

# FCC PART 15.249 TEST REPORT

For

## Hengdian Group Tospo Lighting Co., Ltd

Hengdian Electronics Industrial Zone, Dongyang, Zhejiang, China

**FCC ID: 2AZJ6TPXXC011AO**

<b>Report Type:</b> Original Report	<b>Product Type:</b> PAR Lamp
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<b>Report Number:</b>	RKSB210331003-00A
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## GENERAL INFORMATION

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

Applicant:	Hengdian Group Tospo Lighting Co., Ltd
Tested Model:	G117P38MO5DUO
Product Type:	PAR Lamp
Power Supply:	AC 120V
RF Function:	SRD
Operating Band/Frequency:	5800 MHz
Channel Number:	1
Antenna Type:	PCB Antenna
*Maximum Antenna Gain:	2.3 dBi

*Note: The maximum antenna gain was declared by the applicant.*

*All measurement and test data in this report was gathered from production sample serial number: RKS210331003-1 (Assigned by BACL, Kunshan). The EUT was received on 2021-03-31.*

### Objective

This type approval report is prepared on behalf of *Hengdian Group Tospo Lighting Co., Ltd* in accordance with Part 2-Subpart J, and Part 15-Subparts A and C of the Federal Communication Commission rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.249 rules.

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

No related submittal/grant.

### 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	6.11 dB
	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 and CAB identifier CN0004 under the ISED requirement. 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	5800

### EUT Exercise Software

RF test tool: EMI\_test\_tool

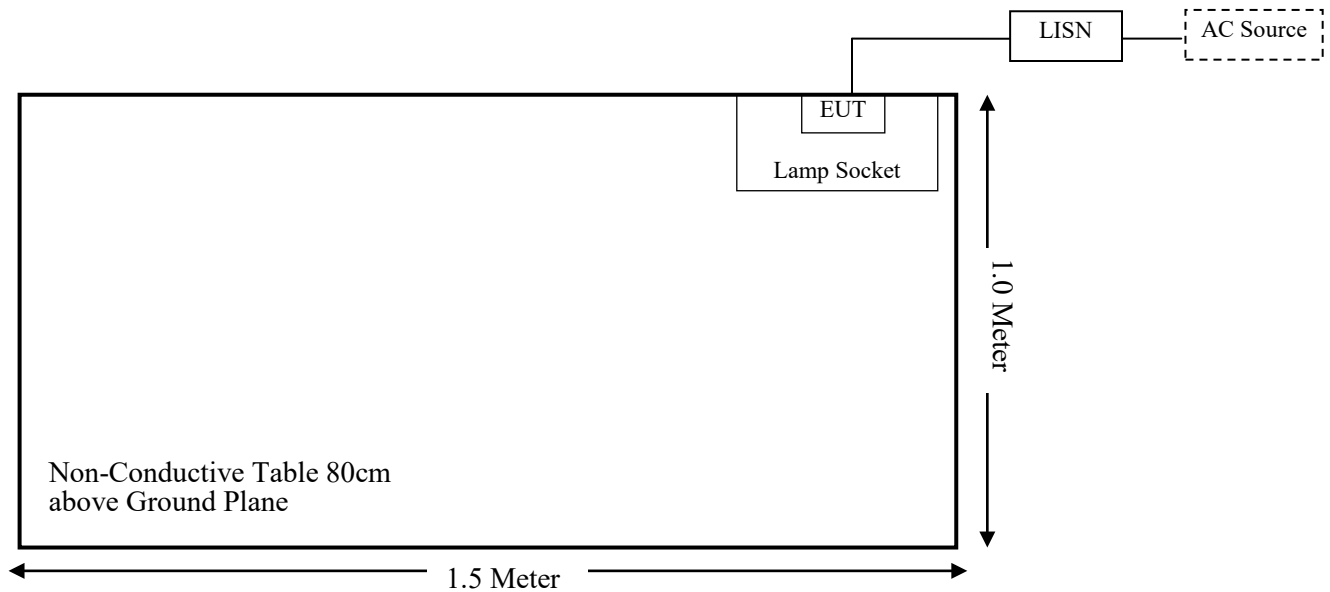
### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	Lamp Socket	/	/

