

FCC RADIO TEST REPORT

FCC ID: 2AX2YM-3

Product: Wireless Dog Fence

Trade Name: N/A

Model Name: M-3

Serial Model: K-6

Report No.: UNIA21040906ER-01

Prepared for

SunSun Electronic Technology Inc.

1942 Broadway Street STE 314C Boulder CO 80302 United States

Prepared by

Shenzhen United Testing Technology Co., Ltd.

2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang
Community, Xixiang Str, Bao'an District, Shenzhen, China

TEST RESULT CERTIFICATION

Applicant's name: SunSun Electronic Technology Inc.

Address: 1942 Broadway Street STE 314C Boulder CO 80302 United States

Manufacture's Name: SunSun Electronic Technology Inc.

Address: 1942 Broadway Street STE 314C Boulder CO 80302 United States

Product description

Product name.....: Wireless Dog Fence

Trade Mark: N/A

Model and/or type reference : M-3, K-6

Standards.....: FCC Part 15 Subpart C 15.231
ANSI C63.10: 2013

This device described above has been tested by Shenzhen United Testing Technology Co., Ltd., and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date (s) of performance of tests.....: Apr. 09, 2021 ~ May 17, 2021

Date of Issue: May 20, 2021

Test Result.....: Pass

Prepared by:

Bob Liao

Bob Liao/Editor

Reviewer:

Kahn Yang

Kahn Yang/Supervisor

Approved & Authorized Signer:

Liuze

Liuze/Manager

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1 TEST SUMMARY

1 TEST PROCEDURES AND RESULTS

FCC and IC Requirements		
FCC Part 15.207	Conducted Emission	PASS
FCC § 15.231(a)(1)	Automatically Deactivate	PASS
FCC Part 15.231(b)	Electric Field Strength of Fundamental Emission	PASS
FCC Part 15.205 & 15.209 & 15.231(b)	Electric Field Strength of Spurious Emission	PASS
FCC Part 15.231(c)	-20dB bandwidth	PASS

2 TEST FACILITY

Test Firm : Shenzhen United Testing Technology Co., Ltd.

Address : 2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19. The testing quality system of our laboratory meets with ISO/IEC-17025 requirements. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

A2LA Certificate Number: 4747.01

The EMC Laboratory has been accredited by A2LA, and in compliance with ISO/IEC 17025:2017 General Requirements for testing Laboratories.

FCC Registration Number: 674885

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission.

IC Registration Number: 21947

The EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada.

3 MEASUREMENT UNCERTAINTY

Measurement Uncertainty

Conducted Emission Expanded Uncertainty = 2.23dB, k=2

Radiated emission expanded uncertainty(9kHz-30MHz) = 3.08dB, k=2

Radiated emission expanded uncertainty(30MHz-1000MHz) = 4.42dB, k=2

Radiated emission expanded uncertainty(Above 1GHz) = 4.06dB, k=2

2 GENERAL INFORMATION

2.1 ENVIRONMENTAL CONDITIONS

During the measurement the environmental conditions were within the listed ranges:

Temperature	Normal Temperature:	26°C
Voltage	Normal Voltage	5V
Other	Relative Humidity	55 %
	Air Pressure	101 kPa

2.2 GENERAL DESCRIPTION OF EUT

Equipment	Wireless Dog Fence
Trade Mark	N/A
Model Name	M-3
Serial No.	K-6
Model Difference	All model's the function, software and electric circuit are the same, only with a product color and model named different. Test sample model:M-3.
FCC ID	2AX2YM-3
Antenna Type	External antenna
Antenna Gain	1.0dbi
Frequency Range	425MHz
Number of Channels	1
Modulation Type	ASK
Battery	N/A
PowerSource	AC 100-240V~50/60Hz

2.3 CARRIER FREQUENCY OF CHANNELS

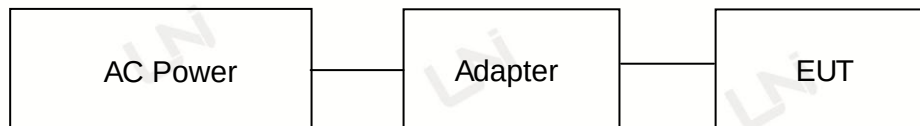
Channel	Frequency (MHz)
1	425

2.4 OPERATION OF EUT DURING TESTING

new battery is used during all test
Operating Mode
The mode is used: Transmitting mode

