EMC TEST REPORT

No. JSH007070368-001

Applicant	:Tsann Kuen Enterprise Co., Ltd. Pao An Industrial District, 3 Kai Fa 2nd Rd, Ren Teh Hsiang, Tainan Taiwan
Manufacturer :	Tsann Kuen (Zhangzhou) Enterprise Co., Ltd. Tsann Kuen Industrial Park, Longchi Development District, Zhangzhou, Fujian, P.R.China
Equipment	:Household Microwave oven
Type/Model	:R-209K#-W, R-220K#-W, R-230K#-W

Summary

The test report is to certify that the tested equipment properly complies with the requirements of:

47CFR Part 18 (2006): Industrial, Scientific, and Medical Equipment

FCC/OET MP-5 (1986): FCC Methods of Measurements of Radio Noise Emissions From Industrial, Scientific, and Medical Equipment

ANSI C63.4 (2003): Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz.

Description

The appliances were tested by Intertek Testing Services Limited Shanghai and found compliance with relevant requirements described in FCC Part 18: ISM Device.

Test results are contained in this test report and Intertek Testing Services Limited Shanghai is assumed full responsibility for the accuracy and completeness of these measurements.

Date of issue: 2007-8-15

Prepared by: Eliot Huang(*Project engineer*)

Approved by: Jonny Jing (*Reviewer*)

Description of Test Facility

Name: Intertek Testing Services Limited Shanghai

Address: Building No.86, 1198 Qinzhou Road(North), Shanghai 200233, P.R. China

FCC Registration Number: 236597

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Content

1.Applicant Information

Applicant :Tsann Kuen Enterprise Co., Ltd.
Pao An Industrial District, 3 Kai Fa 2nd Rd,
Ren Teh Hsiang, Tainan Taiwan

Name of contact : Mr. Deco Lee

Telephone : 86 596 6268899-70529

Telefax : 86 596 6268064

Manufacture : Tsann Kuen (Zhangzhou) Enterprise Co., Ltd.
Tsann Kuen Industrial Park, Longchi Development District,
Zhangzhou, Fujian, P.R.China

Country of origin : P.R. China

2.Information of Equipment Under Test (EUT)

2.1 Identification of the EUT

Equipment : Household Microwave oven

Type of EUT :☑ Production ☐ Pre-product ☐ Pro-type

Type/model : R-209K#-W, R-220K#-W, R-230K#-W

Brand name : SHARP

FCC ID : RBJ-R2XXK

Date of sample receipt : July 11, 2007

Date of test : July 12 – August 13, 2007

2.2 Technical specification

ISM Frequency : 2.45 GHz

Rating : 120V, 60Hz, 800W

Description of EUT : The EUT is household microwave oven. Suffix "#" may be replaced by capitalized letter denoting cosmetic color and suffix "-W" may be provided to represent manufacturing location.

The models in Column "A" are identical to those in Column "B" (basic model) except for model number and cosmetic differences. Any further differences are noted in the comments column.

A	B	
Model No.(s)	Model No.(s)	Comments
R-209K#-W	R-220K#-W	Key-sheet design on control panel and color of door frame sash.
R-220K#-W	R-220K#-W	Color of door frame sash.

2.3 Test procedure:

The test was performed according to the procedures in FCC/OET MP-5 (1986)

2.4 Mode of operation during the test / Test peripherals used

The EUT was operated during the measurement under following load condition according to sec.. 4.1 in FCC/OET MP-5 (1986).

1) RF Power Output Measurement
   1000 ml of water, with the beaker located in the center of the oven
2) AC conducted Emission Measurement
   1000 ml of water, with the beaker located in the center of the oven
3) Radiated Emission Measurement (radiation on second and third harmonics)
   Two loads, one of 700 ml and the other of 300 ml, 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.
4) All other Measurement (radiated emission)
   700 ml of water, with the beaker located in the center of the oven
5) ISM Frequency Measurement
   1000 ml of water, with the beaker located in the center of the oven

The EUT was set to normal operation and all the operation modes were observed.

