



*Testing Tomorrow's Technology*

**CFR 47 Part 18 Industrial Scientific and Medical Equipment  
Subpart C Technical Standards,  
Part 18.305, Field Strength Limits and Part 18.307, Conducted limits  
Permissive Change Report**

**for the**

**Sharp Corporation**

**Model: R-1514-T Y  
With Model 2M303J(L) Magnetron**

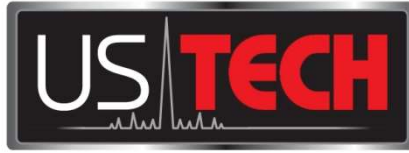
**FCC ID: APYDMR0160**

**Test Date: April 27, 28, May 1, 9, 10, 2017  
Issue Date: June 21, 2017**

**UST Project No: 17-0134**

Total Number of Pages Contained Within this report: 24

**3505 Francis Circle Alpharetta, GA 30004  
PH: 770-740-0717 Fax: 770-740-1508  
[www.ustech-lab.com](http://www.ustech-lab.com)**

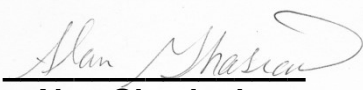


*Testing Tomorrow's Technology*

I certify that I am authorized to sign for the manufacturer and that all of the statements in this report and in the exhibits attached hereto are true and correct to the best of my knowledge and belief:

**US Tech (Agent responsible for test):**

**By:**

  
**Name: Alan Ghasiani**

**Title: President – Consulting Engineer**

**Date: June 21, 2017**



NVLAP LAB CODE 200162-0

This report shall not be reproduced except in full. This report may be copied in part only with the prior written approval of US Tech. The results contained in this report are subject to the adequacy and representative character of the sample provided. US Tech NVLAP accreditation does not allow product endorsement by NVLAP or any agency of the U.S. Government.

**3505 Francis Circle Alpharetta, GA 30004  
PH: 770-740-0717 Fax: 770-740-1508  
[www.ustech-lab.com](http://www.ustech-lab.com)**

## **Table Of Contents**

| <b><u>Title</u></b> | <b><u>Paragraph</u></b>                                       | <b><u>Page</u></b> |
|---------------------|---------------------------------------------------------------|--------------------|
| 1                   | General Information .....                                     | 5                  |
| 1.1                 | Purpose of the Report .....                                   | 5                  |
| 1.2                 | Product Description .....                                     | 5                  |
| 1.3                 | Related Submittal(s)/Grant(s) .....                           | 5                  |
| 1.4                 | Test Methodology .....                                        | 5                  |
| 1.5                 | Test Facility .....                                           | 6                  |
| 1.6                 | Test Equipment .....                                          | 7                  |
| 2                   | System Test Configuration .....                               | 8                  |
| 2.1                 | Characterization of Sample Tested .....                       | 8                  |
| 2.2                 | EUT Exercise Software .....                                   | 8                  |
| 2.3                 | Special Accessories .....                                     | 8                  |
| 2.4                 | Test Rationale .....                                          | 8                  |
| 2.5                 | Tested System Details .....                                   | 8                  |
| 2.6                 | Configuration of Tested System .....                          | 9                  |
| 2.7                 | Equipment Modifications .....                                 | 10                 |
| 2.8                 | Test Results .....                                            | 10                 |
| 2.9                 | Measurement Uncertainty .....                                 | 10                 |
| 3                   | Power Line Conducted Emissions Data (47 CFR 18.307) .....     | 11                 |
| 3.1                 | Test Site Description .....                                   | 11                 |
| 4                   | Radiated Emissions Data (47 CFR 18.301, 18.303, 18.305) ..... | 13                 |
| 4.1                 | Test Site Description .....                                   | 13                 |
| 4.2                 | Test Limits/Calculations .....                                | 15                 |
| 4.2.1               | Part 18 ISM Test Limits .....                                 | 15                 |
| 4.2.2               | General Field Strength Calculation .....                      | 16                 |
| 5                   | Variation in Operating Frequency .....                        | 19                 |
| 5.1                 | Variation in Operating Frequency Over Time .....              | 19                 |
| 5.2                 | Variation in Operating Frequency with Line Voltage .....      | 21                 |
| 6                   | Output Power .....                                            | 24                 |

### **Exhibits (Supplied Separately)**

FCC Application Forms  
Agency Agreement  
Sample Label  
Internal Photos  
Test Configuration Photos

### **List of Tables**

|                                                       |    |
|-------------------------------------------------------|----|
| Table 1. Test Equipment .....                         | 7  |
| Table 2. EUT and Peripherals .....                    | 8  |
| Table 3. Detail of I/O Cables Attached to EUT .....   | 9  |
| Table 4. Power Line Conducted Emissions.....          | 12 |
| Table 5. Radiated Emissions Data 30 MHz to 1 GHz..... | 17 |
| Table 6. Radiated Emissions Data 1 GHz to 25 GHz..... | 18 |
| Table 7. Measured Frequency Variation .....           | 19 |
| Table 8. Measured Supply Voltage Variation .....      | 21 |

### **List of Figures**

|                                                                             |    |
|-----------------------------------------------------------------------------|----|
| Figure 1. Block Diagram of Test Configuration.....                          | 9  |
| Figure 2. Radiated Emissions Disturbance Measurement Facility Diagram ..... | 14 |
| Figure 3. Frequency Variation at Nominal Voltage .....                      | 20 |
| Figure 4. Frequency Variation at Low Voltage .....                          | 22 |
| Figure 5. Frequency Variation at High Voltage.....                          | 23 |

## **1 General Information**

### **1.1 Purpose of the Report**

The purpose of the test report is to file a permissive change request for the Sharp Corporation Model: R-1514-T Y microwave oven with FCC ID: APYDMR0160 for the following reason:

- An alternate magnetron is being certified for use with the product. The alternate magnetron is Sharp model: 2M303J(L).