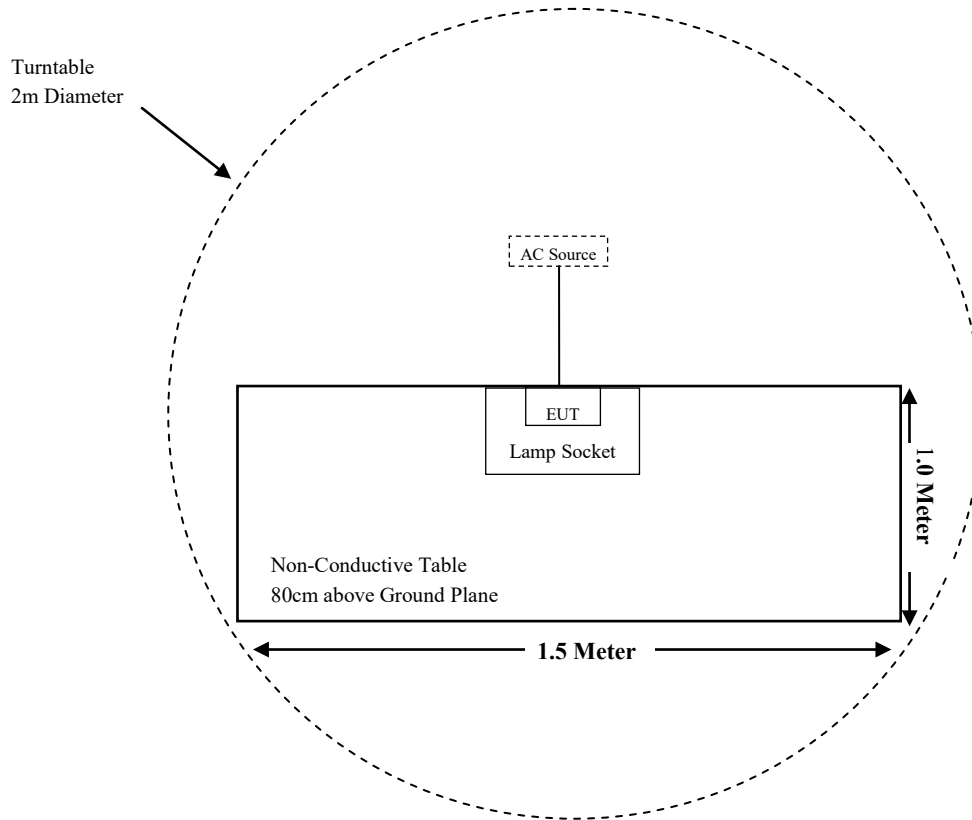
### External I/O Cable

Cable Description	Length (m)	From Port	To
Power Cable	1.0	EUT	LISN/AC Source

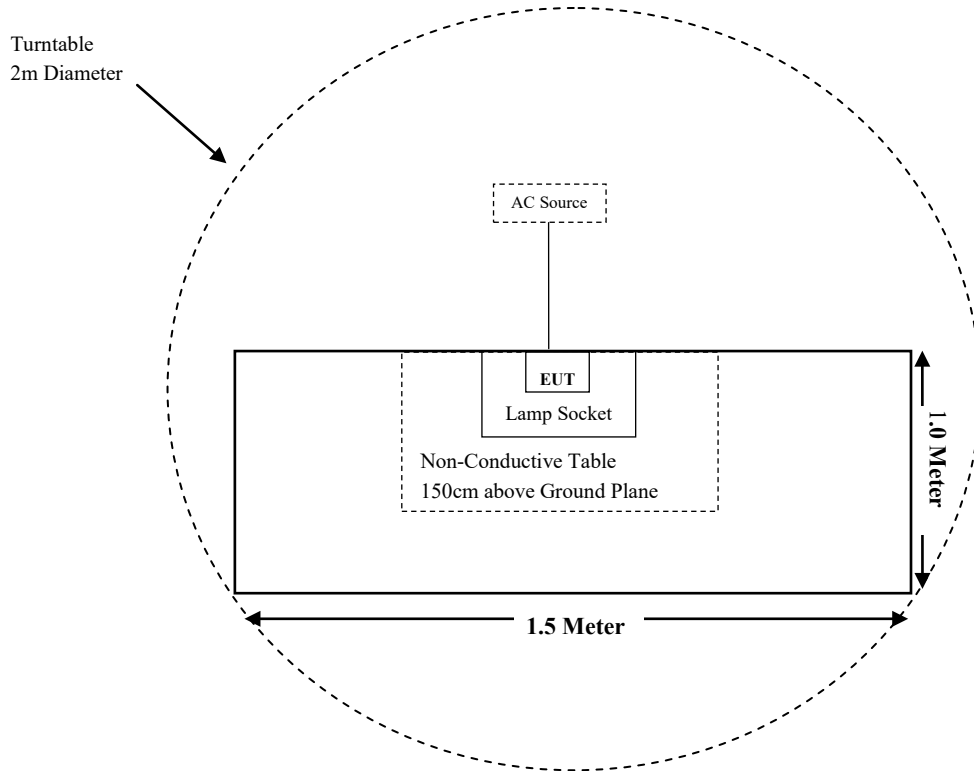
### Block Diagram of Test Setup



For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



**SUMMARY OF TEST RESULTS**

<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
§15.203	Antenna Requirement	Compliant
§15.207(a)	AC Line Conducted Emissions	Compliant
15.205, §15.209, §15.249	Radiated Emissions& Out of Band Emission	Compliant
§15.215 (c)	20 dB Bandwidth	Compliant

**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	2020-11-27	2021-11-26
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2020-01-07	2023-01-06
Sonoma Instrument	Pre-amplifier	310N	171205	2020-08-14	2021-08-13
Rohde & Schwarz	Auto test Software	EMC32	100361	N/A	N/A
MICRO-COAX	Coaxial Cable	Cable-8	008	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2020-08-15	2021-08-14
<b>Radiated Emission Test (Chamber 2#)</b>					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207/040	2021-04-01	2022-03-31
ETS-LINDGREN	Horn Antenna	3115	9311-4159	2020-07-15	2023-07-14
