FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

Wireless Charger

Model: P00001122

Trade Name: ZOOX

Issued to

Primax Electronics LTD
669,Ruey Kuang Road,Neihu 114 Taipei,Taiwan,R.O.C.

Issued by

Compliance Certification Services Inc.
Wugu Laboratory
No.11, Wugong 6th Rd., Wugu Dist.,
New Taipei City, Taiwan
Issued Date: March 13, 2023

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	February 24, 2023	Initial Issue	ALL	Allison Chen
01	March 13, 2023	See the following Note Rev.(01)	P.6	Allison Chen

Note:
Rev.(01)
1. Modify test result in section 3.

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APPENDIX 1 - PHOTOGRAPHS OF EUT

1. TEST RESULT CERTIFICATION

Applicant:	Primax Electronics LTD 669,Ruey Kuang Road,Neihu 114 Taipei,Taiwan,R.O.C.
Manufacturer:	Dongguan Primax Electronic &Telecommunication Products Ltd. No#135, Keji East Road, Shijie Town, Dongguan City, Guangdong Province, 523290, China
Equipment Under Test:	Wireless Charger
Trade Name:	ZOOX
Model:	P00001122
Date of Test:	December 12~13, 2022

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 15.209	Compliance
Statements of Conformity	
Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.	

We hereby certify that:

All test results conform to above mentioned standards.

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part15.203, Part15.207, Part15.209. Part15.215.

The test results of this report relate only to the tested sample EUT identified in this report.

Approved by:

Dally Hong

Dally Hong
Sr. Engineer
Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product	Wireless Charger
Trade Name	ZOOX
Model Number	P00001122
Model Discrepancy	N/A
Received Date	December 7, 2022
Power Supply	Power from Battery. (DC 12V)
Frequency Band	127.72-132.72 kHz
Antenna Specification	Antenna Type: Coil Brand: FINE ELECTRONICS INDUSTRIAL (HK) LIMITED Model: F19.5x25.2-3coil-25mm-101F

Remark:
1. For more details, refer to the User's manual of the EUT.
2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

3. TEST SUMMARY

Standard Sec.	Chapter	Test Item	Result
15.215	7.1	20dB Bandwidth	Pass
15.209	7.2	Transmitter Radiated Emission	Pass
15.207	7.3	AC Power-line Conducted Emission	Not applicable
15.203	7.4	Coil Rulers and Specifications	Pass

Remark: Permanent coil antenna and an unique coupler to intentional radiator, meet the 15.203 requirement

4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10: 2013 , ANSI C63.4 2014 and FCC CFR 47 Part 15.203, 15.207.15.209,15.215.

4.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.207.15.209, 15.215 under the FCC Rules Part 15 Subpart C and ANSI C63.10: 2013.

4.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in ANSI C63.10: 2013, Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz was using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. The EUT is set 3m away from the receiving antenna, which 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. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in ANSI C63.10: 2013.

4.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in other rules, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	([2])
13.36 - 13.41	322 - 335.4		

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] Above 38.6

(b) Except as provided by other rules, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

4.5 DESCRIPTION OF TEST MODES

The EUT (model: P00001122) had been tested under operating condition.

Radiated Emission Measurement Below 1G	
Test Condition	**Radiated Emission Below 1G**
Power supply Mode	**Mode 1: EUT power by Battery (Left)** **Mode 2: EUT power by Battery (Right)** **Mode 3: EUT power by Battery (Left + Right)**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**

Remark:
1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(X-Plane) were recorded in this report

5. INSTRUMENT CALIBRATION

5.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

5.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

RF Conducted Test Site					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal Date**	**Cal Due**
EXA Signal Analyzer	Keysight	N9010B	MY60242460	2022-01-30	2023-01-29
Loop Probe	LANGER EMV-TECHNIK	RF-R 50-1	02-2644	2022-01-24	2023-01-23
Software	N/A				