### **1.2 Product Description**

The Equipment Under Test (EUT) is the Sharp Corporation R-1514-T Y Microwave Oven Drawer Cooking Appliance. The EUT is rated to be 1000 Watts. The input power is rated at 120 VAC, 60Hz.

The EUT was tested at 100% microwave power setting.

### **1.3 Related Submittal(s)/Grant(s)**

The original Grant for this EUT was issued on May 5<sup>th</sup>, 2015 and a subsequent Permissive Change Grant was issued on January 1<sup>st</sup>, 2007.

### **1.4 Test Methodology**

The EUT was configured as shown in the block diagram and photographs herein. The sample was tested per FCC measurement Procedure MP-5, "Methods of Measurement of Radio Noise Emissions from Industrial, Scientific and Medical Equipment" (1986) as well as per CFR 47 part 18. Conducted and radiated emissions data were taken with the Test Receiver or Spectrum Analyzer's resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. At frequencies above 1 GHz, the resolution bandwidth was increased to 1 MHz. The video bandwidth was three times more than resolution bandwidth on the spectrum analyzer. All measurements are peak unless stated otherwise. Interconnecting cables were manipulated as necessary to maximize emissions.

US Tech Test Report:  
Report Number:  
Issue Date:  
Customer:  
FCC ID:  
Model:

FCC Part 18 Subpart C  
17-0134  
September 13, 2016  
Sharp Corporation  
APYDMR0160  
R-1514-T Y

---

## **1.5 Test Facility**

For equipment authorized under a Declaration of Conformity (DoC), the party performing the measurements shall be accredited for performing such measurements by an authorized accreditation body. US Tech currently is Accredited by the NIST NVLAP organization, Lab Code: 200162-0 and FCC Part 18 is in our Scope of Accreditation.

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA. This site has been fully described and registered with the FCC under site registration number 186022. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under IC site number 9900A-1.

## 1.6 Test Equipment

The following table details the test equipment used in the evaluation of this product.

**Table 1. Test Equipment**

| INSTRUMENT           | MODEL NUMBER     | MANUFACTURER      | SERIAL NUMBER       | CALIBRATION DUE DATE |
|----------------------|------------------|-------------------|---------------------|----------------------|
| SPECTRUM ANALYZER    | E4407B           | AGILENT           | US41442935          | 5/11/2017            |
| SPECTRUM ANALYZER    | DSA815           | RIGOL             | DSA8A18030138       | 6/30/2017            |
| PREAMPLIFIER         | 8449B            | HEWLETT-PACKARD   | 3008A00480          | 12/01/2017           |
| PREAMPLIFIER         | 8447D            | HEWLETT-PACKARD   | 1937A02980          | 11/01/2017           |
| BICONICAL ANTENNA    | 3110             | EMCO              | 9307-1431           | 8/25/2017            |
| HORN ANTENNA         | 3115             | EMCO              | 9107-3723           | 9/22/2018<br>2 yr    |
| LOG PERIODIC ANTENNA | 3146             | EMCO              | 9305-3600           | 9/22/2018<br>2 yr    |
| LISN (x2)            | 9028-50-TS24-BNC | SOLAR ELECTRONICS | 910494 &<br>910495  | 11/20/2016           |
| Fluke Data logger    | Hydra Series II  | FLUKE             | 8821014/<br>8822004 | 5/03/2017            |
| CALCULATION PROGRAM  | N/A              | N/A               | N/A                 | N/A                  |

Note: The calibration interval of the above test instruments is 12 months unless stated otherwise and all calibrations are traceable to NIST/USA.

## 2 System Test Configuration

### 2.1 Characterization of Sample Tested

The samples used for test were received on April 18, 2017 in good condition.

### 2.2 EUT Exercise Software

No software was exercised while the EUT was being tested. The EUT was programmed to perform at 100% power level. The test was performed using 1000 ml of tap water in a 150 mm diameter cylindrical glass vessel placed in the center of the oven.

### 2.3 Special Accessories

There were not special accessories required for this product testing.

### 2.4 Test Rationale

The EUT, cable and wiring arrangement, and mode of operation that produced the emissions with the highest levels relative to the applicable limits was selected for final measurements.

The interconnect cable(s) and/or power cord(s) were moved into various positions of the most likely configurations to maximize the emissions. In this case the placement of the cables had negligible effects. The test configuration photographs represent the final configuration used for testing.

### 2.5 Tested System Details

**Table 2. EUT and Peripherals**

| PERIPHERAL<br>MFG.                      | MODEL<br>NUMBER | SERIAL<br>NUMBER      | FCC ID     | CABLES<br>P/D |
|-----------------------------------------|-----------------|-----------------------|------------|---------------|
| Microwave Oven Drawer<br>(EUT)<br>Sharp | R-1514-T Y      | Engineering<br>Sample | APYDMR0160 | N/A           |

U= unshielded S= shielded P= Power D= Data



**Table 3. Detail of I/O Cables Attached to EUT**

| DESCRIPTION OF CABLE | DETAILS OF CABLE             |                    |                   | CABLE LENGTH |
|----------------------|------------------------------|--------------------|-------------------|--------------|
| Power Cable          | Manufacturer and Part Number |                    |                   | 1.5 m        |
|                      | CND                          |                    |                   |              |
|                      | Shield Type                  | Shield Termination | Type of Backshell |              |
|                      | NA                           | NA                 | NA                |              |

**Shield Type**

N/A = None  
 F = Foil  
 B = Braided  
 2B = Double Braided  
 CND = Could Not Determine  
 C = Conduit

**Shield Termination**

N/A = None  
 360 = 360°  
 P = Pigtail/Drain Wire  
 CND = Could Not Determine

**Type of Backshell**

N/A = Not Applicable  
 PS = Plastic Shielded  
 PU = Plastic Unshielded  
 MS = Metal Shielded  
 MU = Metal Unshielded

## 2.6 Configuration of Tested System



**Figure 1. Block Diagram of Test Configuration**

## 2.7 Equipment Modifications

No modifications were made to the EUT in order for it to meet the requirements.

