

## FCC PART 15.249

### TEST REPORT

For

**Waylens Inc.**

2711 Centerville Road - Suite 400, Wilmington, Delaware, United States, 19808

**FCC ID: 2AKAF-TW02C1**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Secure360 Wi-Fi
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<b>Report Number:</b>	RSHA180404004-00C
<b>Report Date:</b>	2018-06-08
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## GENERAL INFORMATION

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

Applicant	Waylens Inc.
Tested Model	TW02
Product Type	Secure360 Wi-Fi
Dimension	60 mm (L)* 60 mm (W)*50mm(H)
Power Supply	DC 12V

*\*All measurement and test data in this report was gathered from production sample serial number: 20180404004.  
(Assigned by the BACL. The EUT supplied by the applicant was received on 2018-04-04)*

### Objective

This type approval report is prepared on behalf of *Waylens Inc.* in accordance with Part 2-Subpart J, and Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.249 rules.

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

FCC Part15.247 DSS & DTS submission with FCC ID: 2AKAF-TW02C1.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Lab Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

**Measurement Uncertainty**

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19 dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
	18GHz~40GHz	5.65dB
Occupied Bandwidth		0.5kHz
Temperature		1.0°C
Humidity		6%

**Test Facility**

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

**SYSTEM TEST CONFIGURATION****Justification**

Channel list:

Channel	Frequency (MHz)
1	2451.2

**EUT Exercise Software**

No software was used during the test.

**Support Equipment List and Details**

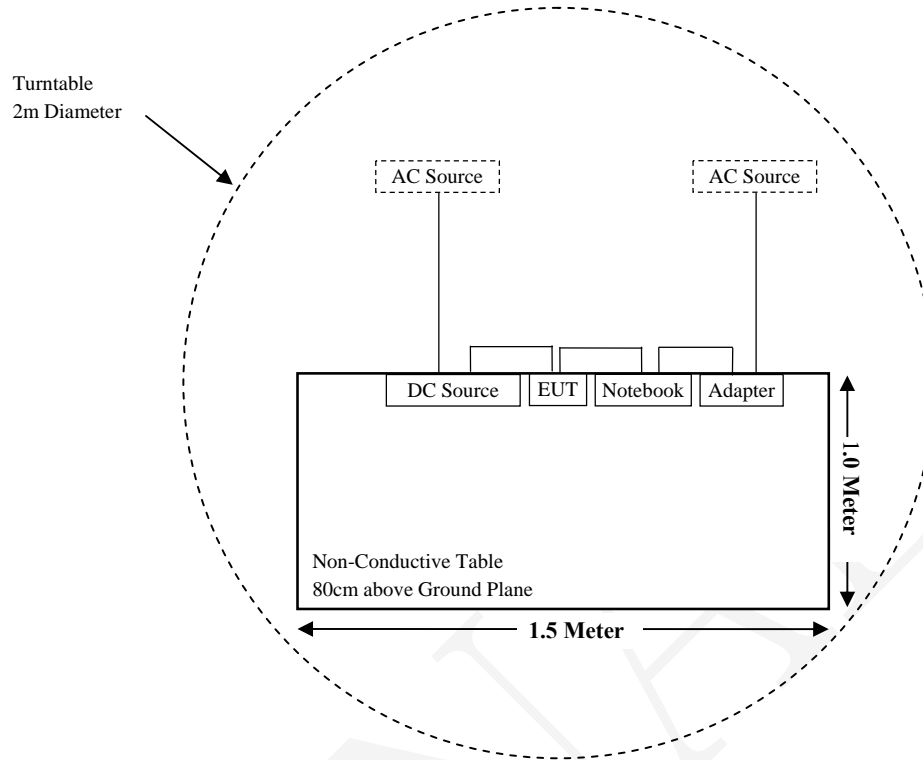
Manufacturer	Description	Model	Serial Number
DELL	Notebook	GX620	D65874152
DELL	Adapter	LA65NS0-00	DF263
/	Serial Board	/	/

