Lab Code: 200707-0

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: PR4GET1503X

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

Test Engineer:	Lebron Wang
Report Number:	RSZ120706552-00
Report Date:	2012-07-19
Reviewed By:	Suny Sun EMC Engineer
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd 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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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Whirlpool Microwave Products Development Limited.*'s product, model number: *YKHMS2040 (FCC ID: PR4GET1503X)* or the "EUT" in this report was a *Microwave Oven*, which was measured approximately: 76.0 cm (L) x 41.5 cm (W) x 44.0 cm (H), rated input voltage: AC 120 V/60 Hz, and the operating frequency is 2450 MHz.

**All measurement and test data in this report was gathered from production sample serial number: 1207009 (Assigned by the BACL, Shenzhen). The EUT was received on 2012-07-06.*

Objective

The following test 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 the C2PC application of the device. The difference between the original device and the current one is as follows:

Part	Original	New
Model	YWMH2205	YKHMS2040
Magnetron	Matsushita 2M167B-M16	LG-2M226

For the changes made to the device, all item testing were performed.

Related Submittal(s)/Grant(s)

Original submission with FCC ID: PR4GET1503X which is granted on 2010-01-21.

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.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 200707-0).

The current scope of accreditations can be found at http://ts.nist.gov/Standards/scopes/2007070.htm

OPERATING CONDITION/TEST CONFIGURATION

Justification

The EUT was provided for tests as a stand-alone device. It was prepared for testing in accordance with the manufacturer's instructions. 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.

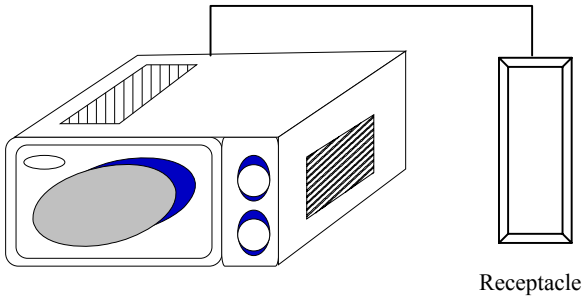
Equipment Modifications

No modifications were made to the unit tested.

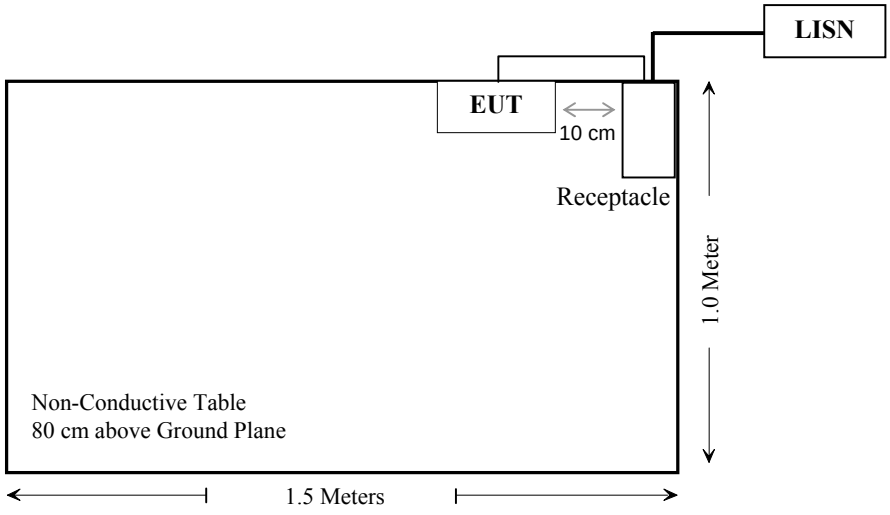
External Cable List and Details

Cable Description	Length (m)	From/Port	To
Unshield Undetachable AC Cable	1.0	LISN	Receptacle
Unshield Undetachable AC Cable	0.8	Receptacle	EUT