## 2.8 Test Results

Line conducted emissions testing was conducted and compared to 18.307(b) limits. The worst case line conducted emission was 4.5 dB below the limit at 0.1512 MHz on the Phase line. All other conducted emissions were at least 5.1 dB below the limit.

Radiated emissions testing was conducted and compared to 18.305 (a) and (b) limits. The worst case radiated emission in the frequency range 30 MHz to 25 GHz was 10.1 dB below the limit at 5165.00 MHz. All other radiated emissions were at least 11.4 dB below the limit in that range.

## 2.9 Measurement Uncertainty

### Conducted Emissions:

Measurement Uncertainty (within a 95% confidence level) for this test was  $\pm 2.8$  dB.

- ☐ - The data listed in this test report may exceed the test limit because it does not have enough margin (more than 2.8 dB) to meet the measurement uncertainty interval. The EUT conditionally passes this test.
- ☒ - The data listed in this test report has enough margin, more than 2.8, dB to meet the measurement uncertainty interval. The EUT unconditionally passes this test.

### Radiated Emissions:

Measurement Distance of 10 m:

The measurement uncertainty (with a 95% confidence level) for this test using a Biconnical Antenna is  $\pm 5.21$  dB.

The measurement uncertainty (with a 95% confidence level) for this test using a Log Periodic Antenna is  $\pm 4.99$  dB.

Measurement Distance of 3 m:

The measurement uncertainty (with a 95% confidence level) for this test using a double ridge horn antenna is  $\pm 5.08$  dB.

- ☐ - The data listed in this test report may exceed the test limit because it does not have enough margin to meet the measurement uncertainty interval. The EUT conditionally passes this test.
- ☒ - The data listed in this test report has enough margin to meet the measurement uncertainty interval. The EUT unconditionally passes this test.

### **3 Power Line Conducted Emissions Data (47 CFR 18.307)**

#### **3.1 Test Site Description**

The mains terminal interference measurement facility is a shielded room (Lectro Magnetics, Inc., Type LDC6-0812-8-2793) 4.0 m deep x 2.5 m wide x 2.5 m high. Power for the shielded room is filtered (Lectroline, EMX-1020-2, rated 125/250 V, 20 A, 50/60 Hz).

The artificial mains networks are Solar Electronics models 8028. A nonconductive table 1.5 m deep x 1.0 m wide x 0.8 m high is used for tabletop equipment. All grounded conducting surfaces including the case or cases of one or more artificial mains networks is at least 0.8 m from any surface of the EUT. The EUT is a floor standing unit; therefore the unit was placed on the floor 50cm away from all vertical coupling surfaces.

US Tech Test Report:  
 Report Number:  
 Issue Date:  
 Customer:  
 FCC ID:  
 Model:

FCC Part 18 Subpart C  
 17-0134  
 September 13, 2016  
 Sharp Corporation  
 APYDMR0160  
 R-1514-T Y

**Table 4. Power Line Conducted Emissions**

| Conducted Emissions 120 VAC |                       |                |                     |                           |             |               |
|-----------------------------|-----------------------|----------------|---------------------|---------------------------|-------------|---------------|
| Tested By:                  | Test: Part 18.307 DoC |                |                     | Client: Sharp Corporation |             |               |
| RKM                         | Project: 17-0134      |                | Class: B            | Model: R-1514-T Y         |             |               |
| Frequency (MHz)             | Test Data (dBuV)      | AF+CA-AMP (dB) | Peak Results (dBuV) | Average Limits (dBuV)     | Margin (dB) | Detector Used |
| PHASE                       |                       |                |                     |                           |             |               |
| 0.1547                      | 52.80                 | 0.41           | 53.21               | *65.7                     | 12.5        | PK            |
| 0.1547                      | 27.85                 | 0.41           | 28.26               | 55.7                      | 27.5        | AVG           |
| 0.5192                      | 42.24                 | 0.19           | 42.43               | *56.0                     | 13.6        | PK            |
| 0.5192                      | 24.92                 | 0.19           | 25.11               | 46.0                      | 20.9        | AVG           |
| 1.2266                      | 42.40                 | 0.16           | 42.56               | *56.0                     | 13.4        | PK            |
| 1.2266                      | 28.11                 | 0.16           | 28.27               | 46.0                      | 17.7        | AVG           |
| 8.3083                      | 48.67                 | 0.58           | 49.25               | *60.0                     | 10.7        | PK            |
| 8.3083                      | 31.59                 | 0.58           | 32.17               | 50.0                      | 17.8        | AVG           |
| 14.2833                     | 36.72                 | 0.50           | 37.22               | 50.0                      | 12.8        | PK            |
| 26.5833                     | 47.16                 | 0.86           | 48.02               | *60.0                     | 12.0        | PK            |
| 28.5833                     | 30.89                 | 0.92           | 31.81               | 50.0                      | 18.2        | AVG           |
| NEUTRAL                     |                       |                |                     |                           |             |               |
| 0.1693                      | 56.43                 | 0.33           | 56.76               | *65.0                     | 8.2         | PK            |
| 0.1693                      | 31.93                 | 0.33           | 32.26               | 55.0                      | 22.7        | AVG           |
| 0.7242                      | 35.27                 | 0.15           | 35.42               | 46.0                      | 10.6        | PK            |
| 1.9333                      | 50.64                 | 0.14           | 50.78               | *56.0                     | 5.2         | PK            |
| 1.9333                      | 27.23                 | 0.14           | 27.37               | 46.0                      | 18.6        | AVG           |
| 9.3667                      | 37.17                 | 0.59           | 37.76               | 50.0                      | 12.2        | PK            |
| 19.4500                     | 55.39                 | 0.59           | 55.98               | *60.0                     | 4.0         | PK            |
| 19.4500                     | 31.17                 | 0.59           | 31.76               | 50.0                      | 18.2        | AVG           |
| 20.4167                     | 54.26                 | 0.67           | 54.93               | *60.0                     | 5.1         | PK            |
| 20.4167                     | 31.98                 | 0.67           | 32.65               | 50.0                      | 17.3        | AVG           |