2.5 DESCRIPTION OF TEST SETUP

Operation of EUT during Conducted testing:



Operation of EUT during Radiation testing:

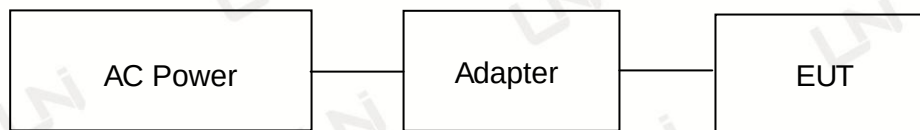


Table for auxiliary equipment:

Equipment Description	Manufacturer	Model	Calibration Due Date
Adapter	N/A	SYM-JDA0502JC037	N/A

3.1 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
Conduction Emissions Measurement					
1	Conducted Emission Test Software	EZ-EMC	Ver.CCS-3A1-CE	N/A	N/A
2	AMN	Schwarzbeck	NNLK8121	8121370	2021.10.15
3	AMN	ETS	3810/2	00020199	2021.10.15
4	AAN	TESEQ	T8-Cat6	38888	2021.10.15
5	Pulse Limiter	CYBRTEK	EM5010	E115010056	2021.05.26
6	EMI Test Receiver	Rohde&Schwarz	ESCI	101210	2021.10.15
Radiated Emissions Measurement					
1	Radiated Emission Test Software	EZ-EMC	Ver.CCS-03A1	N/A	N/A
2	Horn Antenna	Sunol	DRH-118	A101415	2021.10.18
3	Broadband Hybrid Antenna	Sunol	JB1	A090215	2021.11.15
4	PREAMP	HP	8449B	3008A00160	2021.10.21
5	PREAMP	HP	8447D	2944A07999	2021.05.26
6	EMI Test Receiver	Rohde&Schwarz	ESR3	101891	2021.10.15
7	MXA Signal Analyzer	Keysight	N9020A	MY51110104	2021.10.15
8	Active Loop Antenna	Com-Power	AL-310R	10160009	2021.05.28
9	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2021.05.28
10	Horn Antenna	A-INFOMW	LB-180400-KF	J211060660	2021.10.23
11	Loop Antenna	Beijing daze Technology	ZN30401	13015	2021.10.15
12	EM Clamp	Schwarzbeck	MDS21	03350	2021.10.20

3 TEST CONDITIONS AND RESULTS

3.1 CONDUCTED EMISSIONS TEST

Limit

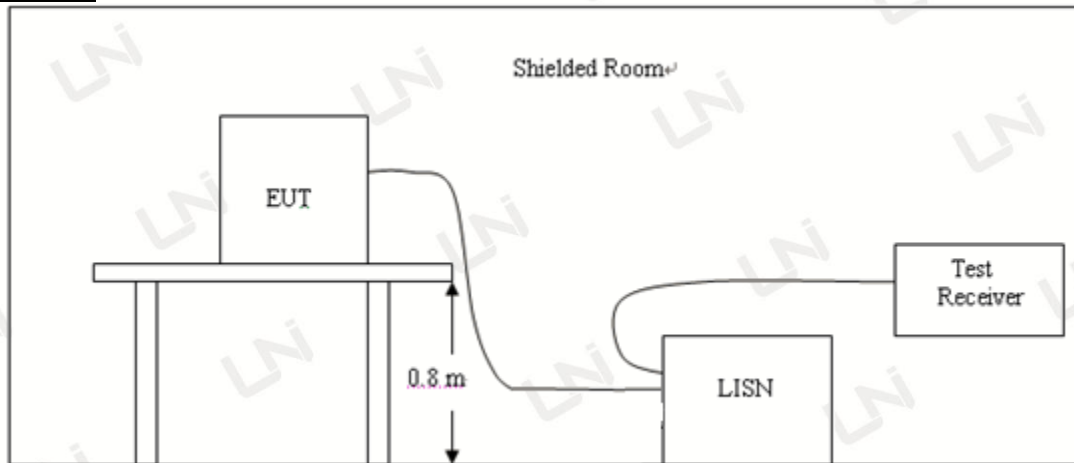
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

