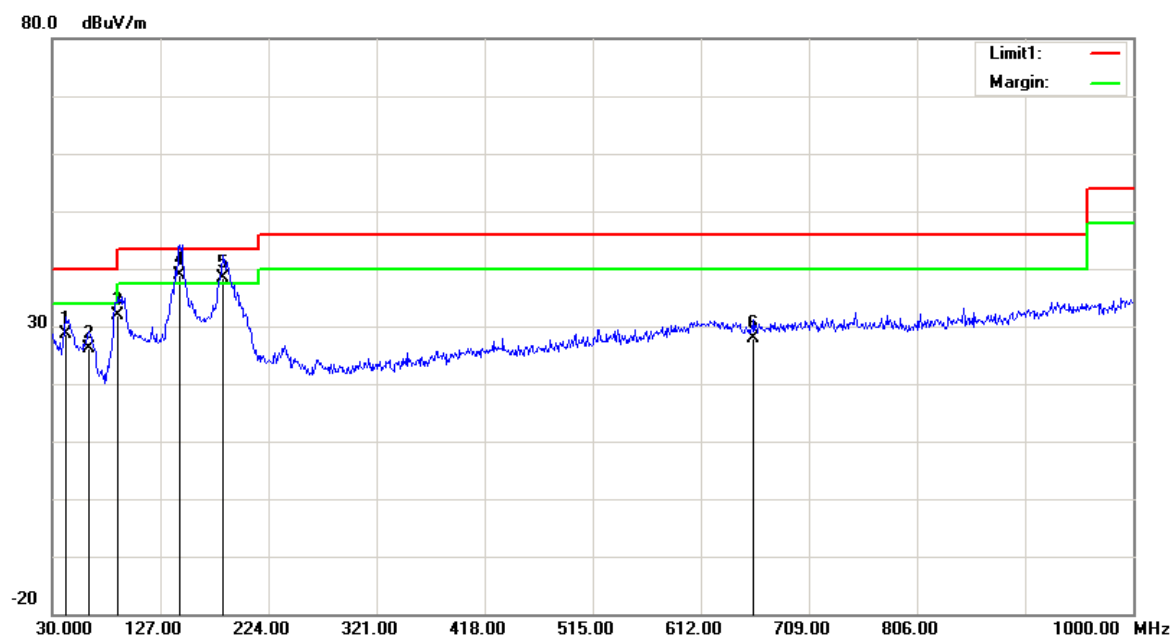
Test Mode: Transmitting

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

Horizontal:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.0000	25.72	QP	-1.82	23.90	40.00	16.10
61.0400	37.90	QP	-13.90	24.00	40.00	16.00
119.2400	36.54	QP	-10.34	26.20	43.50	17.30
145.4300	44.09	QP	-6.59	37.50	43.50	6.00
183.2600	46.30	QP	-7.50	38.80	43.50	4.70
239.5200	34.12	QP	-7.32	26.80	46.00	19.20

Vertical:

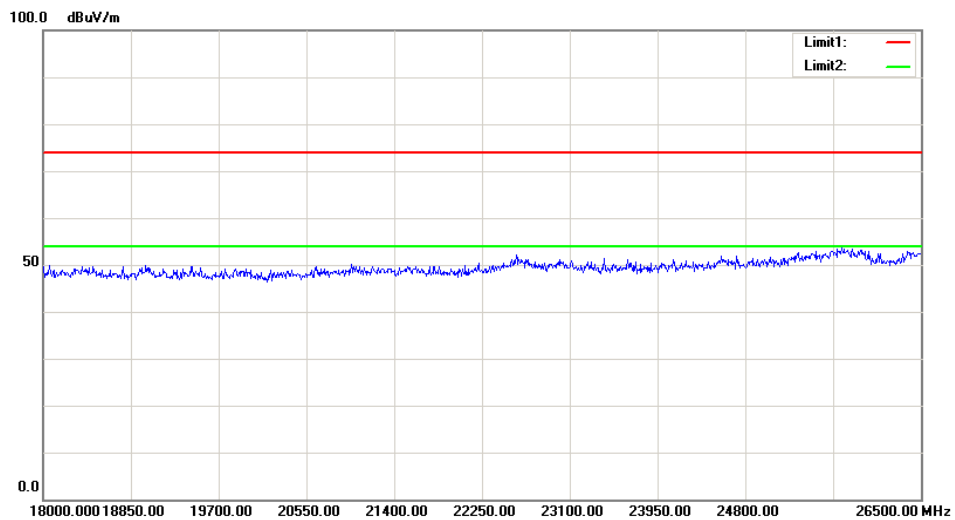
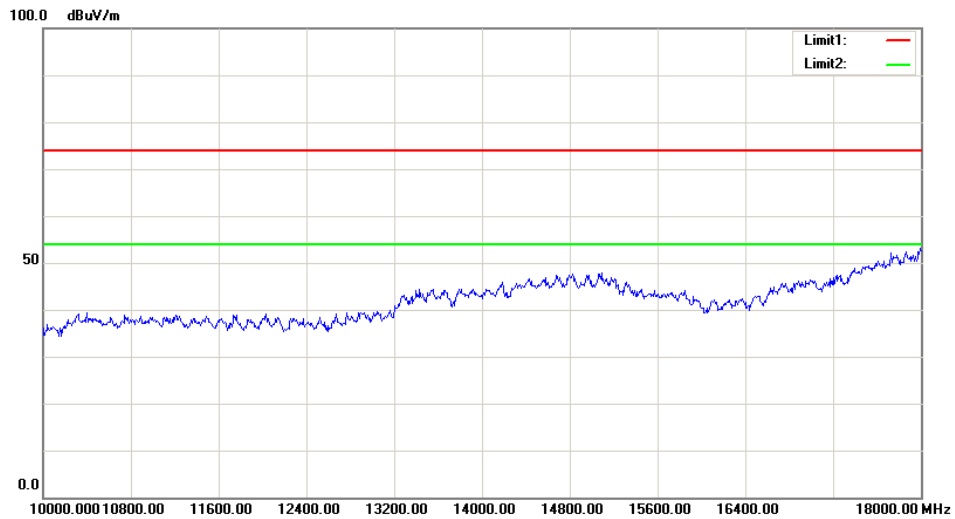
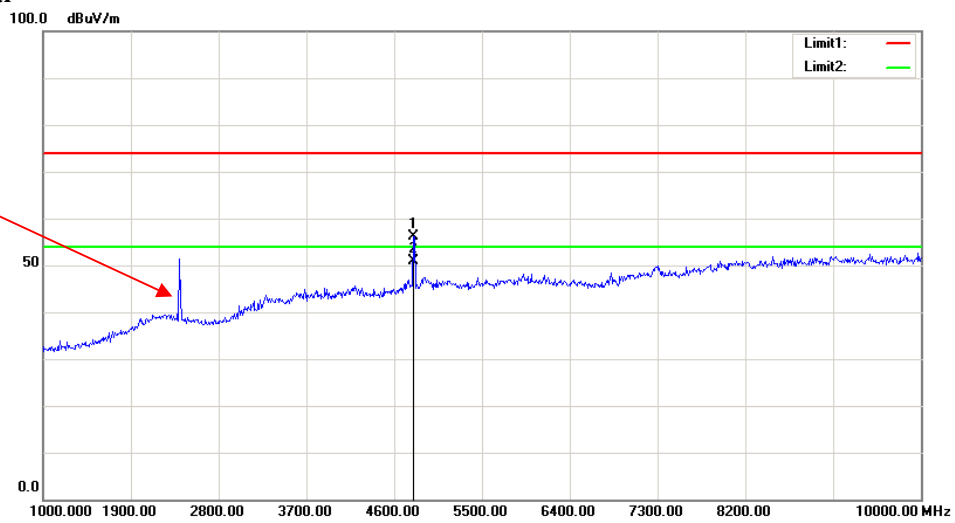
Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
42.6100	37.02	QP	-8.32	28.70	40.00	11.30
62.9800	40.11	QP	-13.91	26.20	40.00	13.80
89.1700	44.52	QP	-12.52	32.00	43.50	11.50
144.4600	45.57	QP	-6.57	39.00	43.50	4.50
183.2600	45.80	QP	-7.50	38.30	43.50	5.20
659.5300	23.75	QP	4.25	28.00	46.00	18.00