ETS-LINDGREN	Horn Antenna	3116	2516	2020-01-07	2023-01-06
MICRO-TRONICS	Notch Filter	BRC50705	G085	2020-08-05	2021-08-04
A.H.Systems, inc	Amplifier	PAM-0118P	512	2020-08-14	2021-08-13
SELECTOR	Amplifier	EM18G40G	060726	2021-03-22	2022-03-21
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2020-08-15	2021-08-14
<b>RF Conducted Test</b>					
Rohde & Schwarz	Signal Analyzer	FSV40	101116	2020-07-28	2021-07-27
Narda	Attenuator	10dB	010	2020-08-15	2021-08-14
Hengdian Group Tospo Lighting Co., Ltd.	RF Cable	Hengdian Group Tospo Lighting Co., Ltd. C01	C01	Each Time	/
<b>Conducted Emission Test</b>					
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03- 101746-zn	2020-07-28	2021-07-27
Rohde & Schwarz	LISN	ENV216	101115	2020-11-27	2021-11-26
Audix	Test Software	e3	V9	/	/
Rohde & Schwarz	Pulse limiter	ESH3-Z2	100552	2020-08-10	2021-08-09
MICRO-COAX	Coaxial Cable	Cable-15	015	2020-08-15	2021-08-14

\* **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 for SRD, which was permanently attached to the EUT, antenna gain is 2.3 dBi, fulfill the requirement of this section, please refer to the EUT photos.

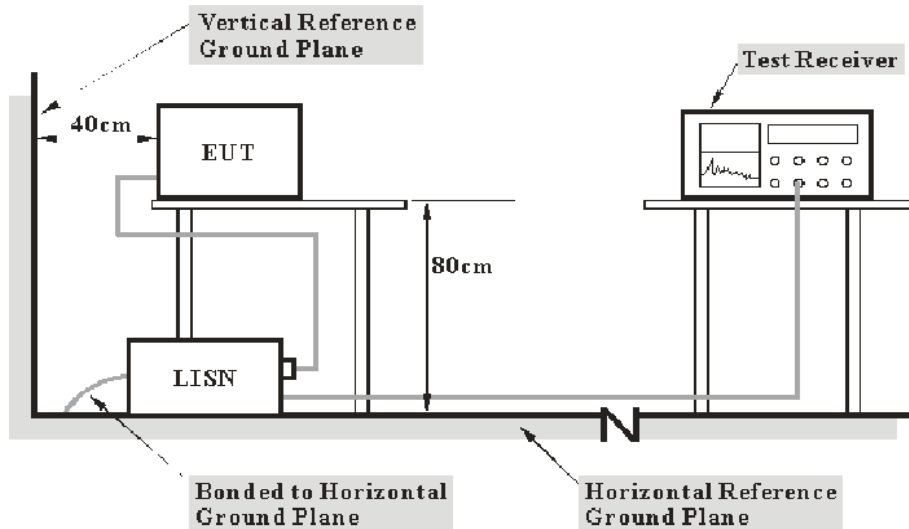
**Result:** Compliant.