Test Setup



Test Procedure

- 1, The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. A wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
- 2, Support equipment, if needed, was placed as per ANSI C63.10.
- 3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4, If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5, All support equipments received AC power from a second LISN, if any.
- 6, The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7, Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

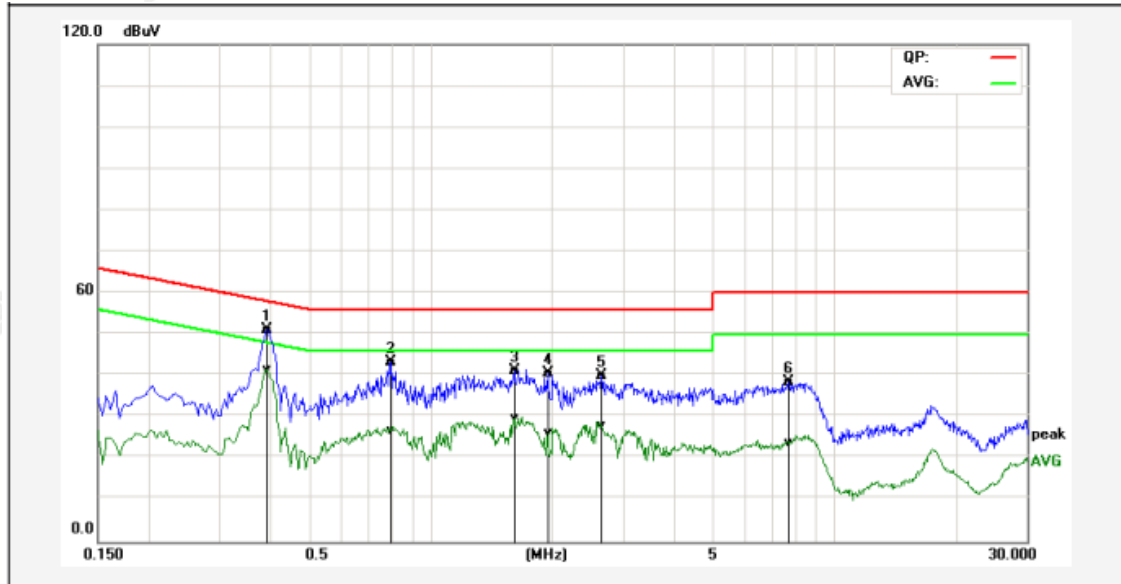
Test Result

Pass

Remark:

All modes were tested at AC 120V and 240V, only the worst result of AC 120V was reported.

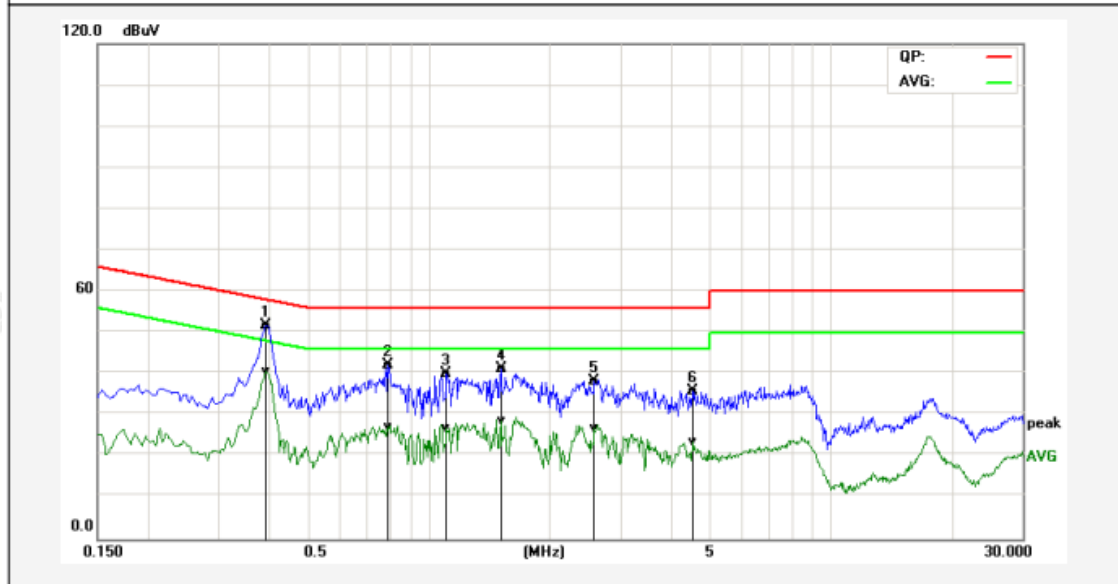
Temperature:	24°C	Relative Humidity:	45%
Test Date:	Apr. 23, 2021	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Line
Test Mode:	Normal work		