2) 1-25GHz:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	57.13	PK	H	28.10	1.80	0.00	87.03	N/A	N/A
2402.00	55.22	AV	H	28.10	1.80	0.00	85.12	N/A	N/A
2402.00	53.56	PK	V	28.10	1.80	0.00	83.46	N/A	N/A
2402.00	51.64	AV	V	28.10	1.80	0.00	81.54	N/A	N/A
2390.00	24.39	PK	H	28.08	1.80	0.00	54.27	74.00	19.73
2390.00	13.45	AV	H	28.08	1.80	0.00	43.33	54.00	10.67
4804.00	57.02	PK	H	32.91	3.17	37.20	55.90	74.00	18.10
4804.00	52.04	AV	H	32.91	3.17	37.20	50.92	54.00	3.08
7206.00	46.53	PK	H	35.74	4.82	37.23	49.86	74.00	24.14
7206.00	35.42	AV	H	35.74	4.82	37.23	38.75	54.00	15.25
Middle Channel: 2440 MHz									
2440.00	57.37	PK	H	28.18	1.82	0.00	87.37	N/A	N/A
2440.00	55.58	AV	H	28.18	1.82	0.00	85.58	N/A	N/A
2440.00	53.63	PK	V	28.18	1.82	0.00	83.63	N/A	N/A
2440.00	51.38	AV	V	28.18	1.82	0.00	81.38	N/A	N/A
4880.00	55.97	PK	H	33.06	3.27	37.21	55.09	74.00	18.91
4880.00	49.48	AV	H	33.06	3.27	37.21	48.60	54.00	5.40
7320.00	46.57	PK	H	36.03	4.62	37.37	49.85	74.00	24.15
7320.00	35.13	AV	H	36.03	4.62	37.37	38.41	54.00	15.59
High Channel: 2480 MHz									
2480.00	56.18	PK	H	28.26	1.84	0.00	86.28	N/A	N/A
2480.00	54.35	AV	H	28.26	1.84	0.00	84.45	N/A	N/A
2480.00	52.63	PK	V	28.26	1.84	0.00	82.73	N/A	N/A
2480.00	50.13	AV	V	28.26	1.84	0.00	80.23	N/A	N/A
2483.50	25.87	PK	H	28.27	1.84	0.00	55.98	74.00	18.02
2483.50	14.23	AV	H	28.27	1.84	0.00	44.34	54.00	9.66
4960.00	52.36	PK	H	33.22	3.23	37.25	51.56	74.00	22.44
4960.00	46.28	AV	H	33.22	3.23	37.25	45.48	54.00	8.52
7440.00	45.86	PK	H	36.34	4.41	37.52	49.09	74.00	24.91
7440.00	34.32	AV	H	36.34	4.41	37.52	37.55	54.00	16.45