## 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 measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

### 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

ANSI C63.10-2013 clause 6.2

During the conducted emission test, the EUT was connected to the outlet of the LISN.

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

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

## Factor & Over Limit Calculation

The Factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Factor (dB)} = \text{LISN VDF (dB)} + \text{Cable Loss (dB)} + \text{Transient Limiter Attenuation (dB)}$$

The “**Over Limit**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit of 7 dB means the emission is 7 dB above the limit. The equation for Over Limit calculation is as follows:

$$\text{Over Limit (dB)} = \text{Read level (dB}\mu\text{V)} + \text{Factor (dB)} - \text{Limit (dB}\mu\text{V)}$$

## Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

## Test Data

### Environmental Conditions

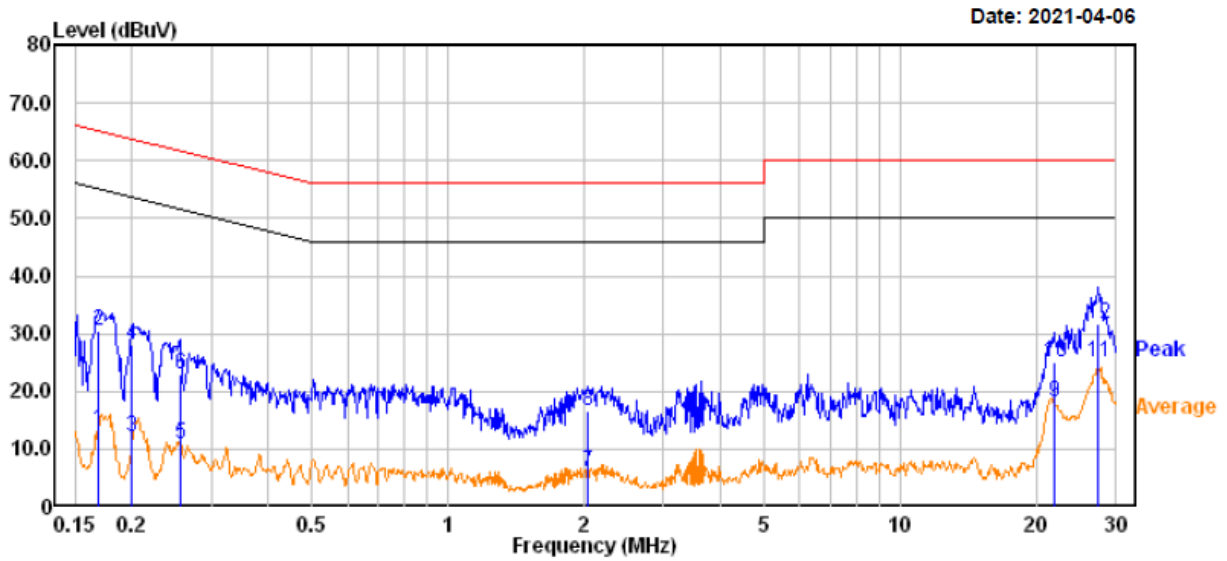
<b>Temperature:</b>	25.3 °C
<b>Relative Humidity:</b>	50 %
<b>ATM Pressure:</b>	101.5 kPa

