FCC PART 18

TEST REPORT

For

Guangdong Midea Kitchen Appliances Manufacturing Co., Ltd

No.6, Yong An Road, Beijiao, Shunde, Foshan,Guangdong China

FCC ID: VG8EM217G4V

Report Type:	Product Type:
Original Report	Microwave Oven

Report Number:	RSZ170921551-00
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Reviewed By:	Hill He EMC Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 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

Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Guangdong Midea Kitchen Appliances Manufacturing Co., Ltd*'s product, model number: *EM217G4V (FCC ID: VG8EM217G4V)* or the "EUT" in this report is a *Microwave Oven*, which was measured approximately: 56.3 cm (L) x 42.0 cm (W) x 34.0 cm (H), the input power is AC 120V/60Hz. The highest operating frequency is 2450MHz.

Note: The serial models: 1217G1A, EM217G### (#=0-9 or A-Z or blank) and EM217G4V are identical; they have the same or similar structure, PCB, Material and function to the testing product. The difference between them is only the model number. EM217G4V was selected for fully testing, the detailed information can be referred to the declaration which was stated and guaranteed by the applicant.

**All measurement and test data in this report was gathered from production sample serial number: 1709082. (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2017-09-21.*

Objective

This report is prepared on behalf of *Guangdong Midea Kitchen Appliances Manufacturing 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.

Measurement Uncertainty

Item			Expanded Measurement uncertainty
AC Power Line Conducted Emissions			2.20 dB (k=2, 95% level of confidence)
Radiated emission	30MHz~200MHz	Horizontal	4.58 dB (k=2, 95% level of confidence)
		Vertical	4.59 dB (k=2, 95% level of confidence)
	200MHz~1 GHz	Horizontal	4.83 dB (k=2, 95% level of confidence)
		Vertical	5.85 dB (k=2, 95% level of confidence)
	1 GHz~6 GHz	Horizontal/Vertical	4.08 dB (k=2, 95% level of confidence)
	Above 6 GHz	Horizontal/Vertical	4.59 dB (k=2, 95% level of confidence)
RF Output Power with Power meter			±0.5dB
Occupied Bandwidth			±0.5kHz
Temperature			±1.0℃

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.

Bay Area Compliance Laboratories Corp. (Shenzhen) has been accredited to ISO/IEC 17025 by CNAS (Lab code: L2408). And accredited to ISO/IEC 17025 by NVLAP (Lab code: 200707-0), the FCC Designation No. CN5001 under the KDB 974614 D01.

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.

Bay Area Compliance Laboratories Corp. (Shenzhen) was registered with ISED Canada under ISED Canada Registration Number 3062B.

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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.

Equipment Modifications

No modifications were made to the EUT tested.

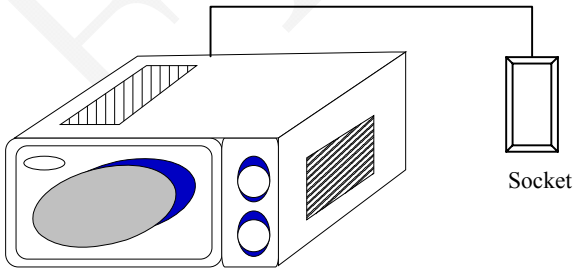
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Bull	Socket	N/A	140217