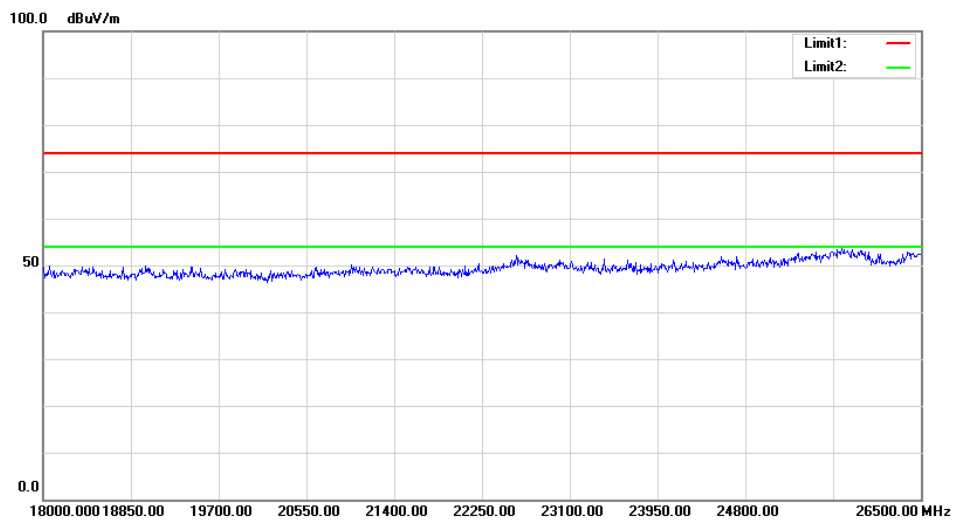
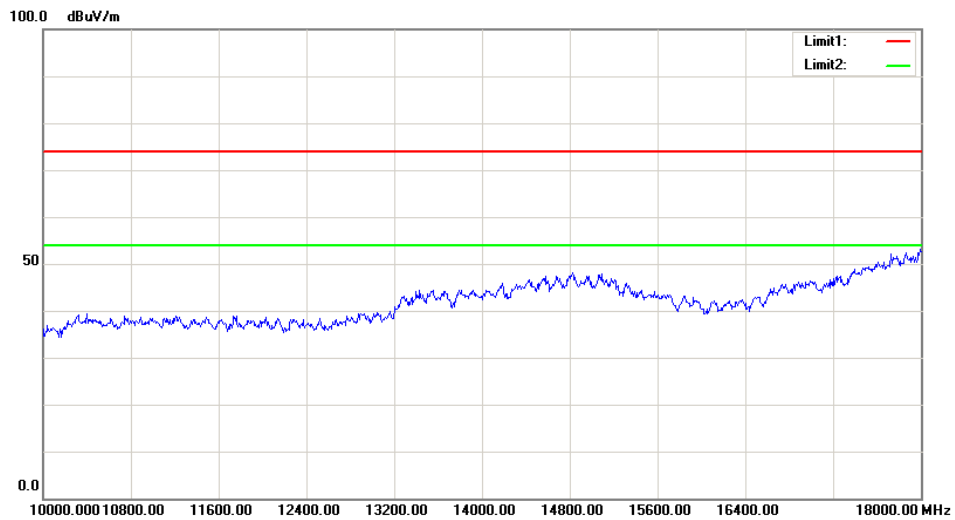
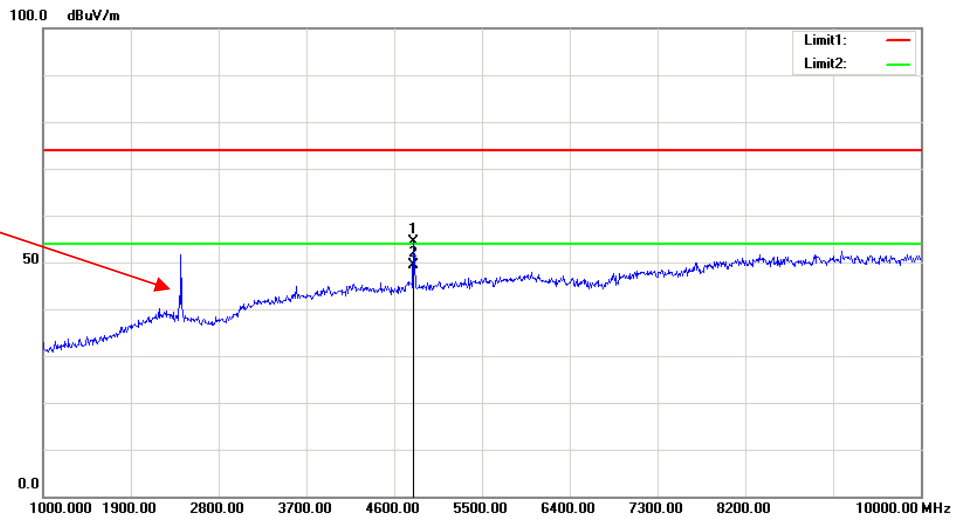
Worst plots (Low Channel) **Horizontal**

Fundamental
Test with Band
Rejection Filter



Vertical

Fundamental
Test with Band
Rejection Filter



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

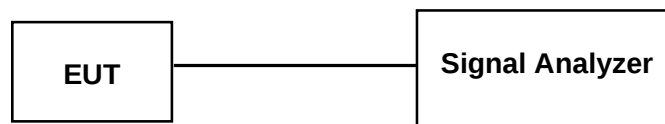
Applicable Standard

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) $\geq 3 \times \text{RBW}$.
- 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
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2017-8-31	2018-8-31
N/A	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