*The testing was performed by Stone Zhang on 2021-04-06.*

*Test Mode: SRD transmitting at 5800MHz*

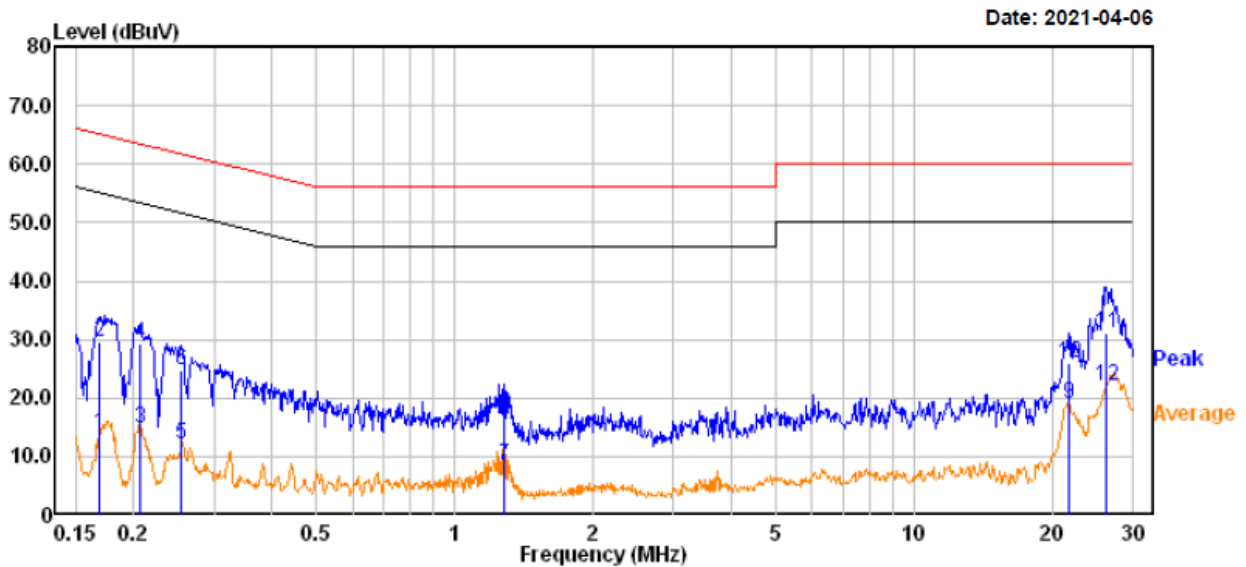
**Test Result:** Compliant.

AC 120V/60 Hz, Line



	Read Freq	Read Level	Factor	Limit Level	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dB	
1	0.168	-6.50	19.83	13.33	55.05	-41.72 Average
2	0.168	10.76	19.83	30.59	65.05	-34.46 QP
3	0.200	-7.70	19.82	12.12	53.60	-41.48 Average
4	0.200	8.24	19.82	28.06	63.60	-35.54 QP
5	0.256	-8.86	19.82	10.96	51.57	-40.61 Average
6	0.256	3.00	19.82	22.82	61.57	-38.75 QP
7	2.043	-13.85	19.80	5.95	46.00	-40.05 Average
8	2.043	-3.14	19.80	16.66	56.00	-39.34 QP
9	21.915	-1.63	19.84	18.21	50.00	-31.79 Average
10	21.915	5.23	19.84	25.07	60.00	-34.93 QP
11	27.426	5.20	19.74	24.94	50.00	-25.06 Average
12	27.426	12.10	19.74	31.84	60.00	-28.16 QP

AC 120V/60 Hz, Neutral



	Read Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.169	-5.99	19.83	13.84	55.01	-41.17	Average
2	0.169	9.77	19.83	29.60	65.01	-35.41	QP
3	0.206	-5.10	19.82	14.72	53.35	-38.63	Average
4	0.206	9.41	19.82	29.23	63.35	-34.12	QP
5	0.254	-7.73	19.82	12.09	51.61	-39.52	Average
6	0.254	4.79	19.82	24.61	61.61	-37.00	QP
7	1.279	-11.43	19.82	8.39	46.00	-37.61	Average
8	1.279	-2.54	19.82	17.28	56.00	-38.72	QP
9	21.698	-0.95	19.86	18.91	50.00	-31.09	Average
10	21.698	6.07	19.86	25.93	60.00	-34.07	QP
11	26.223	11.51	19.71	31.22	60.00	-28.78	QP
12	26.223	2.41	19.71	22.12	60.00	-37.88	QP

Note:

- 1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
- 2) Over Limit (dB) = Read level (dBUV) + Factor (dB) - Limit (dBUV)

