FCC PART 18

TEST REPORT

For

Zhongshan Donlim Weili Electrical Appliances Co., Ltd.

Fusha Industrial Park, Fusha Town, Zhongshan City, China

FCC ID: YI4DW20UX83L

Report Type:	**Product Type:**
Original Report	Microwave oven

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Report Number:	RSZ160629551-00
Report Date:	2016-07-11
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Zhongshan Donlim Weili Electrical Appliances Co., Ltd.'*s product, model number: *20UX83-L (FCC ID: YI4DW20UX83L)*or the "EUT" in this report is a *Microwave oven,* which was measured approximately:45.1 cm (L) x 32.7 cm (W) x 25.65 cm (H), the input power is AC 120V/60Hz. The highest operating frequency is 2468MHz.

**All measurement and test data in this report was gathered from production sample serial number: 1606059 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2016-06-29.*

Objective

This report is prepared on behalf of *Zhongshan Donlim Weili Electrical Appliances Co., Ltd.* 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.

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.

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 October 31, 2013. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

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.

OPERATING CONDITION/TEST CONFIGURATION

Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

EUT Exercise Software

No exercise software was used.

Special Accessories

No special accessory was used.

Equipment Modifications

No modification was made to the EUT tested.

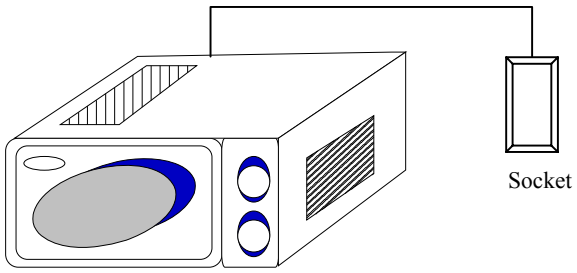
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
N/A	Socket	N/A	140217

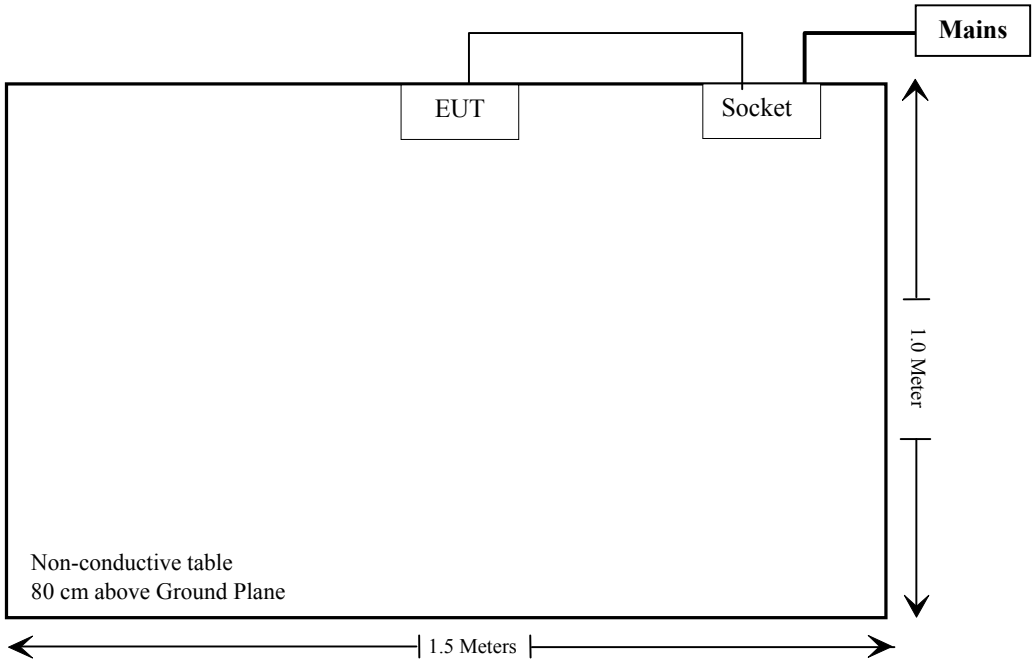
External Cable

Cable Description	Length (m)	From/Port	To
Un-shielding Un-detachable AC Cable	1.0	Mains	Socket
Un-shielding Un-detachable AC Cable	0.8	EUT	Socket