**External I/O Cable**

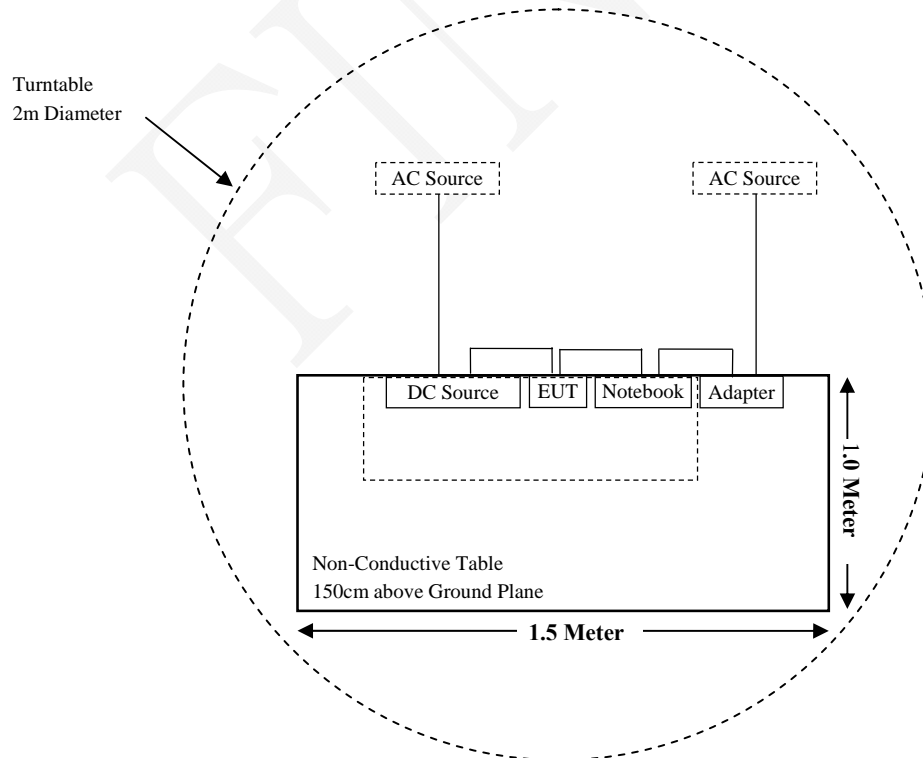
Cable Description	Length (m)	From Port	To
Serial Cable	0.2	EUT	Notebook
Power Cable-1	1.8	EUT	DC Source
Power Cable-2	0.8	Notebook	Adapter

## Block Diagram of Test Setup

For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207(a)	Conduction Emissions	Not Applicant (See Note 1)
15.205, §15.209, §15.249	Radiated Emissions& Out of Band Emission	Compliant
§15.215 (c)	20 dB Bandwidth	Compliant

Note 1: The EUT is a vehicle device.

**TEST EQUIPMENT LIST**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>Radiated Emission Test (Chamber 1#)</b>					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2017-11-12	2018-11-11
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2016-12-26	2019-12-25
Sonoma Instrument	Pre-amplifier	310N	171205	2017-08-15	2018-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
EAST	Regulated DC Power Supply	MCH-303D-II	14070562	2017-10-10	2018-10-09
MICRO-COAX	Coaxial Cable	Cable-8	008	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2017-08-15	2018-08-14
<b>Radiated Emission Test (Chamber 2#)</b>					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2017-08-27	2018-08-26
ETS-LINDGREN	Horn Antenna	3115	6229	2016-01-11	2019-01-10
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-10-18	2019-10-17
Mini-Circuits	Amplifier	ZVA-183W-S+	220701818	2018-05-20	2019-05-19
EM Electronics Corporation	Amplifier	EM18G40G	060726	2018-03-22	2019-03-21
MICRO-TRONICS	Band Reject Filter	BRM50702	/	2017-08-05	2018-08-04
Narda	Attenuator/10dB	10dB	/	2017-08-15	2018-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
EAST	Regulated DC Power Supply	MCH-303D-II	14070562	2017-10-10	2018-10-09
MICRO-COAX	Coaxial Cable	Cable-6	006	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2017-08-15	2018-08-14
<b>RF Conducted Test</b>					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2017-09-21	2018-09-20
Narda	Attenuator/2dB	2dB	/	2017-08-15	2018-08-14
Waylens Inc.	RF Cable	/	/	Each Time	/
EAST	Regulated DC Power Supply	MCH-303D-II	14070562	2017-10-10	2018-10-09

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



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

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### **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 a PCB antenna and antenna gain is 1.5 dBi, which was permanently attached ,fulfill the requirement of this section, please refer to the EUT photos.