2.5 Instrument list

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Test Receiver	ESCS 30	R&S	EC 2107	2007-1-23	2008-1-22
Test Receiver	ESIB 26	R&S	EC 3045	2007-6-30	2008-6-29
Voltage Probe	ESH2-Z3	R&S	EC 3405	2007-1-23	2008-1-22
A.M.N.	ESH2-Z5	R&S	EC 3119	2007-1-23	2008-1-22
A.M.N.	ESH3-Z5	R&S	EC 2109	2007-1-23	2008-1-22
A.M.N.	ENV 216	R&S	EC 3394	2006-10-18	2007-10-17
I.S.N.	ENY 22	R&S	EC 3218	2007-1-23	2008-1-22
I.S.N.	ENY 41	R&S	EC 3220	2007-1-23	2008-1-22
Current probe	EZ-17	R&S	EC 3221	2007-1-23	2008-1-22
Absorbing clamp	MDS 21	R&S	EC 2108	2007-1-26	2008-1-25
Tri-loop	HXYZ 9170	Schwarzbeck	EC 3384	2007-6-30	2008-6-29
Harmonic-flicker system	5001ix-PACS-1	CI	EC 2110	2007-1-23	2008-1-22
Ultra-broadband antenna	HL 562	R&S	EC 3046-1	2007-6-30	2008-6-29
Horn antenna	HF 906	R&S	EC 3049	2007-6-30	2008-6-29
Pre-amplifier	Pre-amp 18	R&S	EC 3222	2007-6-30	2008-6-29
Log-period antenna	AT 1080	AR	EC 3044-7	2007-8-21	2008-8-20
Biconical antenna	3109PX	ETS	EC3564	2007-8-21	2008-8-20
Horn antenna	AT 4002	AR	EC 3044-8	2007-8-21	2008-8-20
Signal generator	SMR 20	R&S	EC 3044-1	2007-8-21	2008-8-20
Power amplifier	150W1000	AR	EC 3044-2	2007-8-21	2008-8-20
Power amplifier	25S1G4	AR	EC 3044-4	2007-8-21	2008-8-20
3 m Semi-anechoic chamber	-	Albatross project	EC 3048	2007-7-13	2008-7-12
3 mFully-anechoic chamber	-	Albatross project	EC 3047	2007-7-13	2008-7-12

Digital illuminance meter	TES 1332	TES	EC 2451	2007-6-5	2008-6-4
Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3323	2007-1-11	2008-1-10
Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3324	2007-2-5	2008-2-4
Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3325	2006-12-22	2007-12-21
Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3326	2006-12-22	2007-12-21
Pressure meter	YM3	Shanghai Mengde	EC 3320	2007-3-23	2008-3-22
Isolation transformer	-	Intertek	EC 2100	Not required	Not required
Stable power source	APS 11020	APC	EC 3209	Not required	Not required
Freq. Variable power source	AFC 11010	APC	EC 3210	Not required	Not required
Freq. Variable power source	AFC 33020	APC	EC 3211	Not required	Not required
Multi-meter	179	FLUKE	EC 3326	2006-9-11	2007-9-10
Shielded room	-	Zhongyu	EC 2838	2004-2-3	2009-2-2
Shielded room	-	Zhongyu	EC 2839	2004-2-3	2009-2-2

3. Test Summary

This report applies to tested sample only. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai Limited.

TEST ITEM	RESULT	NOTE
Conducted Emission	Pass	
RF Power Output Measurement	Pass	
Magnetic Field Radiated Emission 9 kHz- 30MHz	Pass	
Radiation Emission 30 MHz – 1000 MHz	Pass	
Radiation Emission 1 GHz - 25 GHz	Pass	
ISM Frequency Measurement	Pass	

Notes: 1: NA =Not Applicable

4. Conducted Emissions Test

Test result: PASS

4.1 Limits

Frequency range (MHz)	Limits dB(μv) Quasi-peak	Average
0.15 ~ 0.5	66 ~ 56 *	56 ~ 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50
Note : * means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz		

4.2 Test Procedure

The EUT was set to achieve the maximum emission level.
The mains terminal disturbance voltage was measured with the EUT in a shielded room.
The EUT was connected to AC power source through an Artificial Mains Network which provide a 50Ω linear impedance Artificial hand is used if appropriate.