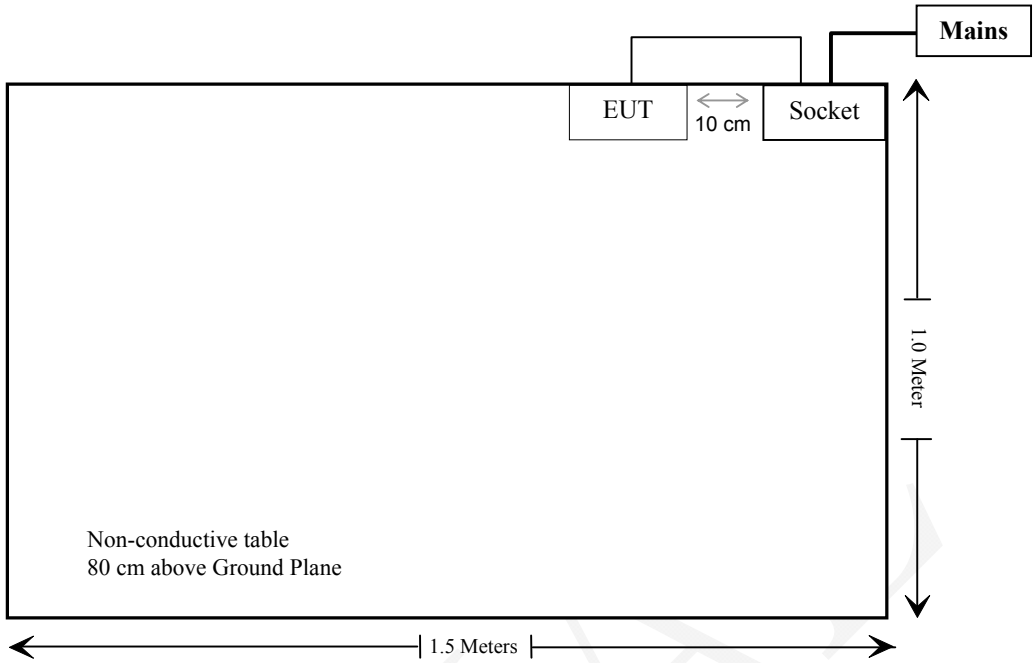
External Cable List and Details

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

Configuration of Test Setup



Block Diagram of Test Setup



TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
CONDUCTED EMISSIONS					
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2016-10-19	2017-10-19
Rohde & Schwarz	LISN	ENV216	3560.6650.12-101613-Yb	2016-12-07	2017-12-07
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2017-05-21	2017-11-19
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
RADIATION HAZARD MEASUREMENT					
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2017-04-24	2018-04-24
GW Instek	Power Meter	GPM 8212	CL110034	2017-04-09	2018-04-09
GW Instek	AC Power Meter	GPM-8212	CH150074	2017-04-09	2018-04-09
MC	Thermometer	N/A	N/A	2017-08-10	2020-08-09
A.H.System	Horn Antenna	3115	9903-5766	NCR	NCR
ETS	Microwave Survery Meter	1501	N/A	NCR	NCR
CAMRY	Electronic Weigher	EK3820	N/A	2016-11-03	2017-11-02
RADIATED EMISSIONS					
HP	Amplifier	HP8447E	1937A01046	2017-05-21	2017-11-19
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2016-12-07	2017-12-07
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2014-12-17	2017-12-16
A.H. System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2017-04-24	2018-04-24
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2017-05-21	2018-05-21
TDK	Chamber	Chamber A	2#	2016-12-05	2019-12-05
TDK	Chamber	Chamber B	1#	2016-12-06	2019-12-06
R&S	Auto test Software	EMC32	V9.10	NCR	NCR