3M 966 Chamber Test Site					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal Date**	**Cal Due**
PXA Signal Analyzer	Keysight Technologies	N9030B	MY62291089	2022-10-14	2023-10-13
Loop Antenna	COM-POWER	AL-130	121051	2022-04-13	2023-04-12
Preamplifier	EMEC	EM330	060609	2022-02-23	2023-02-22
Thermo-Hygro Meter	WISEWIND	1206	D07	2021-12-28	2022-12-27
Bi-Log Antenna	Sunol Sciences	JB3	A030105	2022-08-03	2023-08-02
Cable	Huber+Suhner	104PEA	20995+11112+182330	2022-02-23	2023-02-22
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Software	e3 V9-210616c				

Remark:
1. Each piece of equipment is scheduled for calibration once a year.
2. N.C.R. = No Calibration Required.

5.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	± 2.1183
Radiated Emission_9kHz-30MHz	± 3.814
Radiated Emission_30MHz-200MHz	± 4.272
Radiated Emission_200MHz-1GHz	± 4.619
Channel Bandwidth	± 2.1863

Remark: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

5.4 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

☐ No. 12, Ln. 116, Wugong 3rd Rd., Wugu Dist., New Taipei City, Taiwan.

CAB identifier: TW1309

Test site	Test Engineer	Remark
AC Conduction Room	-	Not applicable, because EUT doesn't connect to AC Main Source direct.
Radiation	Tony Chao	-
Conducted	David Li	-

Remark: The lab has been recognized as the FCC accredited lab. under the KDB 974614 D01 and is listed in the FCC pubic Access Link (PAL) database, FCC Registration No. :444940, the FCC Designation No.:TW1309

6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

6.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID
1	DC power Source	TECH	PROGRAMMABLE	N/A	N/A

Remark:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer’s requirements and conditions for the intended use.

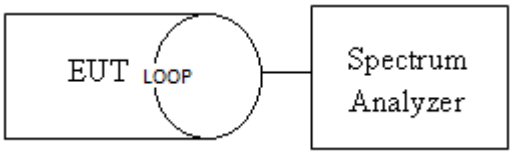
7. TEST REQUIREMENTS

7.1 20DB BANDWIDTH

Definition

According to FCC Part 15.215 (c) ,Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

Test Configuration



TEST PROCEDURE

The Loop antenna connected to the spectrum analyzer, was touching to the transmitter antenna. Set the RBW=1kHz, VBW=3kHz, Detector = Peak, Trace mode = Max hold, Sweep = 500ms.Measure the maximum width of the emission that is constrained by the frequencies associated with the Occupied Bandwidth.

