

## FCC PART 15C


## TEST REPORT

For

### Earfun Technology (HK) Limited

FLAT/RM A 9F,SILVERCORP INTERNATIONAL TOWER 707-713 NATHAN ROAD  
MONGKOK KL, HONG KONG

**FCC ID: 2AVIT-EFC100**

<b>Report Type:</b> Original Report	<b>Product Name:</b> Wireless Charging Pad
<b>Report Number:</b> DG1210616-23579E-00A	
<b>Report Date:</b> 2021-07-06	
<b>Reviewed By:</b>	Ivan Cao Assistant Manager 
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## GENERAL INFORMATION

### Product Description for Equipment Under Test (EUT)

<b>EUT Name:</b>	Wireless Charging Pad
<b>EUT Model:</b>	EFC100
<b>Operation Frequency:</b>	110-148kHz
<b>Maximum Wireless Output:</b>	15W
<b>Rated Input Voltage:</b>	DC 5V/2A, 9V/2A,12V/2A from QC Adapter
<b>Serial Number:</b>	DG1210616-23579E-RF_S1
<b>EUT Received Date:</b>	2021.06.18
<b>EUT Received Status:</b>	Good

### Objective

This Type approval report is prepared on behalf of *Earfun Technology (HK) Limited* in accordance with Part 2, Subpart J, and Part 15, Subparts A and C of the Federal Communications Commission's rules.

The objective is to determine the compliance of the EUT with FCC rules, 15.203, 15.205, 15.207, 15.209.

### Test Methodology

All measurements detailed in this Test Report were performed in accordance with ANSI C63.10-2013 "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices".

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

### Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
radiated Emissions	9kHz~30MHz: 4.12dB 30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical
Temperature	±1 °C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

*Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.*

**Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.12, Pulong East 1<sup>st</sup> Road, Tangxia Town, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier : CN0022.

**Declarations**

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol “▲”. Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

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**SYSTEM TEST CONFIGURATION**

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**Justification**

The system was configured for testing in a test mode

The device is a wireless charger operation on frequency 110 kHz - 148 kHz.

**EUT Exercise Software**

No software used in test.

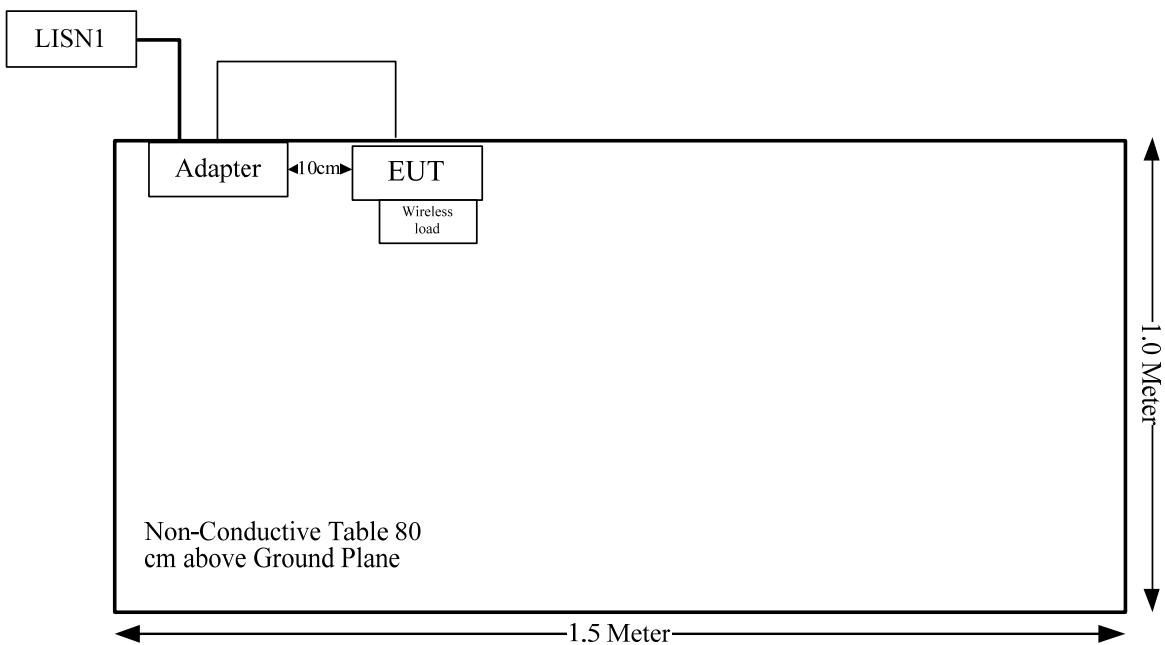
**Support Equipment List and Details**

Manufacturer	Description	Model	Serial Number
MPOW	Wireless Charging Load	Load-1	Load-1
DJI	adapter	QC24-CN	QC24-CN-1