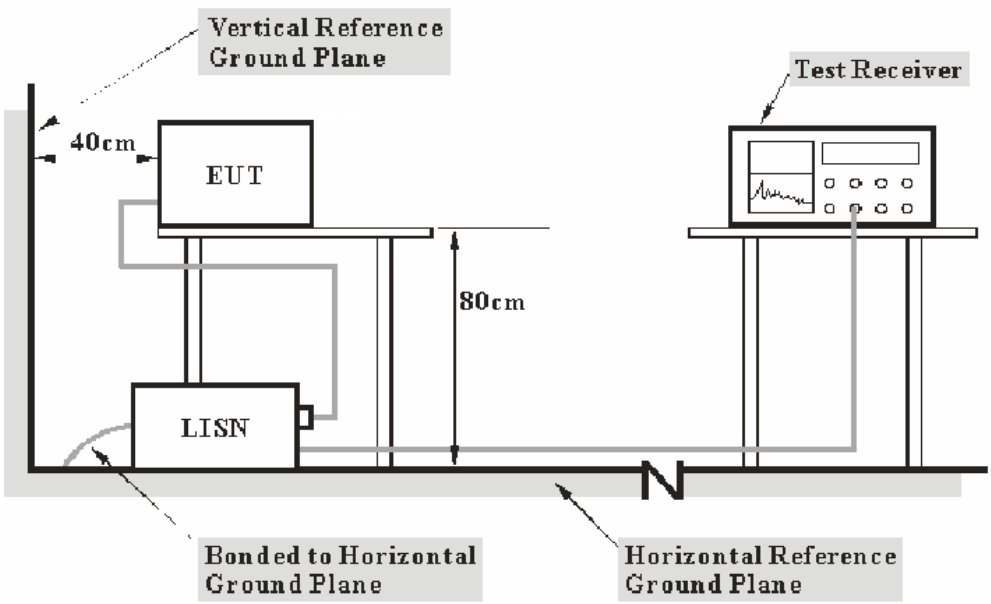
*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

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:	26 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Joson Xiao on 2017-09-27.

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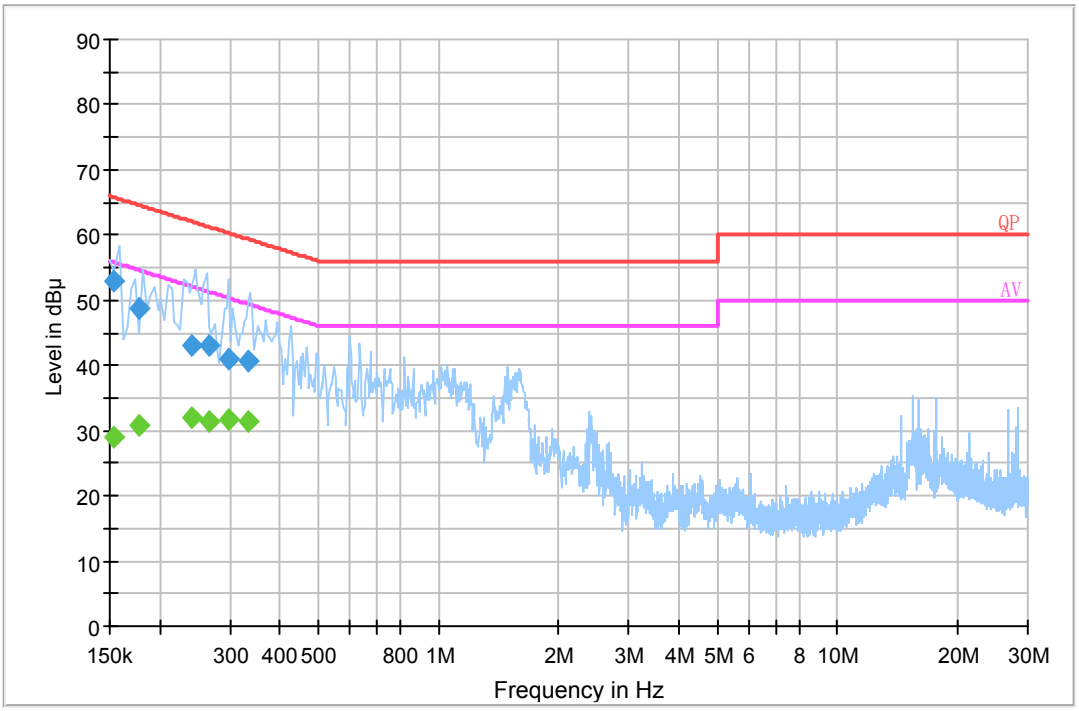
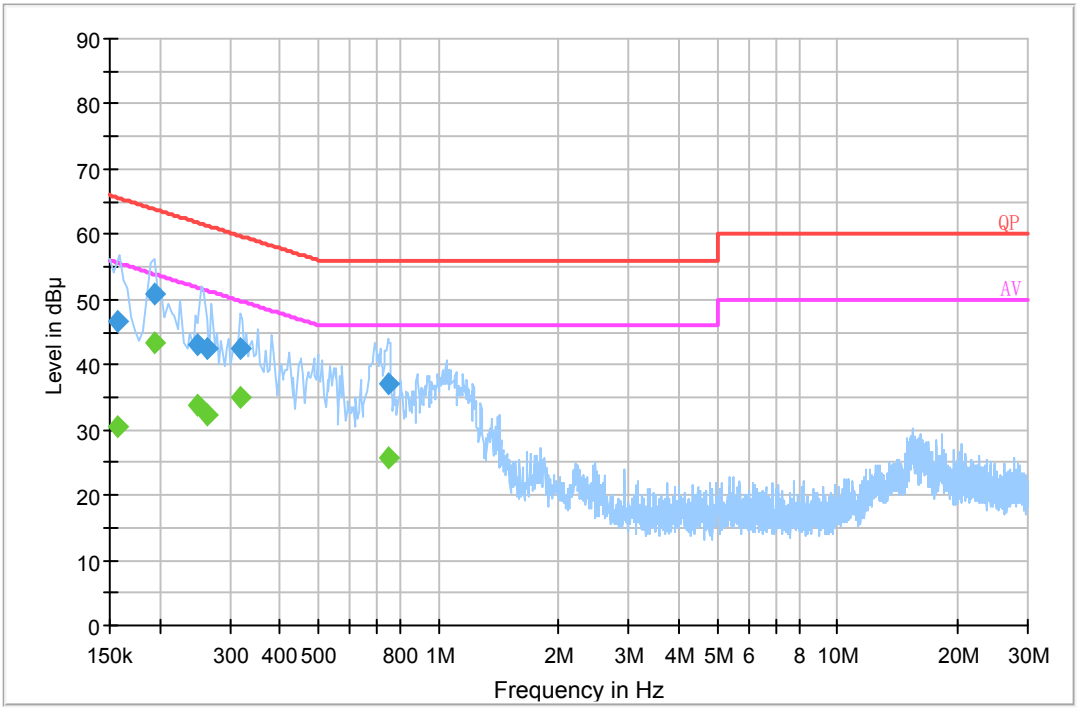
EUT operation mode: Boiling Water with MAX Power & Fan Maximum