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1*	0.3940	41.51	31.70	9.71	51.22	41.41	57.98	47.98	-6.76	-6.57	Pass
2P	0.7980	33.47	16.98	9.75	43.22	26.73	56.00	46.00	-12.78	-19.27	Pass
3P	1.6180	31.48	19.97	9.79	41.27	29.76	56.00	46.00	-14.73	-16.24	Pass
4P	1.9540	30.95	16.54	9.78	40.73	26.32	56.00	46.00	-15.27	-19.68	Pass
5P	2.6580	30.19	18.22	9.82	40.01	28.04	56.00	46.00	-15.99	-17.96	Pass
6P	7.7180	28.72	14.14	9.86	38.58	24.00	60.00	50.00	-21.42	-26.00	Pass

Remark: Factor = Insertion Loss + Cable Loss, Result=Reading + Factor, Margin=Result – Limit.

Temperature:	24°C	Relative Humidity:	45%
Test Date:	Apr. 23, 2021	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Neutral
Test Mode:	Normal work		



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1*	0.3940	42.13	30.91	9.71	51.84	40.62	57.98	47.98	-6.14	-7.36	Pass
2P	0.7940	32.49	17.50	9.75	42.24	27.25	56.00	46.00	-13.76	-18.75	Pass
3P	1.1060	30.30	17.16	9.75	40.05	26.91	56.00	46.00	-15.95	-19.09	Pass
4P	1.5140	31.37	18.86	9.76	41.13	28.62	56.00	46.00	-14.87	-17.38	Pass
5P	2.5860	28.45	16.99	9.82	38.27	26.81	56.00	46.00	-17.73	-19.19	Pass
6P	4.5300	26.05	13.63	9.83	35.88	23.46	56.00	46.00	-20.12	-22.54	Pass

Remark: Factor = Insertion Loss + Cable Loss, Result=Reading + Factor, Margin=Result – Limit.

3.2 RADIATED EMISSION TEST

Radiation Limit

For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dB μ V/m)	Radiated (μ V/m)
30-88	3	40	100
88-216	3	43.5	150
216-960	3	46	200
Above 960	3	54	500

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

In addition to the provisions of 15.231(b) and RSS 210-A1.1.2, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

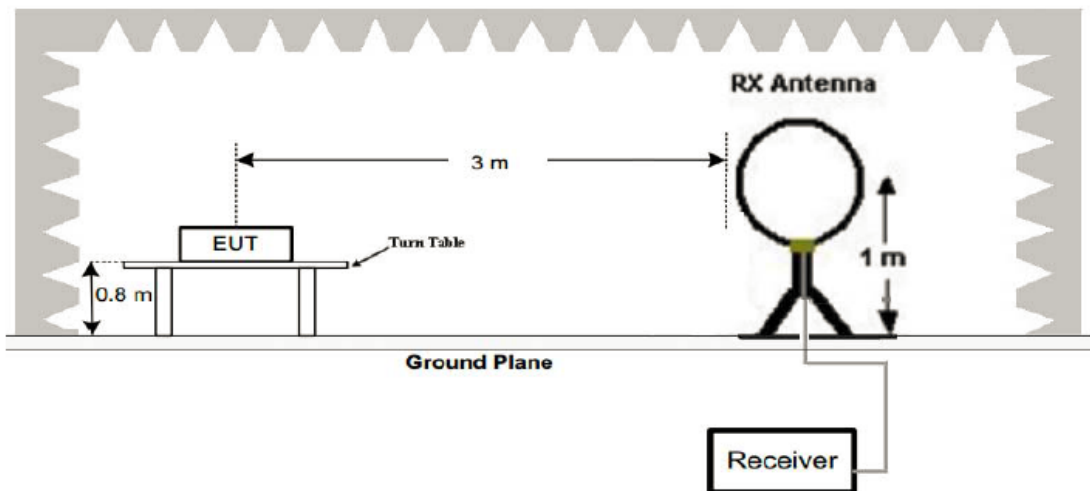
Funda-mental fre-quency (MHz)	Field strength of funda-mental (microvolts/ meter)	Field strength of spurious emissions (microvolts/meter)
40.66–40.70	2,250	225
70–130	1,250	125
130–174	¹ 1,250 to 3,750	¹ 125 to 375
174–260	3,750	375
260–470	¹ 3,750 to 12,500	¹ 375 to 1,250
Above 470	12,500	1,250

¹ Linear interpolations.

