ACCREDITED
TESTING LABORATORY
CERTIFICATE # 4821.01

BACL
Bay Area Compliance Labs Corp.

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:PR4C55011X1

Report Type:	**Product Type:**
Class II Permissive Change	Microwave Oven

Report Number: RSZ190612550-00

Report Date: 2019-06-20

Reviewed By: Alvin Huang
Lab Manager

Prepared By: Bay Area Compliance Laboratories Corp. (Shenzhen)
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Microwave Oven
Model	WML55011
Voltage Range	AC 120V/60Hz
Measure	76.2 cm (L) x 46.4 cm (W) x 24.0 cm (H)
Highest operating frequency	2450 MHz
Microwave output power	1000 Watts
Input power	1800 Watts
Date of Test	2019-06-15
Sample serial number	190612550
Received date	2019-06-12
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.

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

This is a CIIPC application of the device, the difference between the original device and the current one described as following:

(1) Changed the model number;

(2) Main board layout is changed a little bit;

(3) Hood Board was removed three relays;

(4) LED display is different;

(5) LED lamp rating power is different;

(6) Removed the LED driver and cement resistor.

Based on the change made to the device, all the test items were performed.

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 Emissions	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

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.

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.

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.

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.

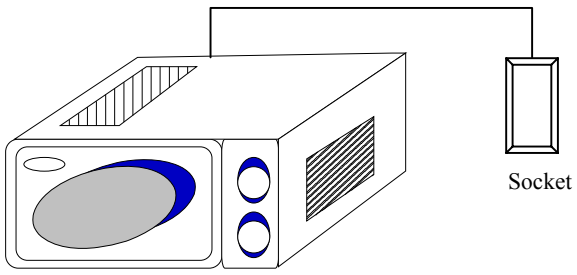
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
N/A	Polypropylene Cup	N/A	N/A

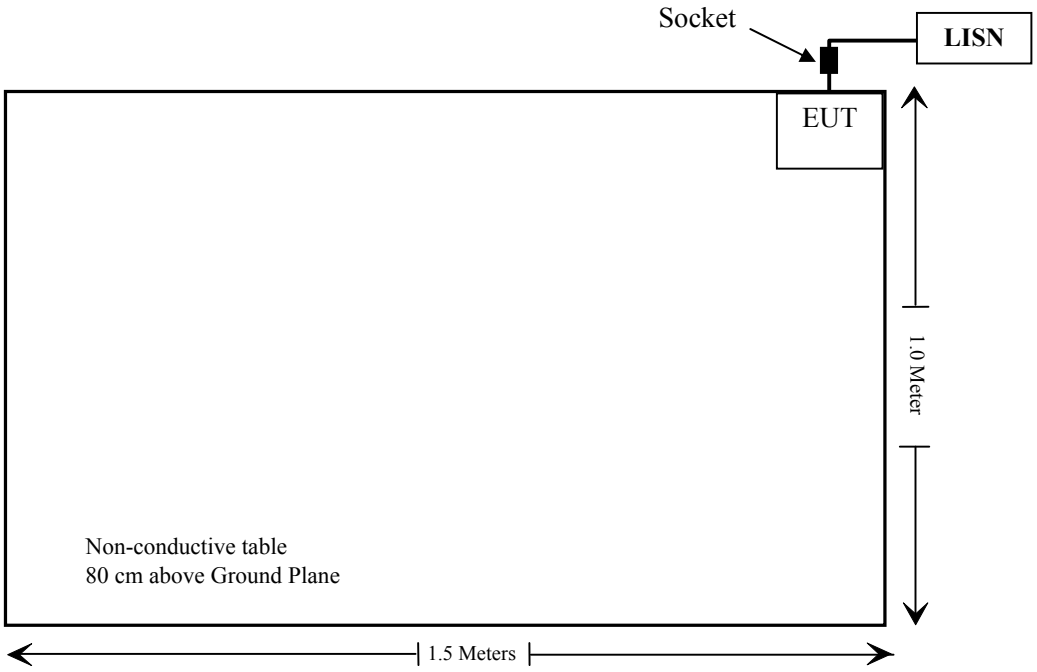
External Cable List and Details

Cable Description	Length (m)	From/Port	To
Un-shielding Un-detachable AC Cable	0.9	Socket	EUT
Un-shielding Un-detachable AC Cable	1.0	LISN	Socket