Temperature:	21.7 °C
Relative Humidity:	30 %
ATM Pressure:	102 kPa

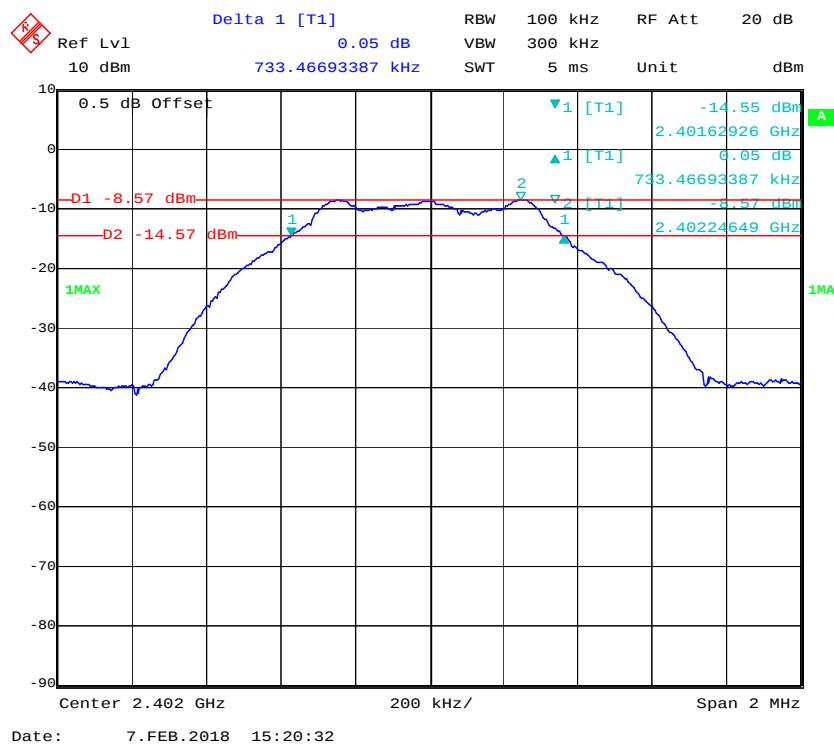
The testing was performed by Kami Zhou on 2018-02-07.

Test Mode: Transmitting

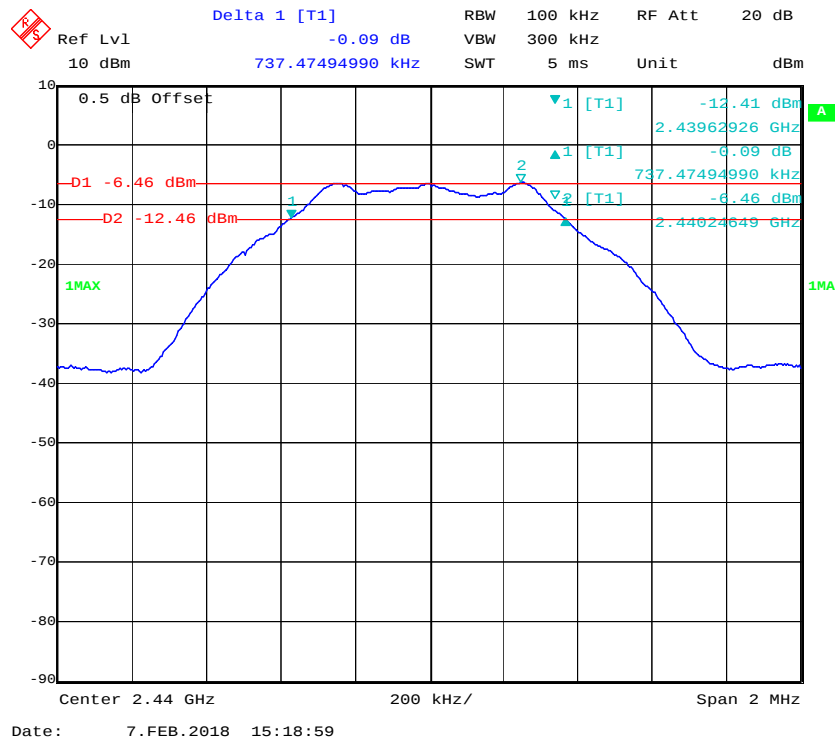
Test Result: Compliant. Please refer to the following table and plots.

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)
Low	2402	0.73	≥ 0.5
Middle	2440	0.74	≥ 0.5
High	2480	0.75	≥ 0.5

