FCC TEST REPORT

For

Smart Microwave Oven

Model Number: DW221

FCC ID: 2BB9RDW221

Report Number : WT238001349

Test Laboratory	:	Shenzhen Academy of Metrology and Quality Inspection
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Revision History

No	Date	Remark
V1.0	2023.08.09	Initial issue

TEST REPORT DECLARATION

Applicant	:	Shenzhen Shuying Technology Co., Ltd
Address	:	Room 01, 13th Floor, No. 9988 Shennan District, Shenzhen, China
Manufacturer	:	Shenzhen Shuying Technology Co., Ltd
Address	:	Room 01, 13th Floor, No. 9988 Shennan District, Shenzhen, China
EUT Description	:	Smart Microwave Oven
Model No.	:	DW221
Trade mark	:	WANDECHU 万得厨
Serial Number	:	/
FCC ID	:	2BB9RDW221

Test Standards:

FCC Part 18

The EUT described above is tested by Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory to determine the maximum emissions from the EUT. Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory is assumed full responsibility for the accuracy of the test results.

The test report is valid for above tested sample only and shall not be reproduced in part without written approval of the laboratory.

Project Engineer:	(Zhou Fangai 周芳媛)	Date:	Aug.09, 2023
Checked by:	(Wan Xiaojing 万晓婧)	Date:	Aug.09, 2023
Approved by:	(Lin Yixiang 林奕翔)	Date:	Aug.09, 2023

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1. TEST RESULTS SUMMARY

Table 1 Test Results Summary

Test Items	FCC Rules	Test Results
Radiation Hazard	FCC PART 18, FCC/OST MP-5, FCC OET Bulletin 56	Pass
Output Power	FCC PART 18, FCC/OST MP-5	Pass
Operating frequencies	18.301, 18.303	Pass
Conducted Emission	18.307	Pass
Radiation Emission	18.305	Pass

Remark: “N/A” means “Not applicable.”

2. GENERAL INFORMATION

2.1. Report information

This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that SMQ approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that SMQ in any way guarantees the later performance of the product/equipment.

The sample/s mentioned in this report is/are supplied by Applicant, SMQ therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.

Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through SMQ, unless the applicant has authorized SMQ in writing to do so.

The lab will not be liable for any loss or damage resulting for false, inaccurate, inappropriate or incomplete product information provided by the applicant/manufacturer.

2.2. Laboratory Accreditation and Relationship to Customer

The testing report were performed by the Shenzhen Academy of Metrology and quality Inspection EMC Laboratory (Guangdong EMC compliance testing center), in their facilities located at NETC Building, No.4 Tongfa Rd., Xili, Nanshan, Shenzhen, China. At the time of testing, Laboratory is accredited by the following organizations:

China National Accreditation Service for Conformity Assessment (CNAS) accredits the Laboratory for conformance to FCC standards, EMC international standards and EN standards. The Registration Number is CNAS L0579.

The Laboratory is Accredited Testing Laboratory of FCC with Designation number CN1165 and Site registration number 582918.

The Laboratory is registered to perform emission tests with Innovation, Science and Economic Development (ISED), and the registration number is 11177A.

The Laboratory is registered to perform emission tests with VCCI, and the registration number are C-20048, G20076, R-20077, R-20078 and T-20047.

The Laboratory is Accredited Testing Laboratory of American Association for Laboratory Accreditation (A2LA) and certificate number is 3292.01.

2.3. Measurement Uncertainty

Conducted Emission

9 kHz~150 kHz *U*=3.7dB k=2
150 kHz~30MHz *U*=3.3dB k=2

Radiated Emission
30MHz~1000MHz *U*=4.3dB k=2
1GHz~6GHz *U*=4.6 dB k=2
6GHz~40GHz *U*=5.1dB k=2

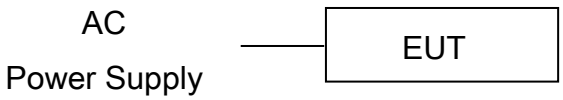
3. PRODUCT DESCRIPTION

3.1. EUT Description

Description	:	Smart Microwave Oven
Manufacturer	:	Shenzhen Shuying Technology Co., Ltd
Model Number	:	DW221
Operating voltage*	:	Limit voltage: 90-132Vac Normal voltage: 100-120Vac
Test voltage	:	120Vac/60Hz
Software Version*	:	1.3.6
Hardware Version*	:	1.0
Operating frequency*	:	2450MHz
Rated input power *	:	1580W
Microwave output power*	:	1000W

Remark: * Declared by the applicant.

3.2. Block Diagram of EUT Configuration



Test mode 1

3.3. Operating Condition of EUT

Test mode 1: Microwave oven operating

EUT has more than one typical operation, only the worst test mode will be recorded in this report.

The Radiated emission measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT is rotated on three test planes to find out the worst emission (X plane).

3.4. Support Equipment List

Table 2 Support Equipment List

Name	Model No.	S/N	Manufacturer
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3.5. Test Conditions

Date of test：Jul.20, 2023- Aug.08, 2023
Date of EUT Receive：Oct.25, 2022
Temperature: 20℃-25℃
Relative Humidity: 47%-58%

3.6. Modifications

No modification was made.

4. TEST EQUIPMENT USED

Table 3 Test Equipment List

No.	Equipment	Manufacturer	Model No.	LAST CALIB	Period
SB9058/05	Test Receiver	R&S	ESCI 3	Sep.13,2022	1 Year
SB4357	AMN	R&S	ENN216	Aug.23,2022	1 Year
SB9549	Shielded Room	Albatross	SR	Sep.06,2022	1 Year
SB15044/01	Test Receiver	R&S	ESW8	Sep.13,2022	1 Year
SB18856	Broadband Antenna	SCHWARZBECK	VULB9163	Sep.07,2022	1 Year
SB9422/16	Horn Antenna	R&S	HF907	Mar.16,2023	1 Year
SB20321/02	Spectrum Analyzer	R&S	FSW43	Jan.12,2023	1 Year
SB8501/11	Antenna	R&S	3160-09	Feb.22,2023	3 Years
SB8501/12	Antenna	R&S	3160-10	Feb.22,2023	3 Years
SB8501/16	Pre-Amplifier	R&S	SCU-26	Jan.19,2023	1 Year
SB9059	Pre-Amplifier	R&S	SCU-40	Aug.23,2022	1 Year
SB18844	Semi Anechoic Chamber	Albatross	9×6×6(m)	Mar.20,2023	1 Year
SB9058/04	Magnet Field Probe	Hioki	3470	Jan.03,2023	1 Year

5. RADIATION HAZARD TEST

5.1. Test Standard and Limit

5.1.1. Test Standard

FCC PART 18
FCC/OST MP-5
FCC OET Bulletin 56

5.1.2. Test Limit

A maximum of 1.0 mW/cm^2 is allowed in according with the applicable FCC standards.

5.2. Test Procedure

A 700mL water load was placed in the center of the oven.
The power setting was set to maximum power.
While the oven was operating, the microwave meter was moved slowly around the door seams to check for leakage.

5.3. Test Data

Table 4 Radiated hazard test data

Maximum power density	Limit	Result
0.221 mW/cm^2	1.0 mW/cm^2	Pass

6. OUTPUT POWER

6.1. Test Standard

FCC PART 18
FCC/OST MP-5

6.2. Test Procedure

The Caloric Method was used to determine maximum output power.
The initial temperature of a 1 000 ml water load was measured. The water load was placed in the center of the oven. The oven was operated at maximum output power. Measure the temperature of the water.

6.3. Test Data

Table 5 Output Power test data

Mass of water (g)	Mass of beaker (g)	Ambient temperature (℃)	Initial temperature (℃)	Final temperature (℃)	Heating time (s)	Output Power (W)
1000	1050	21.8	11	20.8	40	1005.375

Formula:

$$P= \frac{4.187\times m_w\times(T_1-T_0)+0.55\times m_c\times(T_1-T_A)}{t}$$

Where

P is the calculated microwave power output, expressed in watts (W);
m_w is the mass of the water (g);
m_c is the mass of the container (g);
T_A is the ambient temperature (℃)
T_0 is the initial temperature of the water (℃);
T_1 is the final temperature of the water (℃);
t is the heating time，in seconds，excluding the magnetron filament heating-up time. It starts counting from the moment the appliance reaches 90 % of the nominal input power.

7. FREQUENCY MEASUREMENTS

7.1. Test Standard and Limit

7.1.1.Test Standard

FCC Part 18: Section 18.301, 18.303

7.1.2.Test Limit

Table 6 Operating frequencies Test Limit

ISM Frequency	Tolerance
2,450 MHz	±50.0 MHz

7.2. Test Procedure

After operating the oven long enough to assure that stable operating temperature were obtained, the operating frequency was monitored as the input voltage was varied between 80 percent to 125 percent of the nominal rating. And the load quantity was reduced by evaporation to approximately 20 % of the original quantity with nominal rating.

7.3. Test Data

Frequency vs Line Voltage Variation Test

Line Voltage Variation (a.c. V)	Polarity (Horizontal/Vertical)	Frequency (MHz)	Allowed Tolerance for the ISM Band	Result
96 (80 %)	Horizontal	Lower: 2420.240	Lower: 2400 MHz Upper: 2500 MHz	PASS
	Horizontal	Upper: 2499.242		
	Vertical	Lower: 2424.725		
	Vertical	Upper: 2488.307		
108 (90 %)	Horizontal	Lower: 2402.327		
	Horizontal	Upper: 2475.167		
	Vertical	Lower: 2403.464		
	Vertical	Upper: 2487.377		
120 (100 %)	Horizontal	Lower: 2413.721		
	Horizontal	Upper: 2476.535		
	Vertical	Lower: 2414.231		
	Vertical	Upper: 2476.532		
132 (110 %)	Horizontal	Lower: 2418.533		
	Horizontal	Upper: 2479.784		
	Vertical	Lower: 2414.759		
	Vertical	Upper: 2469.389		
150 (125 %)	Horizontal	Lower: 2420.591		
	Horizontal	Upper: 2490.911		
	Vertical	Lower: 2417.732		
	Vertical	Upper: 2481.611		

NOTE:1. Initial load:1 000 ml of water in the beaker.