**Result:** Compliant.

## FCC§15.205, §15.209&§15.249- RADIATED EMISSIONS& OUT OF BAND EMISSION

### 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:

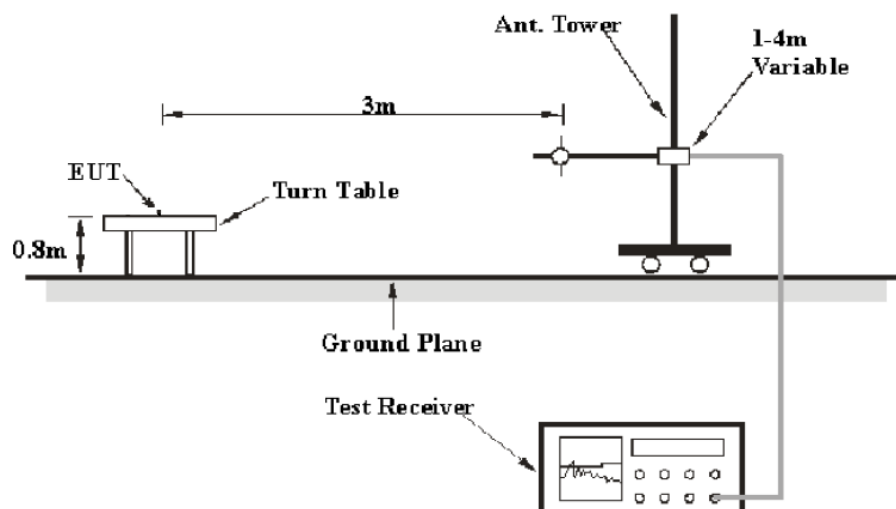
Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

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

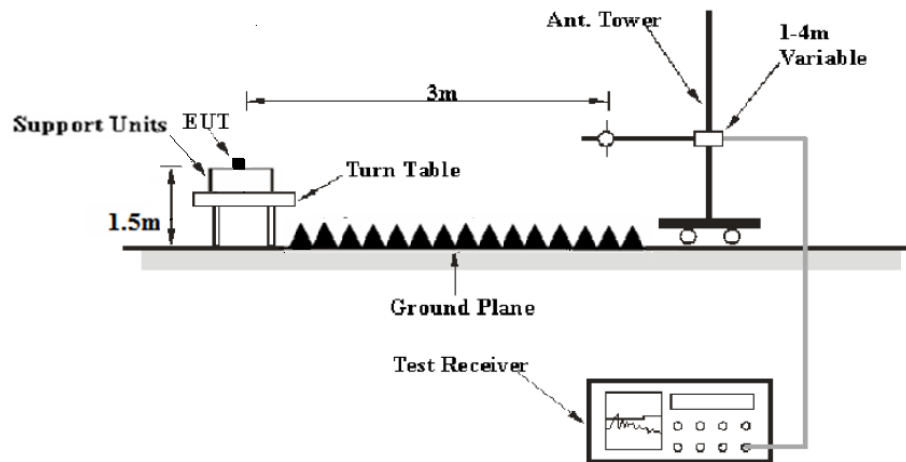
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

### EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission and out of band emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209/15.205 and FCC 15.249 limits.

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

### Test Equipment Setup

The system was investigated from 30 MHz to 25 GHz.

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

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1GHz	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 detection mode from 30MHz 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 Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15.209 & 15.205 & 15.249.

#### Test Data

##### Environmental Conditions

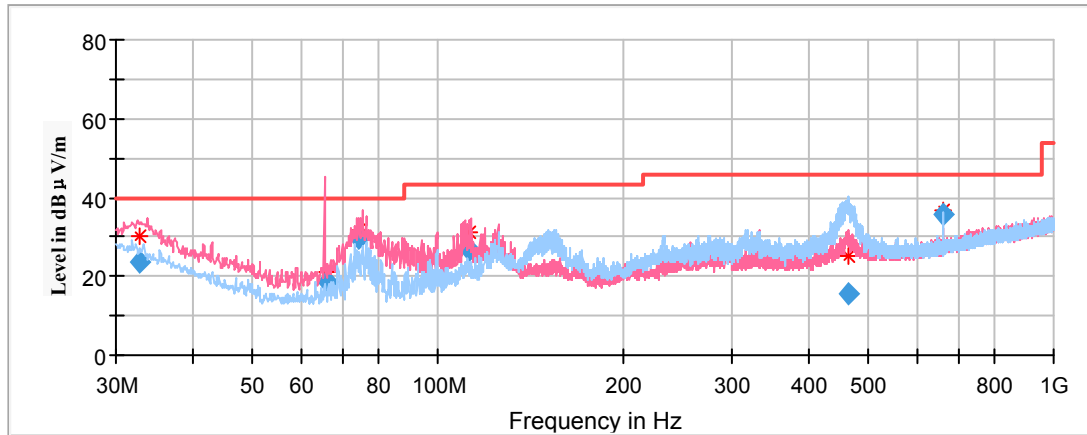
<b>Temperature:</b>	24.6°C
<b>Relative Humidity:</b>	52%
<b>ATM Pressure:</b>	101.2 kPa