Configuration of Test Setup



Block Diagram of Test Setup



SUMMARY OF TEST RESULT

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

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
CONDUCTED EMISSIONS					
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2018-07-11	2019-07-11
Rohde & Schwarz	LISN	ENV216	3560.6650.12-101613-Yb	2019-01-25	2020-01-25
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2019-03-02	2020-03-02
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	Signal Analyzer	FSV40	101473	2019-01-09	2020-01-08
GW Instek	Power Meter	GPM 8212	CL110034	2019-04-09	2020-04-09
GW Instek	AC Power Meter	GPM 8212	CL110045	2019-04-09	2020-04-09
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

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RADIATED EMISSIONS					
Sonoma Instrument	Amplifier	310N	186238	2018-11-12	2019-11-12
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03 -101746-zn	2018-07-11	2019-07-11
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017-12-22	2020-12-21
A.H.System	Horn Antenna	SAS-200/571	135	2018-09-01	2021-08-31
Rohde & Schwarz	Signal Analyzer	FSEM	845987/005	2018-06-23	2019-06-23
COM-POWER	Pre-amplifier	PA-122	181919	2018-11-12	2019-11-12
TDK	Chamber	Chamber A	2#	2018-09-20	2021-09-19
TDK	Chamber	Chamber B	1#	2018-09-20	2021-09-19
R&S	Auto test Software	EMC32	V9.10	NCR	NCR
Agilent	Spectrum Analyzer	8564E	3943A01781	2019-03-02	2020-03-02
the electro-Mechanics Co.	Horn Antenna	3116	9510-2270	2018-10-14	2021-10-14
Heatsink Required	Amplifier	QLW-18405536-J0	15964001002	2018-11-12	2019-11-12
IW MICROWAVE	RF Cable	2PS-1401-2760-2ps	SN 03	2018-11-12	2019-11-12
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

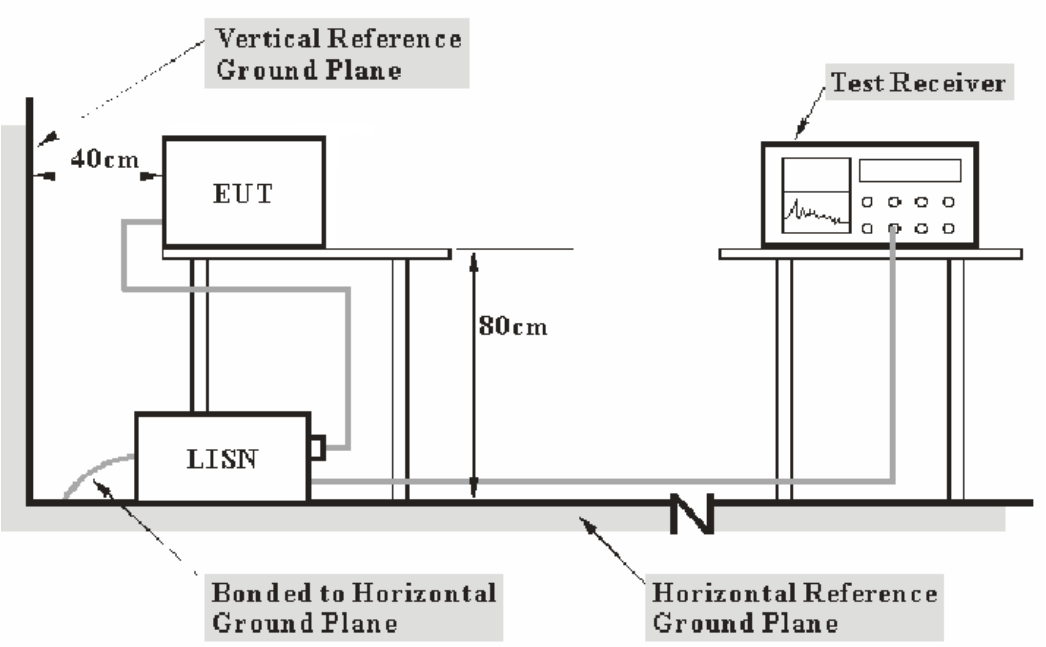
*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

CONDUCTED EMISSIONS

Applicable Standard

FCC §18.307

EUT Setup



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

Test Procedure

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.