TEST RESULTS

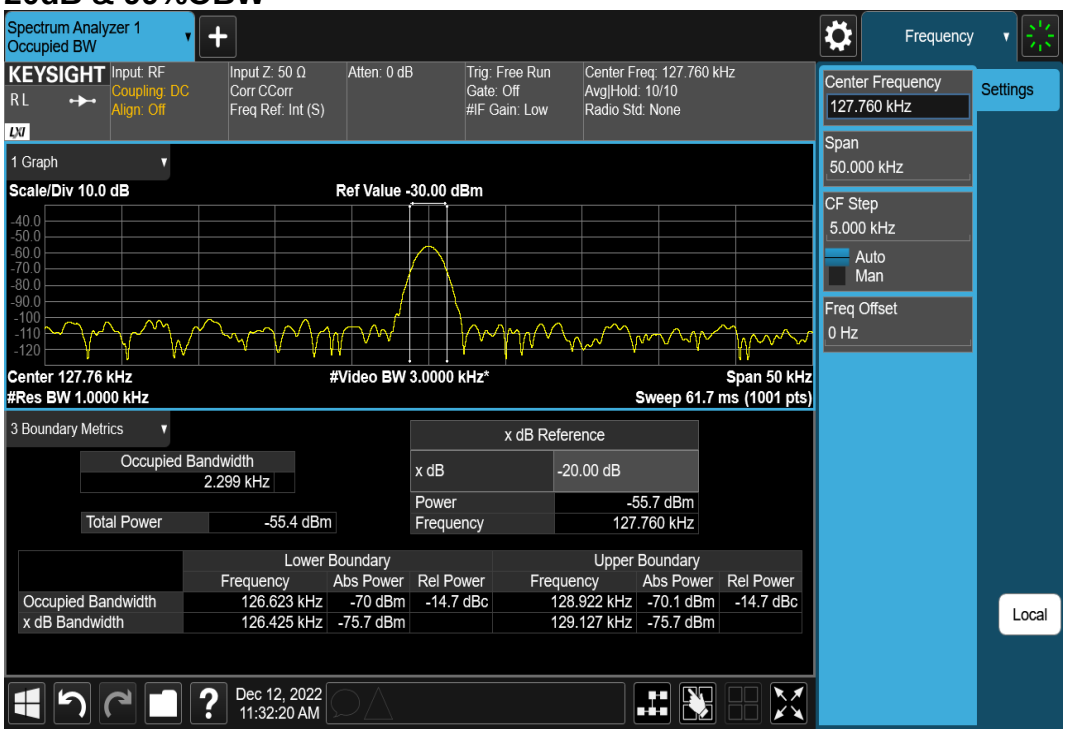
Compliance

Temperature:	20.3℃	**Test Date:**	December 12, 2022
Humidity:	58% RH	**Tested By:**	David Li

Occupied Channel Bandwidth Result						
Modulation Mode	Frequency (F_C)	99% Bandwidth (kHz)	F_{SL} (kHz)	F_L BW (kHz)	F_H at 20dB BW (kHz)	F_{SH} at 20dB BW (kHz)
Full charging loading	127.76	2.299	126.623	128.922	126.425	129.127
Limit		N/A	N/A	N/A	N/A	N/A
Result		**Complied**				

Test Data

20dB & 99%OBW



7.2 TRANSMITTER RADIATED EMISSION

LIMIT

1. According to FCC PART 15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

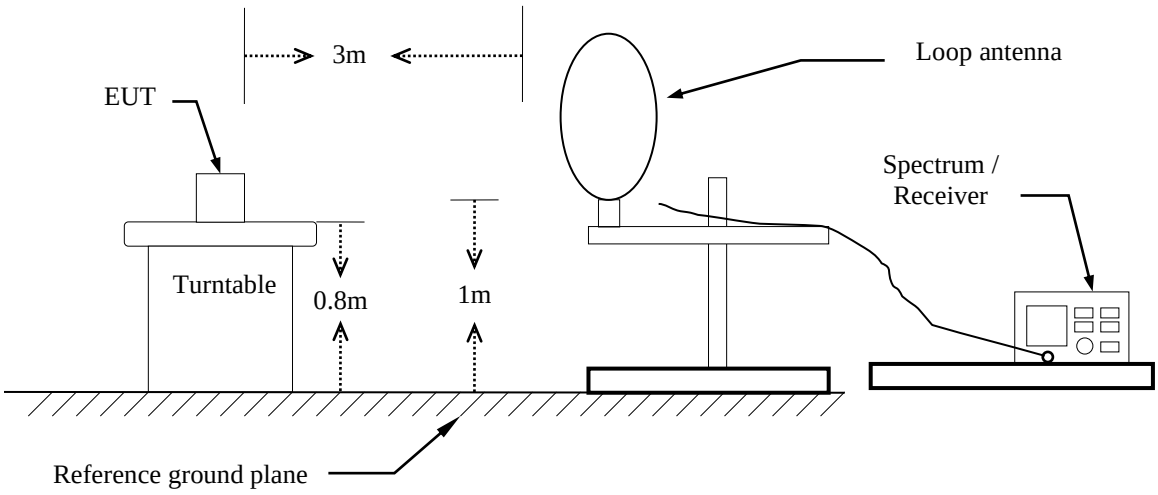
Remark: Except as provided in other rules, fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