AC 120V/60Hz, Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Corrected Factor (dB)	Limit (dBµV)	Margin (dB)	Remark (PK/QP/Ave.)
0.153500	52.9	20.2	65.8	12.9	QP
0.177500	48.8	20.2	64.6	15.8	QP
0.241500	43.2	20.2	62.0	18.9	QP
0.266500	42.9	20.2	61.2	18.3	QP
0.297500	40.9	20.2	60.3	19.5	QP
0.332930	40.7	20.2	59.4	18.7	QP
0.153500	29.1	20.2	55.8	26.7	Ave.
0.177500	30.8	20.2	54.6	23.8	Ave.
0.241500	32.1	20.2	52.0	20.0	Ave.
0.266500	31.5	20.2	51.2	19.8	Ave.
0.297500	31.7	20.2	50.3	18.6	Ave.
0.332930	31.5	20.2	49.4	17.9	Ave.

AC 120V/60Hz, Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Corrected Factor (dB)	Limit (dBµV)	Margin (dB)	Remark (PK/QP/Ave.)
0.157500	46.5	20.2	65.6	19.1	QP
0.193500	50.9	20.2	63.9	13.0	QP
0.249500	43.0	20.2	61.8	18.7	QP
0.262500	42.5	20.2	61.4	18.9	QP
0.317230	42.4	20.2	59.8	17.4	QP
0.746810	37.1	20.0	56.0	18.9	QP
0.157500	30.4	20.2	55.6	25.2	Ave.
0.193500	43.3	20.2	53.9	10.5	Ave.
0.249500	33.8	20.2	51.8	17.9	Ave.
0.262500	32.4	20.2	51.4	18.9	Ave.
0.317230	34.9	20.2	49.8	14.9	Ave.
0.746810	25.7	20.0	46.0	20.3	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

Test Data

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Joson Xiao on 2017-09-25.