Configuration of Test Setup



Block Diagram of Test Setup



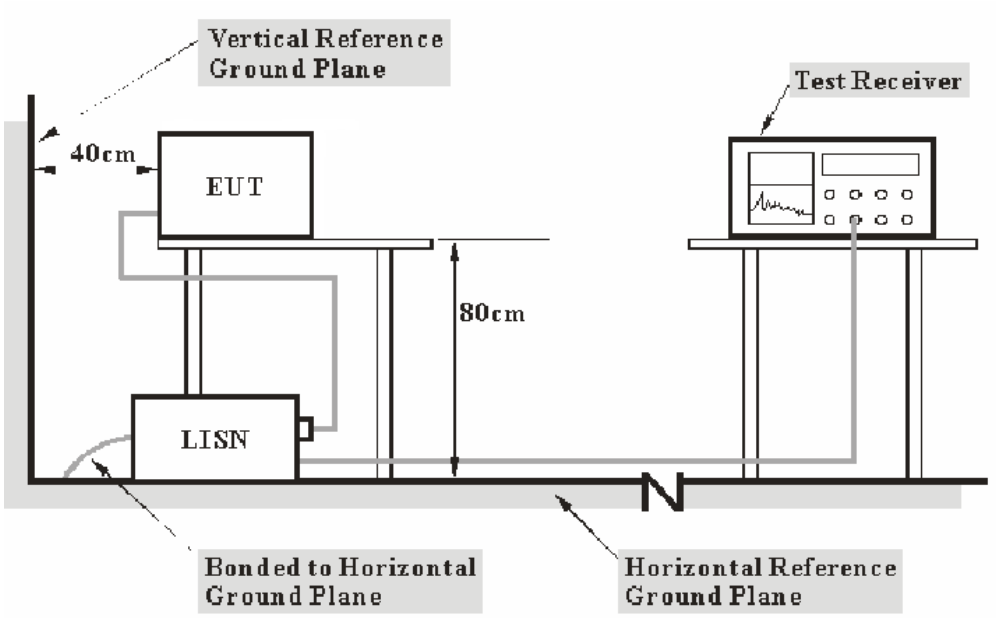
CONDUCTED EMISSIONS

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on CISPR 16-4-2, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is 2.4 dB (k=2, 95% level of confidence).

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

The EUT 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2011-11-24	2012-11-23
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2011-11-17	2012-11-16
Rohde & Schwarz	Attenuator	ESH3Z2	DE25985	2012-07-08	2013-07-07
BACL	CE Test software	BACL-CE	V1.0	N/A	N/A

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Corrected Factor & Margin Calculation

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

Correction Factor = LISN VDF + Cable Loss + Pulse Limiter Attenuation

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 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Procedure

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

Test Results Summary

According to the recorded data in following table, the worst margin reading of:

10.86 dB at **0.595 MHz** in the **Line** conductor mode

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

$$L_m \pm U_{(Lm)} \leq L_{lim} \pm U_{cispr}$$
$$\text{or } U_{(Lm)} \leq Margin \pm U_{cispr}$$

The measurement result of EUT is below the limit level by a margin 10.86 dB and
$U_{(Lm)}$(2.4dB)≤*Margin*(10.86 dB) +U_{cispr}(3.4 dB),
so the EUT complies with the limit of the FCC Part 18.