Above 30MHz

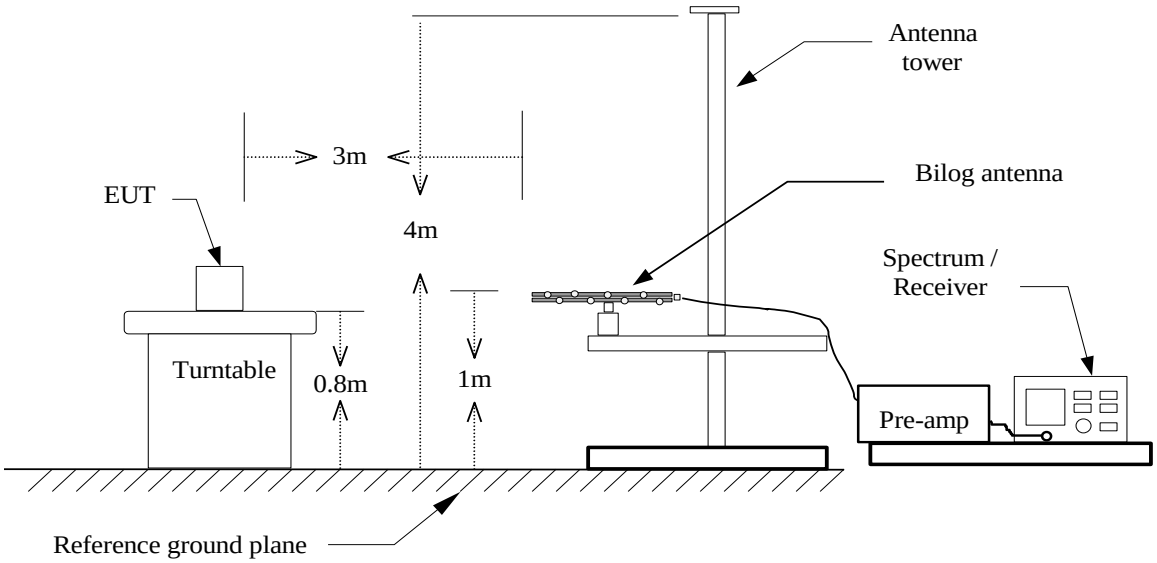
Frequency (MHz)	Field Strength		Measurement Distance (meter)
	(μV/m)	(dBμV/m)	
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Test Configuration

9kHz ~ 30MHz



30MHz ~ 1GHz



TEST PROCEDURE

For 9KHz ~ 30MHz

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:
   Below 1GHz:
   RBW=200kHz / VBW=600kHz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.
8. Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

For 30MHz ~ 1GHz

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:
   RBW=100kHz / VBW=300kHz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.

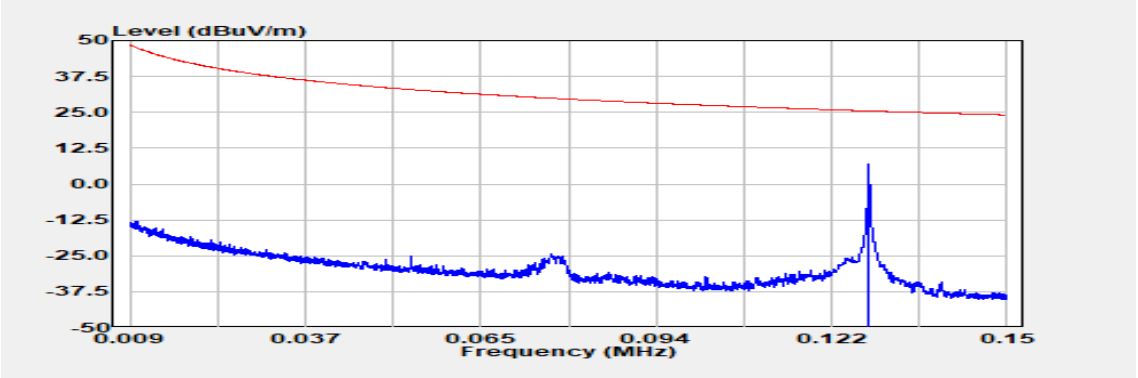
Main

Operation Mode:	Charging mode	**Test Mode:**	Mode 1
Temperature:	23.5℃	**Test Date:**	December 13, 2022
Humidity:	62% RH	**Tested by:**	Tony Chao