“\*” denotes Quasi-peak limit used.

Sample Calculations: at 0.1547 MHz: 52.80 dBuV + 0.41 dB = 53.21 dBuV

Test Date: May 1, 2017

Tested By  
 Signature: 

Name: Robert K. Mills

## **4 Radiated Emissions Data (47 CFR 18.301, 18.303, 18.305)**

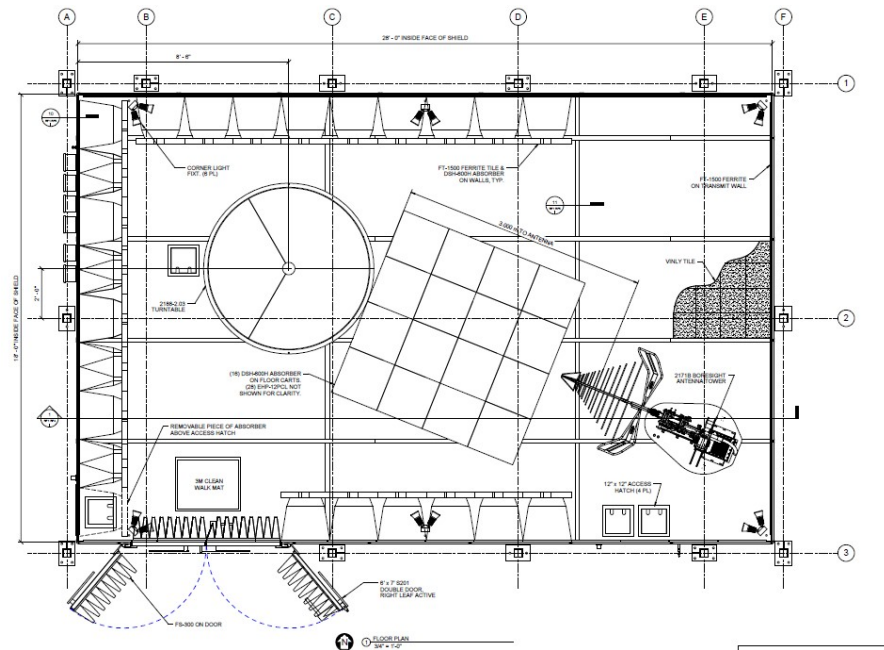
### **4.1 Test Site Description**

The radiated emissions disturbance measurement facility consists of a 8.5m meters long by 5.5 meter wide and 5.6 meter high shielded semi anechoic EMC Chamber. The chamber is lined with ferrite core and RF absorbers. The quiet zone is 2.0 meters.

The test facility layout is shown in the figure below. A remotely controlled 2.0 m diameter flush-mounted turntable is provided for rotating (through at least 360 degrees) the EUT. A nonconductive table, 1.5 m long by 1.0 m wide by 0.8 m high is used in conjunction with the turntable for tabletop equipment. Electrical service for the EUT is provided through openings at the center of the turntable.

Provision for receiving antenna power and data wires is provided by junction boxes place at the parameter of the chamber. The receive antenna mast is remotely controlled and can be varied in height from 1 m to 4 m.

Power and data cables for the radiated disturbance measurement facility are run through PVC tubing under the raised floor or are laid directly upon the ground plane.



## 4.2 Test Limits/Calculations

### 4.2.1 Part 18 ISM Test Limits

Per 47 CFR 18.301 the ISM equipment may be operated on any frequency above 9 kHz except as indicated in 47 CFR 18.303. The field strength limit per 47 CFR 18.305 for ISM equipment operating on a frequency specified in 47 CFR 18.301 is permitted unlimited radiated energy in the band specified for that frequency. The field strength levels of emissions which lie outside the bands specified in 47 CFR 18.301 must not exceed the limits detailed in CFR 18.305, unless otherwise indicated.

Per the table in 18.301, the frequency 2450 MHz  $\pm$ 50MHz is allowed unlimited radiated energy. The EUT fundamental frequency is stated to be 2450 MHz.

The field strength levels of emissions which lie outside the bands specified in 18.301, unless otherwise indicated, shall not exceed the following:

Any type of equipment unless otherwise specified that operate above 500 watts: 25  $\mu$ V/m X SQRT (power/500) at the distance of 300m.