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 0.05mW/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	17.53	2062	2000

☒ 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: 1100 milliliters of water in the beaker located in the center of the oven.

● Load for frequency measurement: 1100 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 750 and the other of 350 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 25 ºC ± 1 ºC is used for the test. The water temperature is measured immediately before it is poured into the container.

A quantity of 1 100 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)
1100	377.0	27.0	9.7	19.0	37

RF Output Power = (4.187 x 1100 x (19.0 –9.7) +0.55 x 377.0 x (19.0 –27.0) /37= 1112.82 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 (1112.82/500)

LFS = 37.30

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
37.30	31.43	71.43

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

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Operating Frequency Measurement

Variation in Operating Frequency with Time

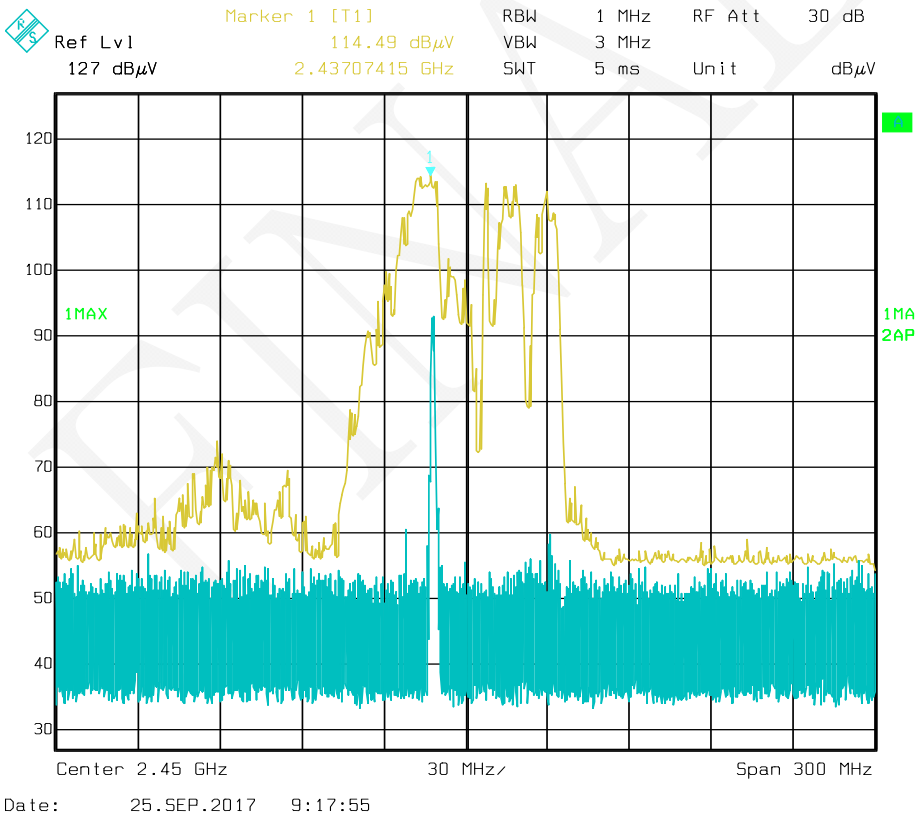
The operating frequency was measured using a spectrum analyzer. Starting with the EUT at room temperature, a 1000mL water load was placed in the center of the oven and the oven was operated at maximum output power. The fundamental operating frequency was monitored until the water load was reduced to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

The results of this test are as follows:

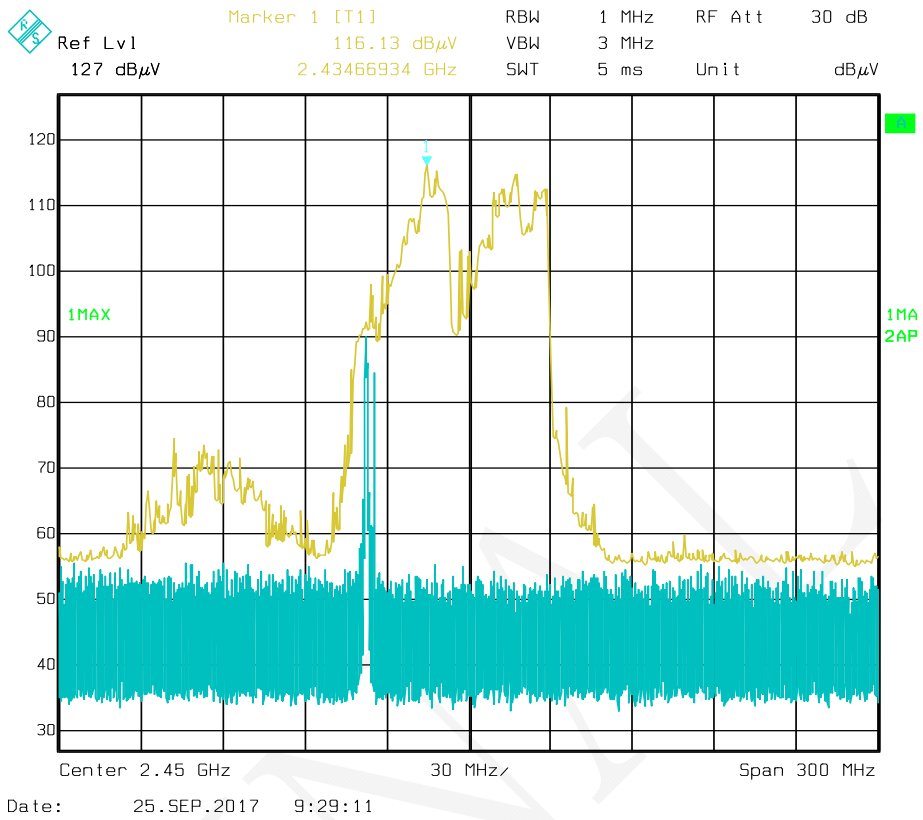
Frequency at Start time (MHz)	Frequency at End time (MHz)
2437.07	2434.67

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

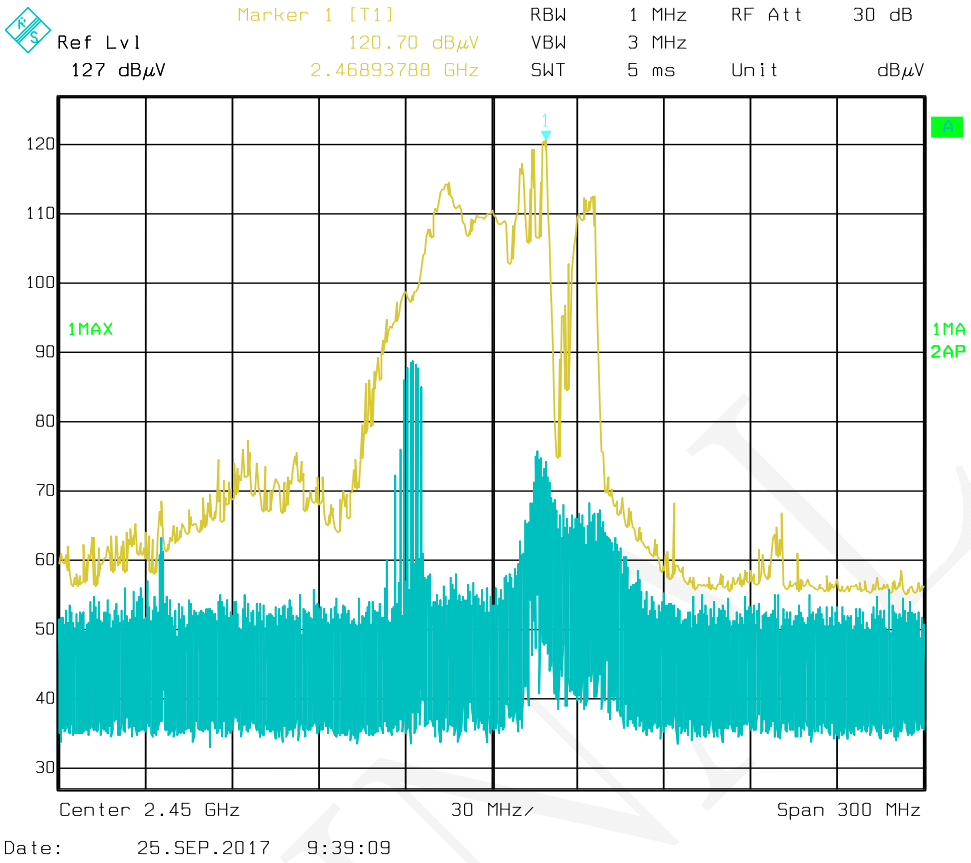
The EUT was operated / warmed by at least 10 minutes of use with a 1000 mL water load at room temperature at the beginning of the test. Then the operating frequency was monitored as the input voltage was varied between 80 and 125 percent of the nominal rating.