2.Line voltage varied from 80 % to 125 %.

Frequency vs Load Variation Test

Volume of water (ml)	Polarity (Horizontal/Vertical)	Frequency (MHz)	Allowed Tolerance for the ISM Band	Result
200	Horizontal	Lower: 2420.756	Lower: 2400 MHz Upper: 2500 MHz	PASS
	Horizontal	Upper: 2485.499		
	Vertical	Lower: 2416.310		
	Vertical	Upper: 2485.088		
400	Horizontal	Lower: 2419.406		
	Horizontal	Upper: 2483.924		
	Vertical	Lower: 2419.325		
	Vertical	Upper: 2489.936		
600	Horizontal	Lower: 2414.315		
	Horizontal	Upper: 2490.704		
	Vertical	Lower: 2413.040		
	Vertical	Upper: 2496.530		
800	Horizontal	Lower: 2419.460		
	Horizontal	Upper: 2478.830		
	Vertical	Lower: 2415.530		
	Vertical	Upper: 2495.951		
1000	Horizontal	Lower: 2419.760		
	Horizontal	Upper: 2486.906		
	Vertical	Lower: 2415.788		
	Vertical	Upper: 2480.138		

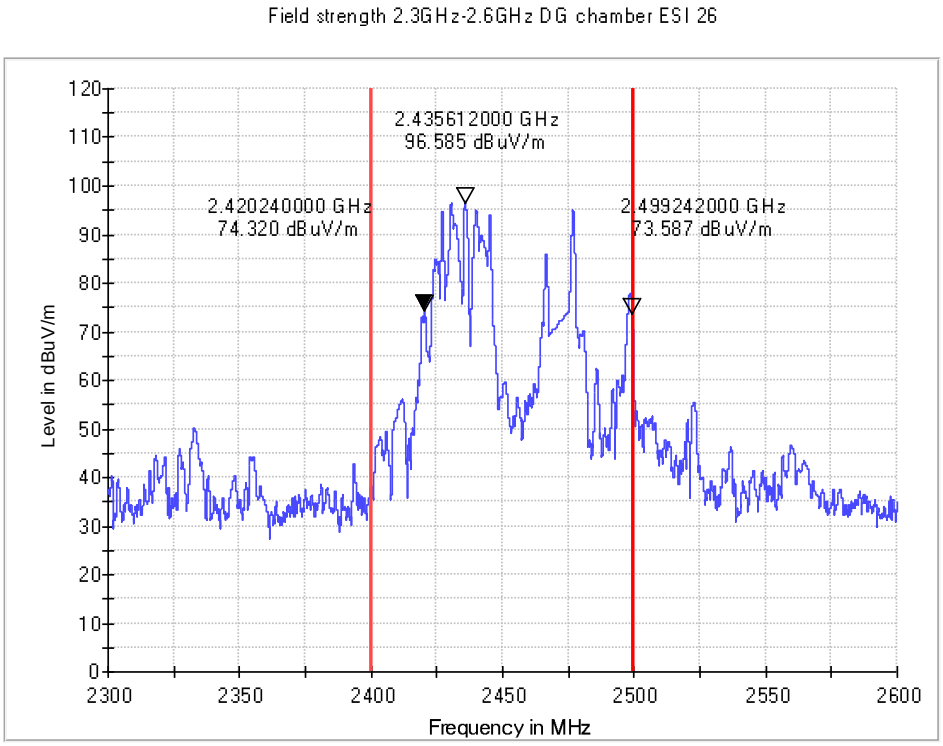
NOTE:1. The water load was varied between 200 ml to 1 000 ml.

2. Frequency was measured by using nominal voltage (a.c.120V).

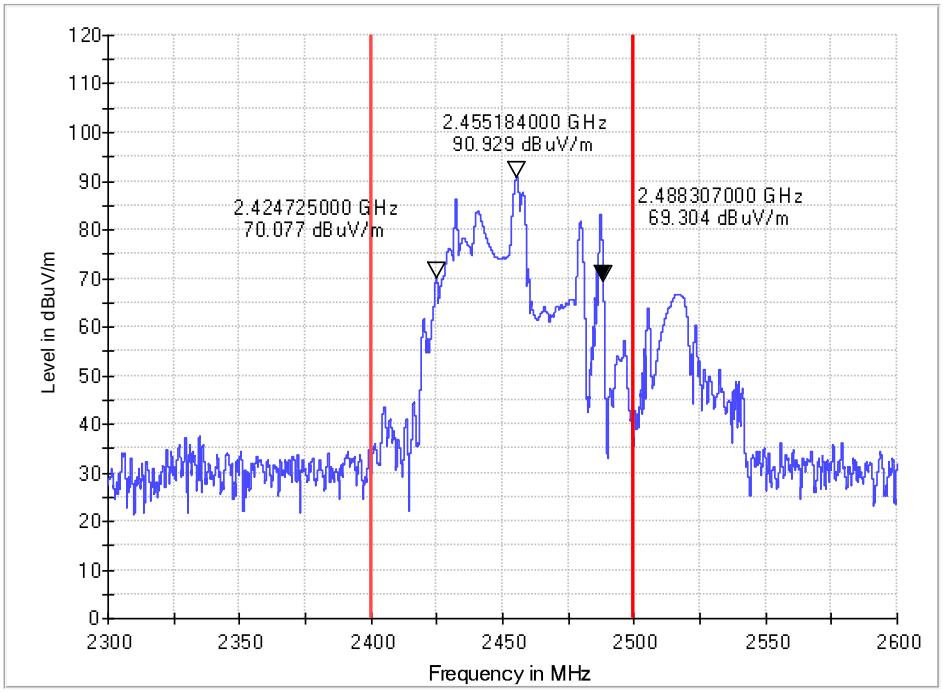
Frequency vs Line Voltage Variation Test

Operation frequency with 96 VAC and 1000 ml load:

Horizontal

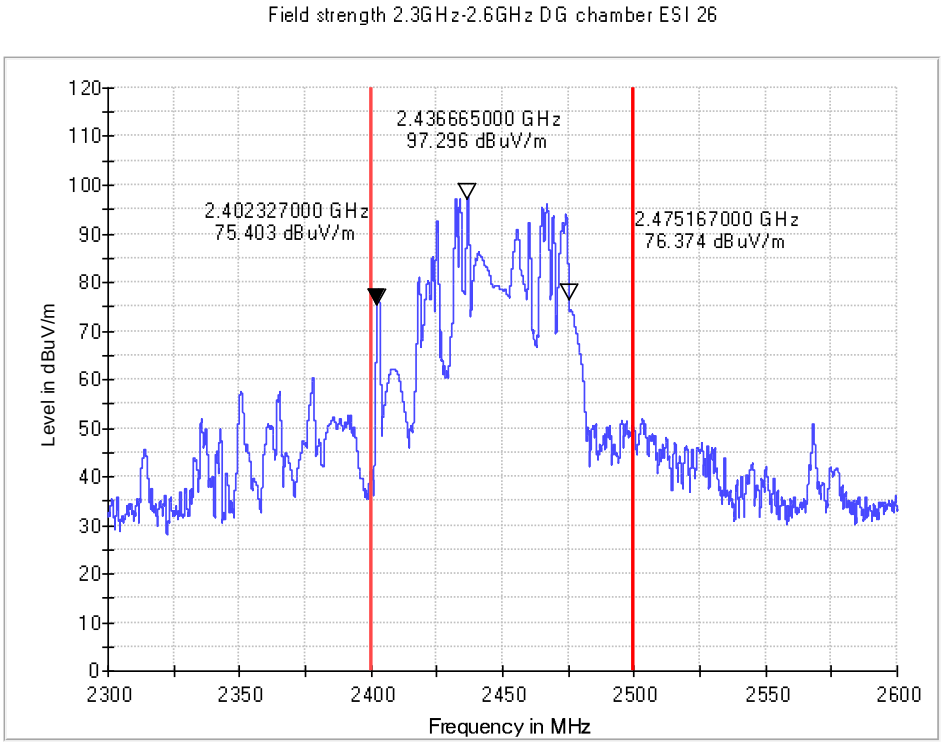


Vertical



Operation frequency with 108 VAC and 1000 ml load:

Horizontal



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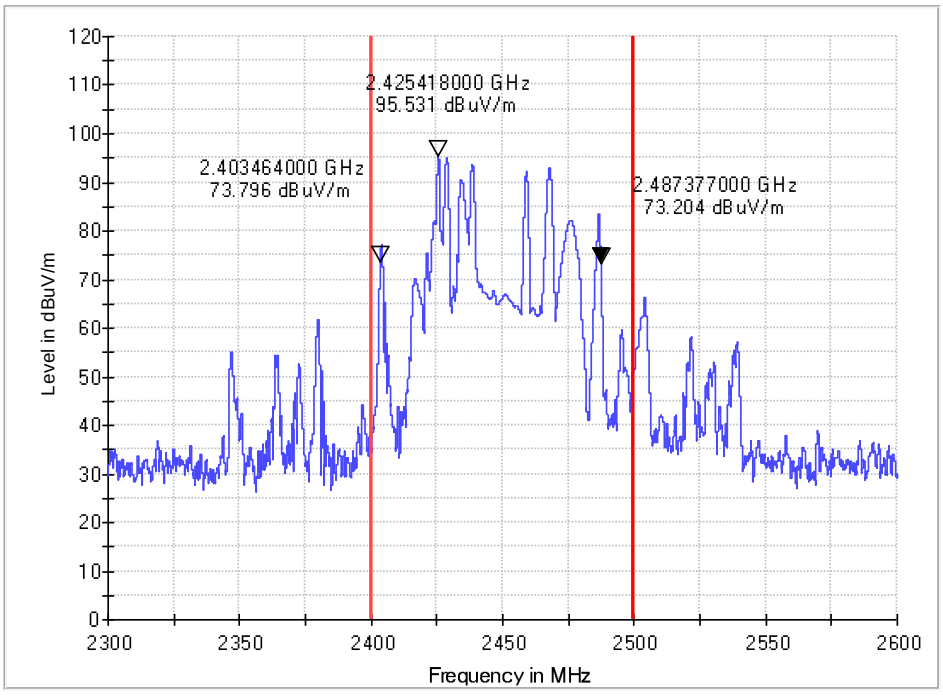

