



# FCC PART 15.249

## TEST REPORT

For

### ALATECH Technology Limited

39F., No. 758, Jungming S. RD. Taichung, Taiwan

**FCC ID: YQOSC003**

<b>Report Type:</b> Original Report	<b>Product Type:</b> MAGNET-LESS CYCLING SPEED / CADENCE SENSOR
<b>Report Producer:</b> Kaylee Chiang	<i>Kaylee Chiang</i>
<b>Report Number:</b> RXZ1806021-00B	
<b>Report Date:</b> 2018-08-27	
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## Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
1.0	RXZ1806021	RXZ1806021-00B	2018.08.27	Original Report	Kaylee

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## GENERAL INFORMATION

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

Applicant	ALATECH Technology Limited
	39F., No.758,Jungming S. RD. Taichung, Taiwan
Manufacturer	ZHEJIANG ALA FITNESS TECHNOLOGY LTD.
	NO.405 Tongxin Road, Tongxiang Economic Development Zhejiang 314500,China
Brand(Trade) Name	ALATECH
Product (Equipment)	MAGNET-LESS CYCLING SPEED / CADENCE SENSOR
Model Name	SC003
Frequency Range	2457 MHz
Antenna Specification	PCB Antenna/Gain: -1.32 dBi
Output	3Vdc from Battery
Received Date	June 20, 2018
Date of Test	Aug 23, 2018 ~ Aug 24, 2018

*\*All measurement and test data in this report was gathered from production sample serial number: 1806021*

*(Assigned by BACL, Taiwan)*

### Objective

This report is prepared on behalf of *ALATECH Technology 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 ANT+ mode of EUT compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.249 rules.

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

FCC Part 15.247 DTS submission with FCC ID: YQOSC003

### 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

**Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Taiwan) to collect test data is located on

70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

68-3, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

Bay Area Compliance Laboratories Corp. (Taiwan) Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3180) and the FCC designation No.TW3180 under the Mutual Recognition Agreement (MRA) in FCC Test. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.10.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 974454. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in an engineering mode, which was provided by manufacturer. The engineering mode was configured the system transmitting with maximum power. For ANT+ mode, only 1 channel (2457MHz) was used.

### EUT Exercise Software

No test software was used.

### Equipment Modifications

No modification was made to the EUT.

### Support Equipment List and Details

Description	Manufacturer	Model Number	FCC ID/DOC	S/N
N/A	N/A	N/A	N/A	N/A

### External Cable List and Details

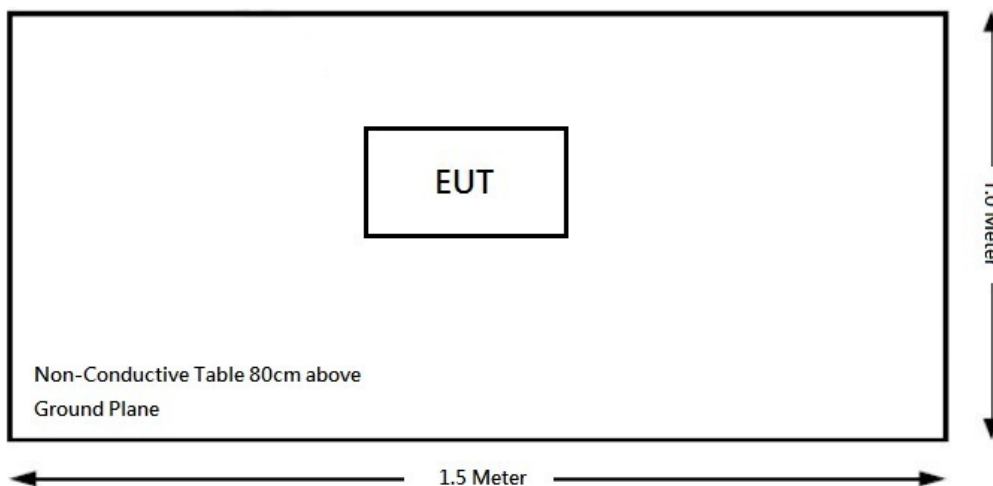
Cable Description	Length (m)	From	To
N/A	N/A	N/A	N/A