**Support Cable List and Details**

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
USB Cable	yes	No	1.2	USB Port of adapter	EUT

## Block Diagram of Test Set



## SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §1.1310, §2.1091	MAXIMUM PERMISSIBLE EXPOSURE (MPE)	Compliance
FCC§15.203	Antenna Requirement	Compliance
FCC§15.207	AC Line Conducted Emission	Compliance
§15.209 §15.205	Radiated Emission Test	Compliance

## FCC §1.1310, §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### Applicable Standard

According to subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; \* = Plane-wave equivalent power density;

According with KDB 680106 D01 RF Exposure Wireless Charging Apps v03r01 clause 3 c)

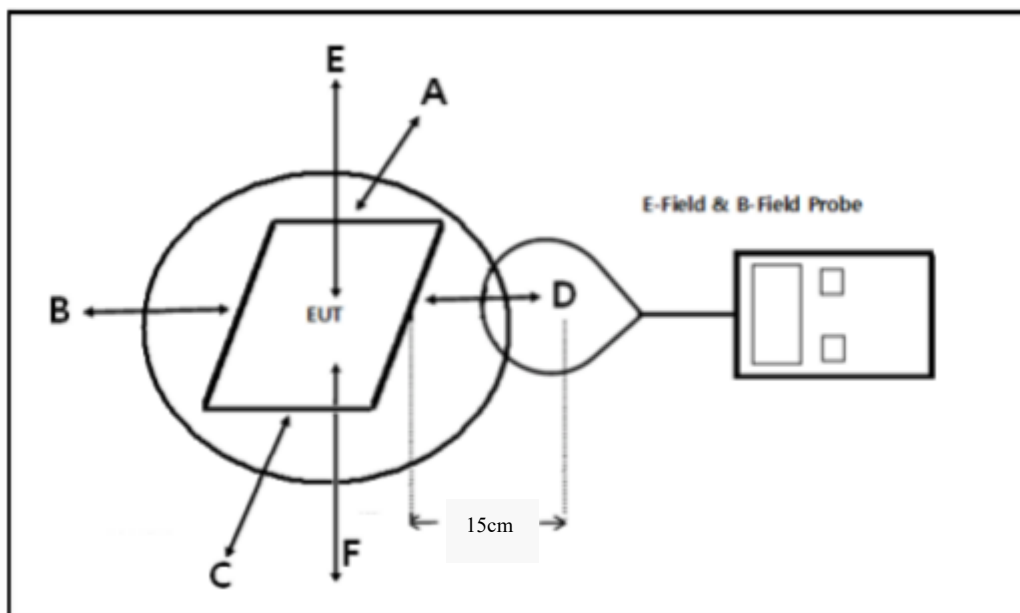
- c) For devices designed for typical desktop applications, such as wireless charging pads, RF exposure evaluation should be conducted assuming a user separation distance of 15 cm. E and H field strength measurements or numerical modeling may be used to demonstrate compliance. Measurements should be made from all sides and the top of the primary/client pair, with the 15 cm measured from the center of the probe(s) to the edge of the device. Emissions between 100 kHz to 300 kHz should be assessed versus the limits at 300 kHz in Table 1 of Section 1.1310: 614 V/m and 1.63 A/m. A KDB inquiry is required to determine the applicable exposure limits below 100 kHz.

According to 680106 D01 RF Exposure Wireless Charging App v03r01 clause 5 b)

- b) Inductive wireless power transfer applications with supporting field strength results and meeting all of the following requirements are not required to submit a KDB inquiry for devices approved using SDoC or a PAG for equipment approved using certification to address RF exposure compliance. However, the responsible party is required to keep a copy of the test report in accordance with KDB 865664 D02. A copy of the test report is to be submitted with the application if the device is approved using certification.
- (1) Power transfer frequency is less than 1 MHz.
  - (2) Output power from each primary coil is less than or equal to 15 watts.
  - (3) The transfer system includes only single primary and secondary coils. This includes charging systems that may have multiple primary coils and clients that are able to detect and allow coupling only between individual pairs of coils.
  - (4) Client device is placed directly in contact with the transmitter.
  - (5) Mobile exposure conditions only (portable exposure conditions are not covered by this exclusion).
  - (6) The aggregate H-field strengths at 15 cm surrounding the device and 20 cm above the top surface from all simultaneous transmitting coils are demonstrated to be less than 50% of the MPE limit.