The results of this test are as follows:

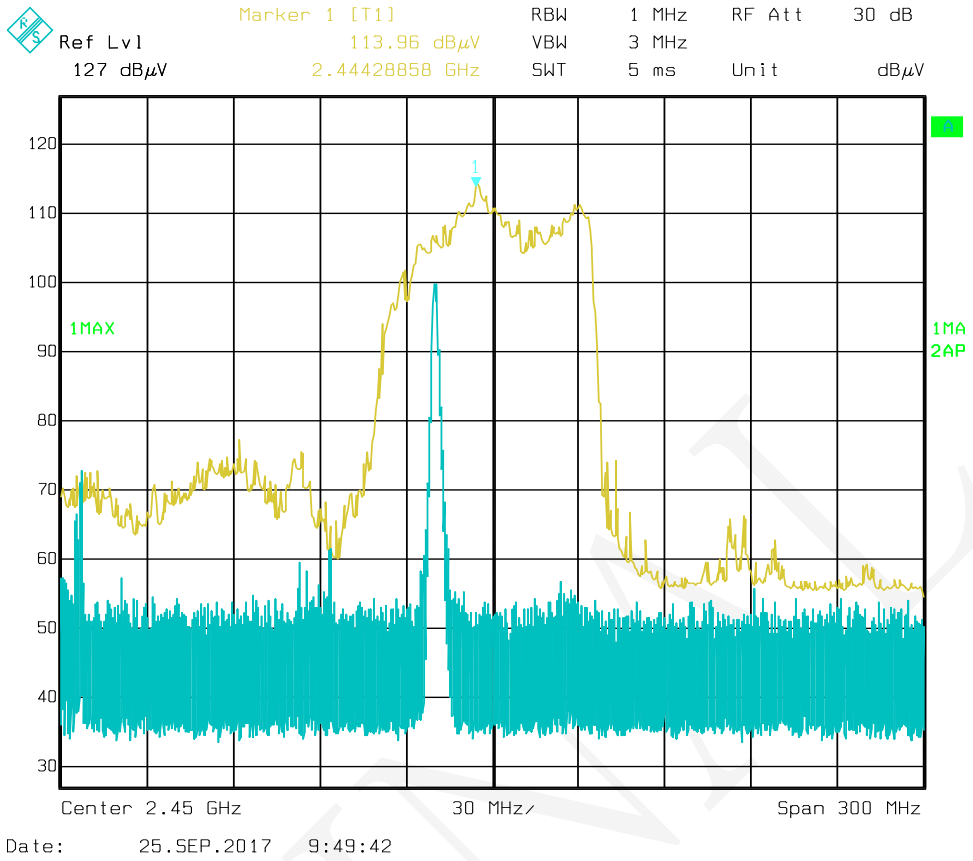
(Low voltage) Frequency (MHz)	(High voltage) Frequency (MHz)
2468.94	2444.29

