



# FCC PART 18 TEST REPORT

For

# Whirlpool Microwave Products Development Limited.

16/F, Paliburg Plaza 68 Yee Woo Street, Causeway Bay, Hong Kong

FCC ID: PR4LPTKACU

Report Type: **Product Type:** Original Report Microwave Oven **Report Number:** RSZ191021556-00 **Report Date:** 2019-10-30 Joson Xiao Joson Xiao **Reviewed By:** EMC Engineer Bay Area Compliance Laboratories Corp. (Shenzhen) **Prepared By:** 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

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# TABLE OF CONTENTS

GENERAL INFORMATION	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
Objective	
RELATED SUBMITTAL(S)/GRANT(S)	
TEST METHODOLOGY	
MEASUREMENT UNCERTAINTY	
TEST FACILITY	
OPERATING CONDITION/TEST CONFIGURATION	5
JUSTIFICATION	5
EUT Exercise Software	
SPECIAL ACCESSORIES	
EQUIPMENT MODIFICATIONS	
SUPPORT EQUIPMENT LIST AND DETAILS	
EXTERNAL CABLE LIST AND DETAILS	
CONFIGURATION OF TEST SETUPBLOCK DIAGRAM OF TEST SETUP	
SUMMARY OF TEST RESULT	7
TEST EQUIPMENT LIST	8
-	
CONDUCTED EMISSIONS	10
APPLICABLE STANDARD	10
EUT SETUP	
EMI TEST RECEIVER SETUP	
TEST PROCEDURE	
TEST RESULTS SUMMARY	
TEST DATA	
RADIATION HAZARD MEASUREMENT	14
APPLICABLE STANDARD	14
Environmental Conditions	
RADIATION HAZARD MEASUREMENT	
INPUT POWER	
LOAD FOR MICROWAVE OVENS	
RF OUTPUT POWER MEASUREMENT	
OPERATING FREQUENCY MEASUREMENT	
RADIATED EMISSIONS	
APPLICABLE STANDARD	20
EUT Setup	
EMI TEST RECEIVER SETUP AND SPECTRUM ANALYZER SETUP	
TEST PROCEDURE	
CORRECTED AMPLITUDE & MARGIN CALCULATION	
TEST PATA AND PLOTS	
LEST DATA AND PLOTS	• • • • • • • • • • • • • • • • • • • •

## **GENERAL INFORMATION**

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

Product	Microwave Oven
Tested Model	KMBT5011
Voltage Range	AC 120V/60Hz
Highest operating frequency	2450 MHz
Microwave output power	1000Watts
Input power	1800Watts
Date of Test	2019-10-23 to 2019-10-24
Sample serial number	191021556 (Assigned by Shenzhen BACL)
Received date	2019-10-21
Sample/EUT Status	Good condition

## **Objective**

This report is prepared on behalf of *Whirlpool Microwave Products Development Limited*. in accordance with Part 2-Subpart J, and Part 18-Subparts A, B and C of the Federal Communication Commissions rules and regulations.

Report No.: RSZ191021556-00

The objective of the manufacturer is to determine compliance with FCC Part 18 limits.

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

No related submittal(s).

## **Test Methodology**

All measurements contained in this report were conducted with MP-5, FCC Methods of Measurements of Radio Noise Emissions from ISM Equipment, February 1986. All measurements were performed at Bay Area Compliance Laboratory Corporation. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## **Measurement Uncertainty**

Parameter		uncertainty
Conducted Emissions		±1.95dB
Radiated	Below 1GHz	±4.75dB
Emissions Above 1GHz		±4.88dB

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

FCC Part 18 Page 3 of 24

## **Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

Report No.: RSZ191021556-00

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.: 342867, the FCC Designation No.: CN1221.

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

FCC Part 18 Page 4 of 24

## OPERATING CONDITION/TEST CONFIGURATION

#### **Justification**

The EUT was operated at maximum (continuous) RF output power. The loads consisted of water in a glass beaker in the amounts specified in the test procedure.

Report No.: RSZ191021556-00

## **EUT Exercise Software**

No exercise software was used.

## **Special Accessories**

No special accessory was used.