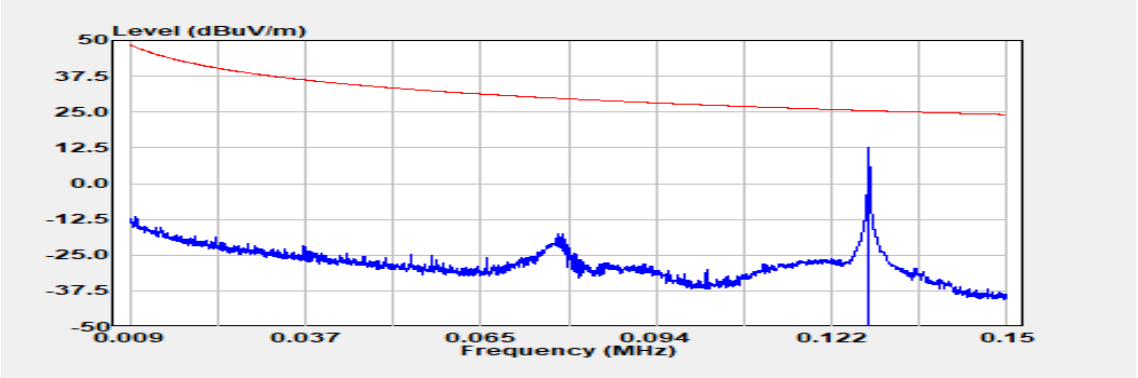
Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Antenna Pol. (V/H/G)
0.128	Peak	73.99	-66.94	7.05	25.48	-18.43	V
0.128	Peak	79.60	-66.94	12.66	25.48	-12.81	H
0.128	Peak	73.02	-66.94	6.08	25.48	-19.39	G