Configuration of Test Setup



Block Diagram of Test Setup



FCC §18.307 - AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §18.307

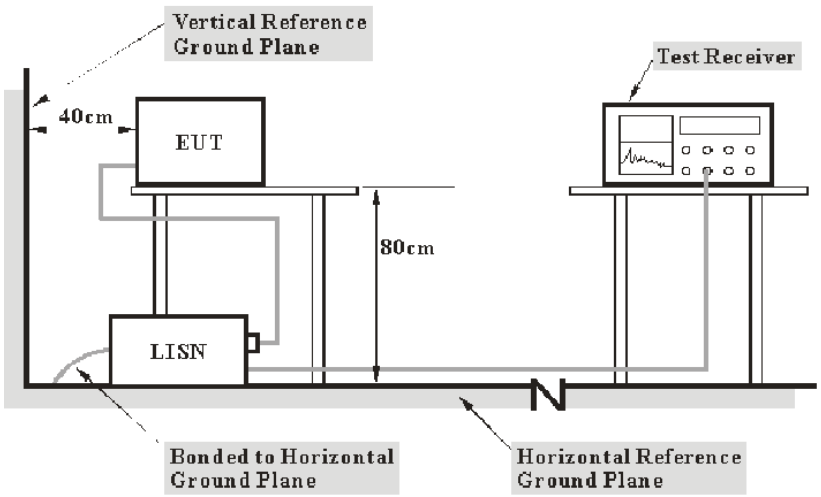
Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements maybe receiver reading, attenuation of the connection between AMN and receiver, AMN voltage division factor, AMN VDF frequency interpolation and receiver related input quantities, etc.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of conducted disturbance test at Bay Area Compliance Laboratories Corp. (Shenzhen) is shown as below. And the uncertainty will not be taken into consideration for the test data recorded in the report

Port	Measurement uncertainty
AC Mains	3.34dB (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 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2016-06-03	2017-06-03
Rohde & Schwarz	LISN	ENV216	3560.6650.12-101613-Yb	2016-06-09	2017-06-09
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2016-05-14	2017-05-14
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR

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

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 18.307(a), the worst margin reading as below:

4.2 dB at **0.400030 MHz** in the **Neutral** conducted mode

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

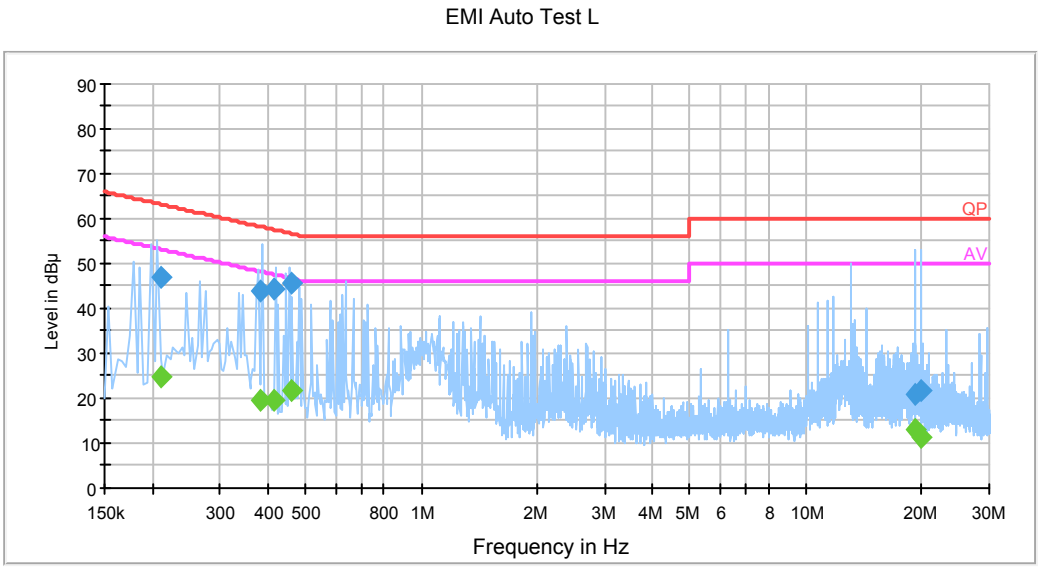
Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Tracy Hu on 2016-07-04.