## **Equipment Modifications**

No modifications were made to the EUT tested.

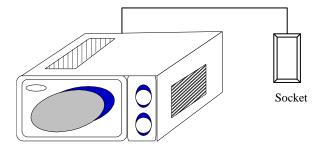
## **Support Equipment List and Details**

Manufacturer	Description	Model	Serial Number
BULL	Socket	GN-606D	N/A
N/A	Glass beaker	N/A	N/A

## **External Cable List and Details**

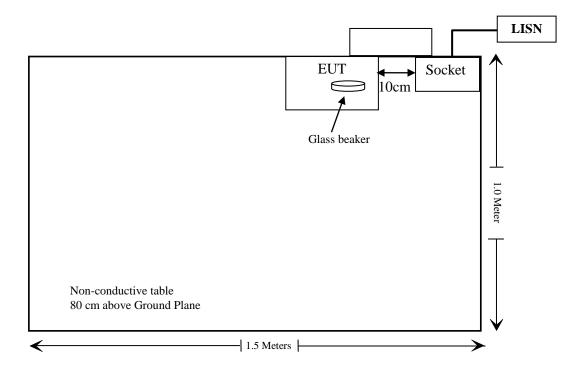
Cable Description	Length (m)	From/Port	То
Un-shielding Un-detachable AC Cable	1.0	Socket	EUT
Un-shielding Un-detachable AC Cable	1.0	LISN	Socket

## **Configuration of Test Setup**



FCC Part 18 Page 5 of 24

## **Block Diagram of Test Setup**



FCC Part 18 Page 6 of 24

## SUMMARY OF TEST RESULT

FCC Rules	Description of Test	Results
§18.307	AC Line Conducted Emissions	Compliance
FCC/OST MP-5 FCC §18.301	Radiation Hazard Measurement	Compliance
§18.305	Field Strength	Compliance

Report No.: RSZ191021556-00

FCC Part 18 Page 7 of 24

## TEST EQUIPMENT LIST

Manufacturer	<b>Description</b> Model		Serial Number	Calibration Date	Calibration Due Date
	CON	DUCTED EMISSI	IONS		
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2019-07-09	2020-07-08
Rohde & Schwarz	LISN	ENV216	3560.6650.12- 101613-Yb	2019-01-25	2020-01-25
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2019-03-02	2020-03-01
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Unknown	Conducted Emission Cable	78652	UF A210B-1- 0720-504504	2018-11-12	2019-11-12
RADIATION HAZARD MEASUREMENT					
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2019-07-22	2020-07-21
GW Instek	Power Meter	GPM 8212	CL110034	2019-04-09	2020-04-09
GW Instek	AC Power Meter	GPM 8212	CL110045	2019-05-03	2020-05-03
MC	Thermometer	Unknown	Unknown	2018-11-01	2019-11-01
A.H.System	Horn Antenna	3115	9903-5766	NCR	NCR
ETS	Microwave Survery Meter	1501	Unknown	NCR	NCR
CAMRY	Electronic Weighed	EK3820	Unknown	2018-11-03	2019-11-02
Ducommun technologies	RF Cable	UFA210A-1- 4724-30050U	MFR64369 223410-001	2018-11-12	2019-11-12
Ducommun Technologies	RF Cable	104PEA	218124002	2018-11-12	2019-11-12

Report No.: RSZ191021556-00

FCC Part 18 Page 8 of 24

Report No.: RSZ191021556-00

FCC Part 18 Page 9 of 24

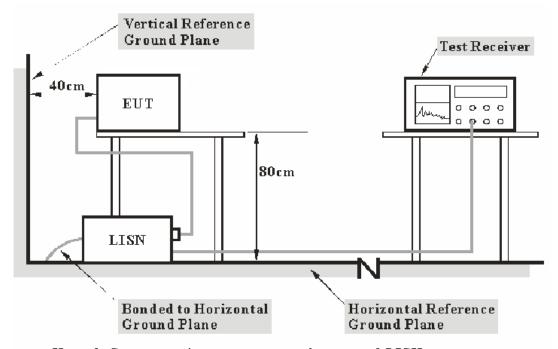
<sup>\*</sup> Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

## **CONDUCTED EMISSIONS**

## **Applicable Standard**

FCC §18.307

## **EUT Setup**



Report No.: RSZ191021556-00

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 MP-5: 1986 measurement procedure. Specification used was with the FCC Part 18.