## Block Diagram of Test Setup



Note: 20 cm for Top test.

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Narda	Exposure Level Tester	ELT-400	N-0229	2019-11-19	2021-11-18
Narda	B Field Probe	ELT Probe 100cm <sup>2</sup>	M-0666	2019-11-19	2021-11-18
Amplifier Research	Isotropic Field Probe	FP5000	301825	2018-11-12	2021-11-12
ETS-Lindgreen	Field Probe	HI-6005	6564158	2019-12-10	2022-12-09

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

Temperature:	26.9°C
Relative Humidity:	62%
ATM Pressure:	100.6kPa
Test Engineer:	Joker Chen
Test Date	2021-06-30

**H-field Strength:**

Frequency Range (kHz)	Position A (A/m)	Position B (A/m)	Position C (A/m)	Position D (A/m)	Position E (A/m)	50% Limit (A/m)	Limit (A/m)
110-148	0.206	0.203	0.199	0.202	0.205	0.815	1.63

Note: Test with 15cm distance from the center of the probe(s) to the edge of the device, 20 cm for top(Position E) test.

**E-field Strength:**

Frequency Range (kHz)	Position A (V/m)	Position B (V/m)	Position C (V/m)	Position D (V/m)	Position E (V/m)	50% Limit (V/m)	Limit (V/m)
110-148	1.69	1.75	1.24	1.32	1.98	307	614

Note: Test with 15cm distance from the center of the probe(s) to the edge of the device, 20 cm for top(Position E) test.

**Result: Compliance****Considerations of compliance 680106 D01 RF Exposure Wireless Charging App v03r01 clause 5 b:**

(1) Power transfer frequency is less than 1 MHz.

Yes, the operation frequency is 110-148 kHz.

(2) Output power from each primary coil is less than or equal to 15 watts.

Yes, the maximum output power of primary coil is **15 Watts**.

(3) The transfer system includes only single primary and secondary coils. This includes charging systems that may have multiple primary coils and clients that are able to detect and allow coupling only between individual pairs of coils.

The transfer system includes only single primary coil, and system detect and allow coupling only between individual pairs of coils.

(4) Client device is placed directly in contact with the transmitter.

Yes, client device is placed directly in contact with the transmitter

(5) Mobile exposure conditions only (portable exposure conditions are not covered by this exclusion).

Yes, mobile exposure conditions only

(6) The aggregate H-field strengths at 15 cm surrounding the device and 20 cm above the top surface from all simultaneous transmitting coils are demonstrated to be less than 50% of the MPE limit.

Yes, the test result for H and E-field strength less than 50% of the MPE limit.

**FCC§15.203 - ANTENNA REQUIREMENT**

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**Applicable Standard**

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.

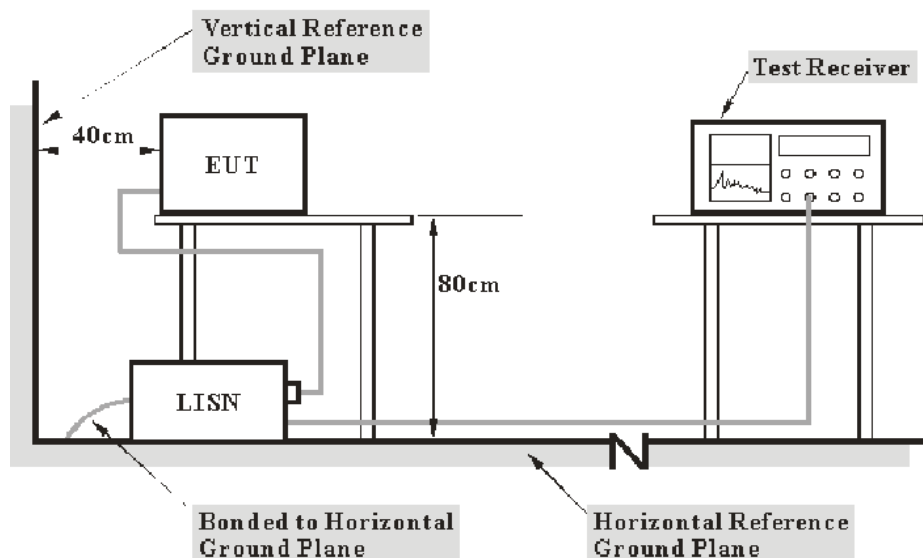
**Antenna Connected Construction**

The EUT has one integral Coil antenna arrangement, which was permanently attached and fulfill the requirement of this section. Please refer to the EUT photos.