■ For Table top equipment

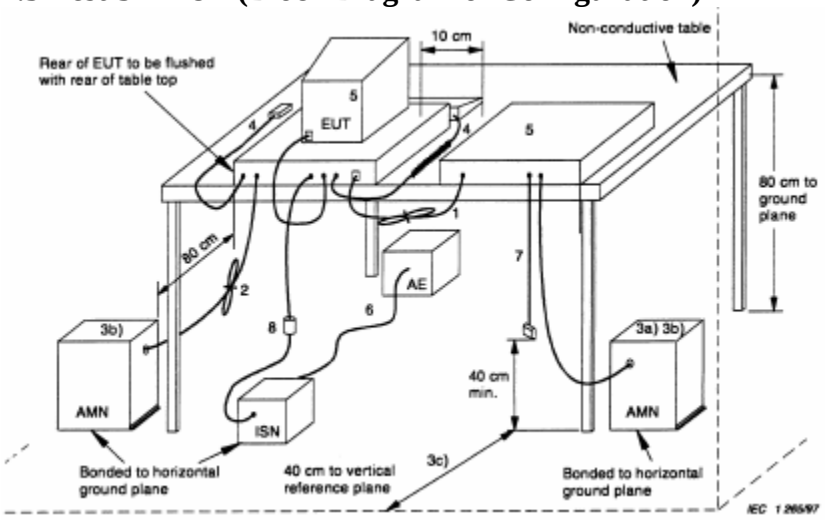
The EUT was placed on a 0.8m high non-metallic table above a metallic plane, The wall of shielded room used as Ground Reference Plane (GRP)

□ For Floor standing equipment

The EUT was placed on a 0.1m high non-metallic support above a metallic plane, The wall of shielded room used as Ground Reference Plane (GRP)

The bandwidth of test receiver ESCS 30 was set at 9kHz.
The frequency range from 150kHz to 30MHz was checked.