The socket was connected to a 120 VAC/ 60Hz 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

FCC Part 18 Page 10 of 24

## **Test Procedure**

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

Report No.: RSZ191021556-00

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

## **Test Results Summary**

According to the EUT complied with the FCC PART 18,

## **Test Data**

## **Environmental Conditions**

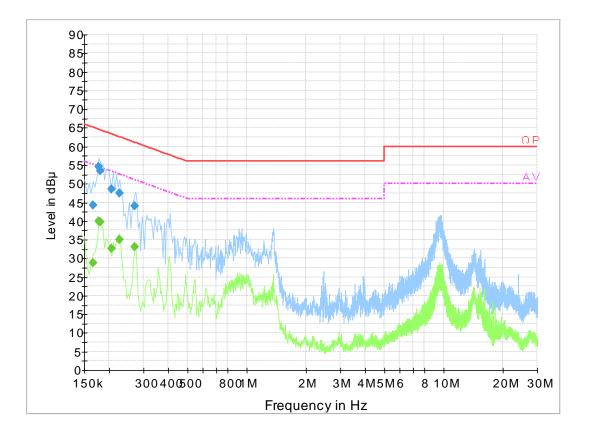
Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Kiki Geng on 2019-10-24.

FCC Part 18 Page 11 of 24

EUT operation mode: WORKING

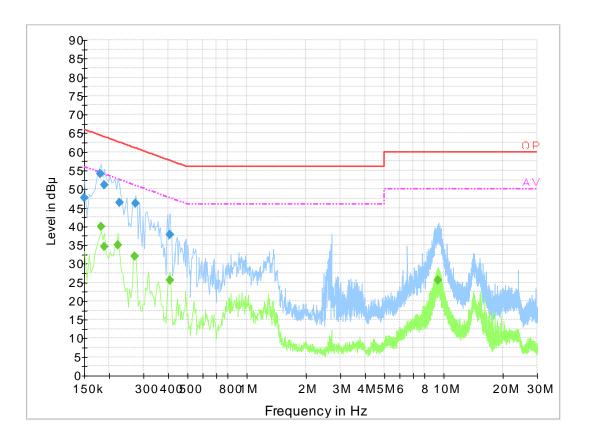
## **AC 120V/60Hz, Line**



Frequency (MHz)	Corrected Amplitude (dBµV)	Corrected Factor (dB)	Limit (dBµV)	Margin (dB)	Remark (PK/QP/Ave.)
0.165500	44.3	19.9	65.2	20.9	QP
0.177500	54.5	19.9	64.6	10.1	QP
0.181500	53.5	19.9	64.4	10.9	QP
0.205500	48.6	19.8	63.4	14.8	QP
0.225500	47.5	19.8	62.6	15.1	QP
0.269500	44.0	19.8	61.1	17.1	QP
0.165500	28.9	19.9	55.2	26.3	Ave.
0.177500	39.9	19.9	54.6	14.7	Ave.
0.181500	39.8	19.9	54.4	14.6	Ave.
0.205500	32.6	19.8	53.4	20.8	Ave.
0.225500	35.0	19.8	52.6	17.6	Ave.
0.269500	33.1	19.8	51.1	18.0	Ave.

FCC Part 18 Page 12 of 24

## AC 120V/60Hz, Neutral



Report No.: RSZ191021556-00

Frequency (MHz)	Corrected Amplitude (dBµV)	Corrected Factor (dB)	Limit (dBµV)	Margin (dB)	Remark (PK/QP/Ave.)
0.150000	47.6	19.8	66.0	18.4	QP
0.181500	54.1	19.8	64.4	10.3	QP
0.189500	51.2	19.8	64.1	12.9	QP
0.226500	46.3	19.8	62.6	16.3	QP
0.273500	46.1	19.7	61.0	14.9	QP
0.407850	37.7	19.8	57.7	20.0	QP
0.182000	39.9	19.8	54.4	14.5	Ave.
0.190000	34.5	19.8	54.0	19.5	Ave.
0.222000	35.1	19.8	52.7	17.6	Ave.
0.270000	31.9	19.7	51.1	19.2	Ave.
0.410000	25.7	19.8	47.6	21.9	Ave.
9.414000	25.6	19.9	50.0	24.4	Ave.