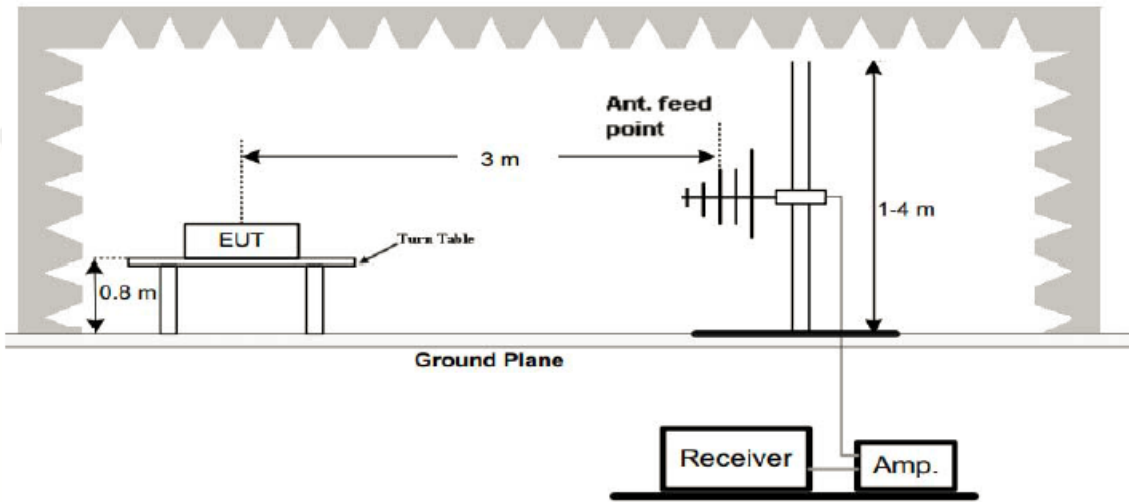
[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 260-470 MHz, μ V/m at 3 meters = $41.6667(F) - 7083.3333$. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

Test Setup

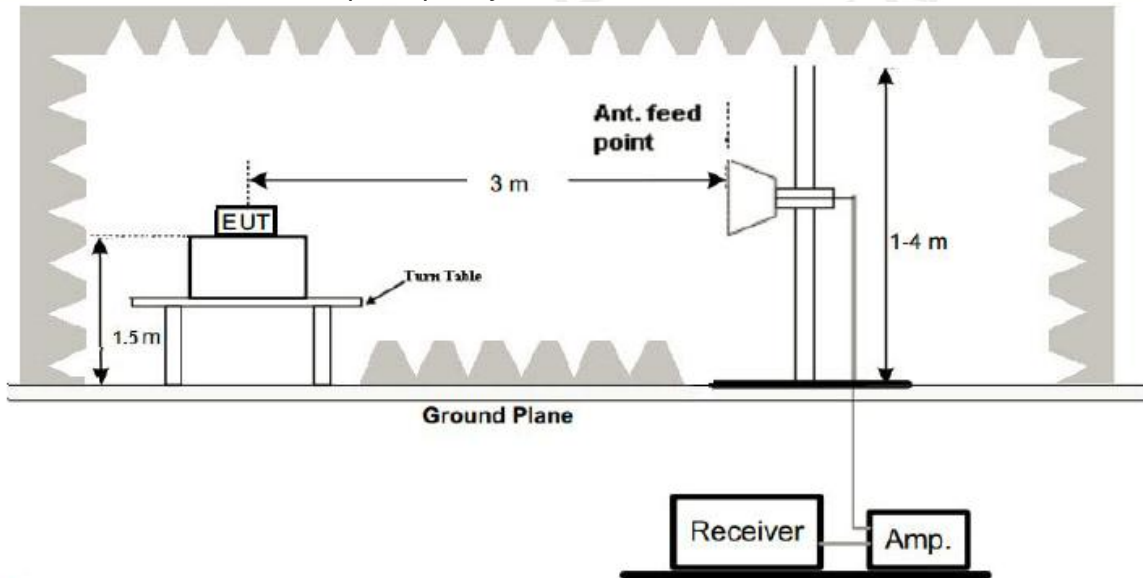
1. Radiated Emission Test-Up Frequency Below 30MHz