Test Data

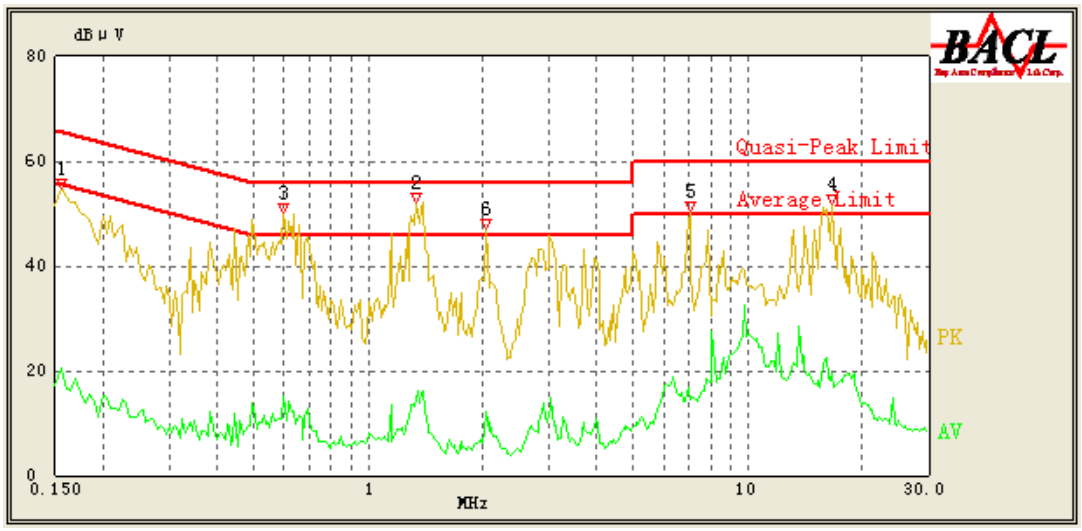
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	48 %
ATM Pressure:	100.2kPa

The testing was performed by Lebron Wang on 2012-07-11.

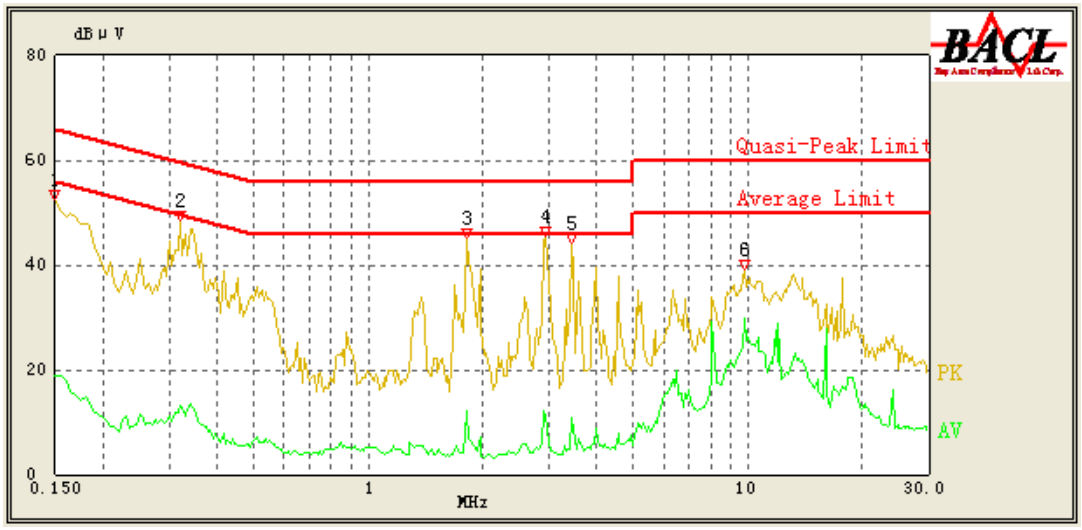
Test Mode: Running (Max Power)

AC 120V/60Hz, Line:



Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.595	45.14	9.72	56.00	10.86	QP
1.335	41.68	9.88	56.00	14.32	QP
2.045	39.65	9.90	56.00	16.35	QP
16.650	43.23	11.64	60.00	16.77	QP
7.065	42.55	10.12	60.00	17.45	QP
0.155	46.98	9.67	65.86	18.88	QP
1.345	16.21	9.88	46.00	29.79	Ave.
16.650	19.59	11.64	50.00	30.41	Ave.
0.600	15.13	9.72	46.00	30.87	Ave.
7.015	16.65	10.12	50.00	33.35	Ave.
2.045	12.09	9.90	46.00	33.91	Ave.
0.155	20.64	9.67	55.86	35.22	Ave.