Operation frequency with 120 VAC and 1000 ml load:

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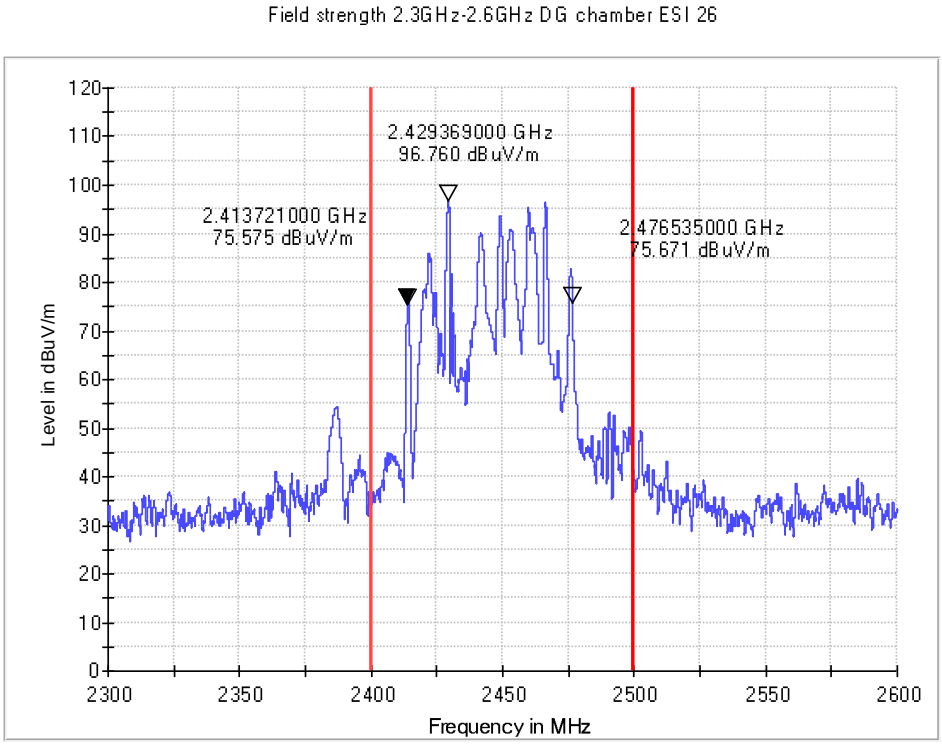

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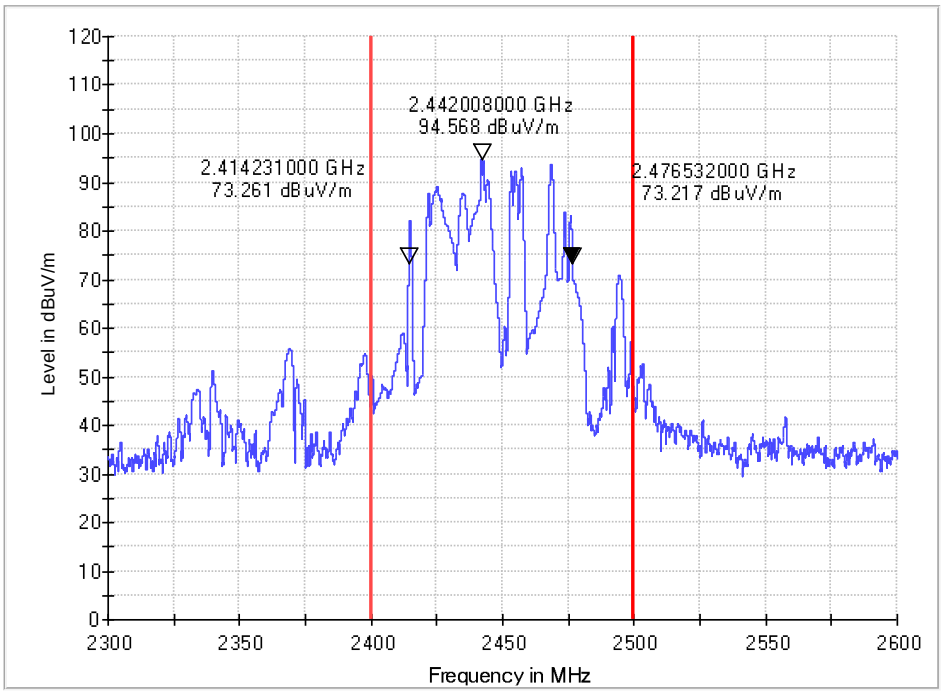
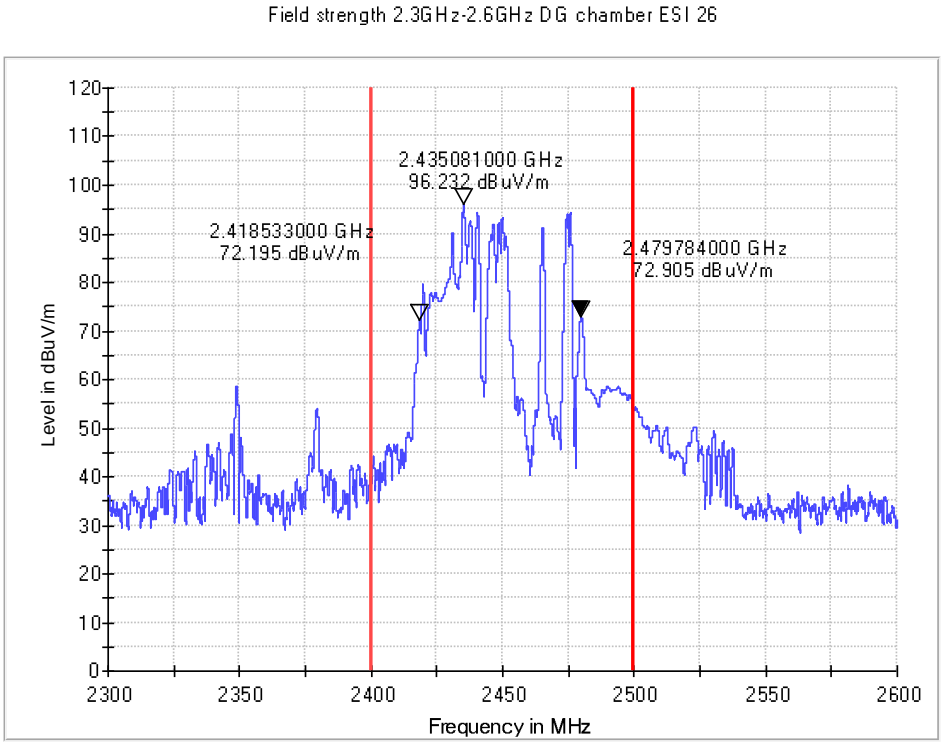


Operation frequency with 132 VAC and 1000 ml load:

Horizontal



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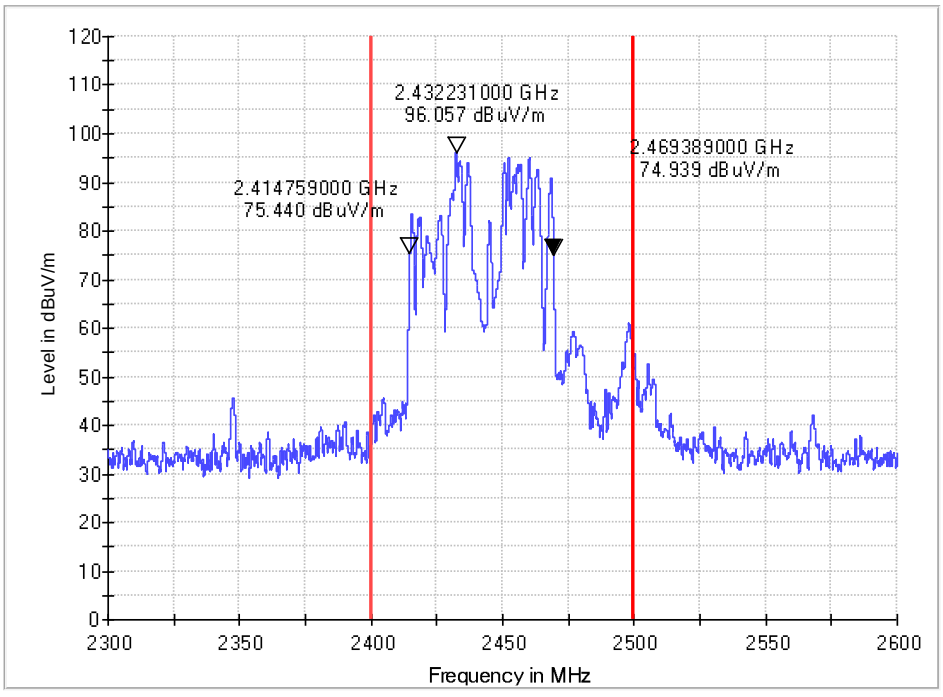
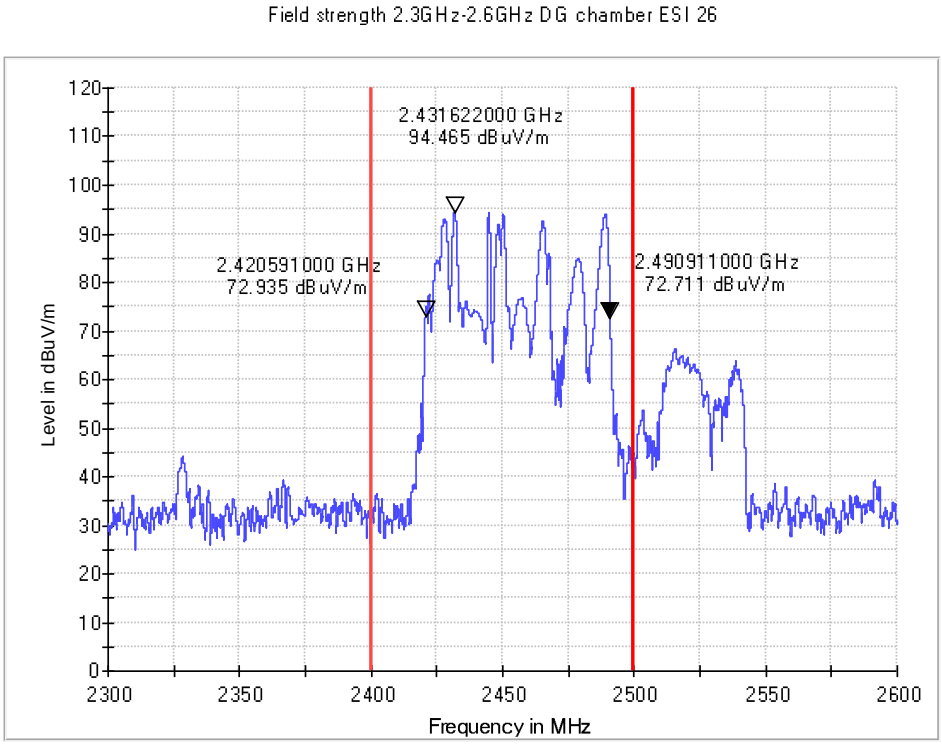