2. Radiated Emission Test-Up Frequency 30MHz~1GHz



3. Radiated Emission Test-Up Frequency Above 1GHz



Test Procedure

- Below 1GHz measurement the EUT is placed on turntable which is 0.8m above ground plane. And above 1GHz measurement EUT was placed on low permittivity and low tangent turn table which is 1.5m above ground plane.
- The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- Repeat above procedures until the measurements for all frequencies are complete.
- The test frequency range from 9kHz to 25GHz per FCC PART 15.33(a).

Note:

For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Result

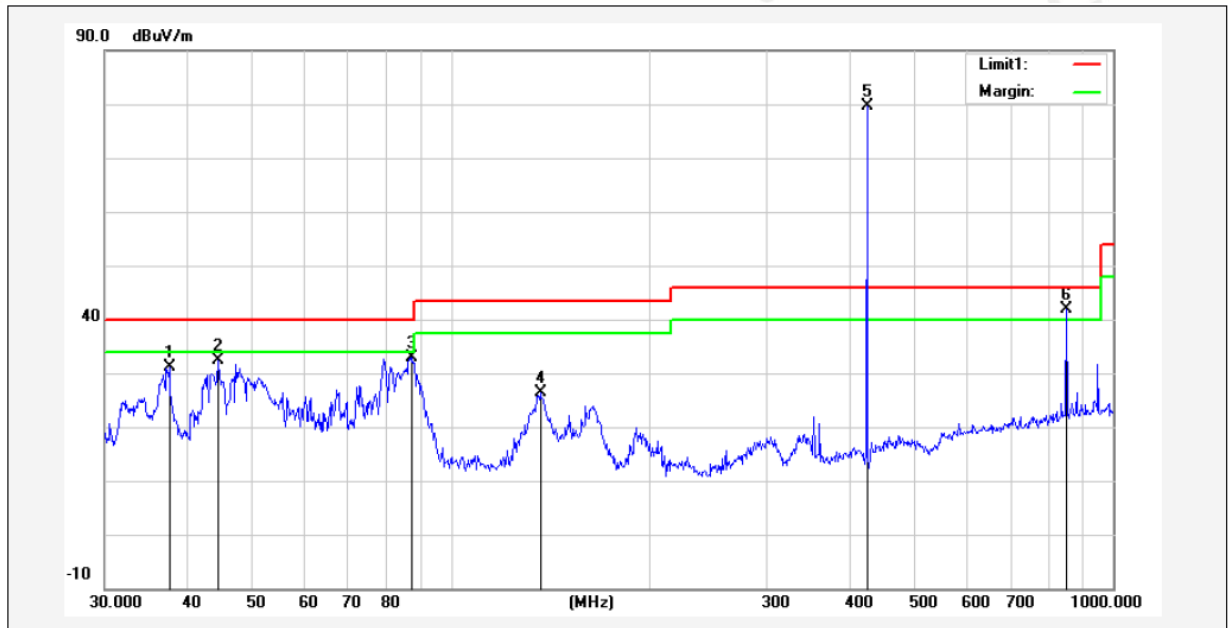
---PASS---

Remark:

1. By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "Z axis" position was the worst, and test data recorded in this report.
2. Radiated emission test from 9KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9KHz to 30MHz and not recorded in this report.

Below 1GHz Test Results:

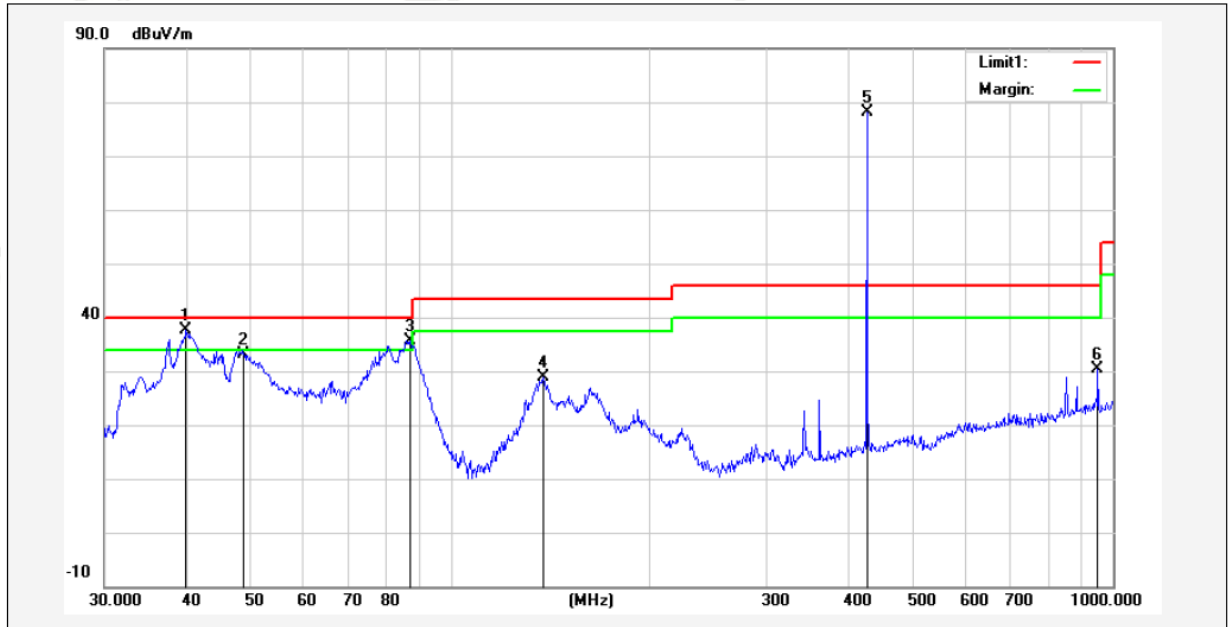
Temperature:	24°C	Relative Humidity:	49%
Test Date:	Apr. 23, 2021	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Polarization:	Horizontal
Test Mode:	Normal work		



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1	37.5478	44.05	-12.96	31.09	40.00	-8.91	120	100	peak
2	44.4308	50.33	-17.98	32.35	40.00	-7.65	180	100	peak
3	87.4177	54.23	-21.34	32.89	40.00	-7.11	150	100	peak
4	136.4598	42.70	-16.43	26.27	43.50	-17.23	120	100	peak
5*	425.0000	92.49	-12.76	79.73	80.53	-0.80	180	100	peak
6!	850.0000	48.72	-6.85	41.87	46.00	-4.13	330	100	peak

Remark: Absolute Level= Reading Level+ Factor, Margin= Absolute Level – Limit
Factor=Ant. Factor + Cable Loss – Pre-amplifier

Temperature:	24°C	Relative Humidity:	49%
Test Date:	Apr. 23, 2021	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Polarization:	Vertical
Test Mode:	Normal work		



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1!	39.8542	52.18	-14.66	37.52	40.00	-2.48	90	100	peak
2	48.6720	53.26	-20.02	33.24	40.00	-6.76	180	100	peak
3!	86.8068	56.95	-21.36	35.59	40.00	-4.41	270	100	peak
4	137.9028	45.26	-16.46	28.80	43.50	-14.70	300	100	peak
5*	425.0000	90.87	-12.76	78.11	80.53	-2.42	330	100	peak
6	950.0000	36.56	-6.15	30.41	46.00	-15.59	120	100	peak

Remark: Absolute Level= Reading Level+ Factor, Margin= Absolute Level – Limit
Factor=Ant. Factor + Cable Loss – Pre-amplifier

Above 1 GHz Test Results:

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	Type
1275	47.69	-5.34	42.35	60.53	-18.18	PK
1700	48.63	-5.02	43.61	60.53	-16.92	PK
2125	47.96	-4.76	43.20	60.53	-17.33	PK
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	Type
1275	48.35	-5.34	43.01	60.53	-17.52	PK
1700	48.92	-5.02	43.90	60.53	-16.63	PK
2125	49.05	-4.76	44.29	60.53	-16.24	PK
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin= Absolute Level – Limit						

Note: 1. Testing is carried out with frequency rang 30MHz to the tenth harmonics, which above 5th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

2. The fundamental frequency is 425MHz, so the fundamental and spurious emissions radiated limit base on the the operating frequency 425MHz.