4.3 Test SET-UP (Block Diagram of Configuration)



4.4 Test Result

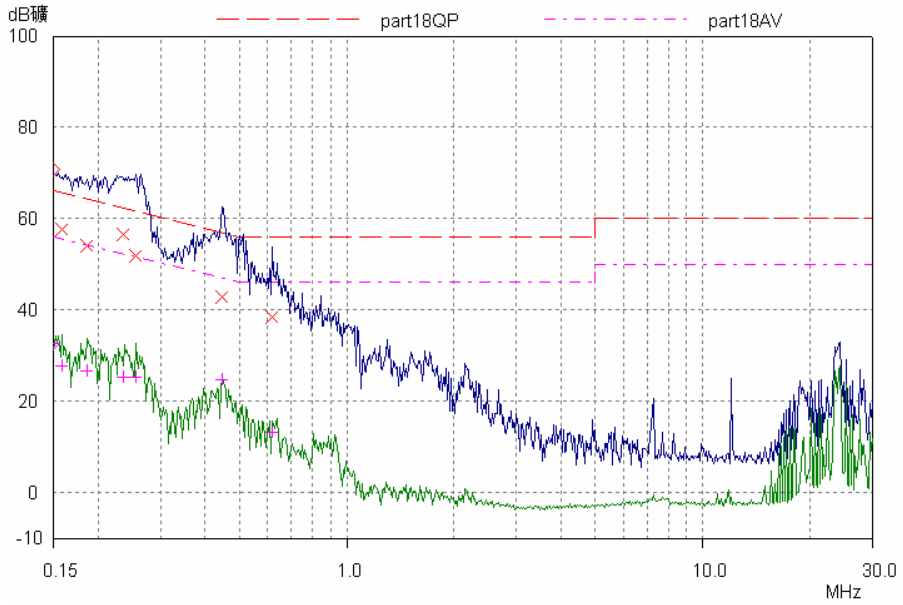
Temperature : 23 °C

Relative Humidity : 40 %

Frequency (MHz)	Line (L/N)	Factor (dB)	Quasi-peak		Average	
			Disturbance level dB(uV)	Permitted limit dB(uV)	Disturbance level dB(uV)	Permitted limit dB(uV)
0.15	N	0.39	57.57	66.00	27.84	56.00
0.18	N	0.78	54.06	64.21	26.76	54.21
0.23	N	0.82	56.53	62.29	25.22	52.29
0.25	L	0.80	51.99	61.57	25.25	51.57
0.44	L	0.68	42.74	56.00	24.76	46.00
0.61	N	0.58	38.46	56.00	13.12	46.00

Note: Since the test software will automatically add the LISN transducer and cable loss to the reading level, only the emission level was listed in the test report.

Waveform:



4.5 Measurement Uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.
Measurement uncertainty is calculated in accordance with CISPR 16-4-2: 2003.
Measurement uncertainty of mains terminal disturbance voltage : ± 3.6dB
The measurement uncertainty is given with a confidence of 95%, k=2.

5. RF Power Output Measurement

Temperature: 20 °C

Humidity: 45%

The power output was measured by the calorimetric method, computing the power output from the observed temperature rise of the load over a period of time.

The AC power input to the oven is measured to sure that the oven is operating in accordance with the manufacturer's specifications.

Rated RF Power: 800W
Load (water): 1000ml
Time: 60sec

Test No.	T1 before test (°C)	T2 after test (°C)	T2-T1 (°C)	RF Power* (W)
1	10.5	19.3	8.8	616
2	10.3	19.1	8.8	616
3	10.1	18.7	8.6	602

Results of Average RF Power: 611.3 W

The limit of the radiated emission at 300m: 28.8 dBuV/m
at 3m: 68.8 dBuV/m

6. Radiated Emission Test

Test result: PASS

6.1 Limits

Equipment	Operating frequency	RF Power generated by equipment (watts)	Field strength limit (uV/m)	Distance (meters)
Any type unless otherwise specified (miscellaneous).	Any ISM frequency	Below 500	25	300
		500 or more	25×SQRT(power/500)	[1]300
	Any non-ISM frequency	Below 500	15	300
		500 or more	15×SQRT(power/500)	[1]300
Industrial heaters and RF stabilized arc welders.	On or below 5,725 MHz	Any	10	1,600
	Above 5,725 MHz	Any	[2]	[2]
Medical diathermy	Any ISM frequency	Any	25	300
	Any non-ISM frequency	Any	15	300
Ultrasonic	Below 490 kHz	Below 500	2,400/F(kHz)	300
		500 or more	2,400/F(kHz)× SQRT(power/500).	[3]300
	490 to 1,600 kHz	Any	24,000/F(kHz)	30
	Above 1,600 kHz	Any	15	30
Induction cooking ranges	Below 90 kHz	Any	1,500	[4]30
	On or above 90 kHz	Any	300	[4]30

[1] Field strength may not exceed 10 μV/m at 1600 meters. Consumer equipment operating below 1000 MHz is not permitted the increase in field strength otherwise permitted here for power over 500 watts.

Remark: 1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the EUT distance of 3 meters.
3. ISM equipment operation on a frequency specified in FCC part 18 Sec. 18.301 is permitted unlimited radiated energy in the band specified for that frequency.

6.2 Test Procedure:

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn-table shall rotate 360 degrees to determine the position of maximum emission level.
EUT is set 3m away from the receiving antenna
For measurement 30MHz - 1000MHz and 1GHz – 25 GHz
The receiving antenna was varied from 1m to 4m to find out the highest emission.
And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

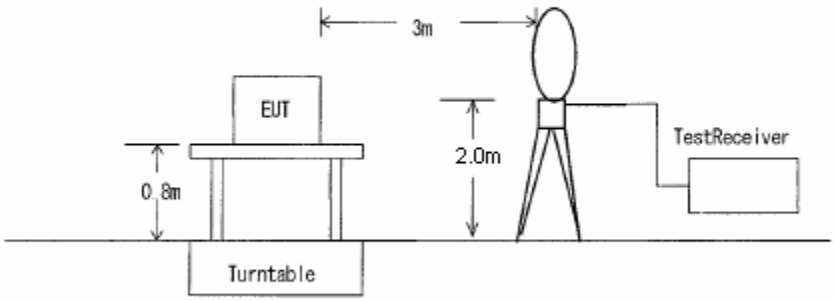
Setting of measuring instruments:

Measurements	Detector	IF Bandwidth
Below 150kHz	Average	200 Hz
From 150kHz to 30MHz	Average	9 kHz
From 30 to 1000MHz	Average	100 kHz
Above 1000MHz	Average	1 MHz

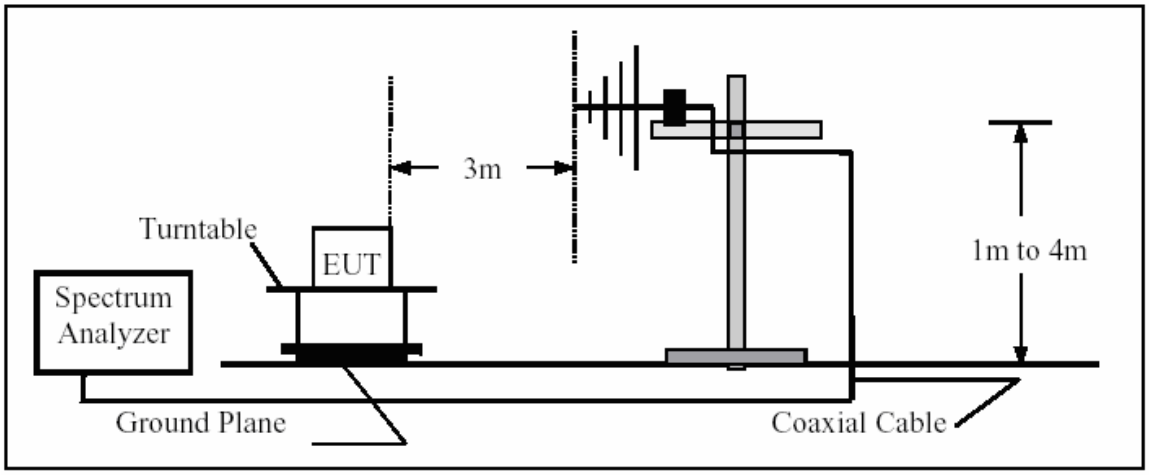
6.3 Test SET-UP (Block Diagram of Configuration)

(A)

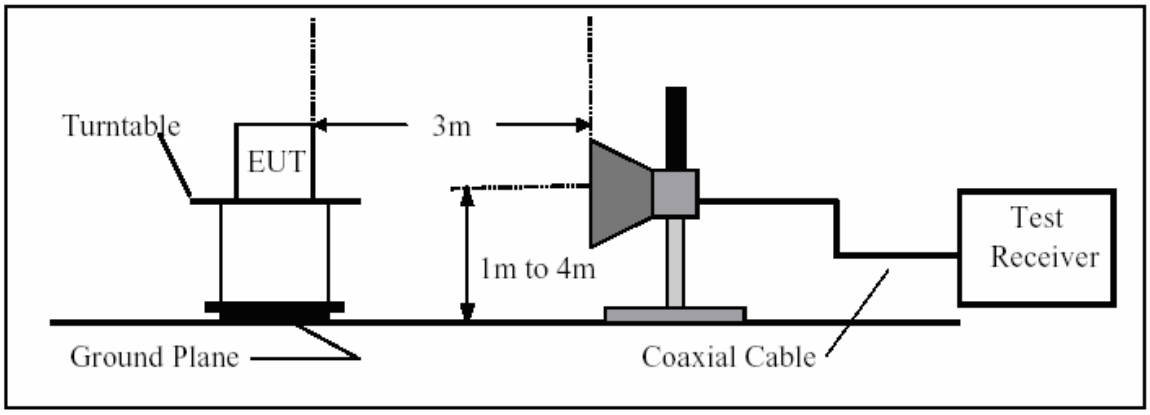
Radiated Disturbance (Magnetic Field) 0.15 MHz – 30 MHz :