Operation frequency with 150 VAC and 1000 ml load:

Horizontal



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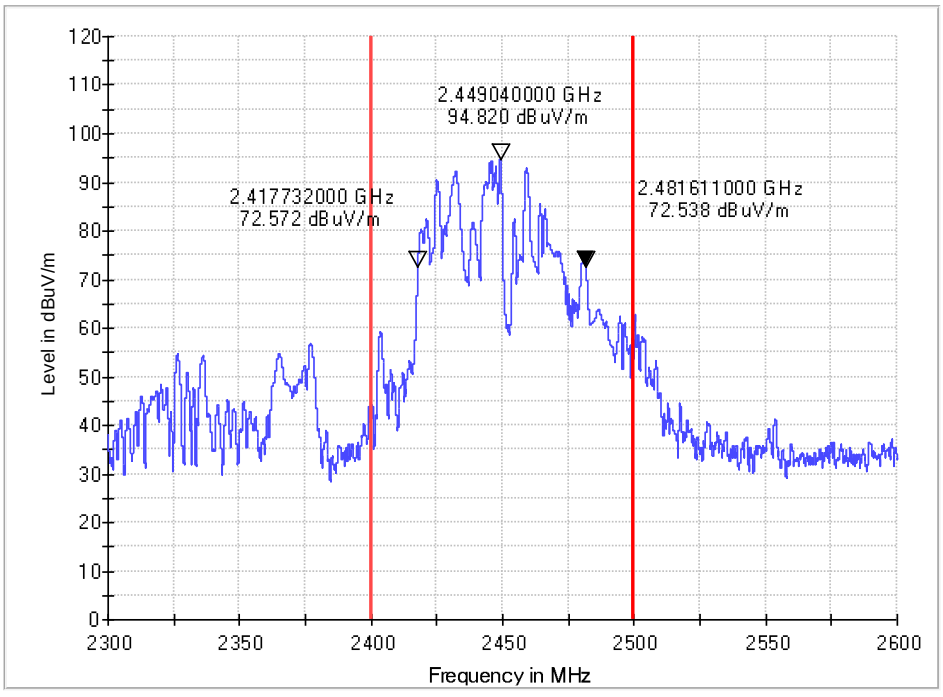
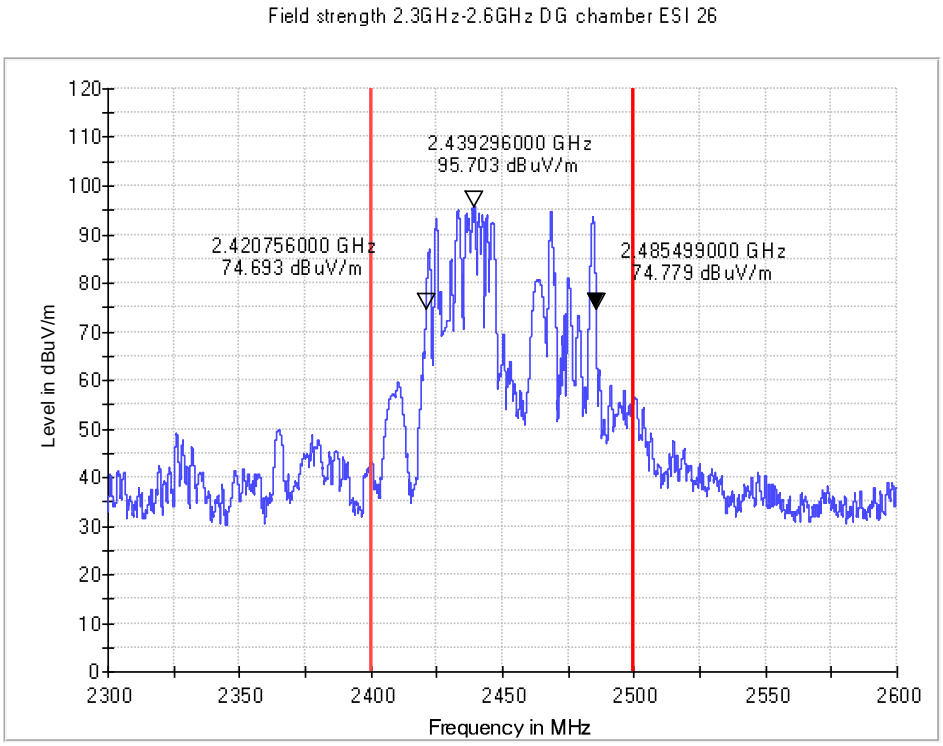


Frequency vs Load Variation Test

Operation frequency with 120 VAC and 200 ml load:

Horizontal



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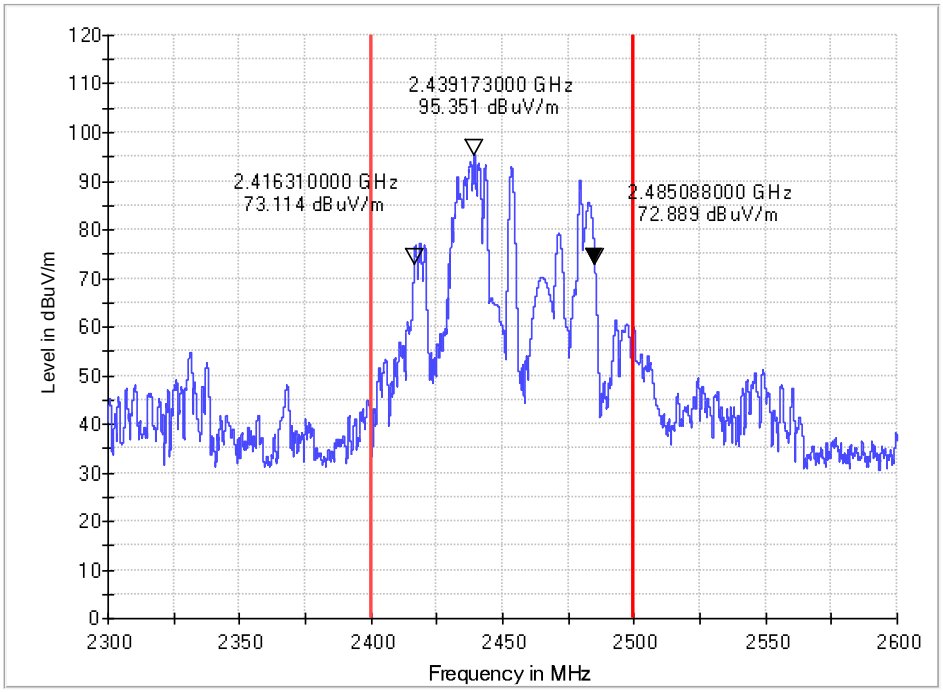

Operation frequency with 120 VAC and 400 ml load:

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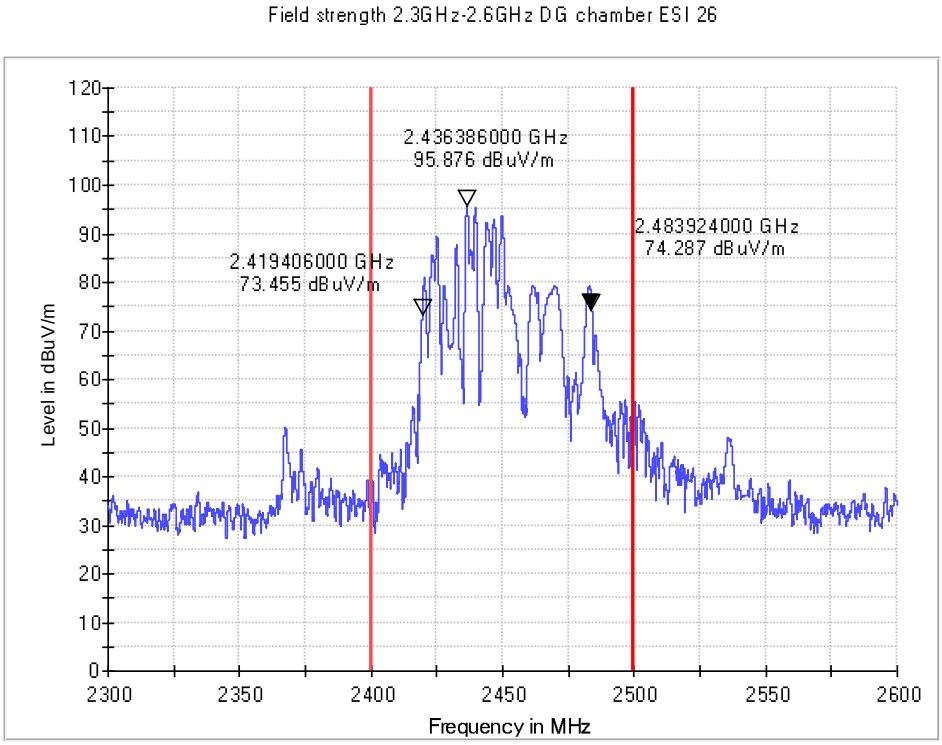
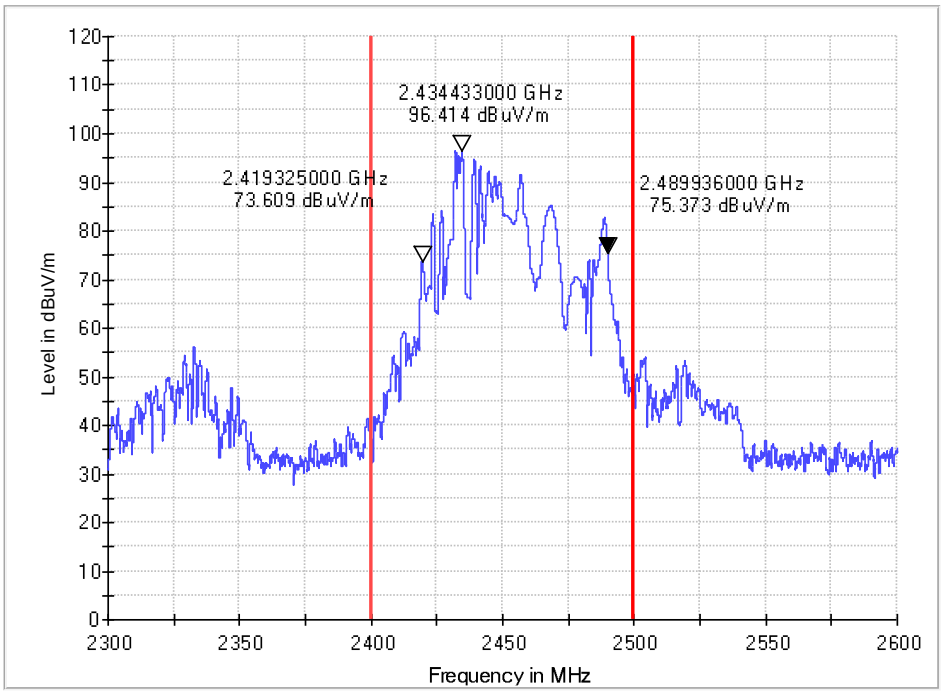
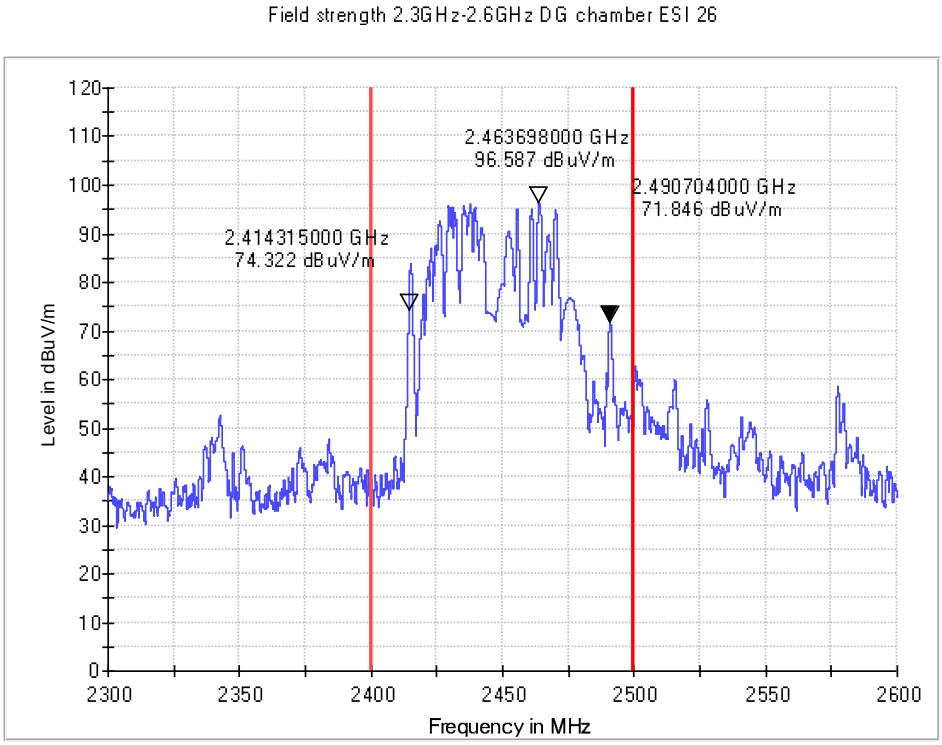


Vertical



Operation frequency with 120 VAC and 600 ml load:

Horizontal



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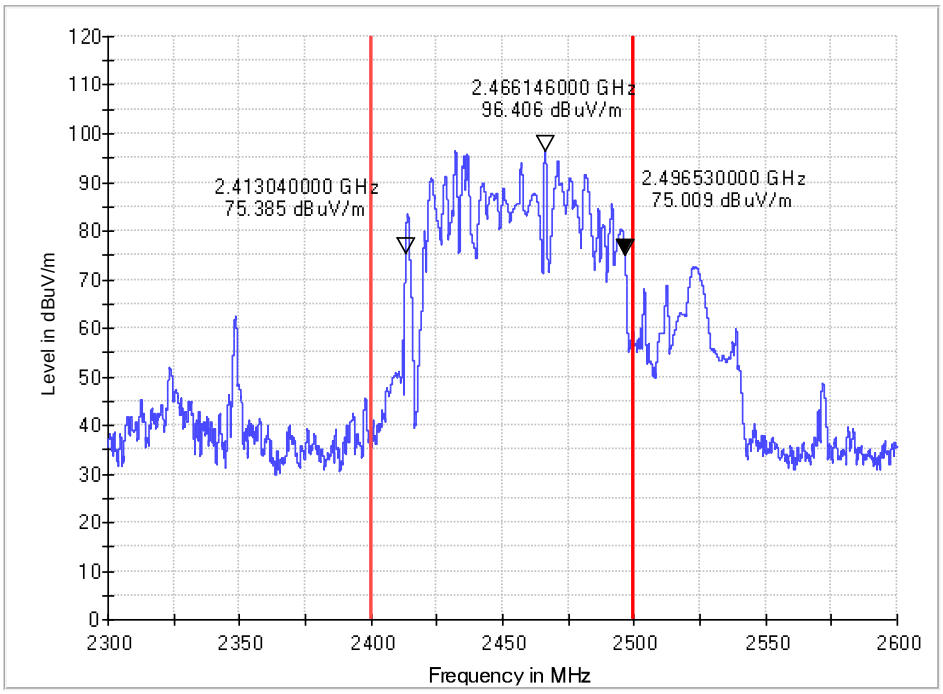

Operation frequency with 120 VAC and 800 ml load:

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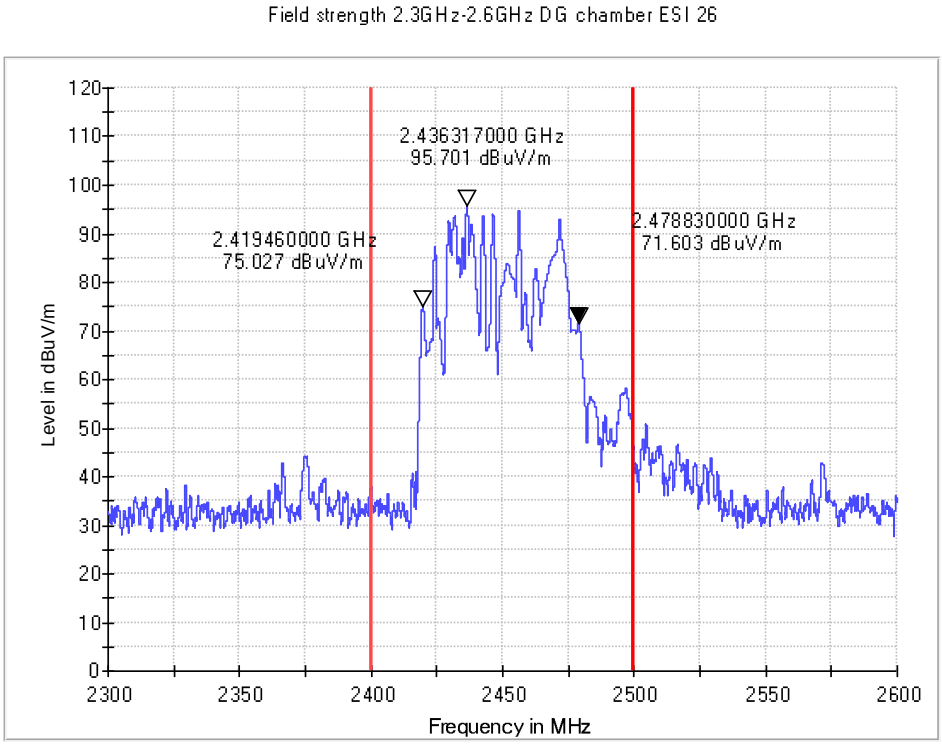