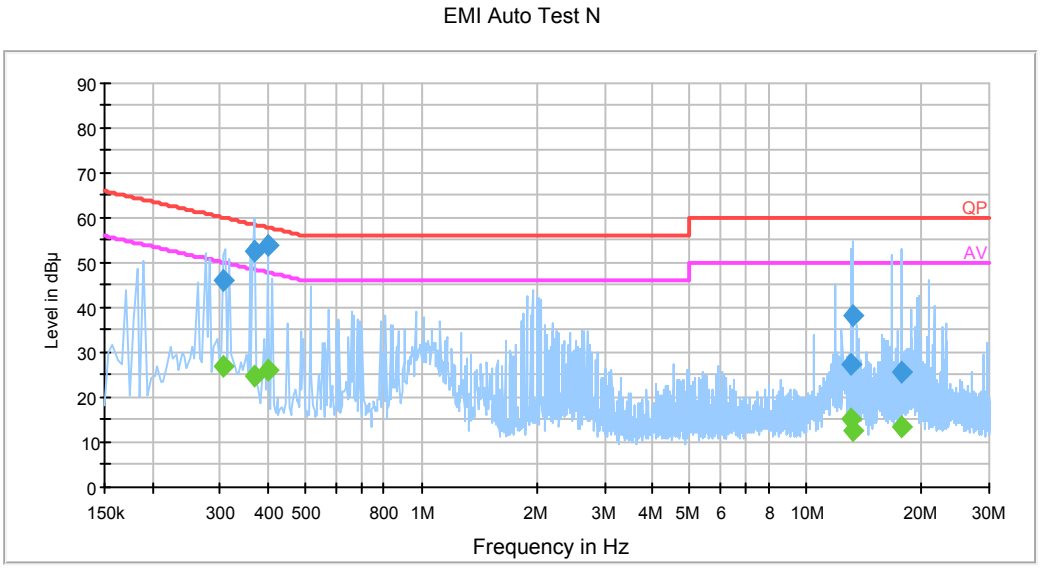
Test Mode: Cooking

AC 120V/60Hz, Line:



Frequency (MHz)	Corrected Amplitude (dBµV)	Corrected Factor (dB)	Limit (dBµV)	Margin (dB)	Remark (PK/QP/Ave)
0.210500	46.9	20.0	63.2	16.3	QP
0.210500	24.8	20.0	53.2	28.4	Ave.
0.380210	43.8	19.9	58.3	14.5	QP
0.380210	19.5	19.9	48.3	28.8	Ave.
0.411730	44.4	19.9	57.6	13.2	QP
0.411730	19.7	19.9	47.6	27.9	Ave.
0.460810	45.5	19.9	56.7	11.2	QP
0.460810	21.7	19.9	46.7	25.0	Ave.
19.317430	21.0	20.1	60.0	39.0	QP
19.317430	13.3	20.1	50.0	36.7	Ave.
19.843650	21.7	20.1	60.0	38.3	QP
19.843650	11.5	20.1	50.0	38.5	Ave.

AC 120V/60 Hz, Neutral:



Frequency (MHz)	Corrected Amplitude (dBµV)	Corrected Factor (dB)	Limit (dBµV)	Margin (dB)	Remark (PK/QP/Ave)
0.305350	46.2	19.9	60.1	13.9	QP
0.305350	27.1	19.9	50.1	23.0	Ave.
0.368450	52.5	19.9	58.5	6.0	QP
0.368450	24.7	19.9	48.5	23.8	Ave.
0.400030	53.7	19.9	57.9	**4.2**	QP
0.400030	26.2	19.9	47.9	21.7	Ave.
13.151250	27.4	20.1	60.0	32.6	QP
13.151250	15.0	20.1	50.0	35.0	Ave.
13.268870	38.4	20.1	60.0	21.6	QP
13.268870	12.7	20.1	50.0	37.3	Ave.
17.804890	25.8	20.1	60.0	34.2	QP
17.804890	13.3	20.1	50.0	36.7	Ave.