#### Note:

- 1) Corrected Amplitude = Reading + Correction Factor
- 2) Correction Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation
- 3) Margin = Limit Corrected Amplitude

FCC Part 18 Page 13 of 24

## RADIATION HAZARD MEASUREMENT

## **Applicable Standard**

FCC §18.301 & FCC/OST MP-5

#### **Environmental Conditions**

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Alan He on 2019-10-23

#### **Radiation Hazard Measurement**

Radiation leakage was measured in the as-received condition with the oven door closed using a microwave leakage meter.

Report No.: RSZ191021556-00

A 275 mL water load was placed in the center of the oven and the oven was operated at maximum output power.

There was no microwave leakage exceeding a power level of  $0.1 \text{mW/cm}^2$  observed at any point 5 cm or more from the external surface of the oven.

A maximum of 1.0 mW/cm<sup>2</sup> is allowed in accordance with the applicable Federal Standards. Hence, microwave leakage in the as-received condition with the oven door closed was below the maximum allowed.

## **Input Power**

Input power and current was measured using a power analyzer. A 1000 mL water load was placed in the center of the oven and the oven was operated at maximum output power. A 1000mL water load was chosen for its compatibility with the procedure commonly used by manufacturers to determine their input ratings.

Input Voltage	Input Current (Amps)	Measured Input Power	Rated Input Power
(V <sub>AC</sub> /Hz)		(Watts)	(Watts)
118.9	14.3	1700	1800

Based on the measured input power, the EUT was found to be operating within the intended specifications.

FCC Part 18 Page 14 of 24

#### **Load for Microwave Ovens**

For all measurements, the energy developed by the oven was absorbed by a dummy load consisting of a quantity of tap water in a beaker. If the oven was provided with a shelf or other utensil support, this support was in its initial normal position. For ovens rated at 1000 watts or less power output, the beaker contained quantities of water as listed in the following subparagraphs. For ovens rated at more than 1000 watts output, each quantity was increased by 50% for each 500watts or fraction thereof in excess of 1000 watts. Additional beakers were used if necessary.

Report No.: RSZ191021556-00

- Load for power output measurement: 1000 milliliters of water in the beaker located in the center of the oven.
- Load for frequency measurement: 1000 milliliters of water in the beaker located in the center of the oven.
- Load for measurement of radiation on second and third harmonic: Two loads, one of 700 and the other of 300 milliliters, of water are used. Each load is tested both with the beaker located in the center of the oven and with it in the right front corner.

## **RF Output Power Measurement**

A cylindrical container of borosilicate glass is used for the test. It has a maximum thickness of 3 mm, an external diameter of approximately 190 mm and a height of approximately 90 mm. The mass of the container is determined.

At the start of the test, the oven and the empty container are at ambient temperature. Water having an initial temperature of  $10 \, \mathbb{C} \pm 1 \, \mathbb{C}$  is used for the test. The water temperature is measured immediately before it is poured into the container.

A quantity of 1000 g  $\pm 5$  g of water is added to the container and its actual mass obtained. The container is then immediately placed in the centre of the oven shelf, which is in its lowest normal position. The oven is operated and the time for the water temperature to attain 20  $\mathbb{C} \pm 2 \mathbb{C}$  is measured. The oven is then switched off and the final water temperature is measured within 60 s.

m <sub>w</sub> (g)	m <sub>c</sub> (g)	T <sub>0</sub> (°C)	$T_1$ ( $C$ )	$T_2$ ( $C$ )	t (s)
1000	377.0	25	9.4	19.9	45

RF Output Power =  $(4.187 \times 1000 \times (19.9 - 9.4) + 0.55 \times 377.0 \times (19.9 - 25.0)) / 45 = 953.47$ Watts

- P is the microwave power output, in watts;
- m<sub>w</sub> is the mass of the water, in grams;
- m<sub>c</sub> is the mass of the container, in grams;
- $T_0$  is the ambient temperature, in degrees Celsius;
- $T_1$  is the initial temperature of the water, in degrees Celsius;
- $T_2$  is the final temperature of the water, in degrees Celsius;
- is the heating time, in seconds, excluding the magnetron filament heating-up time.