Remark:
1. Factor = Antenna factor + Cable loss – Distance conversion factor

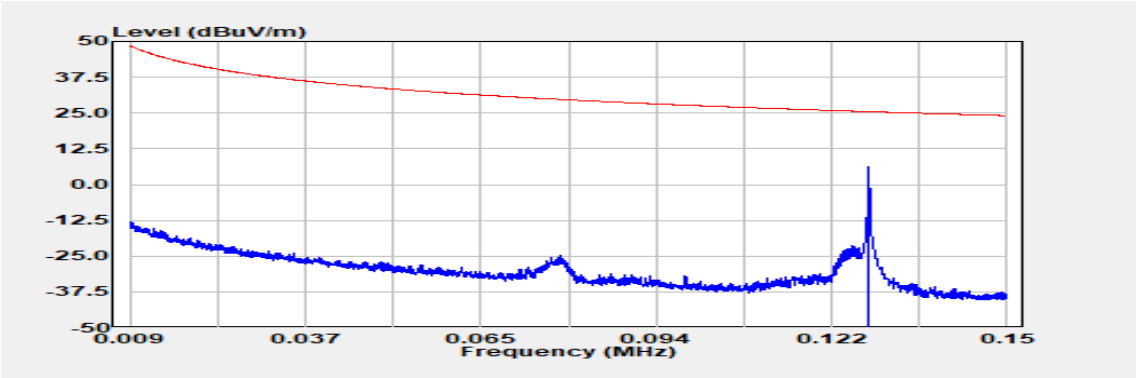
Vertical



Horizontal

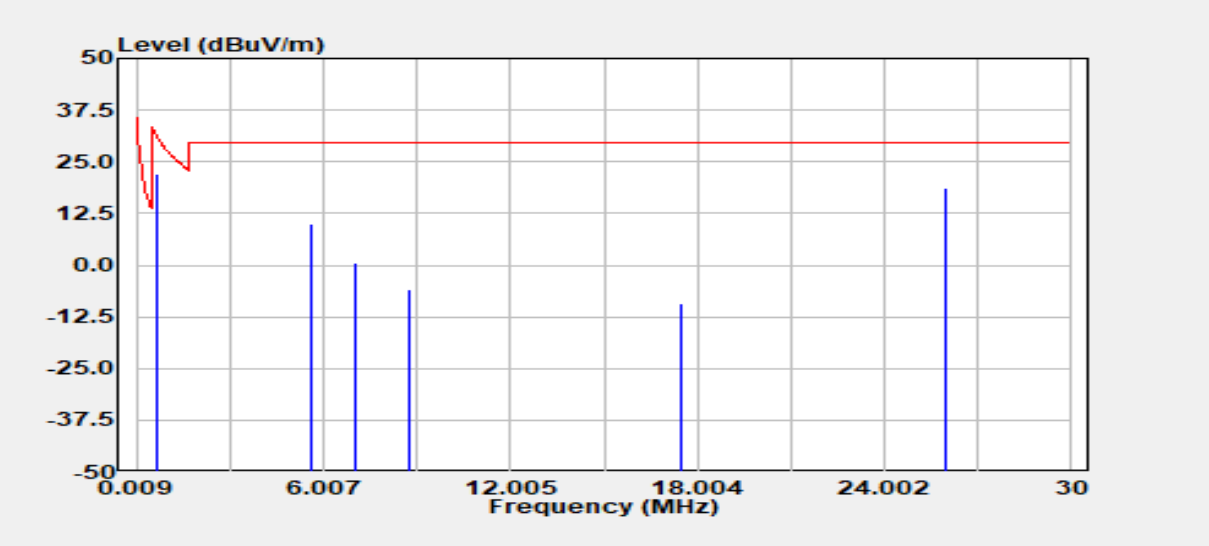


Ground



9 kHz – 30MHz

Operation Mode:	Charging mode	**Antenna Pol.:**	Horizontal
Temperature:	23.5℃	**Test Date:**	December 13, 2022
Humidity:	62% RH	**Tested by:**	Tony Chao
Test Mode:	Mode 1		



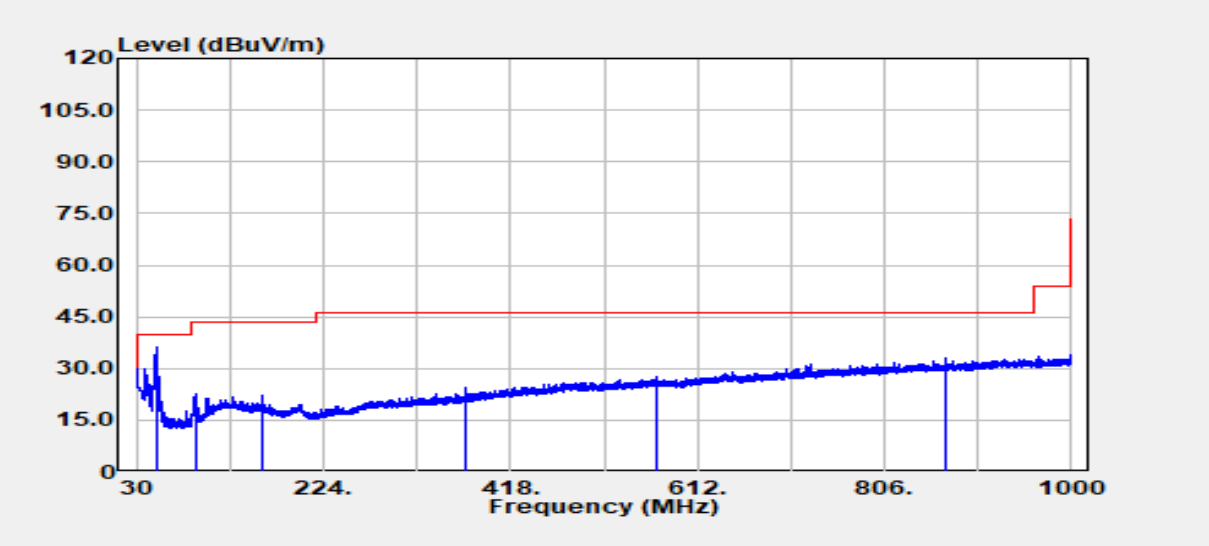
Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit (dBµV/m)	Margin (dB)
0.639	Peak	48.38	-26.48	21.89	31.50	-9.60
5.616	Peak	35.74	-25.72	10.01	29.54	-19.53
7.042	Peak	26.20	-25.46	0.74	29.54	-28.80
8.769	Peak	19.40	-25.15	-5.75	29.54	-35.29
17.444	Peak	15.56	-24.76	-9.19	29.54	-38.73
25.989	Peak	44.31	-25.76	18.55	29.54	-10.99