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

RADIATION HAZARD MEASUREMENT

Applicable Standard

FCC §18.301

Environmental Conditions

Temperature:	23.6 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Tracy Hu on 2016-06-30.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2015-11-12	2016-11-12
GW Instek	Power Meter	CL110034	1937A01046	2016-04-24	2017-04-24
A.H.System	Horn Antenna	SAS-200/571	135	2016-02-11	2017-02-10
MC	Thermometer	N/A	N/A	2015-11-01	2016-11-01
Holaday	Microwave Survey Meter	HI-1501	N/A	2015-11-01	2016-11-01
GW Instek	AC Power Meter	GPM-8212	CH150074	2016-04-10	2017-04-09
CAMRY	Electronic Weigher	EK3820	N/A	2015-11-03	2016-11-02

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

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 1.0mW/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	11.61	1393	1400

☒ 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 900 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

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

A quantity of 1 000 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 35 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	29.5	35.5	40

RF Output Power = (4.187 x 1000 x (35.5– 29.5) +0.55 x 377.0 x (35.5 – 26)) / 40 = 677.30 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_o 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 (677.30/500)

LFS =29.10

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
29.10	29.28	69.28

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

Operating Frequency Measurement

Variation in Operating Frequency with Time

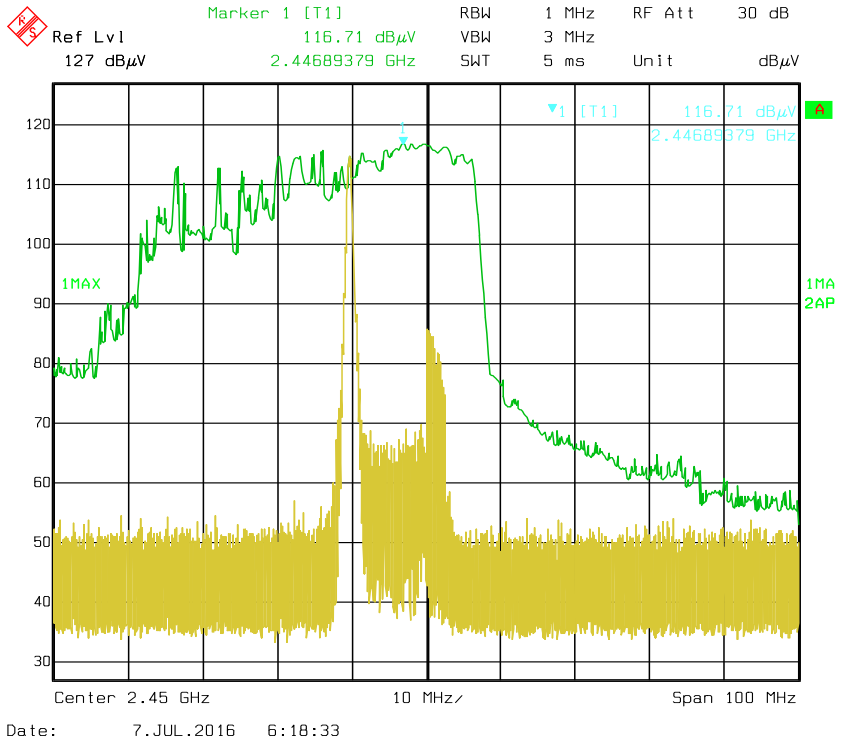
The operating frequency was measured using a spectrum analyzer. Starting with the EUT at room temperature, a 1000mL water load was placed in the center of the oven and the oven was operated at maximum output power. The fundamental operating frequency was monitored until the water load was reduced to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

The results of this test are as follows:

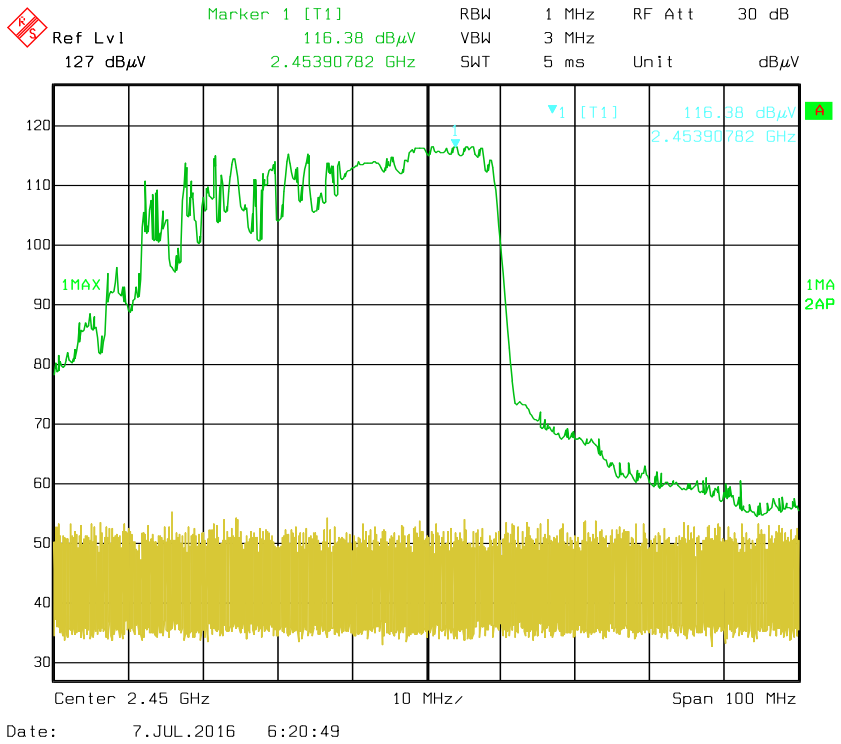
Low Frequency (MHz)	high Frequency (MHz)
2446.89	2453.91