 $\square$  The measurement output power was found to be less than 500 watts. Therefore, in accordance with Section 18.305 of Subpart-C, the measured out-of-band emissions were compared to the limit of  $25\mu V/meter$  at a 300-meter measurement distance.

FCC Part 18 Page 15 of 24

☑ The measured output power was found to exceed 500 watts. Therefore, in accordance with Section 18.305 of Subpart-C, the measured out-of-band emissions were compared with the limit calculated as following:

Report No.: RSZ191021556-00

LFS = 25\*SQRT (Power Output/500)

LFS = 25\*SQRT (953.47/500)

LFS = 34.52

Where: LFS is the maximum allowable field strength for out-of-band emissions in  $\mu V/meter$  at a 300-meter measurement distance. Power Output is the measured output power in watts.

LFS μV/m@300m	dBμV/m@300m	dBμV/m@3m		
34.52	30.76	70.76		

**Note:** Limit  $(dB\mu V/m@3m) = Limit (dB\mu V/m@300m) + 40(dB)$ 

FCC Part 18 Page 16 of 24

## **Operating Frequency Measurement**

## **Variation in Operating Frequency with Time**

The operating frequency was measured using a spectrum analyzer. Starting with the EUT at room temperature, a 1000mL water load was placed in the center of the oven and the oven was operated at maximum output power. The fundamental operating frequency was monitored until the water load was reduced to 20 percent of the original load.

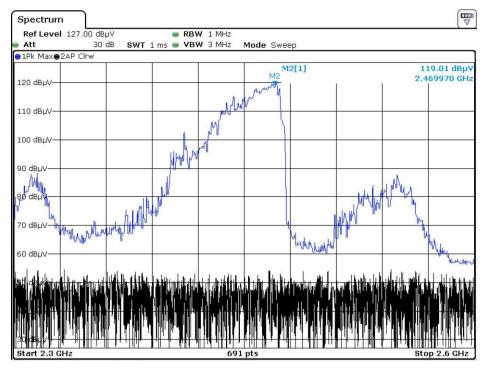
Report No.: RSZ191021556-00

The results of this test are as follows:

Frequency at Start time (MHz)	Frequency at End time (MHz)
2469.97	2473.01

Refer to data pages for details of the variation in operating frequency with time measurement.

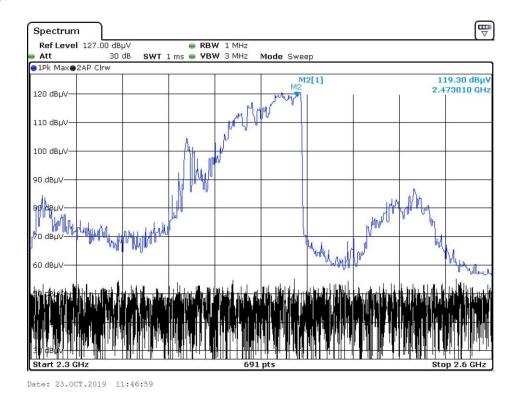
#### **Start time:**



Date: 23.OCT.2019 11:30:19

FCC Part 18 Page 17 of 24

#### **End time:**



# Variation in Operating Frequency with Line Voltage

The EUT was operated / warmed by at least 10 minutes of use with a 1000 mL water load at room temperature at the beginning of the test. Then the operating frequency was monitored as the input voltage was varied between 80 and 125 percent of the nominal rating.