(B) Radiated Emission 30MHz - 1000MHz



(C) Radiated Emission 1GHz – 25 GHz



6.4 Test result.

Temperature: 22 °C

Humidity: 40%

6.4.1 Magnetic Field Radiated Emission 9kHz – 30MHz

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limit at 3m (dBuV/m)	Margin (dB)
0.09	0.35	20	38.9	68.8	29.9
0.25	0.40	20	52.0	68.8	6.8
0.50	0.44	20	56.5	68.8	12.3
0.58	***0.41***	***20***	***59.1***	***68.8***	***9.7***
0.68	0.51	20	56.3	68.8	12.5
1.52	0.48	20	<38	68.8	> 30
Note: Since the test software will automatically add the Antenna Factor and cable loss to the reading level, only the emission level was listed in the test report					

6.4.2 Radiated Emission 30MHz - 1000MHz

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB)	Ant. Pol.(H/V)	Emission Level (dBuV/m)	Limit at 3m (dBuV/m)	Margin (dB)
30.00	0.5	19.5	V/H	<30.0	68.8	> 38.8
175.00	1.1	8.3	V/H	<30.0	68.8	> 38.8
230.00	1.1	9.8	V/H	<30.0	68.8	> 38.8
489.00	2.0	15.7	V/H	<30.0	68.8	> 38.8
735.63	3.0	18.5	H	35.5	68.8	33.3
796.44	***3.0***	***18.8***	***H***	***40.4***	***68.8***	***27.4***
873.65	3.5	21.0	V	35.8	68.8	33.0
931.96	3.8	21.2	V	34.3	68.8	34.5
1000.00	3.9	22.0	V/H	<30.0	68.8	> 38.8
Note: Since the test software will automatically add the Antenna Factor and cable loss to the reading level, only the emission level was listed in the test report						

6.4.3 Radiated Emission 1GHz – 25 GHz

Frequency (MHz)	Corr. Factor (dB)	Antenna Factor (dB)	Ant. Pol.(H/V)	Emission Level (dBuV/m)	Limit at 3m (dBuV/m)	Margin (dB)
4910.0	-23.1	32.7	H	56.0	68.8	12.8
7371.6	-21.4	35.8	H	67.1	68.8	1.7
9833.2	-17.4	37.2	H	66.5	68.8	2.3
1226.9	-17.0	37.6	H	53.7	68.8	15.7
1477.1	-15.2	39.5	H	50.5	68.8	18.3
1719.0	***-10.7***	***41.9***	***H***	***68.0***	***68.8***	***0.8***
22306.8	-13.8	40.4	H	50.0	68.8	18.8
4916.8	-23.1	32.7	V	63.0	68.8	5.8
7371.6	-21.4	35.8	V	66.9	68.8	1.9
9840.2	-17.4	37.2	V	66.4	68.8	2.4
1226.9	-17.0	37.6	V	51.7	68.8	17.1
1466.1	-15.2	39.5	V	50.3	68.8	18.5
1717.7	-10.7	41.9	V	67.8	68.8	1.0
22306.8	-13.8	40.4	V	50.1	68.8	18.7

Note:
1. The correction factor is shown as follows:
Corr. Factor (dB)= Cable Loss + 20dB Att. - Pre-Amp.Gain (dB)
2. Since the test software will automatically add the Antenna Factor and cable loss to the reading level, only the emission level was listed in the test report.

Note:

(1) Test distance: 3 m.

(2) Emission level (dBuV/m) = Reading level (dBuV) + Corr. Factor(dB)+ Antenna Factor (dB)

(3) Margin (dB)= Limit - Emission level

6.5 Measurement uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.
Measurement uncertainty is calculated in accordance with CISPR 16-4-2: 2003
Measurement uncertainty : ± 5.2dB
The measurement uncertainty is given with a confidence of 95%, k=2.