Therefore the limit converted to dBuV/m is:  $20 \log [(25) * \sqrt{(EUT \text{ power}/500)}] = \text{dBuV/m} + 20 \log(300/\text{test distance used}) = \text{XX.X dBuV/m}$

The measured EUT power P, is 1000 Watts as rated and tested by the manufacturer. This value was used in the calculation of the limit for this test.

Limit at 10 meters is  $20 \log [(25) * \sqrt{(1000/500)}] = 30.96 + 20 \log(300/10) = 60.5 \text{ dBuV/m}$ .

Limit at 3 meters is  $20 \log [(25) * \sqrt{(1000/500)}] = 30.96 + 20 \log(300/3) = 70.9 \text{ dBuV/m}$ .

Radiated emissions were evaluated based on 47 CFR 18.309.

#### 4.2.2 General Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + CF - AG$$

where

- FS = Field Strength
- RA = Receiver Amplitude (dBuV)
- CF = Correction Factor (Antenna Factor & Cable Loss) (dB/m)
- AG = Amplifier Gain

Assuming a receiver reading of 100 dBuV and a correction factor of 11.8 dB/m, the following calculation would apply:

$$FS \text{ (dBuV/m)} = 100 \text{ dBuV} + 11.8 \text{ dB/m} = 111.8 \text{ dBuV/m}$$



US Tech Test Report:  
 Report Number:  
 Issue Date:  
 Customer:  
 FCC ID:  
 Model:

FCC Part 18 Subpart C  
 17-0134  
 September 13, 2016  
 Sharp Corporation  
 APYDMR0160  
 R-1514-T Y

**Table 5. Radiated Emissions Data 30 MHz to 1 GHz**

| Radiated Emissions                                                                                                               |                     |                                |                     |                               |                                                  |                |                  |
|----------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------------------|---------------------|-------------------------------|--------------------------------------------------|----------------|------------------|
| Test By:<br>RKM                                                                                                                  | Test: Radiated      | Client: Sharp Corporation      |                     |                               |                                                  |                |                  |
|                                                                                                                                  | Project:<br>17-0134 | Limits Based on:<br>FCC 18.305 | Model: R-1514-T Y   |                               |                                                  |                |                  |
| Frequency<br>(MHz)                                                                                                               | Test Data<br>(dBuV) | AF+CA-AMP<br>(dB/m)            | Results<br>(dBuV/m) | Average<br>Limits<br>(dBuV/m) | Application<br>Test<br>Distance/<br>Polarization | Margin<br>(dB) | Detector<br>Used |
| 64.51                                                                                                                            | 33.26               | -17.05                         | 16.21               | 70.9                          | 3m./HORZ                                         | 54.7           | PK               |
| 141.76                                                                                                                           | 30.26               | -13.97                         | 16.29               | 70.9                          | 3m./HORZ                                         | 54.6           | PK               |
| 77.42                                                                                                                            | 48.52               | -18.26                         | 30.26               | 70.9                          | 3m./VERT                                         | 40.6           | PK               |
| 88.00                                                                                                                            | 32.73               | -17.28                         | 15.45               | 70.9                          | 3m./VERT                                         | 55.4           | PK               |
| 212.24                                                                                                                           | 28.80               | -14.34                         | 14.46               | 70.9                          | 3m./HORZ                                         | 56.4           | PK               |
| 303.84                                                                                                                           | 29.66               | -10.45                         | 19.21               | 70.9                          | 3m./HORZ                                         | 51.7           | PK               |
| 615.00                                                                                                                           | 43.48               | -4.51                          | 38.97               | 70.9                          | 3m./HORZ                                         | 31.9           | PK               |
| 967.10                                                                                                                           | 28.08               | 0.94                           | 29.02               | 70.9                          | 3m./HORZ                                         | 41.9           | PK               |
| 206.28                                                                                                                           | 28.77               | -14.32                         | 14.45               | 70.9                          | 3m./VERT                                         | 56.5           | PK               |
| 230.64                                                                                                                           | 33.67               | -14.25                         | 19.42               | 70.9                          | 3m./VERT                                         | 51.5           | PK               |
| 615.00                                                                                                                           | 48.86               | -4.61                          | 44.25               | 70.9                          | 3m./VERT                                         | 26.6           | PK               |
| 982.50                                                                                                                           | 29.35               | 0.31                           | 29.66               | 70.9                          | 3m./VERT                                         | 41.2           | PK               |
| Measurements were made over the frequency range of 30 MHz – 1000 MHz<br>All other emissions were more than 20 dB from the limit. |                     |                                |                     |                               |                                                  |                |                  |

Sample Calculations: at 64.51 MHz (33.26 dBuV + (-17.05) dB/m) = 16.21 dBuV/m

Test Date: April 27 & 28, 2017

Tested By  
 Signature: 

Name: Robert K. Mills

US Tech Test Report:  
 Report Number:  
 Issue Date:  
 Customer:  
 FCC ID:  
 Model:

FCC Part 18 Subpart C  
 17-0134  
 September 13, 2016  
 Sharp Corporation  
 APYDMR0160  
 R-1514-T Y