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

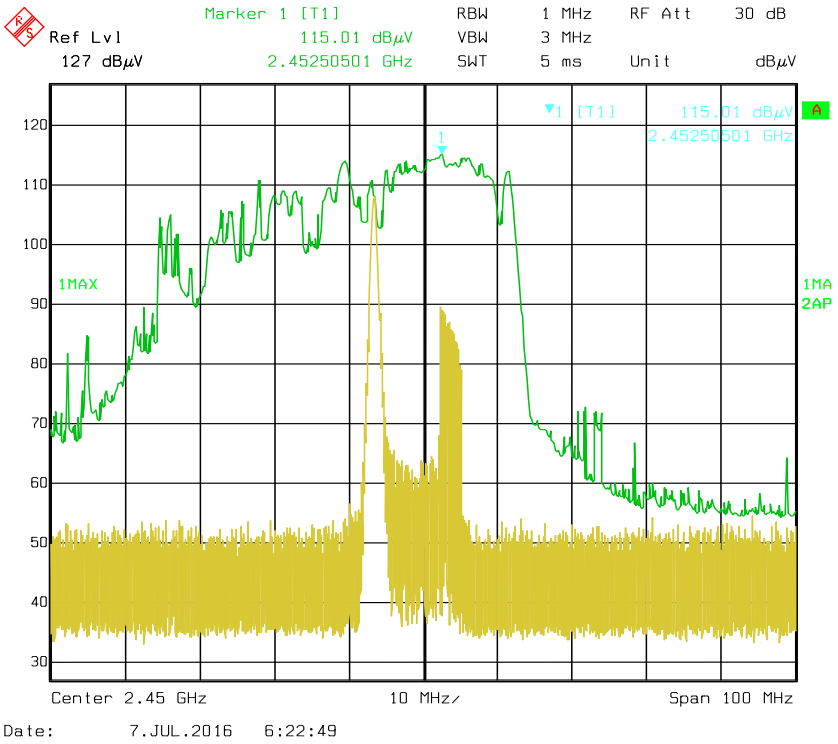
The EUT was operated / warmed by at least 10 minutes of use with a 1000 mL water load at room temperature at the beginning of the test. Then the operating frequency was monitored as the input voltage was varied between 80 and 125 percent of the nominal rating.

The results of this test are as follows:

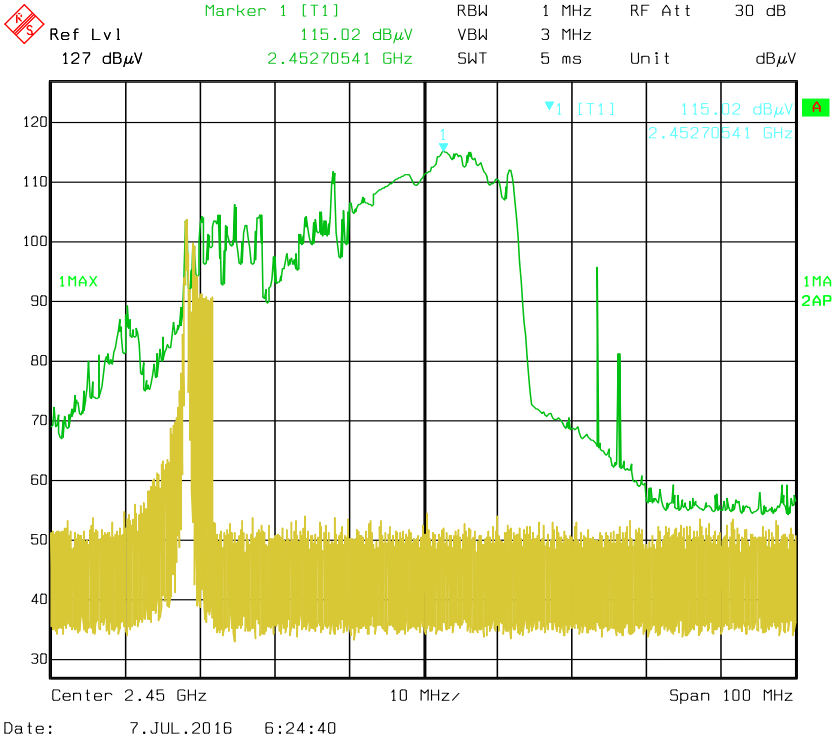
(Low voltage) Frequency (MHz)	(High voltage) Frequency (MHz)
2452.71	2452.51