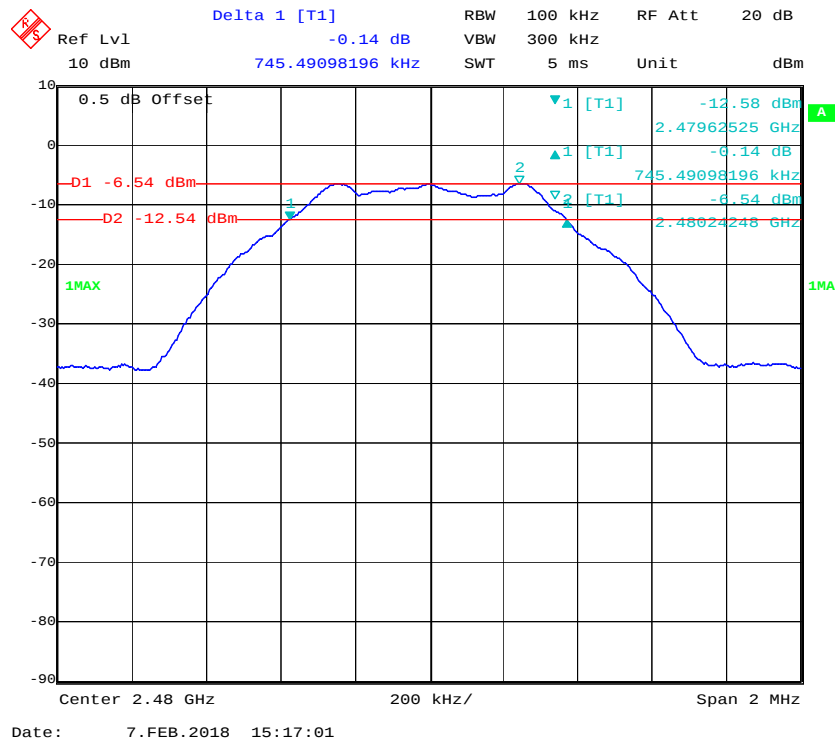
Low Channel



Middle Channel



High Channel



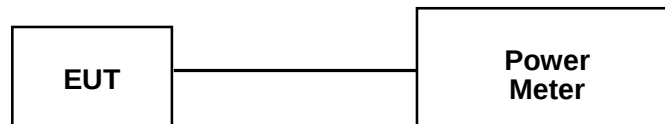
FCC §15.247(b) (3) - MAXIMUM PEAK CONDUCTED OUTPUT POWER

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.
4. Set the power Meter to test Peak output power, record the result as peak power.
5. Set the power meter to test average output power, record the result as average power.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Wideband Power Sensor	N1921A	MY54210016	2017-11-03	2018-11-03
Agilent	Wideband Power Sensor	N1921A	MY54170013	2017-11-03	2018-11-03
Agilent	P-Series Power Meter	N1912A	MY5000448	2017-11-03	2018-11-03
N/A	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**

Temperature:	21.7 °C
Relative Humidity:	30 %
ATM Pressure:	102 kPa

The testing was performed by Kami Zhou on 2018-02-07.

Test Mode: Transmitting

Test Result: Compliant. Please refer to the following table.

Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)	Limit (dBm)
Low	2402	-5.84	30
Middle	2440	-5.94	30
High	2480	-5.94	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

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2017-8-31	2018-8-31
N/A	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

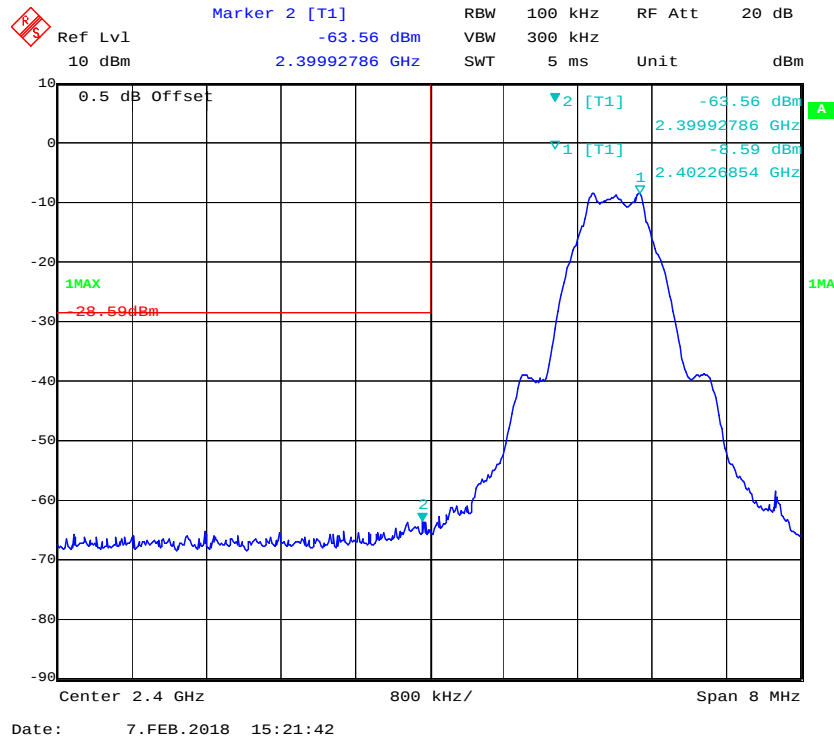
Temperature:	21.7 °C
Relative Humidity:	30 %
ATM Pressure:	102 kPa

The testing was performed by Kami Zhou on 2018-02-07.