Test Results Summary

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

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL., $U_{(Lm)}$ is less than U_{cispr}, if L_m is less than L_{lim}, it implies that the EUT complies with the limit.

Test Data

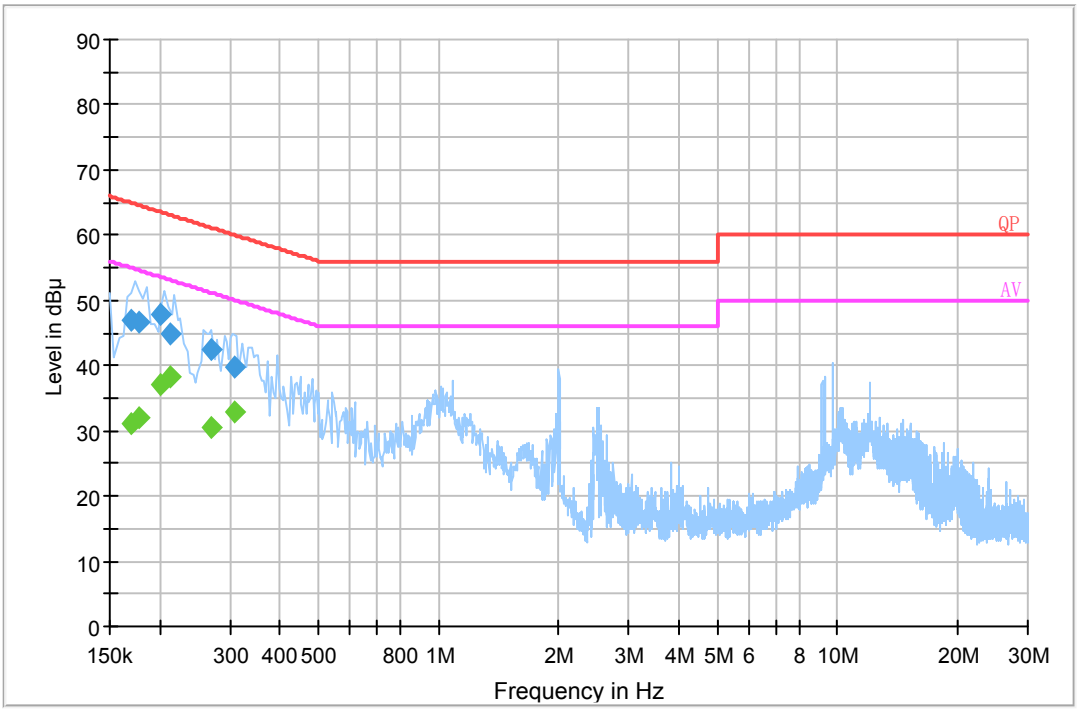
Environmental Conditions

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

The testing was performed by Haiguo Li on 2019-06-15.