## 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:

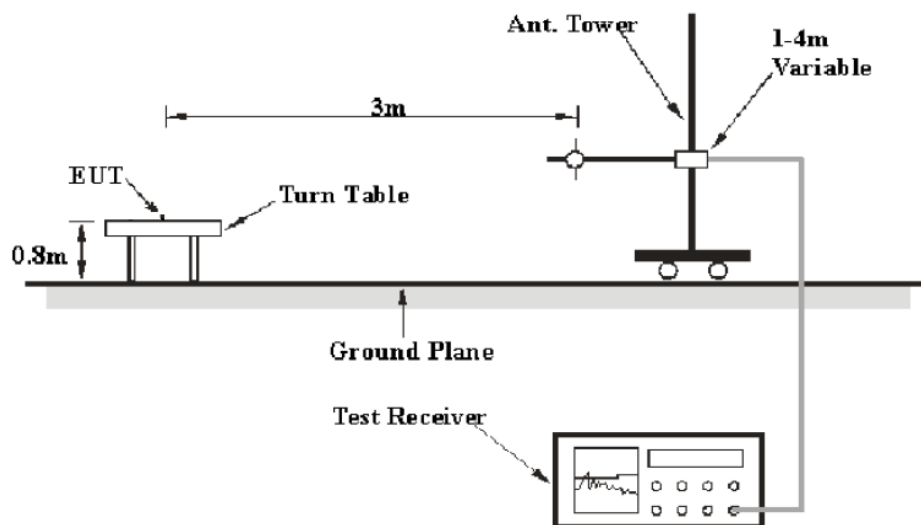
Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24GHz-24.25GHz	250	2500

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

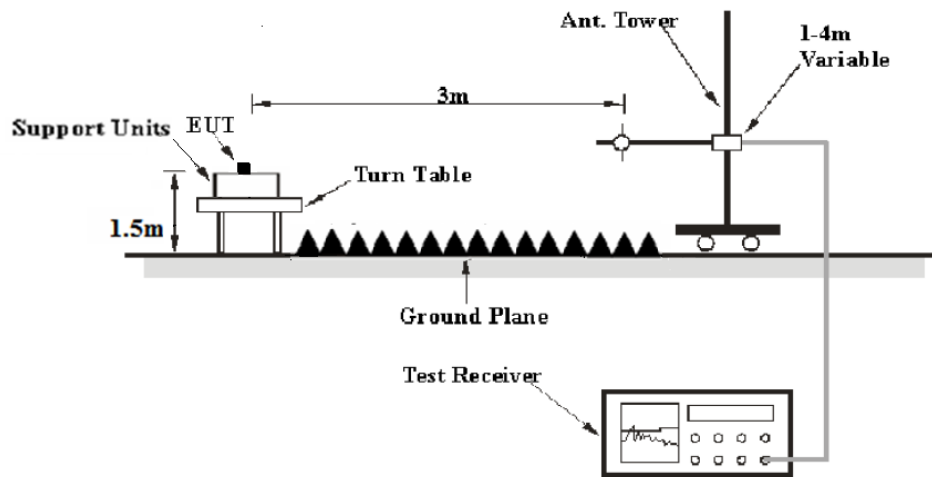
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

### 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 40GHz.

During the radiated emission test, the EMI test receiver Setup 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	/	AVG

**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:

$$\text{Corrected Amplitude (dB}\mu\text{V/m)} = \text{Meter Reading (dB}\mu\text{V)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Amplifier Gain (dB)}$$

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:

$$\text{Margin (dB)} = \text{Limit (dB}\mu\text{V/m)} - \text{Corrected Amplitude (dB}\mu\text{V/m)}$$

## 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>	24.9 °C
<b>Relative Humidity:</b>	51 %
<b>ATM Pressure:</b>	101.3 kPa