*The testing was performed by Mark Yu on 2018-04-20 to 2018-06-08.*

*Test Mode: Transmitting*

**Spurious Emission Test:****30MHz-1GHz**

(Pre-scan in the X, Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded.)



Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	Quasi-peak (dBμV/m)	Height (cm)	Polar (H/V)				
32.859950	23.86	101.0	V	358.0	-6.3	40.00	16.14
66.029600	18.74	101.0	V	321.0	-18.0	40.00	21.26
74.318850	29.50	101.0	V	315.0	-17.9	40.00	10.50
112.817100	26.84	101.0	V	231.0	-13.0	43.50	16.66
463.117950	15.53	101.0	H	77.0	-7.0	46.00	30.47
659.968800	35.49	199.0	H	109.0	-4.0	46.00	10.51

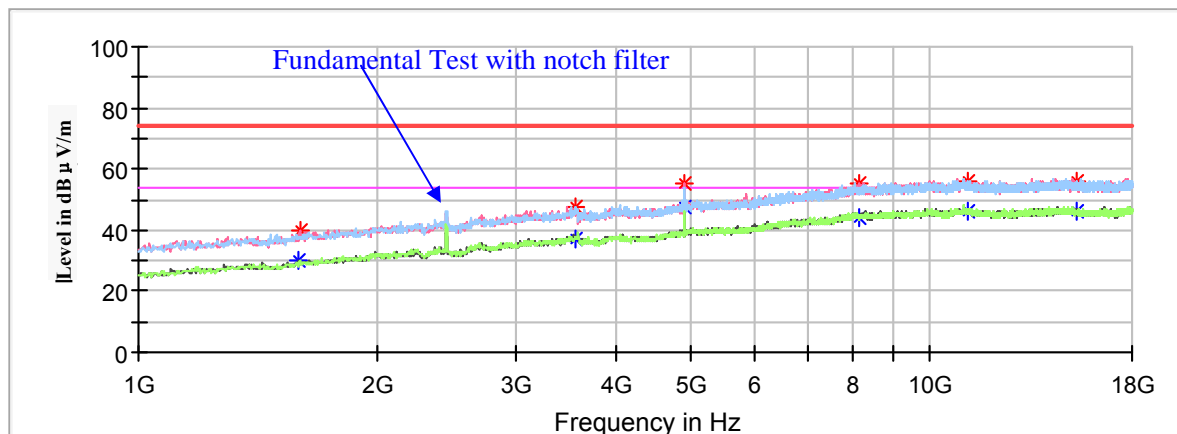
**1GHz-18GHz**

(Pre-scan in the X, Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded.)

Note:

1. This test was performed with the 2.4-2.4835GHz band reject filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor  
Corrected Amplitude = Corrected Factor + Reading  
Margin = Limit – Corrected. Amplitude