**Table 6. Radiated Emissions Data 1 GHz to 25 GHz**

| Radiated Emissions                                                                                                              |                     |                      |                               |                     |                               |                                                  |                |                  |
|---------------------------------------------------------------------------------------------------------------------------------|---------------------|----------------------|-------------------------------|---------------------|-------------------------------|--------------------------------------------------|----------------|------------------|
| Test By:<br>RKM                                                                                                                 | Test: Radiated      |                      | Client: Sharp Corporation     |                     |                               |                                                  |                |                  |
|                                                                                                                                 | Project:<br>17-0134 |                      | Limits Based on:<br>FCC18.305 | Model: R-1514-T Y   |                               |                                                  |                |                  |
| Frequency<br>(MHz)                                                                                                              | Test Data<br>(dBuV) | Additional<br>Factor | AF+CA-AMP<br>(dB/m)           | Results<br>(dBuV/m) | Average<br>Limits<br>(dBuV/m) | Application<br>Test<br>Distance/<br>Polarization | Margin<br>(dB) | Detector<br>Used |
| 4290.00                                                                                                                         | 58.17               | 0.00                 | 2.73                          | 60.90               | 70.9                          | 3.0m./HORZ                                       | 10.0           | <b>PK</b>        |
| 8640.00                                                                                                                         | 56.92               | -9.50                | 16.02                         | 63.44               | 70.9                          | 1.0m./VERT                                       | 7.5            | <b>PK</b>        |
| 4830.00                                                                                                                         | 39.53               | 0.00                 | 3.50                          | 43.03               | 70.9                          | 3.0m./VERT                                       | 27.9           | <b>AVG</b>       |
| 12330.00                                                                                                                        | 39.42               | -9.50                | 20.45                         | 50.37               | 70.9                          | 1.0m./VERT                                       | 20.5           | <b>AVG</b>       |
| Measurements were made over the frequency range of 1 GHz to 25 GHz.<br>All other emissions were more than 20 dB from the limit. |                     |                      |                               |                     |                               |                                                  |                |                  |

Note: For measurements made at test distance of 1 meter an extrapolation factor of -9.5 dB was applied to correct the data for a 3 meter test distance.

Sample Calculations: at 4290.00 MHz (58.17 dBuV +(0.00)dB+ (2.73) dB/m) = 60.90 dBuV/m

Test Date: April 27 & 28, 2017

Tested By  
 Signature: 

Name: Robert K. Mills

## 5 Variation in Operating Frequency

Frequency variation testing was performed per MP-5 section 4.5. The EUT was set up inside the EMC Chamber, and a double ridge horn antenna and spectrum analyzer were used to measure the fundamental frequency of the EUT. The test results are presented below.

### 5.1 Variation in Operating Frequency Over Time

The operating frequency was measured using a spectrum analyzer. Starting with the EUT at room temperature, a 1000 mL 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 over the length of time taken for the water level to reduce to 20 percent of the original level. In this case it took 24mins for the water level to reach 20% or 800 ml.

During the test the fundamental frequency of the EUT must remain within the ISM frequency band of 2450 MHz  $\pm$ 50 MHz, 2400 MHz to 2500 MHz. The results of this test are presented below.

**Table 7. Measured Frequency Variation**

| Low Frequency (MHz) | High Frequency (MHz) |
|---------------------|----------------------|
| 2400.00             | 2468.20              |

Test Date: April 28, 2017

Tested By  
Signature: 