Remark:

1. The frequency bands 9-90 kHz, 110-490 kHz measurements employing an average detector and other below 1GHz measurements employing a CISPR quasi-peak detector.
2. For 9-90kHz, 110kHz-490kHz, the EUT peak value was under average limit, therefore the Average value compliance with the average limit.
   For other frequencies, the Peak value was under the Quasi-peak limit, therefore the Quasi-peak value compliance with the limit. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit.
3. Factor = Antenna factor + Cable loss – Distance conversion factor
4. Since the Factor included the distance conversion factor, the distance of Actual FS is 300m or 30m. (9kHz~490kHz is 300m, 490kHz~30MHz is 30m)
5. The worst receiver antenna pol. is Horizontal.

Below 1 GHz

Operation Mode:	Charging mode	**Antenna Pol.:**	Vertical
Temperature:	23.5℃	**Test Date:**	December 13, 2022
Humidity:	62% RH	**Tested by:**	Tony Chao
Test Mode:	Mode 1		

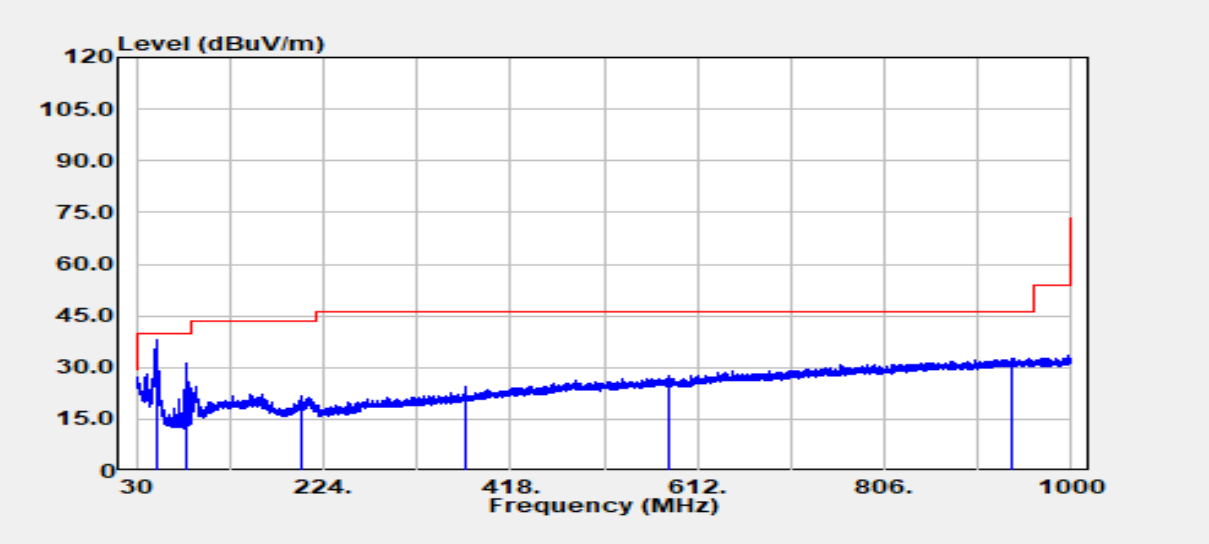


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit (dBµV/m)	Margin (dB)
50.370	Peak	52.09	-15.76	36.33	40.00	-3.67
91.231	Peak	38.04	-15.51	22.53	43.50	-20.97
159.980	Peak	33.24	-10.83	22.41	43.50	-21.09
371.319	Peak	31.48	-7.09	24.39	46.00	-21.61
568.593	Peak	30.21	-2.43	27.78	46.00	-18.22
868.686	Peak	30.73	2.14	32.87	46.00	-13.13