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

High Voltage:



Low Voltage:



RADIATED EMISSIONS

Applicable Standard

FCC §18.305 and FCC §18.309

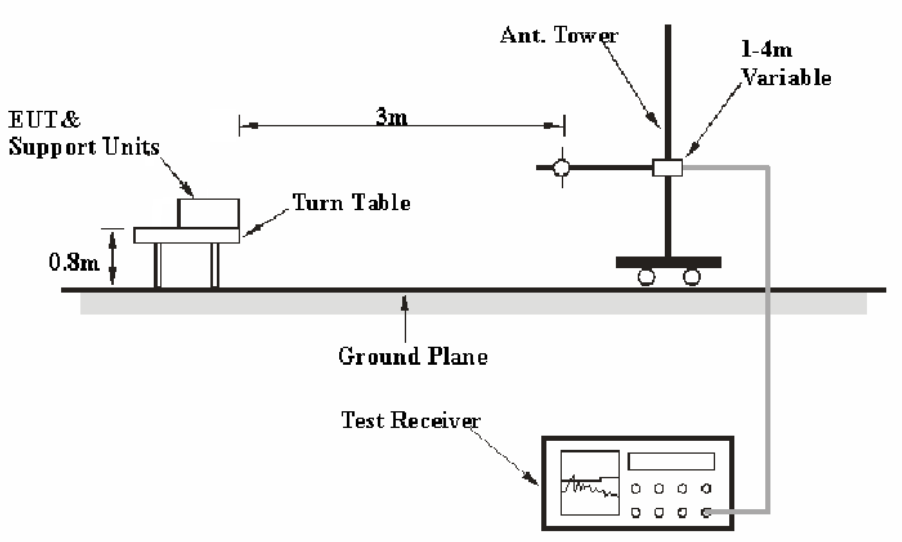
Measurement Uncertainty

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 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Shenzhen) is shown in below table. And the uncertainty will not be taken into consideration for the test data recorded in the report

Frequency	Polarity	Measurement uncertainty
9 kHz~30MHz	/	4.04 dB (k=2, 95% level of confidence)
30MHz~200MHz	Horizontal	4.52 dB (k=2, 95% level of confidence)
	Vertical	4.72 dB (k=2, 95% level of confidence)
200MHz~1GHz	Horizontal	5.81 dB (k=2, 95% level of confidence)
	Vertical	4.64 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	Horizontal / Vertical	4.88 dB (k=2, 95% level of confidence)
Above 6 GHz	Horizontal / Vertical	4.04 dB (k=2, 95% level of confidence)

EUT Setup



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	Detector
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.

The data was recorded in the Quasi-peak detection mode from 30 MHz to 1 GHz, the average detection mode for above 1 GHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447E	1937A01046	2016-05-06	2017-05-06
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2015-11-03	2016-11-03
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2014-12-07	2017-12-06
A.H. System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
Rohde & Schwarz	Signal Analyzer	FSIQ26	837405/023	2016-04-27	2017-04-26
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2016-04-03	2017-04-03
TDK	Chamber	Chamber A	2#	2013-10-15	2016-10-15
TDK	Chamber	Chamber B	1#	2013-07-23	2016-07-22
R&S	Auto test Software	EMC32	V9.10	NCR	NCR

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

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, the worst margin reading as below:

9.45 dB at **8574.54MHz** in the **Horizontal** polarization

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.