Name: Robert K. Mills

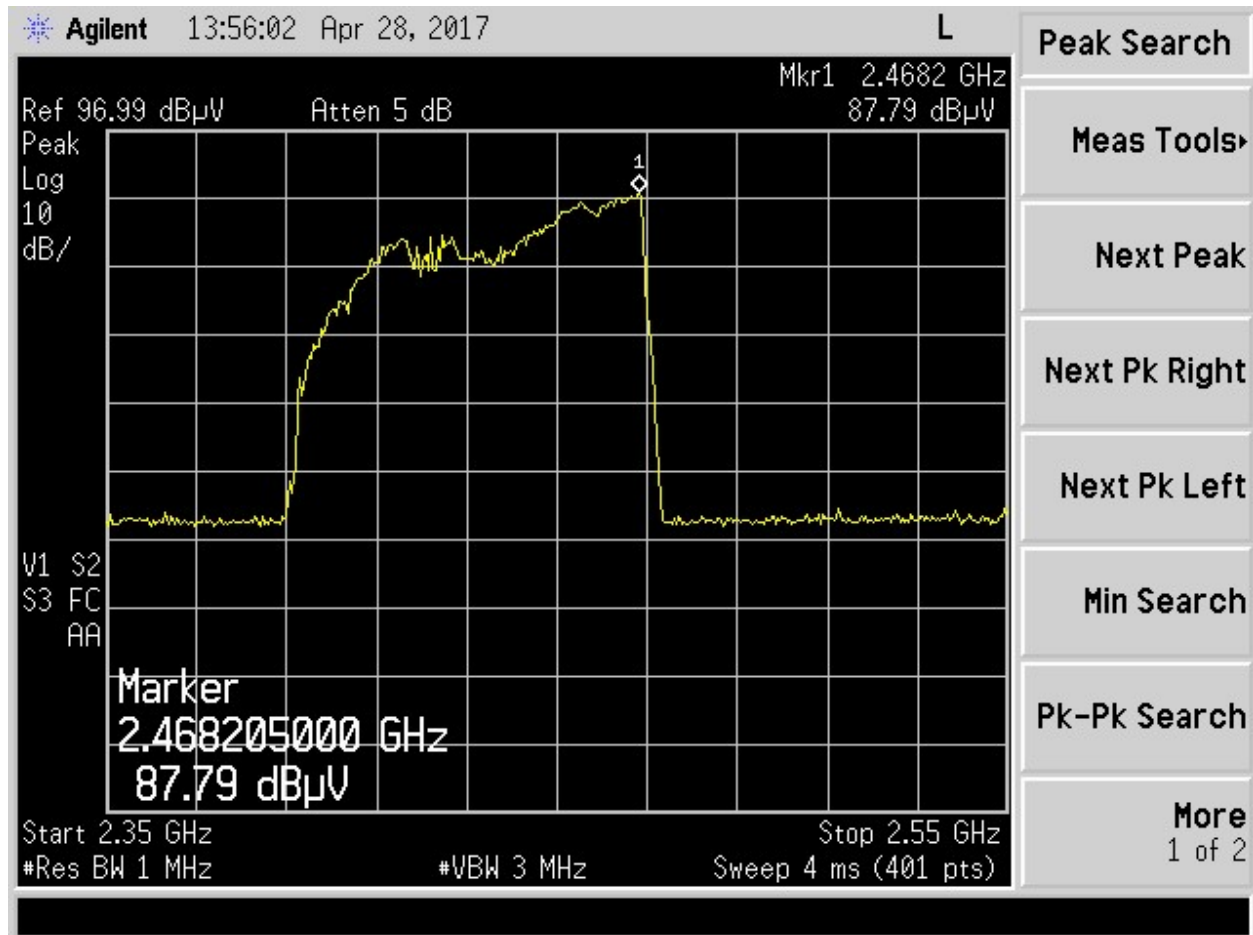


Figure 3. Frequency Variation at Nominal Voltage

## 5.2 Variation in Operating Frequency with Line Voltage

The EUT was operated/warmed up for 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. At each varied voltage level, the EUT was allowed to operate for at least 5 minutes.

During the test, the fundamental frequency of the EUT must remain within the ISM frequency band of 2450 MHz  $\pm$ 50 MHz, or 2400 - 2500 MHz. The results of this test are presented below.

Line voltage varied from 96 VAC to 150 VAC.

**Table 8. Measured Supply Voltage Variation**

| %    | Supply Voltage (V) at 60 Hz | Measured Frequency (MHz) |                |
|------|-----------------------------|--------------------------|----------------|
|      |                             | Low Frequency            | High Frequency |
| 80%  | 96                          | 2400.00                  | 2481.70        |
| 125% | 150                         | 2400.00                  | 2466.08        |

Test Date: April 28, 2017

Tested By  
Signature: 