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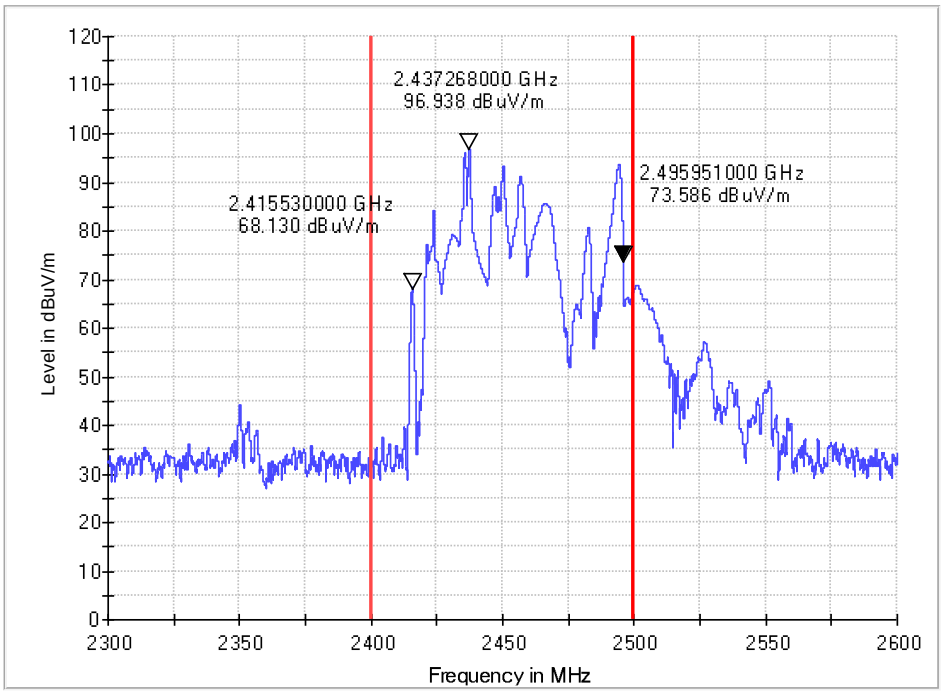

Operation frequency with 120 VAC and 1000 ml load:

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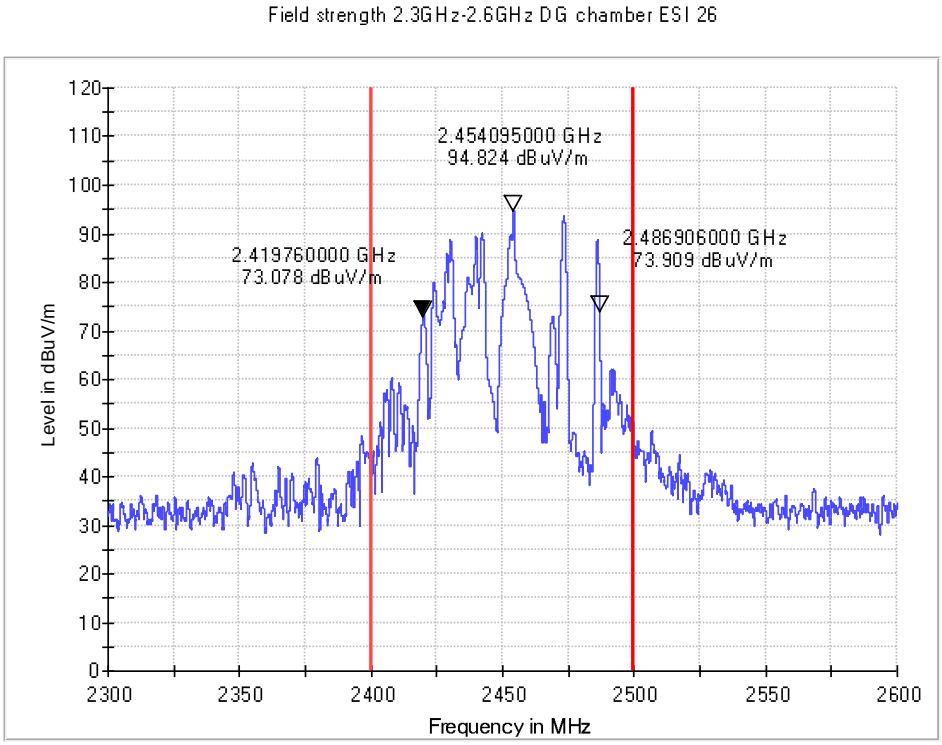

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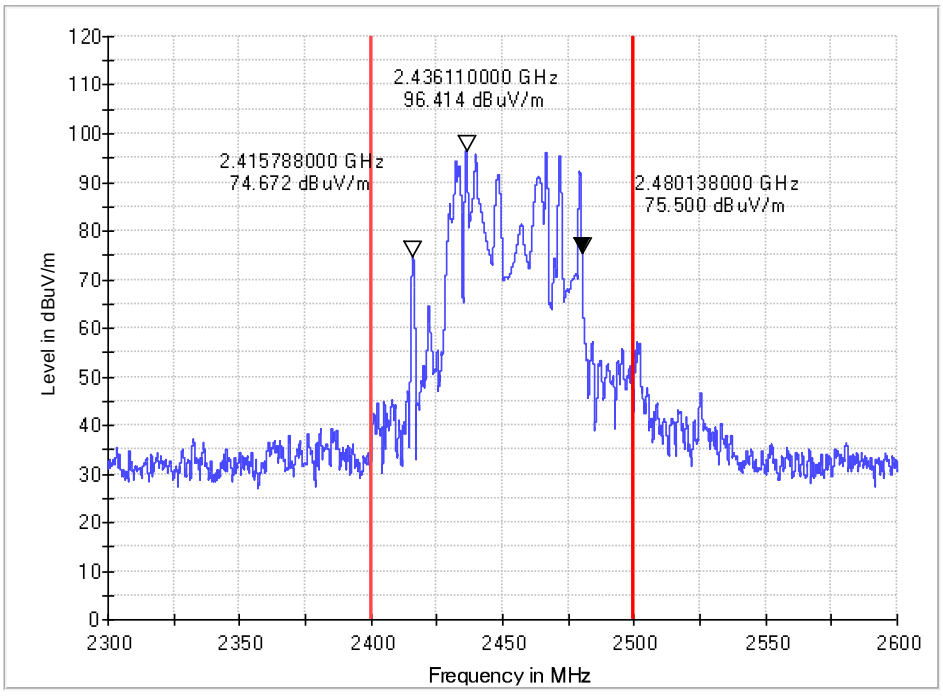


8. CONDUCTED EMISSION TEST

8.1. Test Standard and Limit

8.1.1.Test Standard

FCC Part 18: Section 18.307

8.1.2.Test Limit

Table 7 Conducted Emission Test Limit (Class B)

Frequency	Power Port limits (dBμV)	
	Quasi-peak	Average
0.15MHz ~ 0.5MHz	66～56*	56~46*
0.5MHz ~ 5 MHz	56	46
5 MHz ~ 30MHz	60	50

* Decreasing linearly with logarithm of the frequency

8.2. Test Procedure

The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI test receiver is used to test the emissions from both sides of AC line. The bandwidth of EMI test receiver is set at 9kHz.

8.3. Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

8.4. Test Data

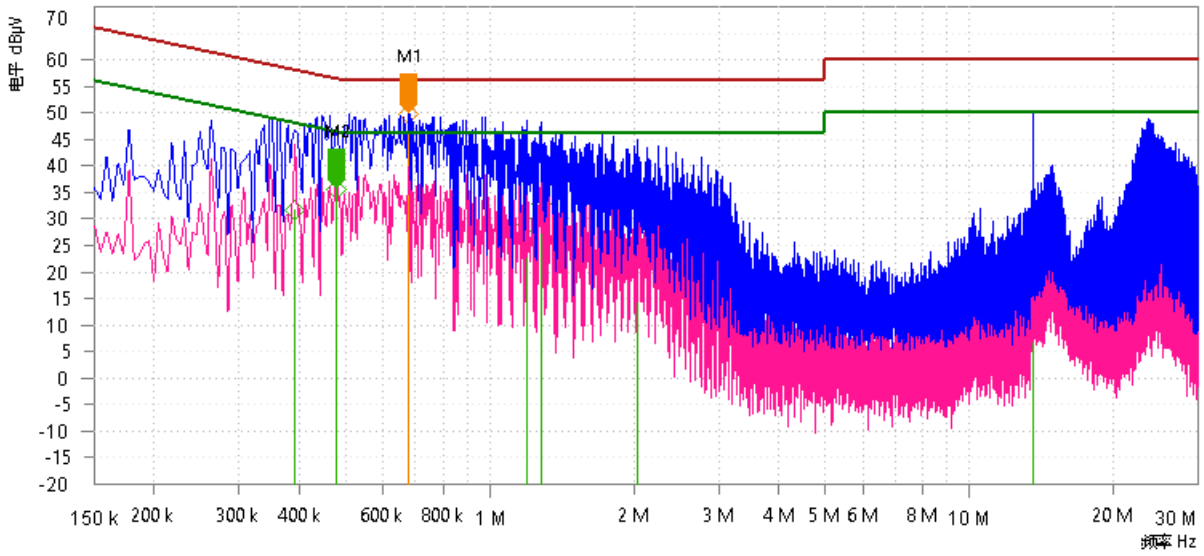
The emissions don’t show in below are too low against the limits. Refer to the test curves.