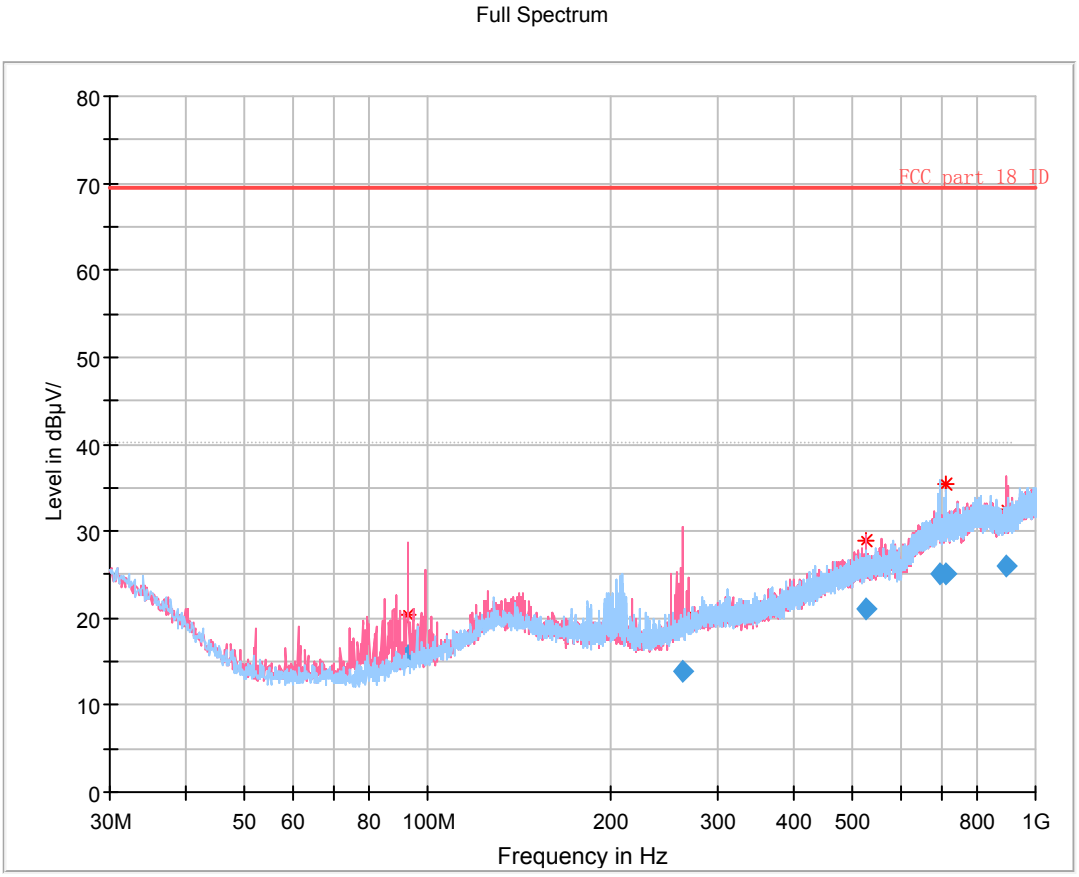
Test Data and Plots

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	52%
ATM Pressure:	101.1 kPa

The testing was performed by Tracy Hu on 2016-07-07.

30 MHz – 1 GHz:



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
92.596750	15.69	181.0	V	307.0	-12.0	69.28	53.59
262.847875	13.91	280.0	V	21.0	-7.1	69.28	55.37
527.002250	21.15	173.0	V	265.0	-1.0	69.28	48.13
698.175625	25.05	355.0	H	259.0	3.5	69.28	44.23
713.156000	25.06	160.0	H	331.0	3.6	69.28	44.22
897.677125	26.05	128.0	V	315.0	4.6	69.28	43.23

Above 1 GHz:

Frequency (MHz)	Reading (dBµV)	Detector (PK/QP/Ave.)	Turntable Degree	Height (m)	Polar (H/V)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4895.39	35.92	Ave.	218	2.4	H	3.56	39.48	69.28	29.8
4906.81	35.48	Ave.	170	1.9	V	3.56	39.04	69.28	30.24
7346.19	34.88	Ave.	336	1.3	H	10.11	44.99	69.28	24.29
7337.77	30.98	Ave.	272	2.4	V	10.11	41.09	69.28	28.19
8574.54	51.32	Ave.	261	1.1	H	8.51	59.83	69.28	**9.45**
8568.33	41.94	Ave.	58	2.3	V	8.51	50.45	69.28	18.83

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