**Block Diagram of Test Setup**

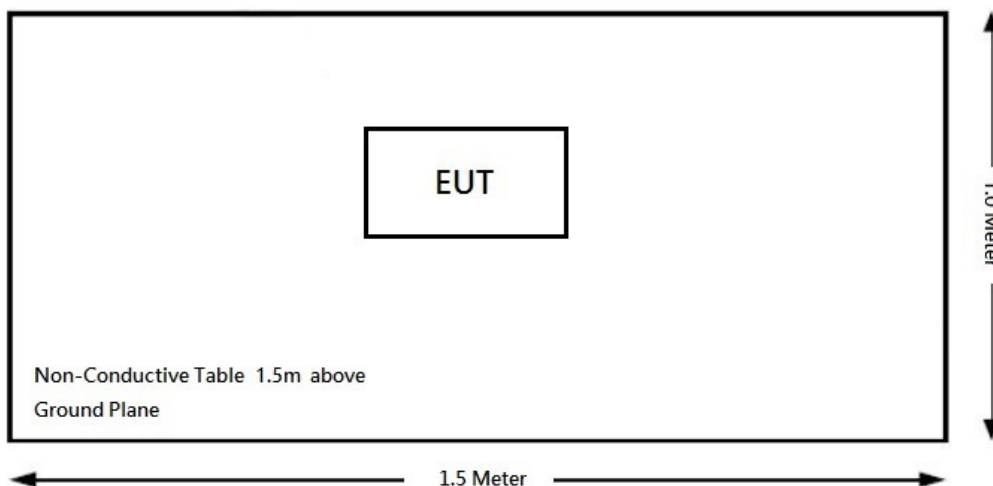
See test photographs attached in setup photos for the actual connections between EUT and support equipment

**Radiation:**

Below 1GHz:



Above 1GHz:



## SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Not applicable
§15.205, §15.209, §15.249	Radiated Emissions	Compliance
§15.215 (c)	20 dB Emission Bandwidth	Compliance

**NOTE:**

Not Applicable: The device is battery operated equipment.



## Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Room (966-A)					
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/1554_2_01	2017/12/20	2018/12/19
Horn Antenna	EMCO	3115	9311-4158	2018/04/20	2019/04/19
Horn Antenna	ETS-Lindgren	3116	62638	2017/09/13	2018/09/12
Preamplifier	Sonoma	310N	130602	2018/07/04	2019/07/03
Preamplifier	EM Electronics Corp.	EM01G18G	060657	2017/12/14	2018/12/13
Microwave Preamplifier	EM Electronics Corporatino	EM18G40G	060656	2018/01/15	2019/01/14
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2017/11/06	2018/11/05
Spectrum Analyzer	Rohde & Schwarz	FSV40	101203	2018/02/12	2019/02/13
Microflex Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2017/10/31	2018/10/30
Microflex Cable	UTIFLEX	UFA210A-1-3149-300300	MFR64639 226389-001	2017/11/10	2018/11/09
Microflex Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2018/03/05	2019/03/04
Microflex Cable	ROSNOL	K1K50-UP0264-K1K50-80CM	160309-2	2018/01/17	2019/01/16
Turn Table	Champro	TT-2000	060772-T	N.C.R	N.C.R
Antenna Tower	Champro	AM-BS-4500-B	060772-A	N.C.R	N.C.R
Controller	Champro	EM1000	60772	N.C.R	N.C.R
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R
NSA	BACL	966-A	N/A	2018/07/09	2019/07/08
VSWR	BACL	966-A	N/A	2018/07/16	2019/07/15
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2018/05/04	2019/05/03
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11
Attenuator	MINI-CIRCUITS	BW-S10W5+	N/A	2018/03/08	2019/03/07

**\*Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements

## **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**

<b>Manufacturer</b>	<b>Type</b>	<b>Antenna Gain</b>	<b>Result</b>
Alatech Technology Limited	PCB Antenna	-1.32 dBi	Compliance