Table 8 Conducted Emission Test Data at mains Port

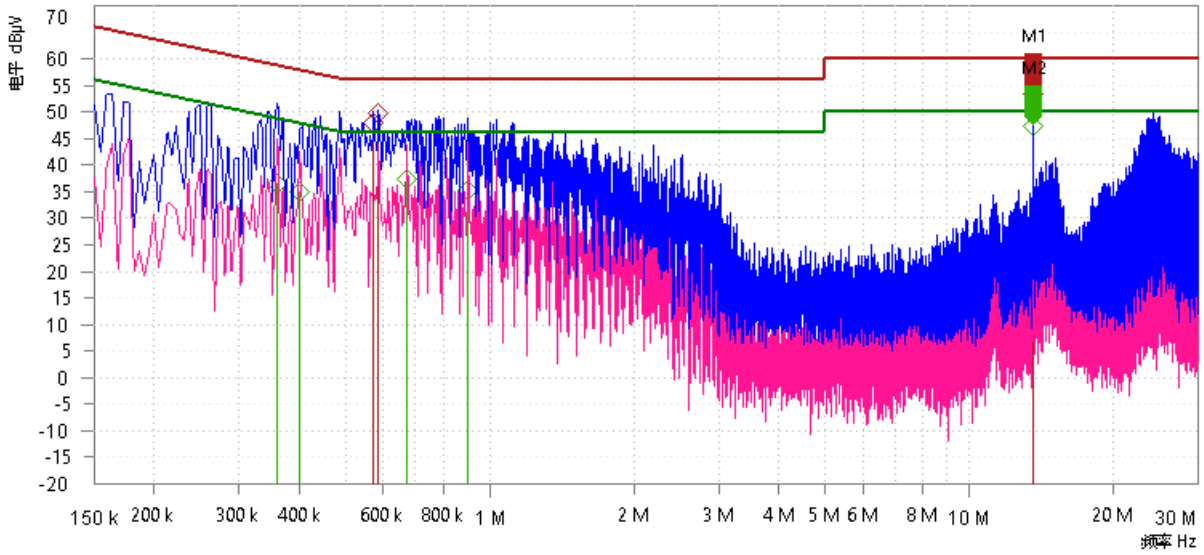
Test mode: 1								
	Frequency (MHz)	Correction Factor (dB)	Quasi-Peak			Average		
			Reading (dBμV)	Emission Level (dBμV)	Limits (dBμV)	Reading (dBμV)	Emission Level (dBμV)	Limits (dBμV)
Line	0.393	9.7	29.2	38.9	58.0	22.0	31.7	48.0
	0.479	9.7	32.4	42.1	56.4	25.8	35.5	46.4
	0.677	9.8	39.0	48.8	56	33.7	43.5	46
	1.199	9.8	25.8	35.6	56	19.2	29.0	46
	1.284	9.8	28.7	38.5	56	22.9	32.7	46
	2.040	9.9	18.8	28.7	56	12.9	22.8	46
Neutral	0.362	9.7	32.4	42.1	58.7	26.7	36.4	48.7
	0.402	9.7	31.9	41.6	57.8	25.3	35.0	47.8
	0.573	9.8	38.2	48.0	56	32.7	42.5	46
	0.587	9.8	39.9	49.7	56	34.4	44.2	46
	0.672	9.8	34.0	43.8	56	27.6	37.4	46
	0.902	9.8	30.6	40.4	56	25.5	35.3	46

REMARKS: 1. Emission level (dBuV) =Read Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB) =LISN Factor (dB) + Cable Factor (dB) +Limiter Factor (dB)
3. The other emission levels were more than 20dB below the limits.

Line



Neutral



9. RADIATION EMISSION TEST

9.1. Test Standard and Limit

9.1.1. Test Standard

FCC Part 18: Section 18.305

9.1.2. Test Limit

Table 9 Radiation Emission Test Limit for FCC (Class B)

RF Power generated by equipment (watts)	Field strength limit (uV/m)	Distance (meters)
Below 500	25	300
500 or more	25 × SQRT (power/500)	300

Frequency range of measurements		
Frequency band in which device operates (MHz)	Range of frequency measurements	
	Lowest frequency	Highest frequency
Below 1.705	Lowest frequency generated in the device, but not lower than 9 kHz.	30 MHz.
1.705 to 30	Lowest frequency generated in the device, but not lower than 9 kHz.	400 MHz.
30 to 500	Lowest frequency generated in the device, but not lower than 9 kHz.	Tenth harmonic or 1000 MHz, whichever is higher.
500 to 1000	Lowest frequency generated in the device or 100 MHz, whichever is lower.	Tenth harmonic.
Above 1000	do	Tenth harmonic or highest detectable emission.

9.2. Test Procedure

The EUT is placed on a turntable, which is 0.8 meter above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set **3 meters** away from the receiving antenna, which is mounted on an antenna tower. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna is used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test.
RBW = 120 kHz (30MHz to 1 GHz); 1 MHz (above 1 GHz)
VBW ≥ 3 x RBW
Detector = Quasi-Peak (frequency range 30 MHz to 1 GHz);
Average (frequency range above 1 GHz)
Load for microwave ovens
- Load for measurement of radiation on second and third harmonic: Two loads, one of 700 and the other with 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.
- Load for all other measurements: 700 milliliters of water, with the beaker located in the center of the oven.

9.3. Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in

a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

9.4. Test Data

The emissions don't show in below are too low against the limits. Refer to the test curves.

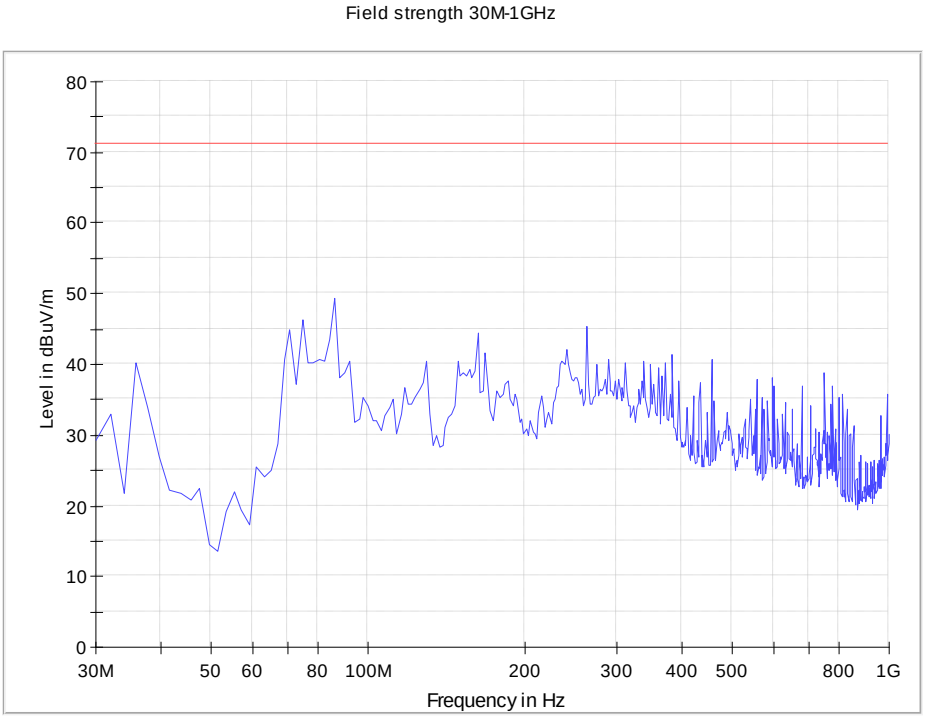
Table 10 Radiated Emission Test Data

Frequency (MHz)	Cable Loss +preamp (dB)	Antenna Factor (dB)	Reading (dBμV/m)	Level (dBμV/m)	Polarity (Horizontal/ Vertical)	Limits (dBμV/m)	Margin (dB)
35.832	0.6	12.3	22.3	35.2	Horizontal	71.0	35.8
70.822	0.9	8.7	31.9	41.5	Horizontal	71.0	29.5
74.709	1.0	8.7	33.7	43.4	Horizontal	71.0	27.6
86.373	1.1	10.3	33.8	45.2	Horizontal	71.0	25.8
162.184	1.5	8.7	30.6	40.8	Horizontal	71.0	30.2
263.267	1.9	12.1	27.6	41.6	Horizontal	71.0	29.4
31.944	0.6	12.3	41.7	54.6	Vertical	71.0	16.4
72.766	1.0	8.7	35.9	45.6	Vertical	71.0	25.4
82.485	1.0	8.5	36.7	46.2	Vertical	71.0	24.8
98.036	1.0	12.8	28.5	42.3	Vertical	71.0	28.7
348.798	2.3	14.1	22.1	38.5	Vertical	71.0	32.5
780.341	3.5	18.8	13.9	36.2	Vertical	71.0	34.8
2022.044	-40.4	28.6	43.2	31.4	Horizontal	71.0	39.6
2328.657	-40.1	28.3	60.9	49.1	Horizontal	71.0	21.9
2430.862	-40.1	28.6	56.1	44.6	Horizontal	71.0	26.4
4372.745	-39.4	33.6	51.5	45.7	Horizontal	71.0	25.3
4883.768	-39.4	34.0	55.3	49.9	Horizontal	71.0	21.1
7404.810	-37.7	35.6	45.5	43.4	Horizontal	71.0	27.6
1987.976	-40.4	26.9	45.4	31.9	Vertical	71.0	39.1
2260.521	-40.3	28.3	52.3	40.3	Vertical	71.0	30.7
2498.998	-40.0	28.6	72.9	61.5	Vertical	71.0	9.5
4372.745	-39.4	33.6	51.5	45.7	Vertical	71.0	25.3
4951.904	-39.5	34.0	56.7	51.2	Vertical	71.0	19.8
17523.046	-32.7	42.9	45.4	55.6	Vertical	71.0	15.4

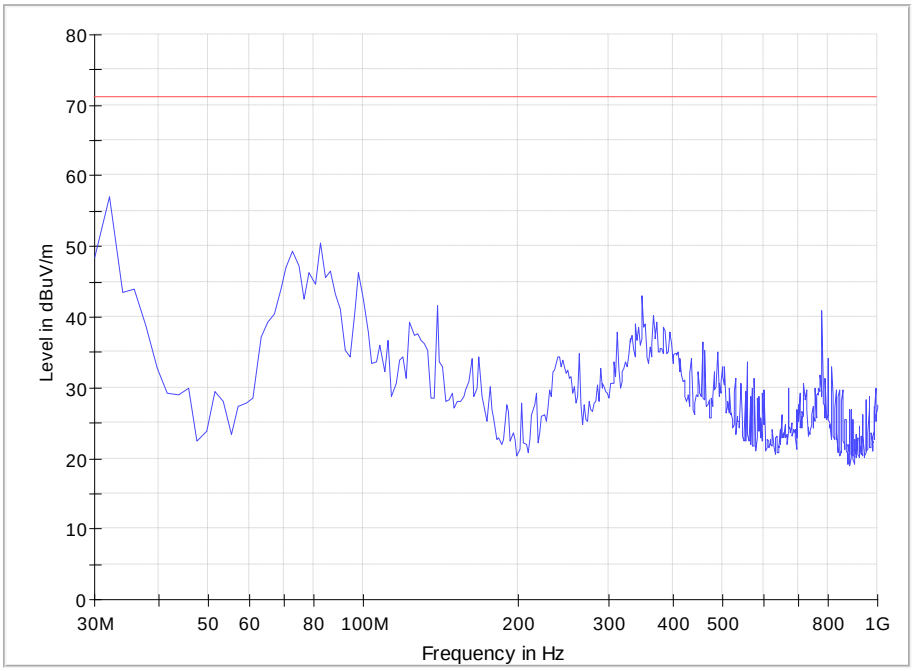
Remark: 1. Emission level (dBuV)=Read Value(dBuV/m) + Antenna Factor(dB)+ Cable Loss +preamp(dB)
2. According to CFR47 §18.305 the field strength has to be calculated with the formula: 25×SQRT (power/500).
With a measured power of 1005.375 W the limit is calculated as follows:
25 x SQRT (1005.375/500) = 35.5 μV/m or 31.0 dBμV/m at 300 m distance
20lg (25*SQRT (power/500)) +20lg (300/3) = 71.0 dBμV/m at 3m distance.