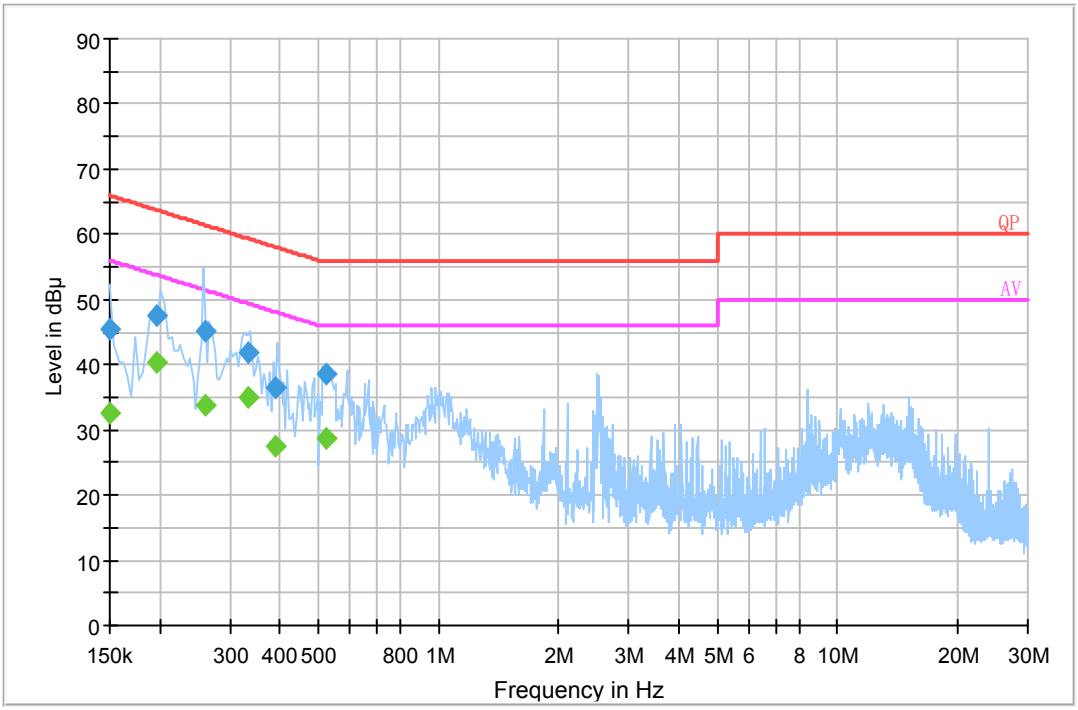
EUT operation mode: 1000mL Water in center of microwave oven with Maximum Power on

AC 120V/60Hz, Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Corrected Factor (dB)	Limit (dBµV)	Margin (dB)	Remark (PK/QP/Ave.)
0.170501	47.0	19.9	64.9	17.6	QP
0.178500	46.7	19.9	64.6	17.9	QP
0.201500	47.7	19.8	63.5	15.8	QP
0.213500	44.8	19.8	63.1	18.3	QP
0.269500	42.3	19.8	61.1	18.8	QP
0.309410	39.7	19.7	60.0	20.3	QP
0.170501	31.1	19.9	54.9	23.8	Ave.
0.178500	32.0	19.9	54.6	22.6	Ave.
0.201500	37.0	19.8	53.5	16.6	Ave.
0.213500	38.3	19.8	53.1	14.8	Ave.
0.269500	30.4	19.8	51.1	20.7	Ave.
0.309410	32.8	19.7	50.0	17.2	Ave.

AC 120V/60Hz, Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Corrected Factor (dB)	Limit (dBµV)	Margin (dB)	Remark (PK/QP/Ave.)
0.150000	45.4	19.8	66.0	20.6	QP
0.197500	47.4	19.8	63.7	16.3	QP
0.261500	45.2	19.8	61.4	16.2	QP
0.332930	42.0	19.8	59.4	17.4	QP
0.392090	36.5	19.8	58.0	21.5	QP
0.522050	38.7	19.8	56.0	17.3	QP
0.150000	32.7	19.8	56.0	23.3	Ave.
0.197500	40.3	19.8	53.7	13.5	Ave.
0.261500	33.8	19.8	51.4	17.6	Ave.
0.332930	34.9	19.8	49.4	14.5	Ave.
0.392090	27.6	19.8	48.0	20.5	Ave.
0.522050	28.6	19.8	46.0	17.4	Ave.

Note:

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

RADIATION HAZARD MEASUREMENT

Applicable Standard

FCC §18.301

Environmental Conditions

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

The testing was performed by Joson Xiao and Alan He on 2019-06-15.

Radiation Hazard Measurement

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

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 0.1mW/cm^2 observed at any point 5 cm or more from the external surface of the oven.