AC 120V/60Hz, Neutral:



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
1.820	38.07	9.89	56.00	17.93	QP
3.450	36.90	9.94	56.00	19.10	QP
0.150	45.97	9.64	66.00	20.03	QP
9.845	29.71	10.28	50.00	20.29	Ave.
0.320	40.74	9.65	61.14	20.40	QP
2.925	38.96	9.93	56.00	27.04	QP
9.845	31.52	10.28	60.00	28.48	QP
1.820	12.09	9.89	46.00	33.91	Ave.
2.935	11.45	9.93	46.00	34.55	Ave.
3.450	10.86	9.94	46.00	35.14	Ave.
0.150	18.91	9.64	56.00	37.09	Ave.
0.320	13.06	9.65	51.14	38.08	Ave.

Note:
1) Corrected Amplitude = Reading + Correction Factor
2) Correction Factor =LISN/ISN VDF (Voltage Division Factor) + Cable Loss + Pulse Limiter Attenuation
The corrected factor has been input into the transducer of the test software.
3) Margin = Limit – Corrected Amplitude

RADIATION HAZARD MEASUREMENT

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	48 %
ATM Pressure:	100.2kPa

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2011-11-17	2012-11-16
Sunol Sciences	Horn Antenna	DRH-118	A052304	2011-12-01	2012-11-30
SUPER ULTRA	Pre-amplifier	ZVA-213+	N/A	2011-11-24	2012-11-23
Ainuo	Digital Power Analyzer	8732B	028706117	2011-12-23	2012-12-23
HY	AC Power Source	9020117	GY053(1)	2011-08-21	2012-08-21
Holday	Leakage Meter	HI-1710	05/2731	2012-06-02	2013-06-02

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

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 0.68mW/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)
120/60	11.8	1416	1500

☒ 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.

The RF output power is rated at 1000 watts

Load used for power output measurement = 1000 milliliters of water
Load used for frequency measurement = 1000 milliliters of water
Load used for harmonic measurement = 700 & 300 milliliters of water
Load used for other measurement = 700 milliliters of water

RF Output Power Measurement

The Caloric Method was used to determine maximum RF output power. The initial temperature of the water load was measured. The water load was placed in the center of the oven. The oven was operated at maximum output power for 200 seconds, the temperature of the water was re-measured.

Quality of Water (ml)	Starting Temperature (ºC)	Final Temperature (ºC)	Elapsed Time (s)
1000	28	68	200

Power = (4.2 joules/calorie)* (volume in milliliters)*(Final temperature- Start temperature)/ (Elapsed time)

Power = 4.2 x 1000 x (68-28) / 200

Power = 840 watts

☐ 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 (840/500)

LFS = 32.4

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.

Manufacturer	Model	LFS	dBµV/m@300m	dBµV/m@3m
Guangdong Whirlpool Electrical Appliance Co., Ltd	YKHMS2040	32.4	30.2	70.2