**Result:** Compliance.

## FCC§15.209, §15.205 & §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.

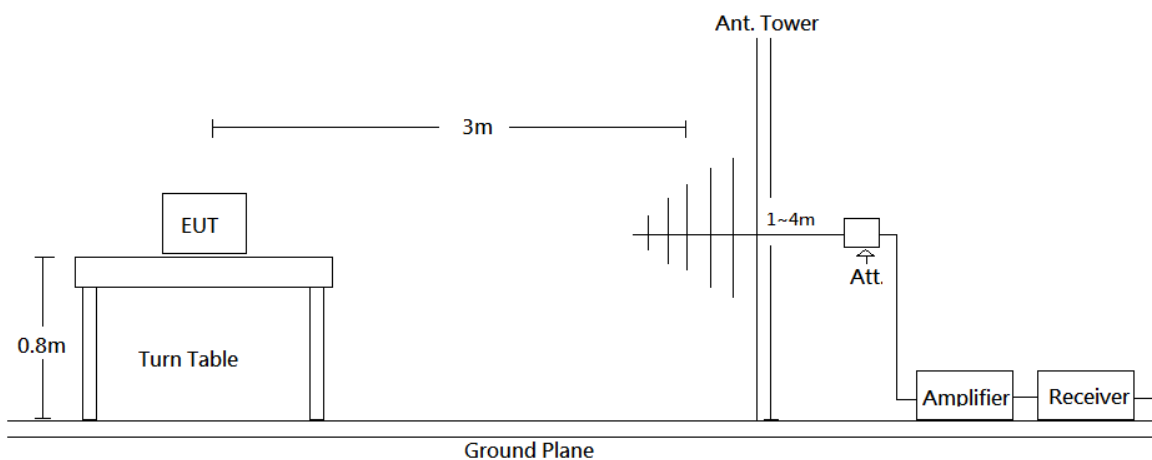
### Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

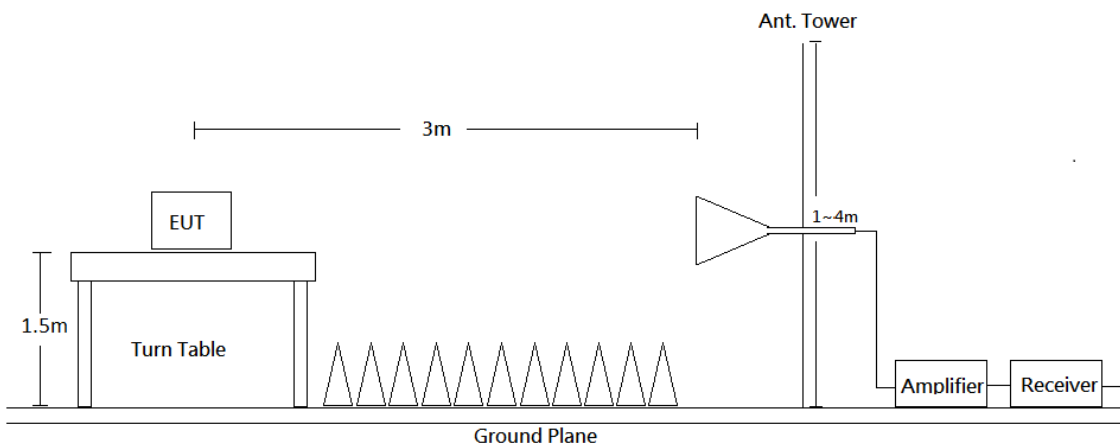
Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Taiwan) is shown in below table. And the uncertainty will not be taken into consideration for the test data recorded in the report.

Frequency	Measurement uncertainty
30 MHz~200 MHz	3.76 dB (k=2, 95% level of confidence)
200 MHz~1 GHz	4.12 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	4.84 dB (k=2, 95% level of confidence)
6 GHz~18 GHz	5.16 dB (k=2, 95% level of confidence)
18 GHz~26 GHz	4.84 dB (k=2, 95% level of confidence)
26 GHz~40 GHz	4.30 dB (k=2, 95% level of confidence)

**EUT Setup  
Below 1GHz:**



**Above 1GHz:**



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

**EMI Test Receiver & Spectrum Analyzer Setup**

The system was investigated from 30 MHz to 26.5 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	Detector
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	3 MHz	/	Ave.

### 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 detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

### Corrected Amplitude & Margin Calculation

The Correct Factor 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:

$$\text{Correct Factor} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain} + \text{Attenuator}$$

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:

$$\text{Margin} = \text{Result} - \text{Limit}$$

### Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, and section 15.205, 15.209 and 15.249.