A maximum of 1.0 mW/cm^2 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 (V_{AC}/Hz)	Input Current (Amps)	Measured Input Power (Watts)	Rated Input Power (Watts)
117.6	15.2	1787.5	1800

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

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.

● 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 ºC ± 1 ºC is used for the test. The water temperature is measured immediately before it is poured into the container.

A quantity of 1000 g ± 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 ºC ± 2 ºC is measured. The oven is then switched off and the final water temperature is measured within 60 s.

m_w (g)	m_c (g)	T_0 (ºC)	T_1 (ºC)	T_2 (ºC)	t (s)
1000	377.0	26.0	9.2	19.6	43

RF Output Power = (4.187 x 1000 x (19.6 –9.2) + 0.55 x 377.0 x (19.6- 26.0)) / 43= 981.81 Watts

P is the microwave power output, in watts;
m_w is the mass of the water, in grams;
m_c 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;
t is the heating time, in seconds, excluding the magnetron filament heating-up time.

☐ 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 25μV/meter at a 300-meter measurement distance.

☒ 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:

LFS = 25*SQRT (Power Output/500)

LFS = 25*SQRT (981.81/500)

LFS = 35.03

Where: LFS is the maximum allowable field strength for out-of-band emissions in μV/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
35.03	30.89	70.89

Note: Limit (dBμV/m@3m) = Limit (dBμV/m@300m) + 40(dB)

Operating Frequency Measurement

Variation in Operating Frequency with Time

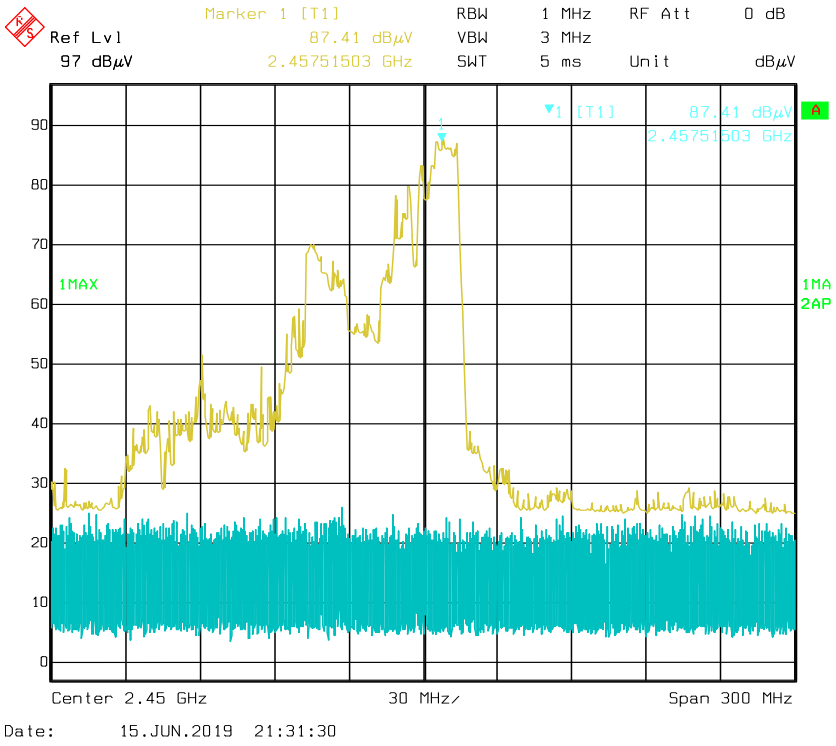
The operating frequency was measured using a spectrum analyzer. Starting with the EUT at room temperature, a 1000mL water load was placed in the center of the oven and the oven was operated at maximum output power. The fundamental operating frequency was monitored until the water load was reduced to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

The results of this test are as follows:

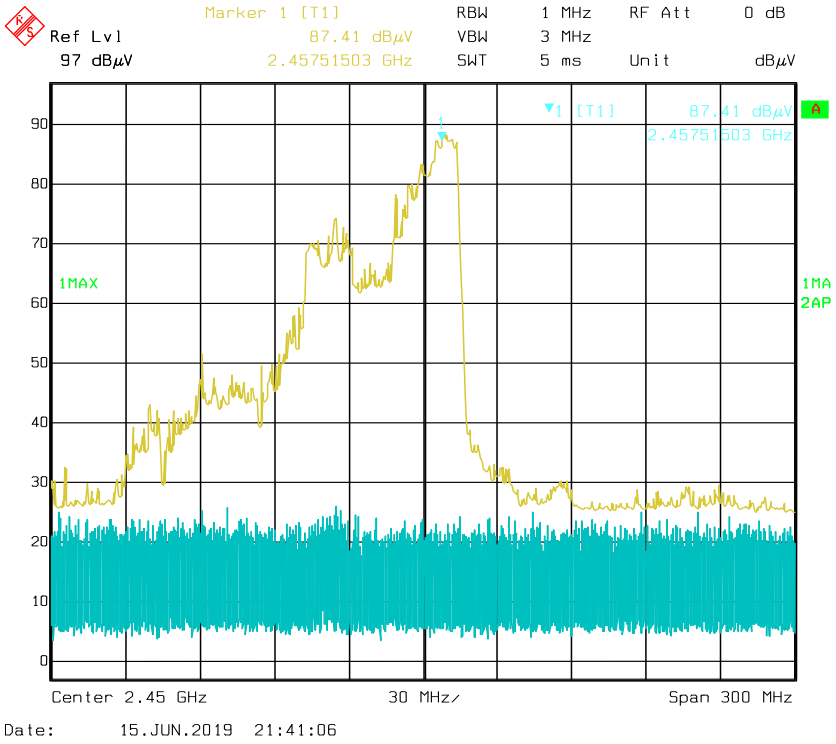
Frequency at Start time (MHz)	Frequency at End time (MHz)
2457.52	2457.52

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

Start time:



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.

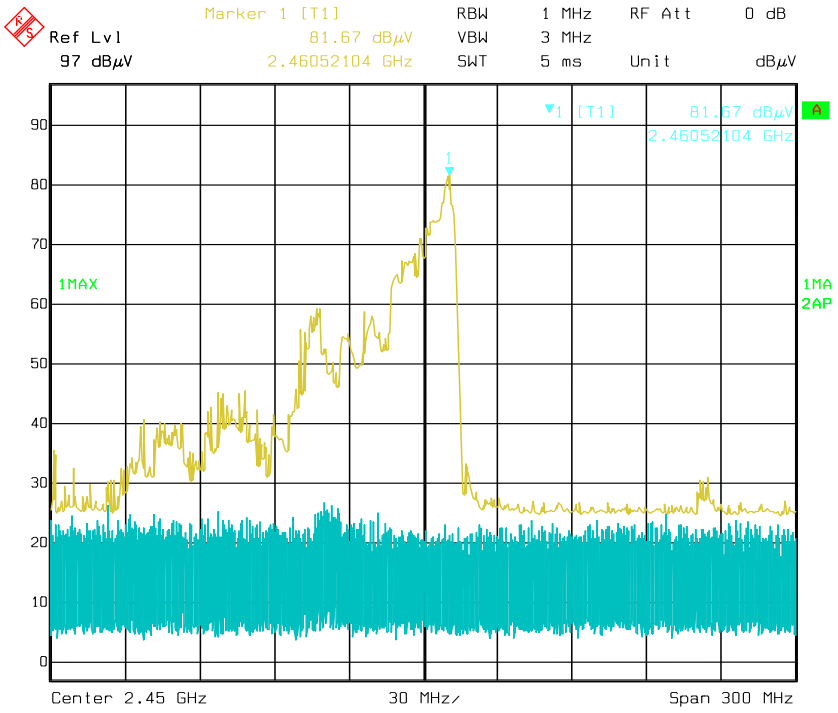
The results of this test are as follows:

Line voltage varied from 96 V_{AC} to 150 V_{AC}.