30MHz-1GHz

Horizontal

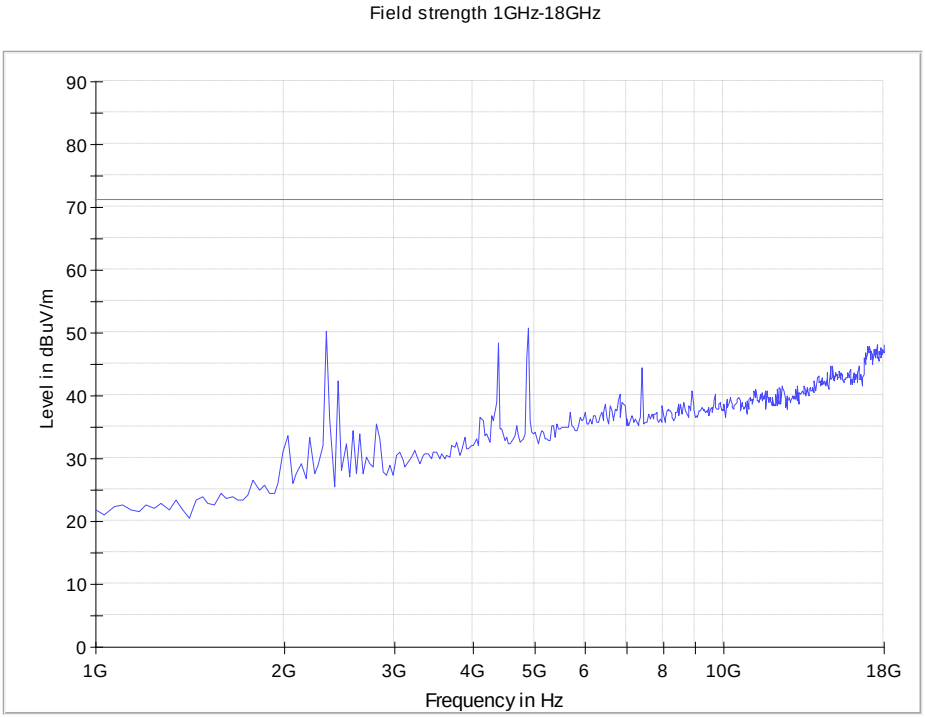


Vertical

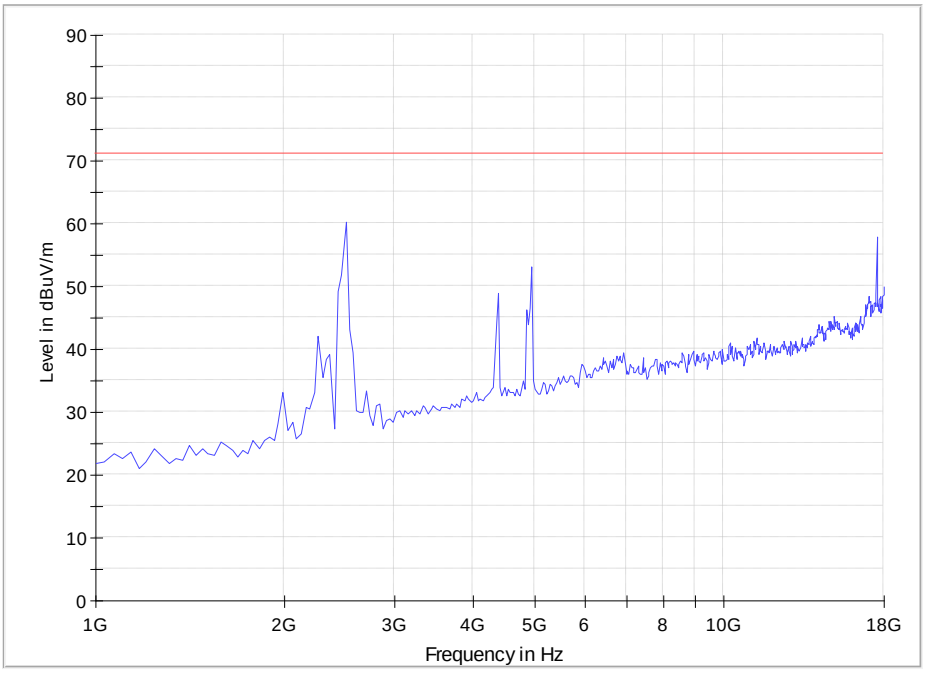


1GHz-18GHz

Horizontal

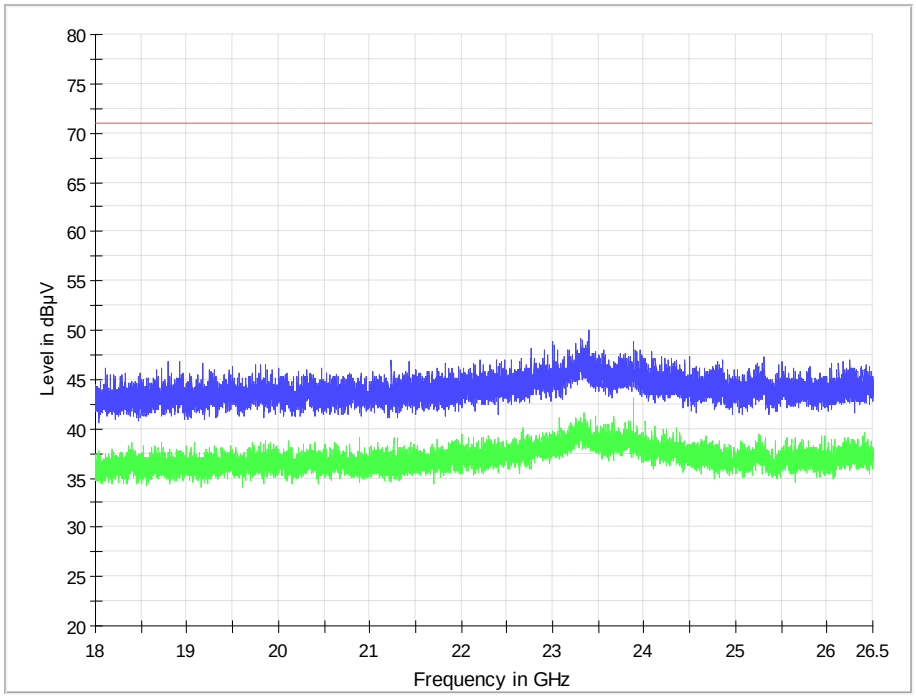


Vertical

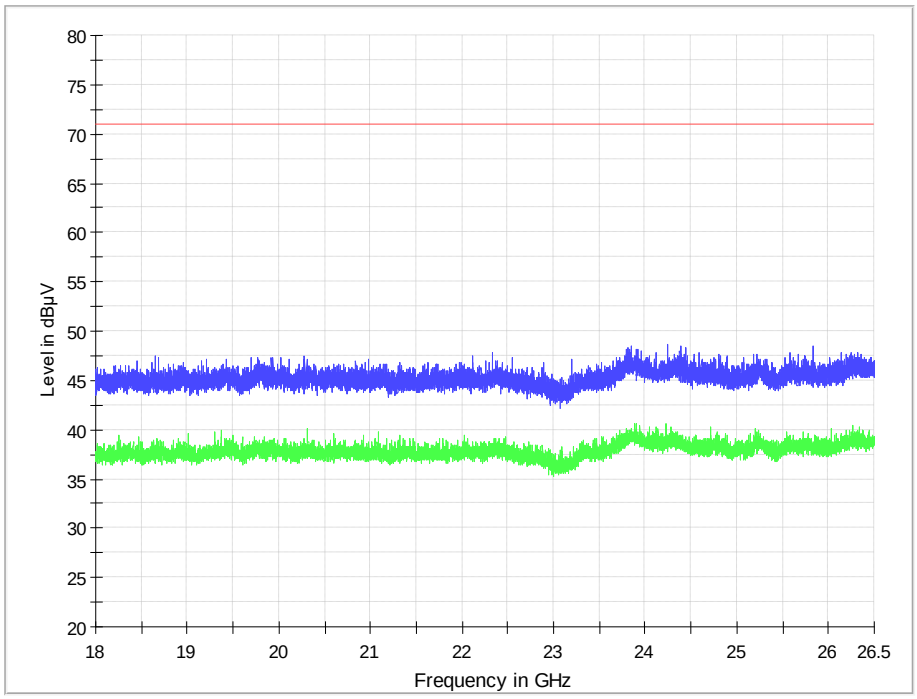


18GHz-26.5GHz

Horizontal



Vertical



----------End of Report ----------