Operating Frequency Measurement

Variation in Operating Frequency with Time

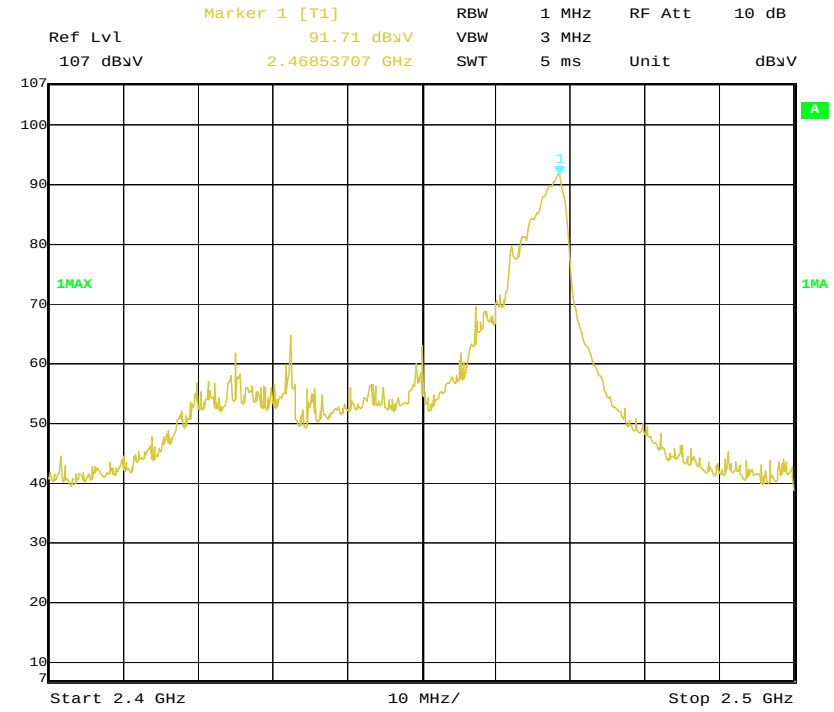
The operating frequency was measured using a spectrum analyzer. Starting with the EUT at room temperature, a 1000ml water load was placed in the center of the oven and the oven was operated at maximum output power. The fundamental operating frequency was monitored until the water load was reduced to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

The results of this test are as follows:

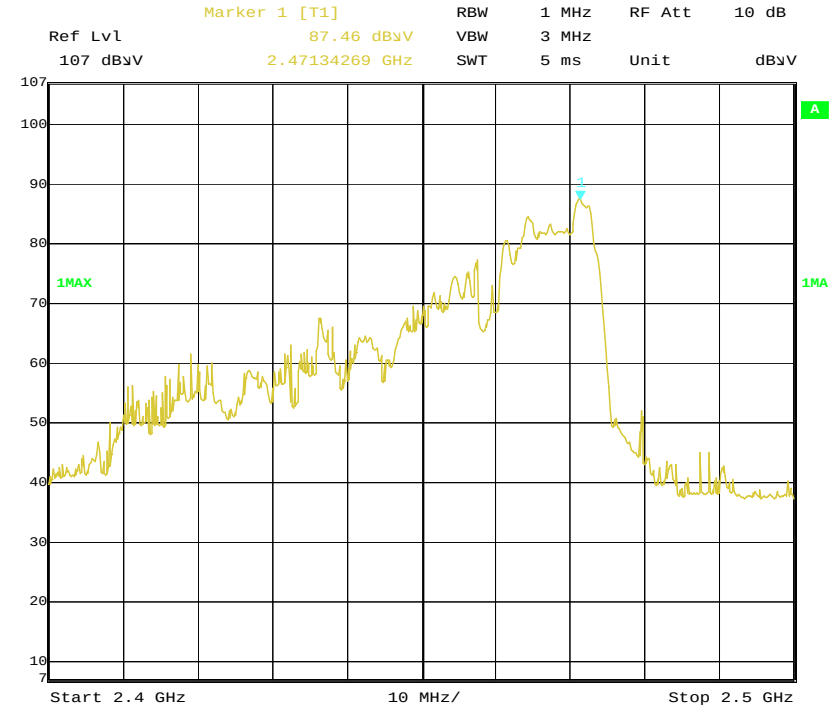
Manufacturer	Model	(Start Time) Frequency (MHz)	(End Time) Frequency (MHz)
Guangdong Whirlpool Electrical Appliance Co., Ltd	YKHMS2040	2468.5	2471.3

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.