Remark:
1. Factor = Antenna factor + Cable loss – Amp gain

Operation Mode: Charging mode
Temperature: 23.5℃
Humidity: 62% RH
Test Mode: Mode 1

Antenna Pol.: Horizontal
Test Date: December 13, 2022
Tested by: Tony Chao



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit (dBµV/m)	Margin (dB)
50.370	Peak	53.66	-15.76	37.90	40.00	-2.10
82.986	Peak	47.46	-16.10	31.36	40.00	-8.64
199.993	Peak	31.58	-9.90	21.68	43.50	-21.82
371.319	Peak	31.34	-7.09	24.25	46.00	-21.75
581.566	Peak	29.90	-2.47	27.42	46.00	-18.58
939.254	Peak	29.30	3.13	32.42	46.00	-13.58

Remark:
1. Factor = Antenna factor + Cable loss – Amp gain

7.3 AC CONDUCTED EMIISION

LIMIT

According to §15.207(a) , for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

Test Configuration

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

TEST RESULTS

Not applicable, because EUT doesn’t connect to AC Main Source direct.

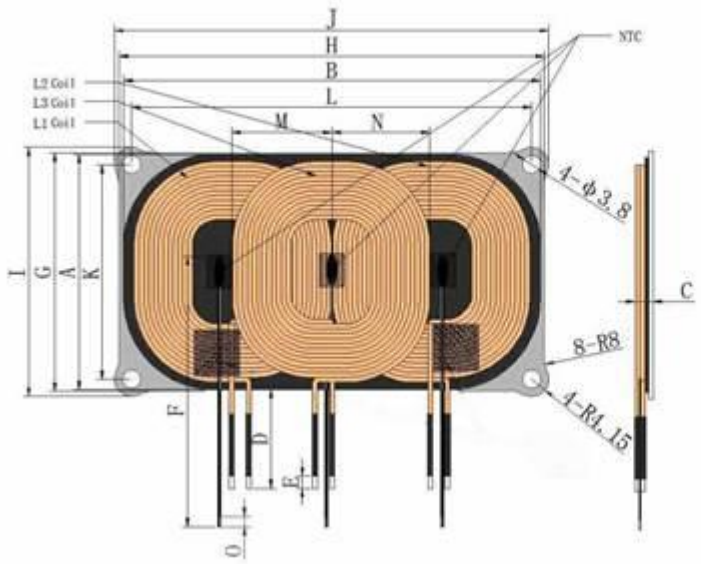
7.4 COIL RULERS AND SPECIFICATIONS

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Antenna Type	Coil
Brand / Model	Brand: FINE ELECTRONICS INDUSTRIAL (HK) LIMITED Model: F19.5x25.2-3coil-25mm-101F

Remark:
1.The antenna(s) of the EUT are permanently attached and there are no provisions for connection to an external antenna. So the EUT complies with the requirements of §15.203.

DIMENSION:(mm)



A	57±1.0
B	101±1.0
C	5.5 Max
D	25±1.5
E	4±1
F	70±2.0
G	57.6±0.15
H	103±0.15
I	60.3 ref
J	105.3±0.15
K	52 ref
L	97±1
M	23.85 ref
N	23.85 ref
O	2.5±1

Winding Specification:

NO.	TERMINAL		WIRE	Turns	Winding Direction
L3 Coil	S	F	Magnet wire 0.06*200P	12Ts	CCW
L1、L2 Coil	S	F	Magnet wire 0.06*200P	11Ts	CCW

ELECTRICAL CHARACTERISTICS:

TEMPERATURE:25±10°C, RELATIVE HUMIDITY:65±20%

NO.	ITEM	TERMINAL	SPECIFICATION	TEST FREQUENCY	TEST EQUIPMENTS
1	IND.	L1、L2 Coil	9.8uH±10%	100KHz/1.0V	LCZ METER 1062B
2	IND.	L3 Coil	10.2uH±10%	100KHz/1.0V	LCZ METER 1062B
3	DCR	S-F	65 mΩ Max		TH2810

- End of Test Report -