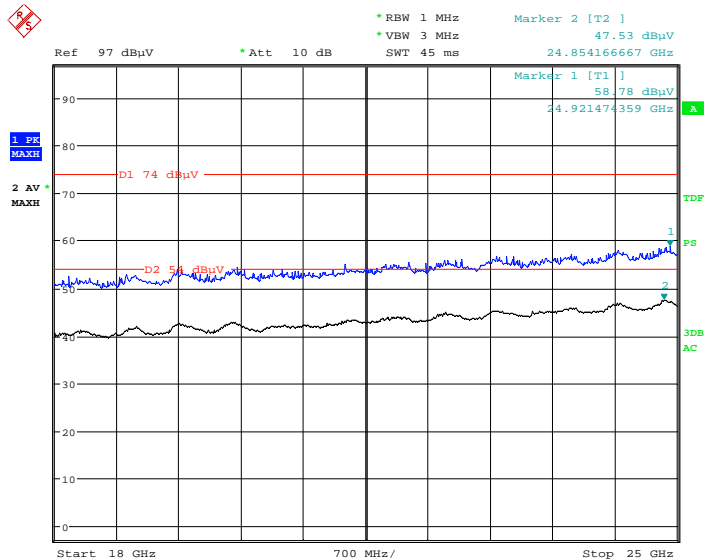
Full Spectrum



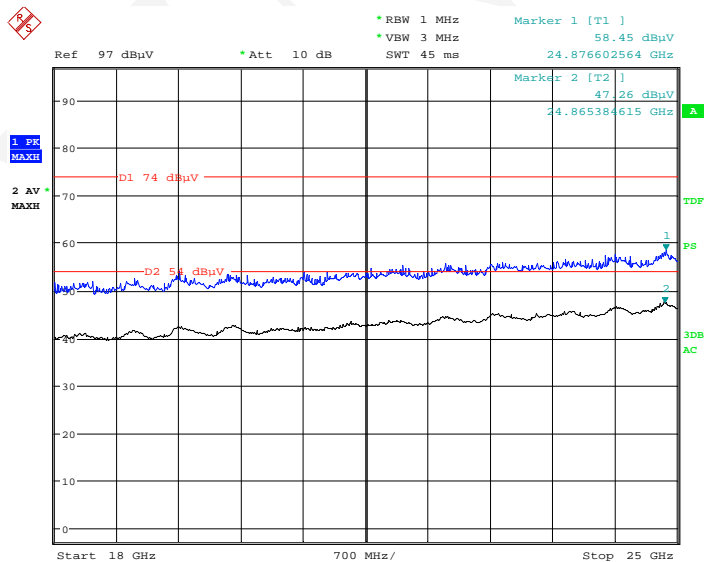
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
1595.000000	---	30.07	100.0	V	203.0	-0.6	54.00	23.93
1595.000000	40.06	---	100.0	V	203.0	-0.6	74.00	33.94
3563.600000	---	37.19	200.0	H	113.0	7.5	54.00	16.81
3563.600000	47.66	---	200.0	H	113.0	7.5	74.00	26.34
4904.000000	---	47.24	200.0	V	103.0	11.2	54.00	6.76
4904.000000	55.31	---	200.0	V	103.0	11.2	74.00	18.69
8116.200000	---	44.31	200.0	H	15.0	17.2	54.00	9.69
8116.200000	55.19	---	200.0	H	15.0	17.2	74.00	18.81
11145.600000	56.23	---	150.0	V	344.0	18.9	74.00	17.77
11145.600000	---	45.88	150.0	V	344.0	18.8	54.00	8.12
15351.400000	55.64	---	100.0	V	256.0	18.3	74.00	18.36
15351.400000	---	46.00	100.0	V	256.0	18.3	54.00	8.00

**18GHz-25GHz**

(Pre-scan in the X, Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded.)

**Horizontal**

Date: 20.APR.2018 18:24:25

**Vertical**

Date: 20.APR.2018 18:39:49

**Fundamental Test & Restricted Bands Emissions Test:**

(Pre-scan in the X, Y and Z axes of orientation, the worst case X-axis of orientation was recorded.)

Note:

1. The test is performed with a 10dB Attenuator.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor  
Corrected Amplitude = Corrected Factor + Reading  
Margin = Limit - Corrected. Amplitude

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
2400.00	---	38.32	149	V	206	5.1	54	15.68
2400.00	41.37	---	149	V	206	5.1	74	32.63
2451.20	67.57	---	221	H	235	5.2	114	46.43
2451.20	---	64.49	221	H	235	5.2	94	29.51
2483.50	---	37.84	240	V	168	5.3	54	16.16
2483.50	40.55	---	240	V	168	5.3	74	33.45



## **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 on the test table without connection to measurement instrument. Turn on the EUT. 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 Data**

#### **Environmental Conditions**

<b>Temperature:</b>	24.2°C
<b>Relative Humidity:</b>	50 %
<b>ATM Pressure:</b>	101.3kPa

*The testing was performed by Mark Yu on 2018-05-16.*

**Test Result:** Compliant.

Test Mode: Transmitting

Frequency (MHz)	20 dB Bandwidth (MHz)
2451.2	4.295



Date: 16.MAY.2018 08:15:24

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