Name: Robert K. Mills

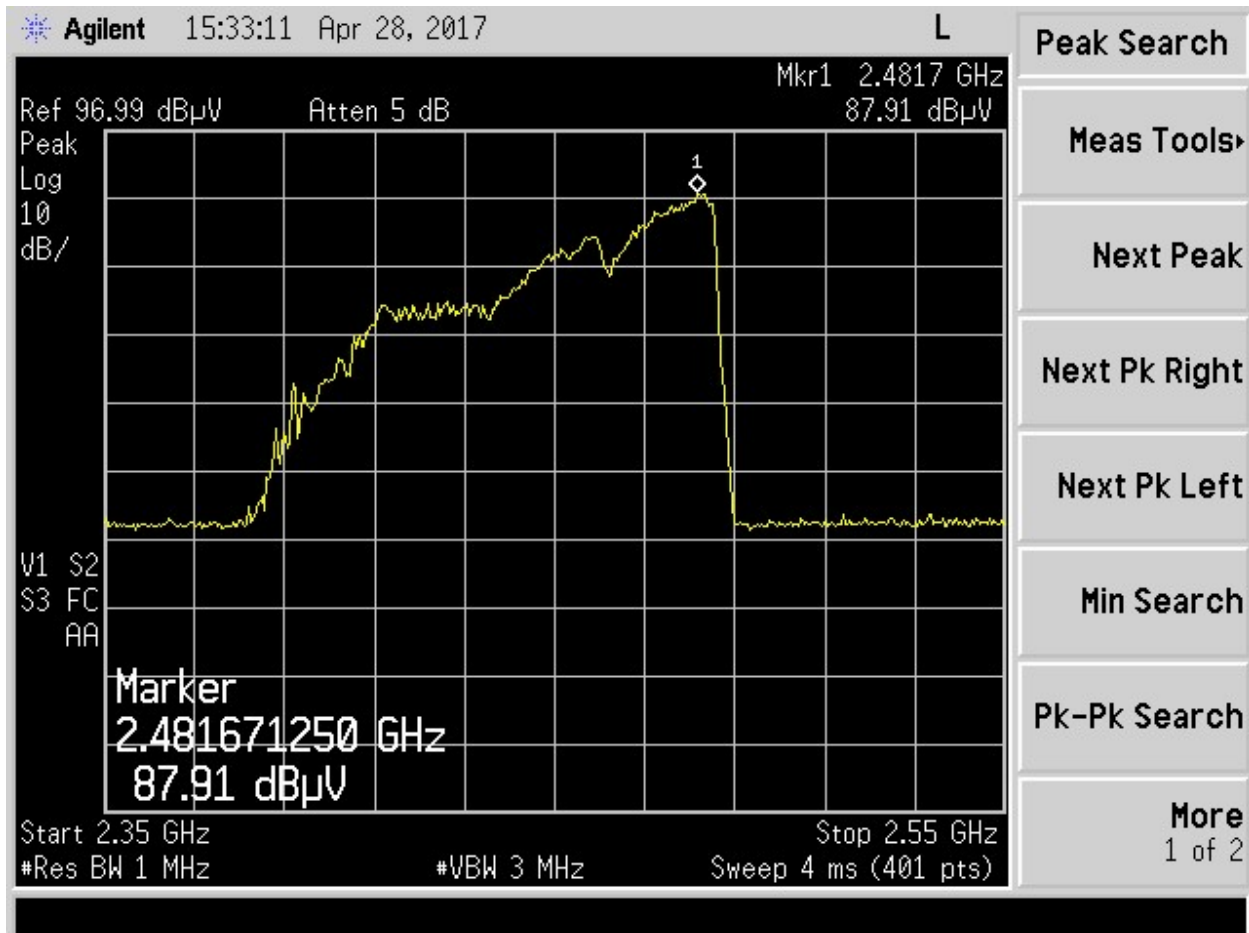


Figure 4. Frequency Variation at Low Voltage

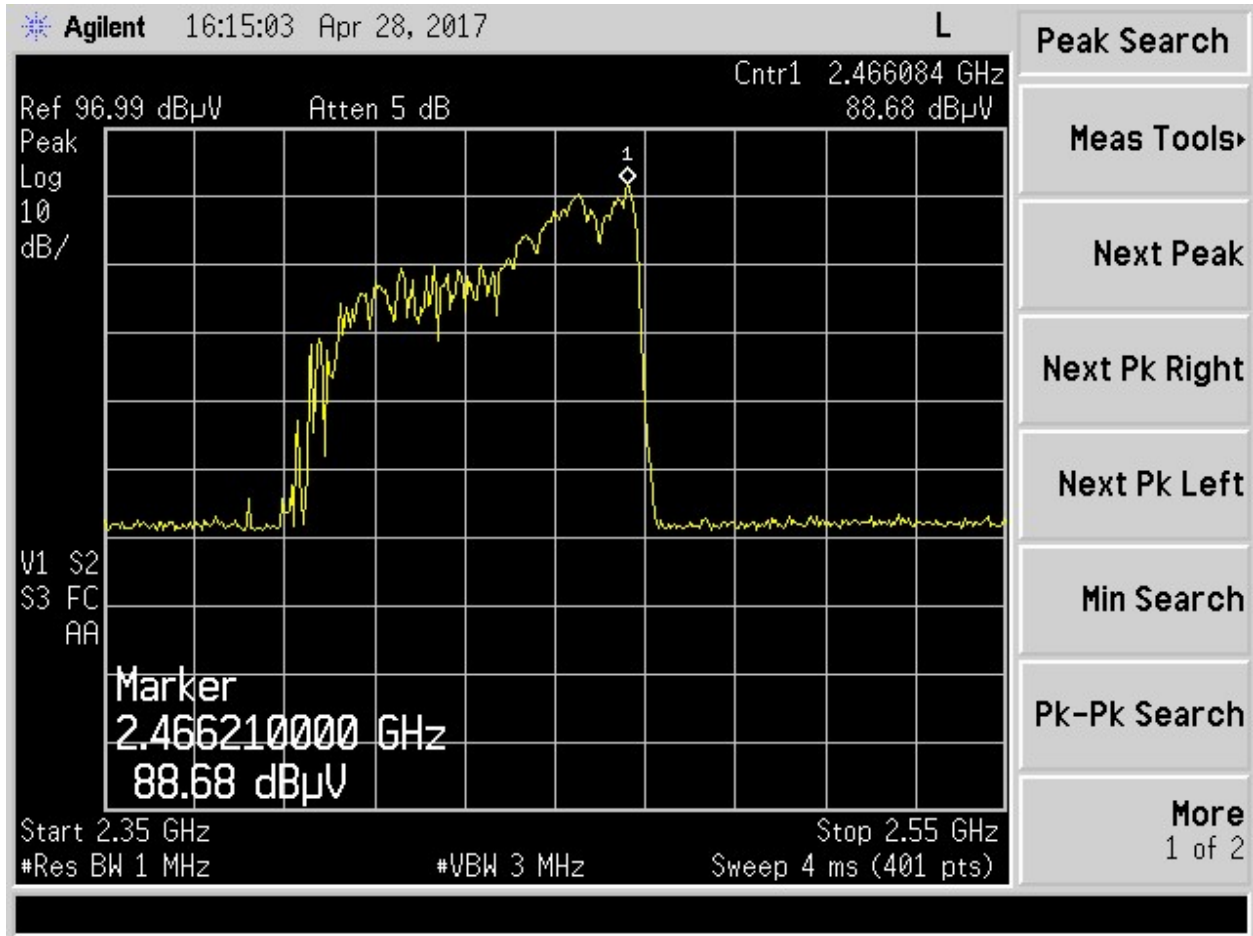


Figure 5. Frequency Variation at High Voltage

## 6 Output Power

The Caloric Method was used to determine maximum output power. The initial temperature of a 1000 ml water load was measured for ovens rated at 1000 watts or less power output. For ovens more than 1000 watts output rating, additional beakers by fraction thereof are used if necessary.

The water load was placed in the center of the oven. The oven was operated at maximum output power for 120 seconds, then the temperature of the water was re-measured.

Three trials were performed and then the results calculated using the following formula:  
Output Power=((4.2 Joules/Cal)\*(Volumn in ml)\*(Temp Rise))/(Time in seconds)

**Table 9. Output Power Results**

| Start Temperature (°C) | Final Temperature (°C) | Temperature Rise | Elapsed Time (seconds) | Water Volume (ml) | RF Power (Watts) |
|------------------------|------------------------|------------------|------------------------|-------------------|------------------|
| 28.6                   | 58.5                   | 29.9             | 120.0                  | 1000.00           | 1046.50          |
| 29.1                   | 56.4                   | 27.3             | 120.0                  | 1000.00           | 955.50           |
| 30.4                   | 56.0                   | 25.6             | 120.0                  | 1000.00           | 896.00           |

Average from the three trials: 966.00 Watts

Test Date: May 9, 2017

Tested By  
Signature: 

Name: George Yang