7. ISM Frequency Measurement

Test result: PASS

7.1 Limits

For ISM equipment designed to operated on one of the ISM frequencies, the maximum frequency deviation due to the load and normal operation conditions shall be measured and shall within the range of FCC part 18, sec. 18.301 ISM frequency tolerance.

ISM frequency	Tolerance
6.78 MHz	±15.0 kHz
13.56 MHz	±7.0 kHz
27.12 MHz	±163.0 kHz
40.68 MHz	±20.0 kHz
915 MHz	±13.0 MHz
2,450 MHz	±50.0 MHz
5,800 MHz	±75.0 MHz
24,125 MHz	±125.0 MHz
61.25 GHz	±250.0 MHz
122.50 GHz	±500.0 MHz
245.00 GHz	±1.0 GHz

7.2 Test Procedure

The maximum frequency deviation was measured at -30dB with respect to the maximum level.

7.2.1 Variation of load.

The EUT was supplied of load specified in clause 2.4 in the report. Start the EUT at room temperature and continue until the load quantity has been reduced by evaporation to approximately 20% of the original quantity.
The test is made with nominal rated supply voltage.

7.2.2 Variation of voltage.

The EUT was supplied of load specified in clause 2.4 in the report.
With this load, start the EUT at room temperature, keeping warm from at least 10 minutes.
Change supply voltage from 80% to 125% of nominal rated voltage.

Setting of measuring instruments:

Detector Function	RBW	VBW	Sweep Time	Span
Peak	100 kHz	100kHz	60ms	200MHz

7.3 Test Results

Temperature: 22 °C

Humidity: 40%

7.3.1 Variation of load

Maximum frequency deviation (MHz)		Load Variation
Lower frequency	Upper Frequency	
2415.5	2469.0	1000ml
2411.5	2470.5	800ml

7.3.2 Variation of voltage

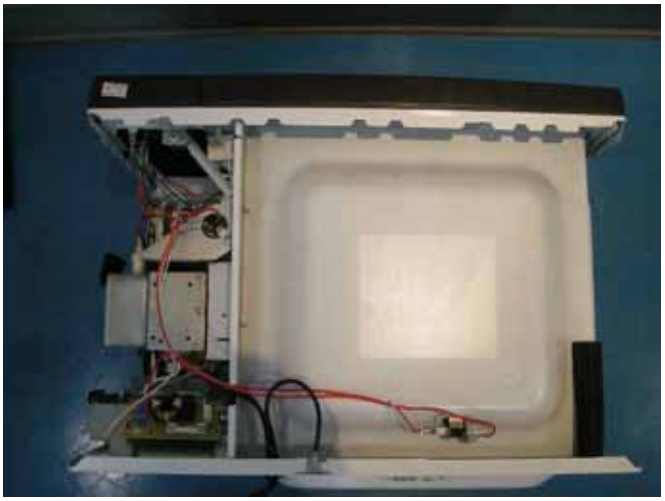
Maximum frequency deviation (MHz)		Voltage Variation
Lower frequency	Upper Frequency	
2406.0	2467.5	96.0V
2415.5	2469.0	120.0V
2417.5	*2470.6*	150.0V

The results were within 2450MHz ± 50MHz.