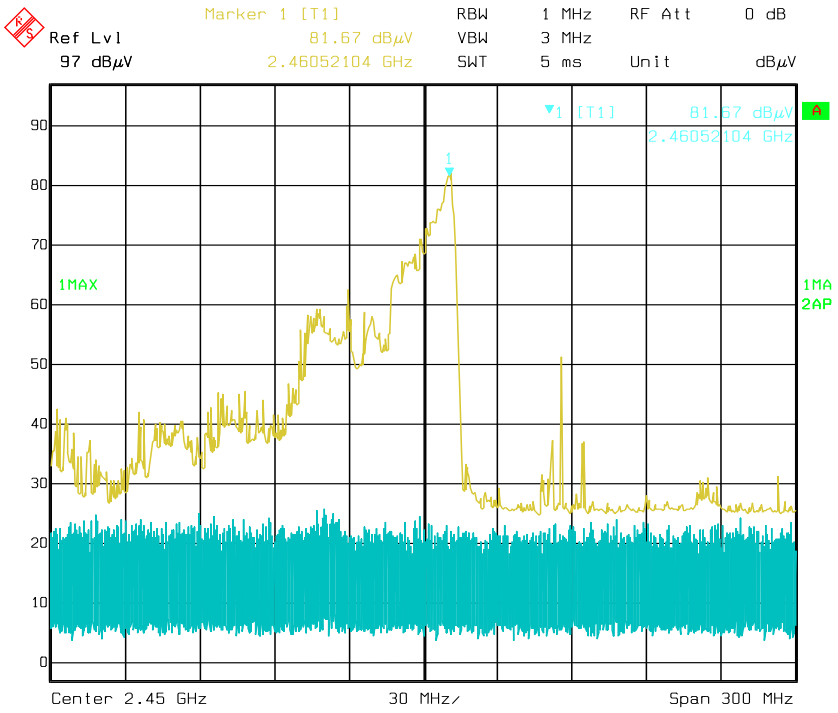
(Low voltage) Frequency (MHz)	(High voltage) Frequency (MHz)
2460.52	2460.52

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

Low Voltage:



High Voltage:



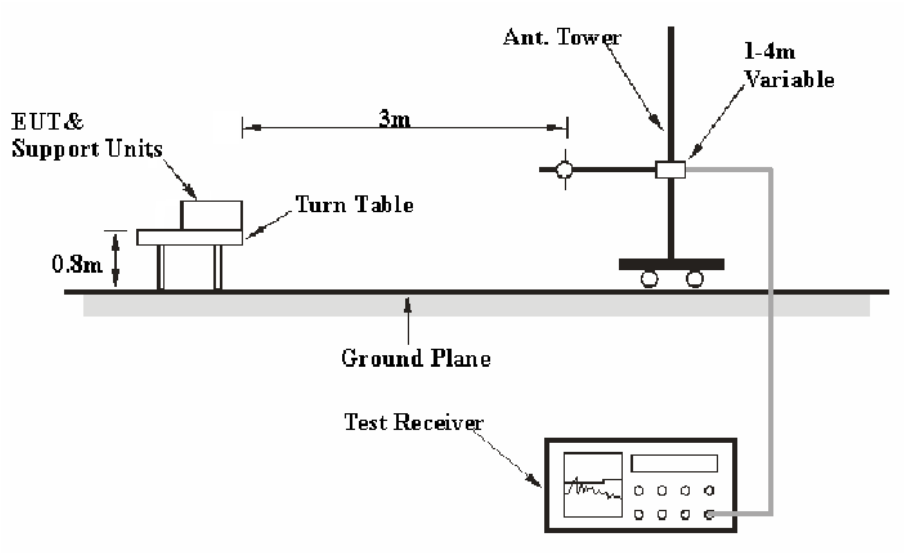
RADIATED EMISSIONS

Applicable Standard

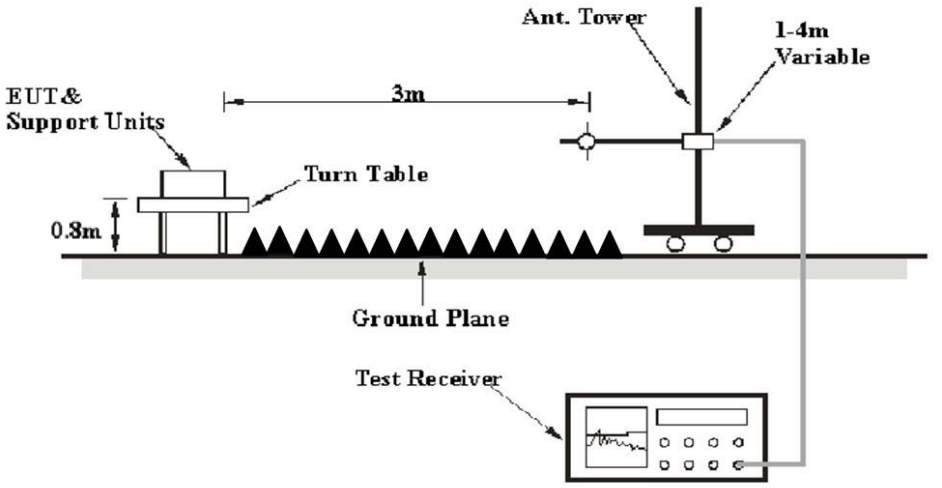
FCC §18.305 and FCC §18.309

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 FCC MP - 5. The specification used was the FCC part 18 limits.

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.
	1MHz	10 Hz	/	Ave.

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 (naïve) 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

Test Results Summary

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

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL., $U_{(Lm)}$ is less than U_{cispr}, if L_m is less than L_{lim}, it implies that the EUT complies with the limit.

Test Data and Plots

Environmental Conditions

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

The testing was performed by Joson Xiao and Alan He on 2019-06-15.

30 MHz – 1 GHz: *1000mL Water in center of microwave oven with Maximum Power on*

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)
144.518500	34.63	QP	184.0	H	46.0	-14.2	70.89	36.26
145.536500	33.30	QP	307.0	H	189.0	-14.2	70.89	37.59
459.986750	30.40	QP	160.0	H	190.0	-8.0	70.89	40.49
626.213375	18.11	QP	177.0	V	0.0	-2.6	70.89	52.78
836.395625	27.46	QP	105.0	V	144.0	5.6	70.89	43.43
925.819000	29.18	QP	143.0	V	327.0	7.1	70.89	41.71

1-25 GHz:

For Band edge and spurious emissions:

Frequency (MHz)	Measurement		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 18	
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
700mL water in center									
2399.28	22.26	Ave.	8	1.8	H	31.87	54.13	70.89	16.76
2399.28	19.50	Ave.	135	1.4	V	31.87	51.37	70.89	19.52
2547.90	19.64	Ave.	202	2.5	H	32.23	51.87	70.89	19.02
2547.90	17.59	Ave.	142	1.3	V	32.23	49.82	70.89	21.07
8188.37	30.09	Ave.	324	2.1	H	13.61	43.70	70.89	27.19
8188.37	29.56	Ave.	122	1.7	V	13.61	43.17	70.89	27.72

For Second and Third Harmonics:

Frequency (MHz)	Measurement		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 18	
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
700mL water in center									
4917.84	31.45	Ave.	124	2.3	H	6.76	38.21	70.89	32.68
4917.84	30.11	Ave.	228	2.2	V	6.76	36.87	70.89	34.02
7404.81	32.59	Ave.	90	1.8	H	12.39	44.98	70.89	25.91
7404.81	31.88	Ave.	174	2.3	H	12.39	44.27	70.89	26.62
300mL water in center									
4915.12	32.33	Ave.	258	1.6	H	6.76	39.09	70.89	31.8
4915.12	31.25	Ave.	176	1.8	V	6.76	38.01	70.89	32.88
7407.35	33.65	Ave.	321	2.1	H	12.39	46.04	70.89	24.85
7407.35	32.45	Ave.	10	2.3	H	12.39	44.84	70.89	26.05

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 *******