### Test Environmental Conditions

Temperature:	25 °C
Relative Humidity:	55 %
ATM Pressure:	1010 hPa

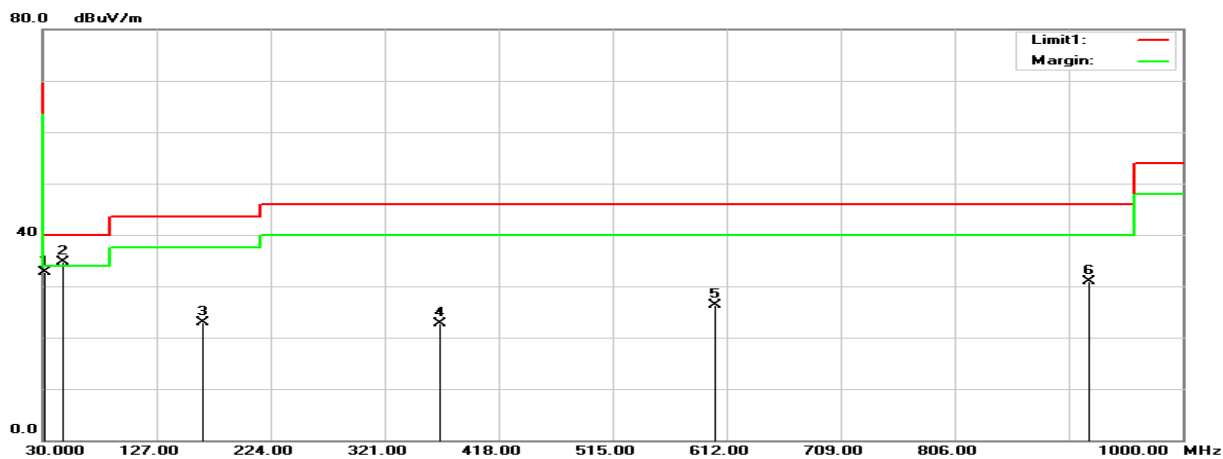
*The testing was performed by Tom Hsu on 2018-08-24.*

### Test Results

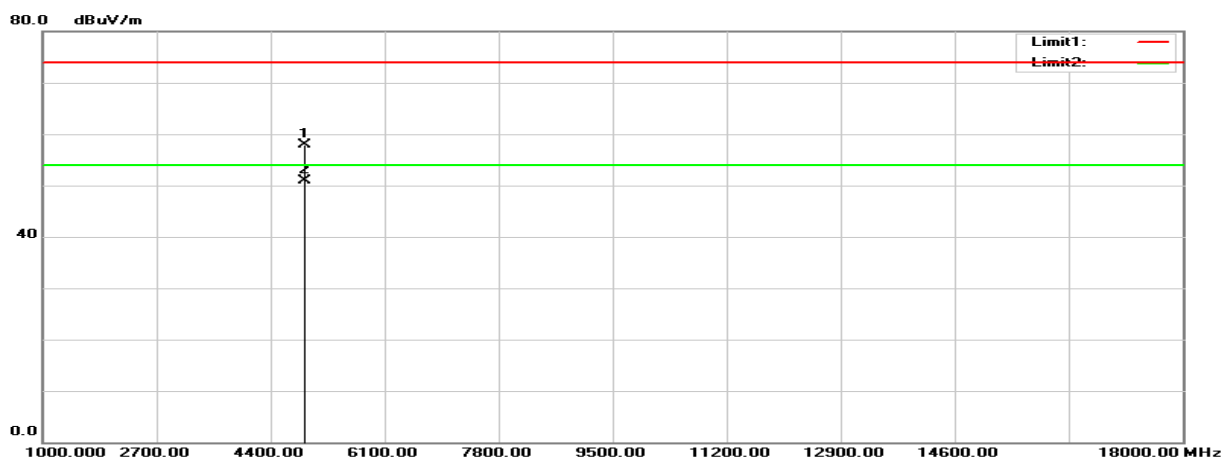
Mode: Transmitting

#### Horizontal

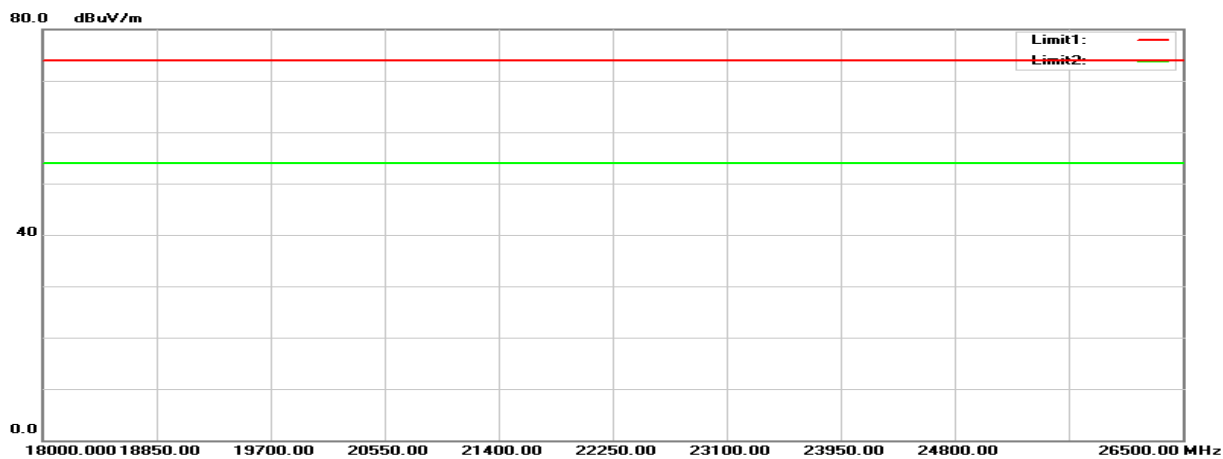
30MHz-1GHz:



1GHz-18GHz:

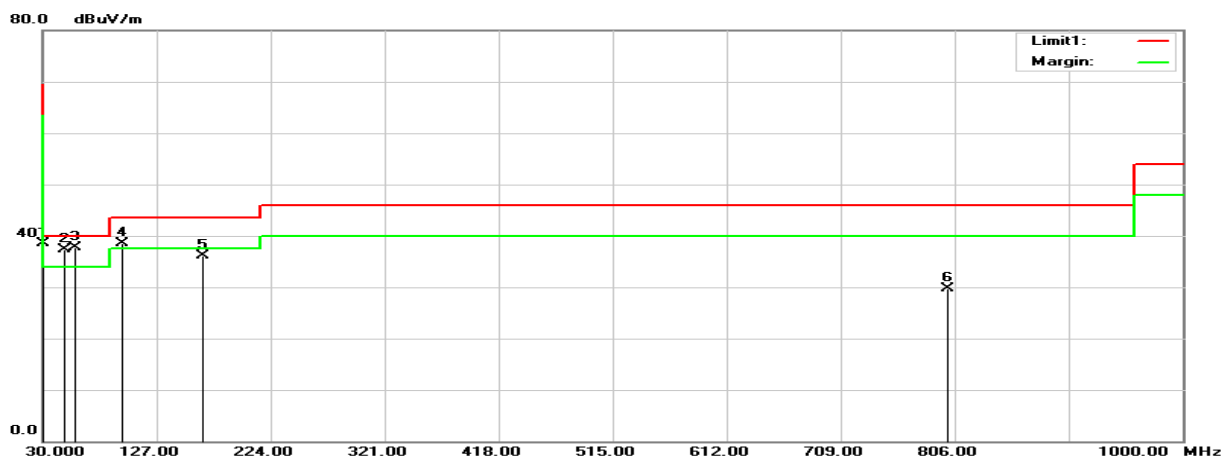


18GHz-26.5GHz:

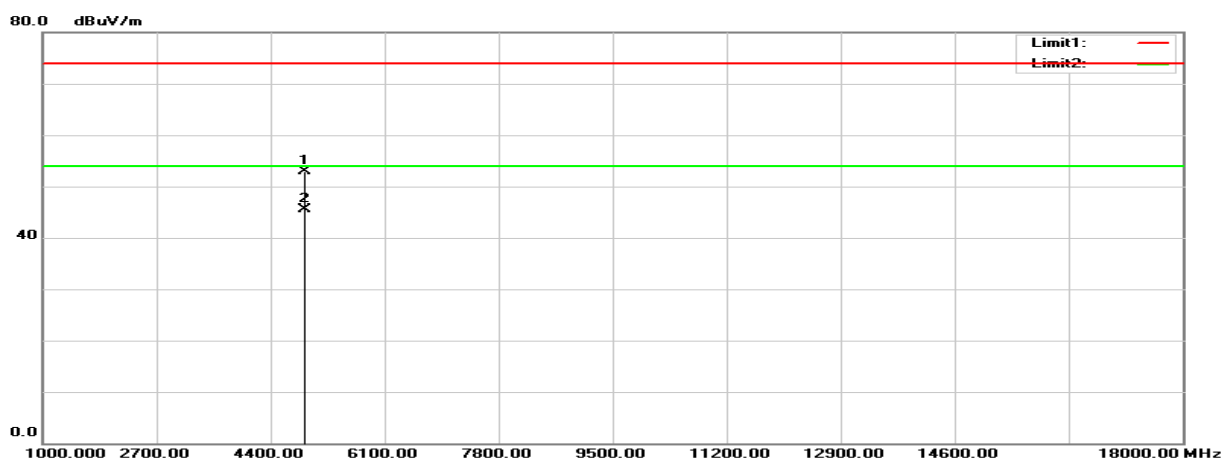


**Vertical**

**30MHz-1GHz:**



**1GHz-18GHz:**



**18GHz-26.5GHz:**



**Horizontal**

Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
(MHz)	(dB $\mu$ V)	Factor(dB/m)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	(cm)	( $^{\circ}$ )	
31.9400	37.03	-4.36	32.67	40.00	-7.33	100	309	QP
47.4600	49.49	-14.82	34.67	40.00	-5.33	100	118	QP
166.7700	33.82	-10.96	22.86	43.50	-20.64	100	34	QP
367.5600	29.96	-7.35	22.61	46.00	-23.39	100	100	QP
602.3000	30.78	-4.40	26.38	46.00	-19.62	100	180	QP
920.4600	30.65	0.16	30.81	46.00	-15.19	100	195	QP
*2457.000	91.96	-4.65	87.31	114.00	-26.69	191	97	peak
*2457.000	91.47	-4.65	86.82	94.00	-7.18	191	97	AVG
4914.000	56.41	1.53	57.94	74.00	-16.06	100	4	peak
4914.000	49.39	1.53	50.92	54.00	-3.08	100	4	AVG

**Vertical**

Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
(MHz)	(dB $\mu$ V)	Factor(dB/m)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	(cm)	( $^{\circ}$ )	
31.0700	42.17	-3.76	38.41	40.00	-1.59	100	157	QP
48.4300	52.58	-15.24	37.34	40.00	-2.66	100	39	QP
57.9500	54.51	-16.81	37.70	40.00	-2.30	100	356	QP
97.9000	52.67	-14.26	38.41	43.50	-5.09	100	191	QP
166.7700	47.10	-10.96	36.14	43.50	-7.36	100	137	QP
800.1800	31.13	-1.47	29.66	46.00	-16.34	100	93	QP
*2457.000	86.40	-4.65	81.75	114.00	-32.25	132	80	peak
*2457.000	85.68	-4.65	81.03	94.00	-12.97	132	80	AVG
4914.000	51.45	1.53	52.98	74.00	-21.02	100	204	peak
4914.000	43.89	1.53	45.42	54.00	-8.58	100	204	AVG

Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported.



## **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. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

### **Test Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	55 %
<b>ATM Pressure:</b>	1010 hPa

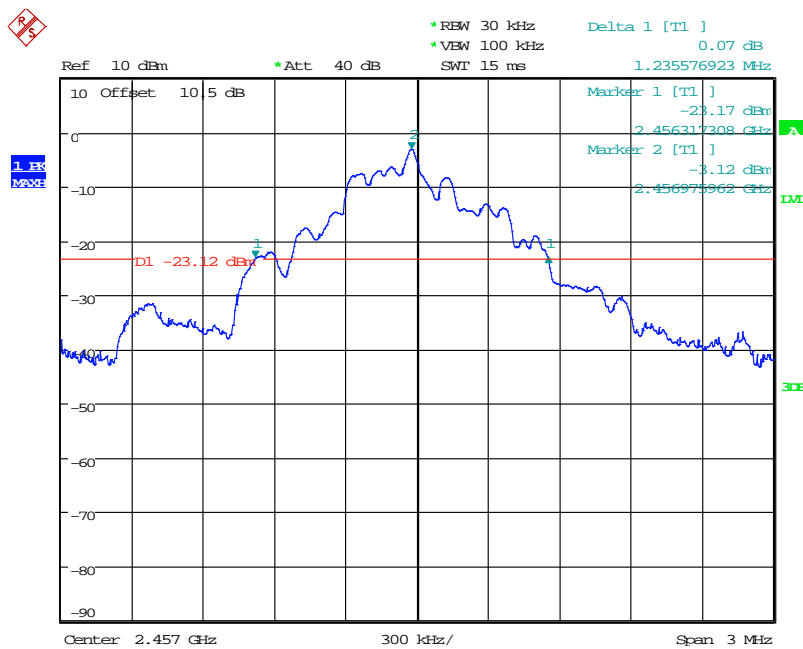
*The testing was performed by Tom Hsu on 2018-08-23.*

**Test Results**

Test Mode: Transmitting

Frequency (MHz)	20 dB Emission Bandwidth (MHz)
2457	1.24

Please refer to the following tables and plots.



Date: 23.AUG.2018 14:26:43

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