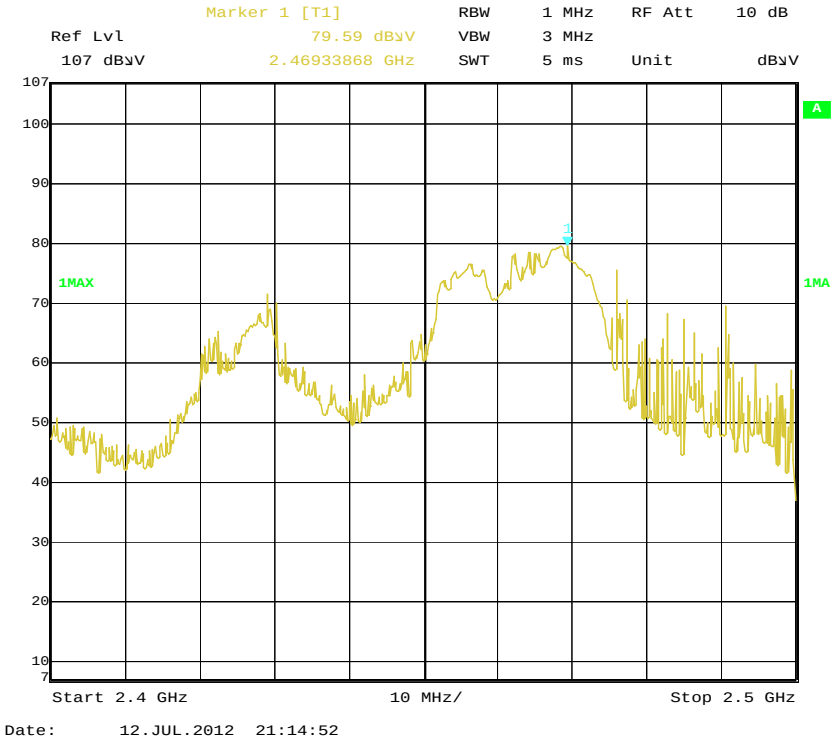
The results of this test are as follows:

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

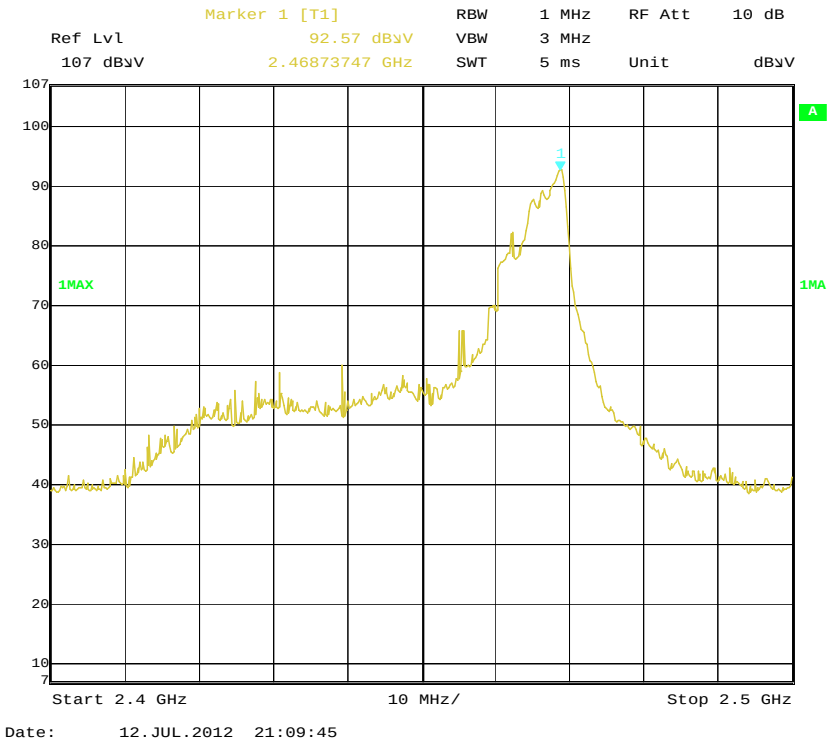
Manufacturer	Model	(Low voltage) Frequency (MHz)	(High voltage) Frequency (MHz)
Guangdong Whirlpool Electrical Appliance Co., Ltd	YKHMS2040	2469.3	2468.7