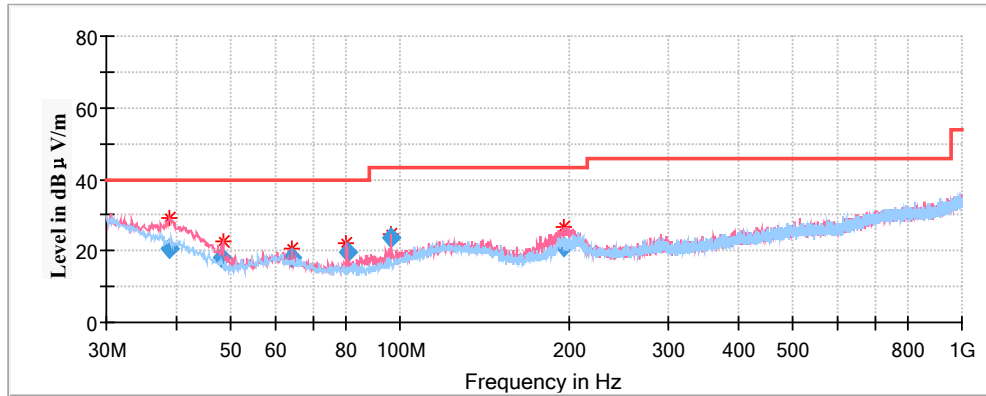
*The testing was performed by Stone Zhang from 2021-04-05 to 2021-04-23.  
Test Mode: SRD transmitting at 5800MHz*



**Spurious Emission Test:**

**30 MHz - 1 GHz**

(Scan with X-Axis, Y-Axis and Z-Axis position, the worst case Y-Axis was recorded)



Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	QuasiPeak (dB μ V/m)	Height (cm)	Polar (H/V)				
38.947300	20.67	100.0	V	177.0	-9.7	40.00	19.33
48.228650	18.36	100.0	V	0.0	-16.0	40.00	21.64
64.351550	18.09	100.0	V	287.0	-15.5	40.00	21.91
80.568950	19.50	100.0	V	184.0	-17.2	40.00	20.50
96.523300	23.63	100.0	V	208.0	-15.4	43.50	19.87
196.284000	21.16	200.0	V	313.0	-12.3	43.50	22.34

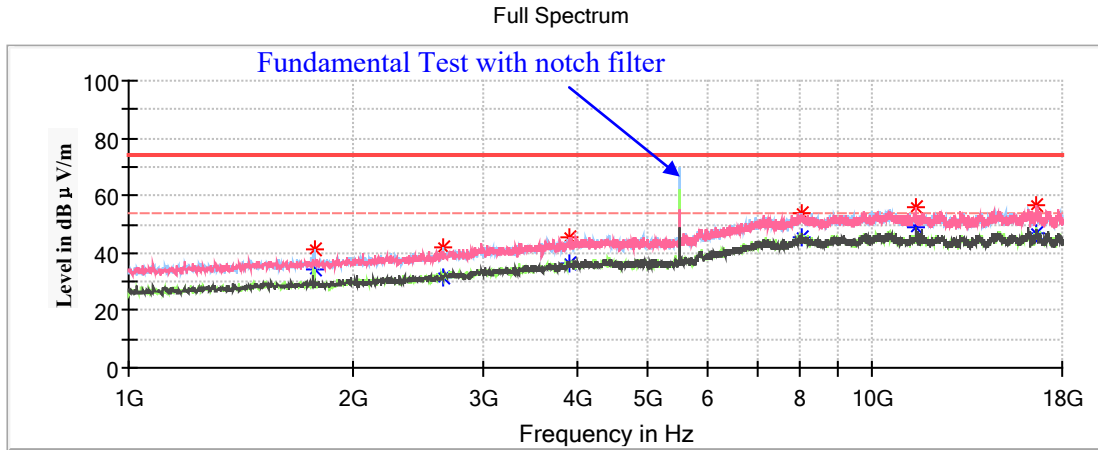
**1GHz-18GHz**

(Scan with X-Axis, Y-Axis and Z-Axis position, the worst case Y-Axis was recorded)

Note:

1. This test was performed with the 5725-5875MHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)  
 Corrected Amplitude (dBµV/m) = Corrected Factor (dB/m) + Reading (dBµV)  
 Margin (dB) = Limit (dBµV/m) – Corrected Amplitude (dBµV/m)