The results of this test are as follows:

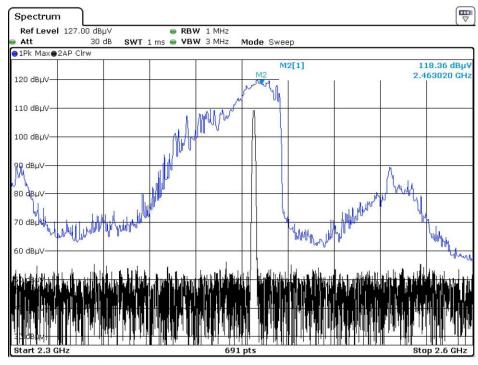
Line voltage varied from 96 V<sub>AC</sub> to 150 V<sub>AC</sub>.

(Low voltage) Frequency	(High voltage) Frequency			
(MHz)	(MHz)			
2463.02	2453.91			

Please refer to following pages for details of the variation in operating frequency with line voltage measurement.

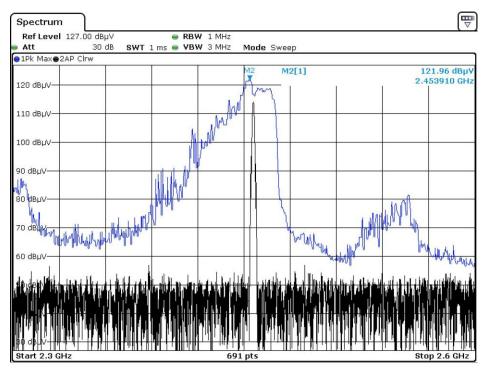
FCC Part 18 Page 18 of 24

## Low Voltage:



Date: 23.0CT.2019 12:00:15

## **High Voltage:**



Date: 23.0CT.2019 12:18:19

FCC Part 18 Page 19 of 24

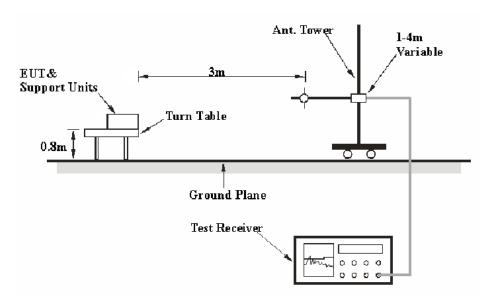
## **RADIATED EMISSIONS**

## **Applicable Standard**

FCC §18.305 and FCC §18.309

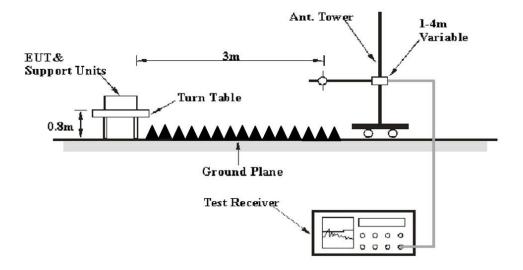
## **EUT Setup**

#### **Below 1GHz:**



Report No.: RSZ191021556-00

## **Above 1GHz:**



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the FCC MP - 5. The specification used was the FCC part 18 limits.

FCC Part 18 Page 20 of 24

The socket was connected to 120 VAC/60 Hz power source.

## **EMI Test Receiver Setup and Spectrum Analyzer Setup**

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver and Spectrum Analyzer were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30MHz – 1000 MHz	100 kHz	300 kHz	120kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK.
Above I GHZ	1MHz	10 Hz	/	Ave.

Report No.: RSZ191021556-00

#### **Test Procedure**

Maximizing procedure was performed on the six (6) highest emissions to ensure that the EUT complied with all installation combinations.

The EUT was in the normal (na we) operating mode during the final qualification test to represent the worst results.