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

Low voltage:



High voltage:



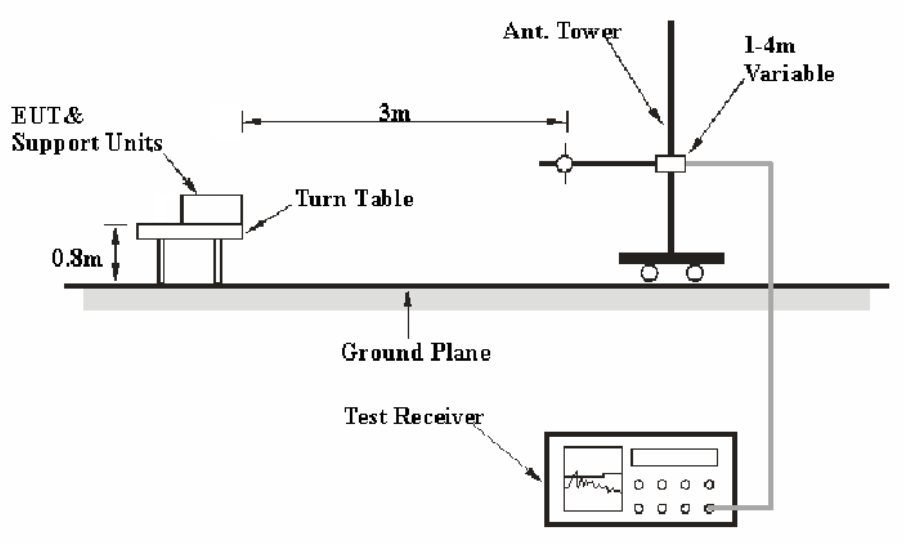
RADIATED EMISSIONS

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, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is 4.0 dB (k=2, 95% of confidence).

EUT Setup



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

The EUT 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	***R B/W***	***Video B/W***	***IF B/W***	***Detector***
30 – 1000 MHz	100 kHz	300 kHz	120 kHz	Quasi-peak
Above 1 GHz	1 MHz	3 MHz		Peak
Above 1 GHz	1 MHz	10 Hz		Average

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447D	2944A09795	2011-11-24	2012-11-23
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2011-11-17	2012-11-16
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2012-11-27
A.H. System	Horn Antenna	SAS-200/571	135	2012-02-11	2013-02-10
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2011-11-24	2012-11-23
SUPER ULTRA	Pre-amplifier	ZVA-213+	N/A	2011-11-24	2012-11-23
R&S	Auto test Software	Auto test Software	V6.30	N/A	N/A

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Test Procedure

For the radiated emissions test, the EUT was connected to the AC floor outlet.

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.

All data was recorded in the Quasi-peak detection mode from 30 MHz to 1 GHz, peak and average detection mode from 1 GHz to 25 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:

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 worst margin reading is below:

17.51 dB at **4933.3 MHz** in the **Vertical** polarization

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

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

The measurement result of EUT is below the limit level by a margin 17.51 dB and
$U_{(Lm)}$(4dB)≤*Margin*(17.51 dB) + U_{cispr}(6.3dB),
so the EUT complies with the limit of the FCC Part 18.