**Channel: 5800MHz**



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)				
1778.600000	---	33.98	200.0	H	213.0	-8.4	54.00	20.02
1778.600000	40.94	---	200.0	H	213.0	-8.4	74.00	33.06
2652.400000	---	31.77	200.0	V	203.0	-5.0	54.00	22.23
2652.400000	41.99	---	200.0	V	203.0	-5.0	74.00	32.01
3907.000000	---	36.34	150.0	V	238.0	0.0	54.00	17.66
3907.000000	45.65	---	150.0	V	238.0	0.0	74.00	28.35
8024.400000	---	45.46	150.0	H	198.0	10.8	54.00	8.54
8024.400000	53.90	---	150.0	H	198.0	10.8	74.00	20.10
11455.000000	---	48.61	200.0	V	20.0	11.8	54.00	5.39
11455.000000	55.67	---	200.0	V	20.0	11.8	74.00	18.33
16577.100000	---	47.05	200.0	H	356.0	11.9	54.00	6.95
16577.100000	56.97	---	200.0	H	356.0	11.9	74.00	17.03



**Restricted Bands Emissions Test:**

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

Note:

- Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)  
 Corrected Amplitude (dB $\mu$ V/m) = Corrected Factor (dB/m) + Reading (dB $\mu$ V)  
 Margin (dB) = Limit (dB $\mu$ V/m) – Corrected Amplitude (dB $\mu$ V/m)

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable	Corrected Factor (dB/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	MaxPeak (dB $\mu$ V/m)	Average (dB $\mu$ V/m)	Height (cm)	Polar (H/V)	Degree			
<b>Channel: 5800 MHz</b>								
5725.000000	---	42.85	150	H	329	3.4	54.00	11.15
5725.000000	50.75	---	150	H	329	3.4	74.00	23.25
5800.000000	83.18	---	200	H	22	4.2	114.00	30.82
5800.000000	---	83.11	200	H	22	4.2	94.00	10.89
5800.000000	83.15	---	200	V	56	4.2	114.00	30.85
5800.000000	---	83.08	200	V	56	4.2	94.00	10.92
5875.000000	50.92	---	200	H	257	4.3	74.00	23.08
5875.000000	---	43.68	200	H	257	4.3	54.00	10.32

## 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

Temperature:	25.3 °C
Relative Humidity:	50 %
ATM Pressure:	101.3 kPa

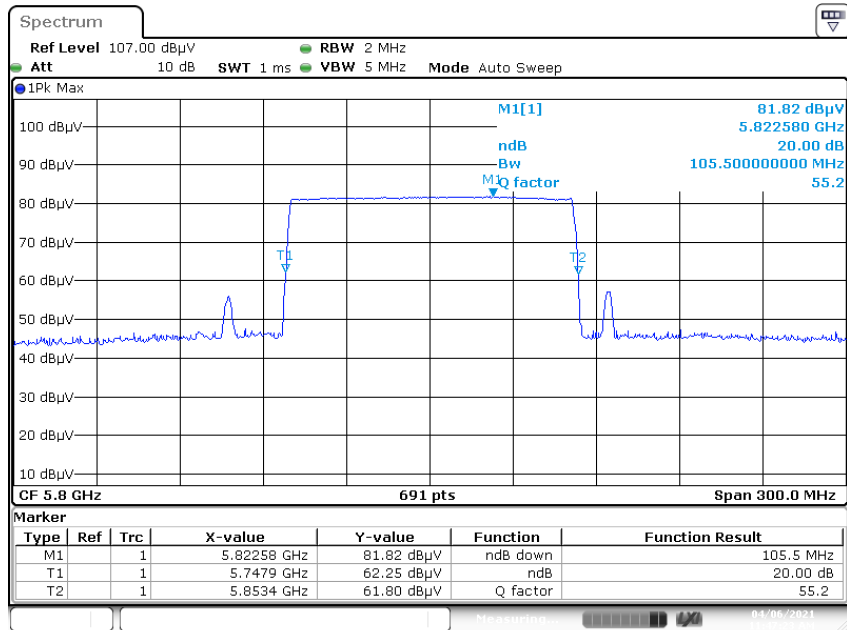
*The testing was performed by Stone Zhang on 2021-04-06.*

**Test Result:** Compliant.

*Test Mode: Transmitting*

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
1	5800	105.50

**Channel 1: 5800MHz**



Date: 6.APR.2021 11:47:23

Note: The device work in sweep mode.

### **Declarations**

- 1: 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 an asterisk '\*'. Customer model name, addresses, names, trademarks etc. are not considered data.
- 2: Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
- 3: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
- 4: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.
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