## **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:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - 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:

Margin = Limit – Corrected Amplitude

FCC Part 18 Page 21 of 24

## **Test Results Summary**

According to the data in the following table, the EUT complied with the FCC Part 18,

Report No.: RSZ191021556-00

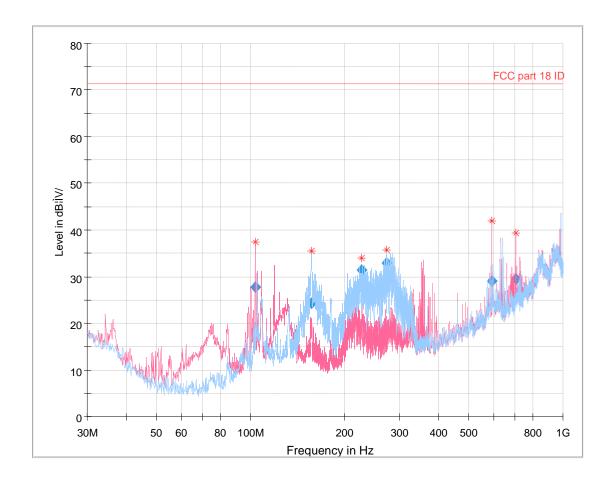
## **Test Data and Plots**

#### **Environmental Conditions**

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Steve Lan on 2019-10-24 for Below 1GHz and Curry Xiang on 2019-10-23 for above 1GHz.

**30 MHz – 1 GHz :**( *Working*)



FCC Part 18 Page 22 of 24

Frequency (MHz)	Corrected Amplitude (dBµV/m)	PK/QP	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
103.787250	27.82	QP	102.0	V	141.0	-16.5	70.76	42.94
156.961250	24.29	QP	287.0	Н	303.0	-14.4	70.76	46.47
227.572375	31.44	QP	133.0	Н	284.0	-14.0	70.76	39.32
272.201750	32.81	QP	108.0	Н	282.0	-12.5	70.76	37.95
592.926375	28.93	QP	161.0	V	287.0	-2.1	70.76	41.83
704.587625	29.56	QP	133.0	V	16.0	-1.1	70.76	41.20

Report No.: RSZ191021556-00

1 -25 GHz:

For Band edge and spurious emissions:

Frequency (MHz)	Mea	Measurement		Rx Antenna		Corrected	Corrected	FCC Part 18	
	Reading (dBµV)	PK/QP/Ave.	Turntable Degree	Height	Polar (H / V)	Factor (dB/m)	Amplitude (dBμV/m)	Limit (dBµV/m)	Margin (dB)
2399.26	16.86	Ave.	295	2.4	Н	31.87	48.73	70.76	22.03
2399.26	16.52	Ave.	295	2.4	V	31.87	48.39	70.76	22.37
2537.12	15.34	Ave.	259	1.7	Н	32.23	47.57	70.76	23.19
2537.12	15.18	Ave.	259	1.7	V	32.23	47.41	70.76	23.35
4284.00	31.06	Ave.	323	2.2	Н	5.82	36.88	70.76	33.88
4284.00	30.88	Ave.	323	2.2	V	5.82	36.70	70.76	34.06

FCC Part 18 Page 23 of 24

#### For Second and Third Harmonics:

Frequency (MHz)	Mea	Measurement		Rx Antenna		Corrected	Corrected	FCC Part 18	
	Reading (dBµV)	PK/QP/Ave.	Turntable Degree	Height (m)	Polar (H / V)	Factor	Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	700mL water in center								
4915.42	42.55	Ave.	355	1.9	Н	6.76	49.31	70.76	21.45
4915.42	40.27	Ave.	355	1.9	V	6.76	47.03	70.76	23.73
7328.43	40.82	Ave.	87	1.7	Н	11.66	52.48	70.76	18.28
7328.43	38.96	Ave.	87	1.7	V	11.66	50.62	70.76	20.14
			300r	nL wate	r in cent	er			
4933.41	43.15	Ave.	355	2.2	Н	6.76	49.91	70.76	20.85
4933.41	40.22	Ave.	355	2.2	V	6.76	46.98	70.76	23.78
7329.41	40.19	Ave.	190	2.5	Н	11.66	51.85	70.76	18.91
7329.41	39.47	Ave.	190	2.5	V	11.66	51.13	70.76	19.63

Report No.: RSZ191021556-00

#### Note:

- 1) Corrected Amplitude = Meter Reading + Correction Factor
- 2) Correction Factor = Antenna Factor + Cable Loss Amplifier Gain
- 3) Margin = Limit Corrected Amplitude
- 4) The data below 20dB to the limit was not recorded.

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

FCC Part 18 Page 24 of 24