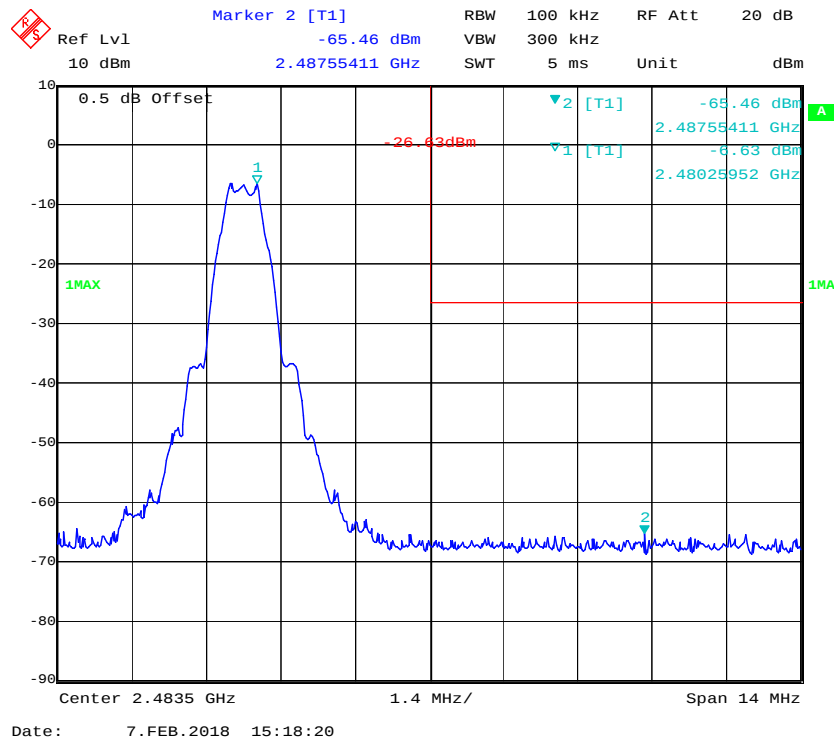
Test mode: Transmitting

Test Result: Compliant. Please refer to following plots.

Band Edge, Left Side



Band Edge, Right Side



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
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2017-8-31	2018-8-31
N/A	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

Temperature:	21.7 °C
Relative Humidity:	30 %
ATM Pressure:	102 kPa

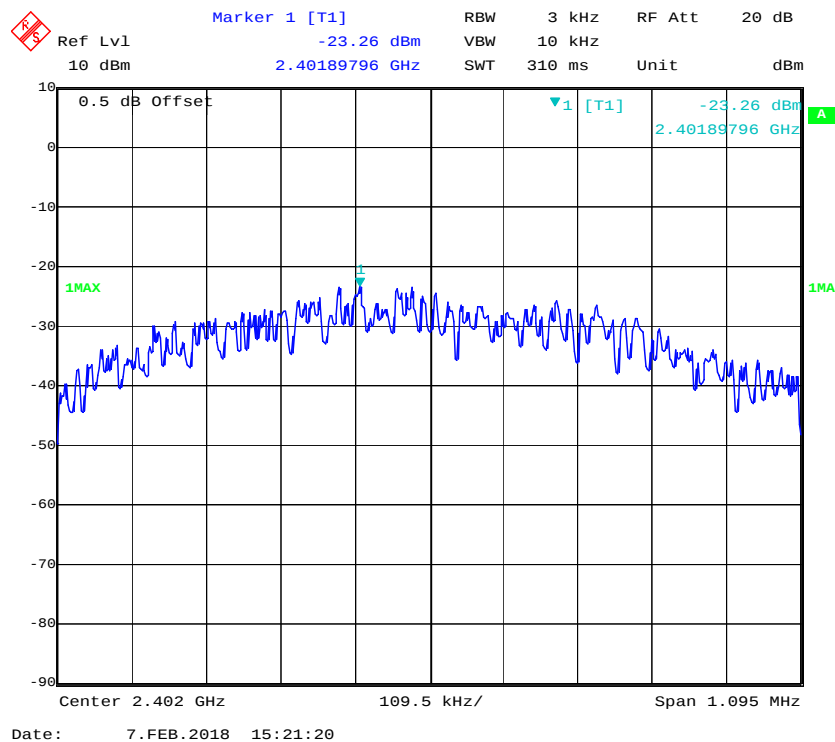
The testing was performed by Kami Zhou on 2018-02-07.