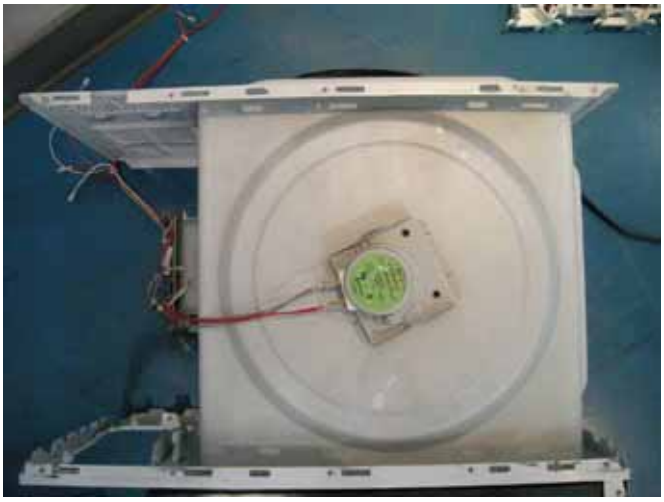
7.4 Measurement uncertainty

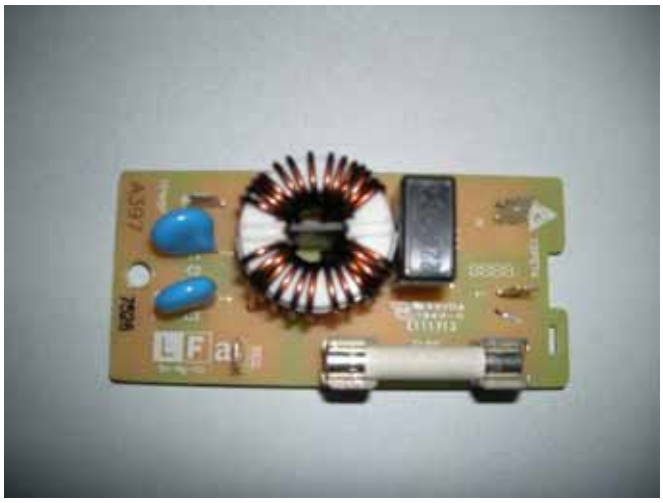
The measurement uncertainty is ±100 kHz.

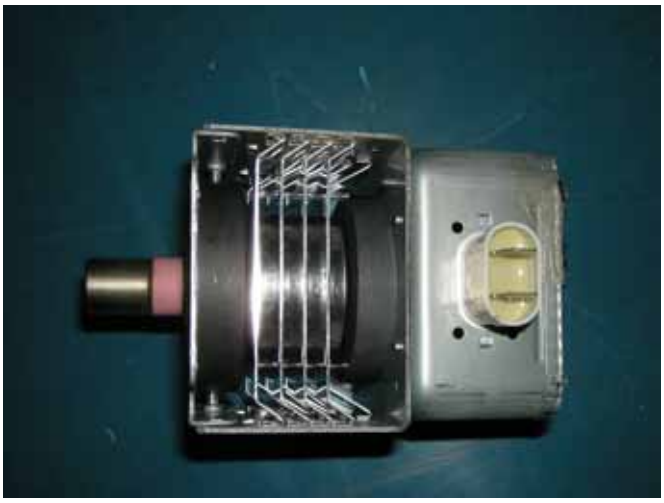
Appendix I: Photograph of EUT



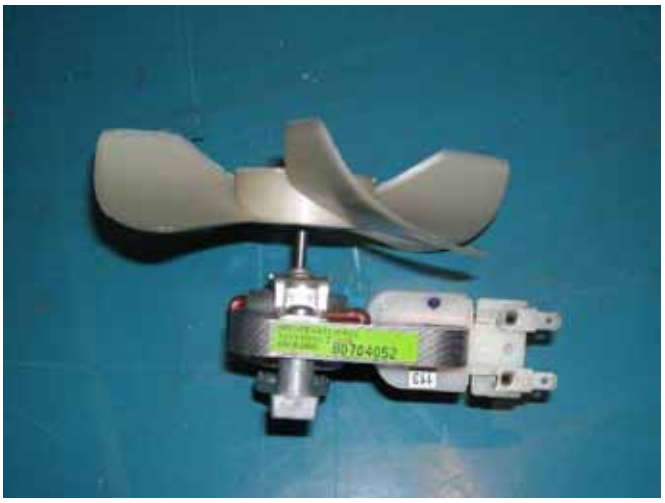

SHARP








SHARP
A351
THAILAND
2M231H(L)
0027J25 77 C
CAUTION
高圧注意




DANGER
HIGH VOLTAGE
DISCHARGE CAPACITOR BEFORE SERVICING
OBJY2
DPC-R
120V 60Hz
DIGITAL POWER COMMUNICATIONS CO., LTD


H.V.CAPACITOR
1900VAC 0.82 μF
50/60Hz
NO PCB'S
RC-QZA328WRZZ
H.V.DANGER
高压注意
C7049