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

High Voltage:



Low Voltage:

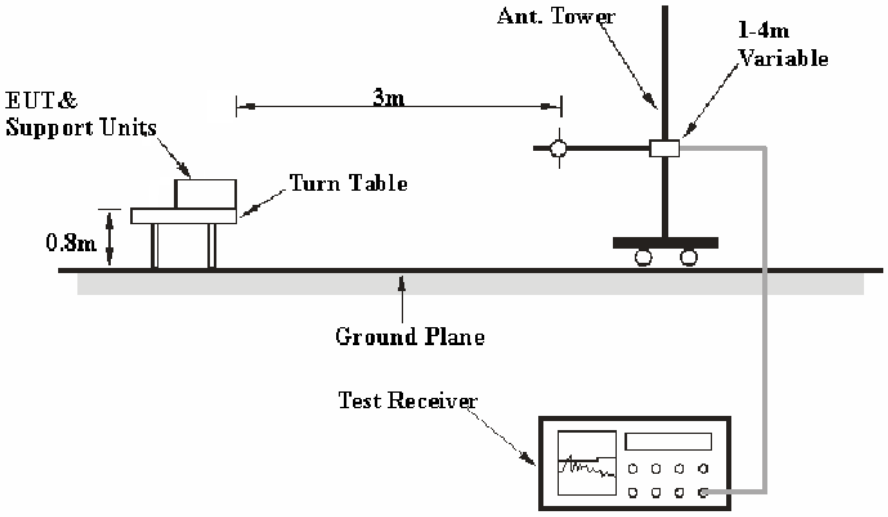

Marker 1 [T1]
Ref Lvl
127 dBµV
113.96 dBµV
2.44428858 GHz
RBW 1 MHz
VBW 3 MHz
SWT 5 ms
RF Att 30 dB
Unit dBµV
120
110
100
90
80
70
60
50
40
30
1MAX
1MA
2AP
Center 2.45 GHz
30 MHz/
Span 300 MHz
Date: 25.SEP.2017 9:49:42

RADIATED EMISSIONS

Applicable Standard

FCC §18.305 and FCC §18.309

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.

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:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Joson Xiao on 2017-09-27.

Test Mode: Boiling Water with MAX Power & Fan Maximum

30 MHz – 1 GHz:

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Detector (PK/QP)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
43.347400	18.40	QP	112.0	V	20.0	-8.6	71.43	53.03
47.994875	25.50	QP	169.0	V	0.0	-10.5	71.43	45.93
139.198900	26.90	QP	145.0	V	134.0	-4.7	71.43	44.53
161.224475	19.00	QP	124.0	V	115.0	-5.1	71.43	52.43
431.799050	22.20	QP	392.0	V	13.0	0.2	71.43	49.23
836.368275	30.81	QP	226.0	H	87.0	9.0	71.43	40.62

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)
2400.00	32.96	Ave.	94	2.3	H	-0.88	32.08	71.43	38.47
2500.00	33.55	Ave.	66	1.6	V	-0.62	32.93	71.43	37.88
9742.03	27.95	Ave.	343	1.9	H	14.93	42.88	71.43	43.48
9736.80	29.83	Ave.	284	2.3	V	14.93	44.76	71.43	41.6
7422.33	30.45	Ave.	10	2.1	H	13.02	43.47	71.43	40.98
7416.14	31.55	Ave.	310	1.0	V	13.02	44.57	71.43	39.88
4907.30	33.63	Ave.	188	1.6	H	6.21	39.84	71.43	37.8
4928.88	28.95	Ave.	298	1.7	V	6.21	35.16	71.43	42.48

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