Test Mode: Transmitting

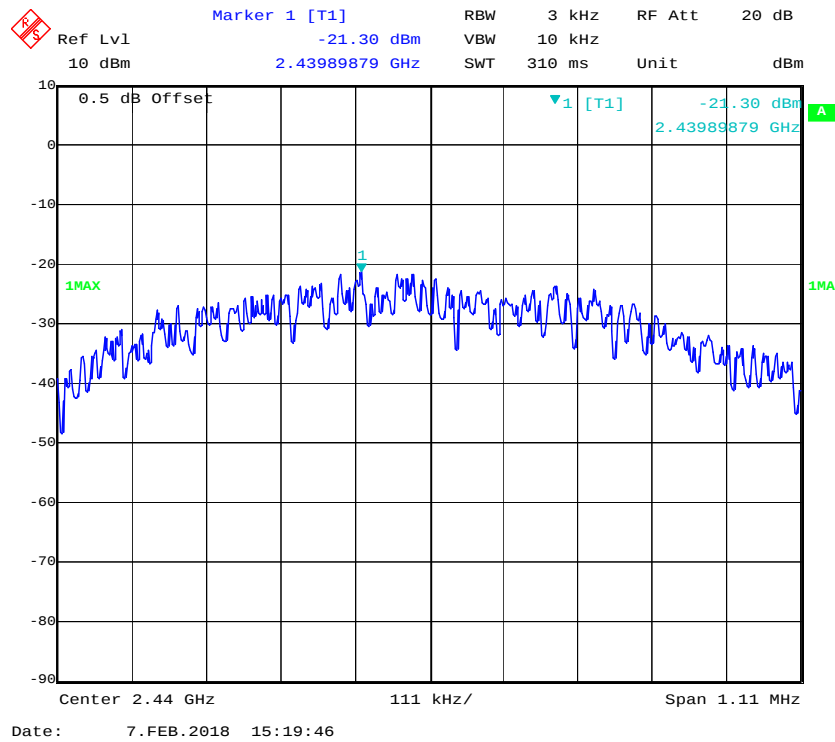
Test Result: Compliant. Please refer to the following table and plots

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
Low	2402	-23.26	≤8
Middle	2440	-21.30	≤8
High	2480	-21.45	≤8

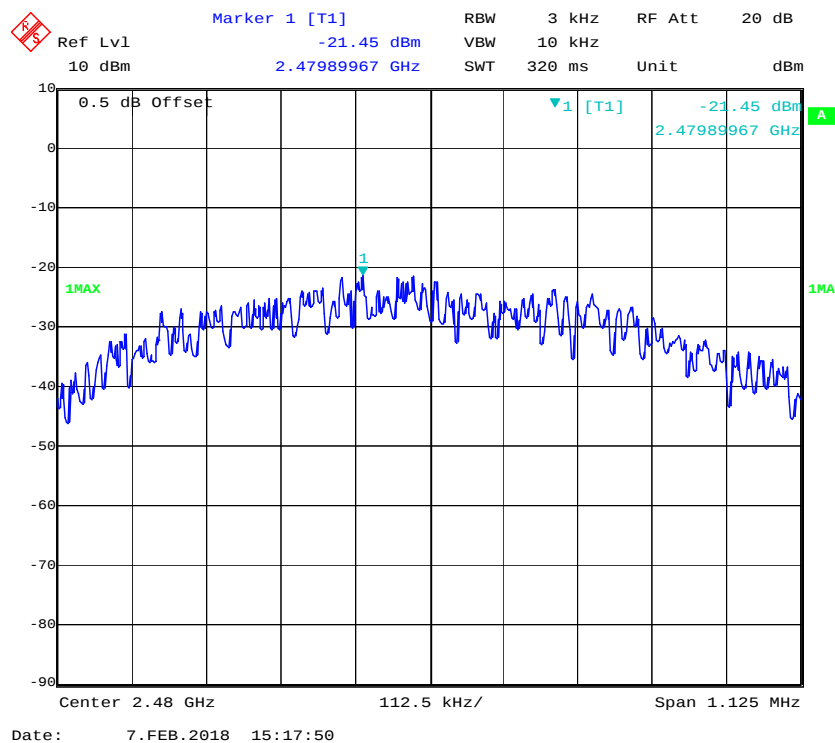
Power Spectral Density, Low Channel



Power Spectral Density, Middle Channel



Power Spectral Density, High Channel



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