Test Data and Plots

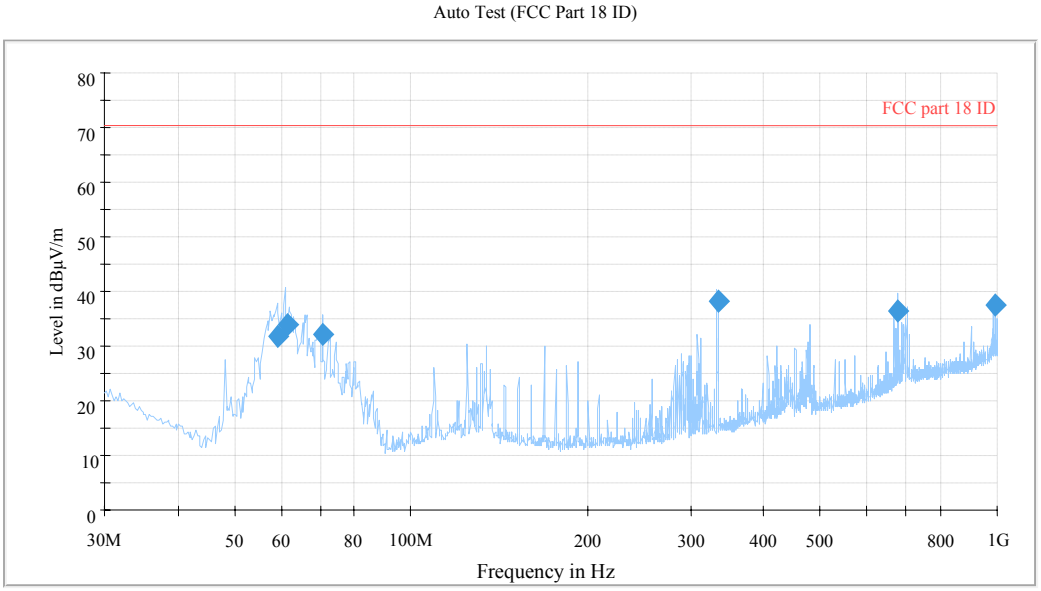
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	56%
ATM Pressure:	100.2kPa

The testing was performed by Lebron Wang on 2012-07-12.

Test Mode: Running (Max Power)

30 MHz to 1 GHz:



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Ant. Polarity	Turntable Position (degree)	Correction Factor (dB)	Limit (dBµV/m)	Margin (dB)
333.361500	38.2	114.0	H	157.0	-11.5	70.2	32.0
988.964750	37.5	256.0	V	220.0	1.4	70.2	32.7
676.852250	36.4	232.0	V	68.0	-3.9	70.2	33.8
61.385000	33.8	180.0	V	333.0	-18.6	70.2	36.4
70.740000	32.3	171.0	V	0.0	-18.2	70.2	37.9
59.409250	31.8	201.0	V	152.0	-18.6	70.2	38.4

1 GHz to 25 GHz:

Frequency (MHz)	Meter Reading (dBµV)	Detector (PK/QP/Ave)	Direction (Degree)	Height (m)	Ant. Polar (H/V)	Antenna Factor (dB)	Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	FCC Part 18	
										Limit (dBµV/m)	Margin (dB)
2468.5	91.71	PK (Fundamental)	220	1.3	H	30.60	3.11	0	125.42	/	/
2467.5	89.44	PK (Fundamental)	90	1.0	V	30.20	3.11	0	122.75	/	/
4933.3	40.20	Ave.	120	1.3	V	34.60	4.39	26.50	52.69	70.2	17.51
4932.6	40.15	Ave.	330	1.5	H	34.60	4.39	26.50	52.64	70.2	17.56
4402.4	32.98	Ave.	120	1.2	V	34.10	4.29	26.50	44.87	70.2	25.33
4423.9	32.30	Ave.	310	1.4	H	34.10	4.29	26.50	44.19	70.2	26.01
4661.1	27.03	Ave.	40	1.4	H	34.60	4.21	26.50	39.34	70.2	30.86
4661.1	23.33	Ave.	240	1.2	V	34.60	4.21	26.50	35.64	70.2	34.56

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