3. Since the peak value is less than the average limit, the average value does not need to be tested.

3.2 -20db OCCUPIED BANDWIDTH

Limit

According to 47 CFR 15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the centre frequency for devices operating above 70MHz and below 900MHz. Bandwidth is determined at the points 20dB down from the modulated carrier.

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=1%-5%OBW, VBW=3RBW, Span= 2*OBW~5*OBW.

The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

Test Configuration

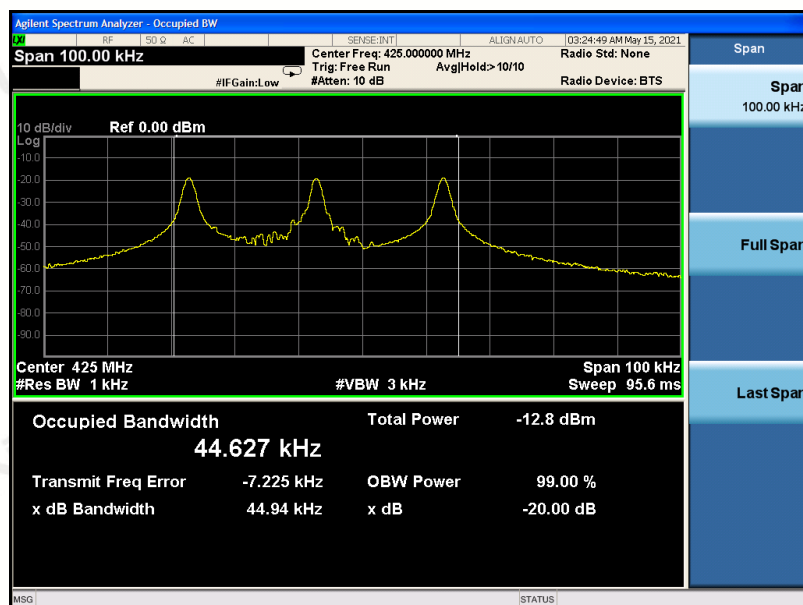


Test Result

---PASS---

Modulation	Channel Frequency (MHz)	99% OBW (KHz)	20dB bandwidth (KHz)	Limit (KHz)	Result
ASK	425	44.627	44.94	$0.25\% \times 425000 = 1062.5$	Pass

ASK Modulation



3.3 Deactivation Time

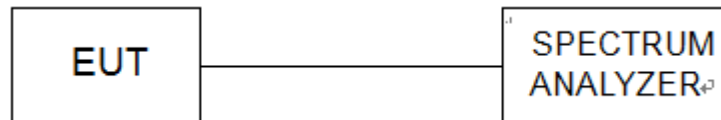
LIMIT

According to FCC §15.231(a)(1), A transmitter activated automatically shall cease transmission within 5 seconds after activation.

TEST PROCEDURE

1. The EUT was placed on a wooded table which is 0.8m height and close to receiver antenna of spectrum analyzer.
2. The spectrum analyzer resolution bandwidth was set to 1 MHz and video bandwidth was set to 1 MHz to encompass all significant spectral components during the test. The spectrum analyzer was operated in linear scale and zero span mode after tuning to the transmitter carrier frequency.

Test Configuration



TEST RESULTS

Frequency (MHz)	One transmission time (S)	Limit(S)	Result
425	3.05	5	Pass



3.4 CALCULATION OF AVERAGE FACTOR

The output field strengths of specification in accordance with the FCC rules specify measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The duty cycle is measured in 200 ms or the repetition cycle period, whichever is a shorter time frame. The duty cycle is measured by placing the spectrum analyzer to set zero span at 100kHz resolution bandwidth.

Averaging factor in dB = $20 \log (\text{duty cycle})$

TEST RESULTS

N/A (Since the peak value is less than the average limit, the average value does not need to be tested)

3.5 ANTENNA REQUIREMENT

Standard Applicable:

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Connected Construction

The antenna used in this product is an External antenna, the directional gains of antenna used for transmitting is 1.0dbi. It is permanently fixed and cannot be disassembled.

ANTENNA



4 PHOTOGRAPH OF TEST

Radiated Emission



Conducted Emission



***** End of Report *****