**Result:** Compliance.

## FCC §15.207 – AC LINE CONDUCTED EMISSION

### EUT Setup



- Note: 1. Support units were connected to second LISN.  
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

The adapter was connected to the main LISN with an AC 120V/60Hz power source.

### EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	LISN	ENV 216	101614	2020-09-12	2021-09-12
R&S	EMI Test Receiver	ESCI	101121	2020-07-07	2021-07-07
MICRO-COAX	Coaxial Cable	C-NJNJ-50	C-0200-01	2020-09-05	2021-09-05
R&S	Test Software	EMC32	Version 9.10.00	N/A	N/A

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

The frequency and amplitude of the six highest ac power-line conducted emissions relative to the limit, measured over all the current-carrying conductors of the EUT power cords, and the operating frequency or frequency to which the EUT is tuned (if appropriate), should be reported, unless such emissions are more than 20 dB below the limit. AC power-line conducted emissions measurements are to be separately carried out only on each of the phase ("hot") line(s) and (if used) on the neutral line(s), but not on the ground [protective earth] line(s). If less than six emission frequencies are within 20 dB of the limit, then the noise level of the measuring instrument at representative frequencies should be reported. The specific conductor of the power-line cord for each of the reported emissions should be identified. Measure the six highest emissions with respect to the limit on each current-carrying conductor of each power cord associated with the EUT (but not the power cords of associated or peripheral equipment that are part of the test configuration). Then, report the six highest emissions with respect to the limit from among all the measurements identifying the frequency and specific current-carrying conductor identified with the emission. The six highest emissions should be reported for each of the current-carrying conductors, or the six highest emissions may be reported over all the current-carrying conductors.

According FCC publication number 174176, for a device with a permanent antenna operating at or below 30 MHz, the measurements done with a suitable dummy load, in lieu of the permanent antenna under the following conditions: (1) perform the AC line conducted tests with the permanent antenna to determine compliance with the Section 15.207 limits outside the transmitter's fundamental emission band; (2) retest with a dummy load in lieu of the permanent antenna to determine compliance with the Section 15.207 limits within the transmitter's fundamental emission band.

## Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

Herein,

$V_C$ : corrected voltage amplitude

$V_R$ : reading voltage amplitude

$A_c$ : attenuation caused by cable loss

VDF: voltage division factor of AMN or ISN

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

### Test Results Summary

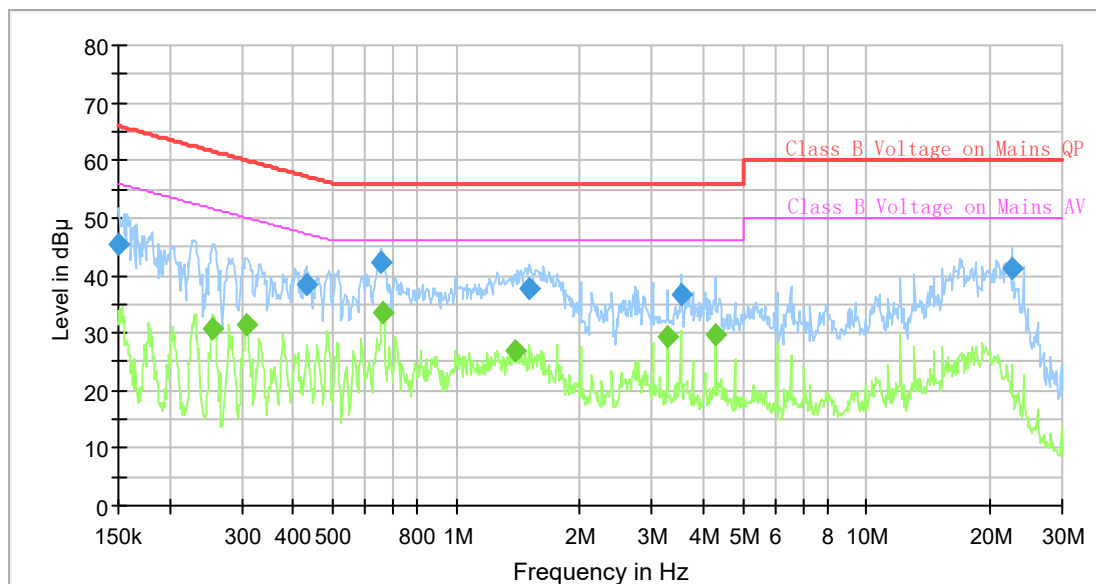
According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

### Test Data

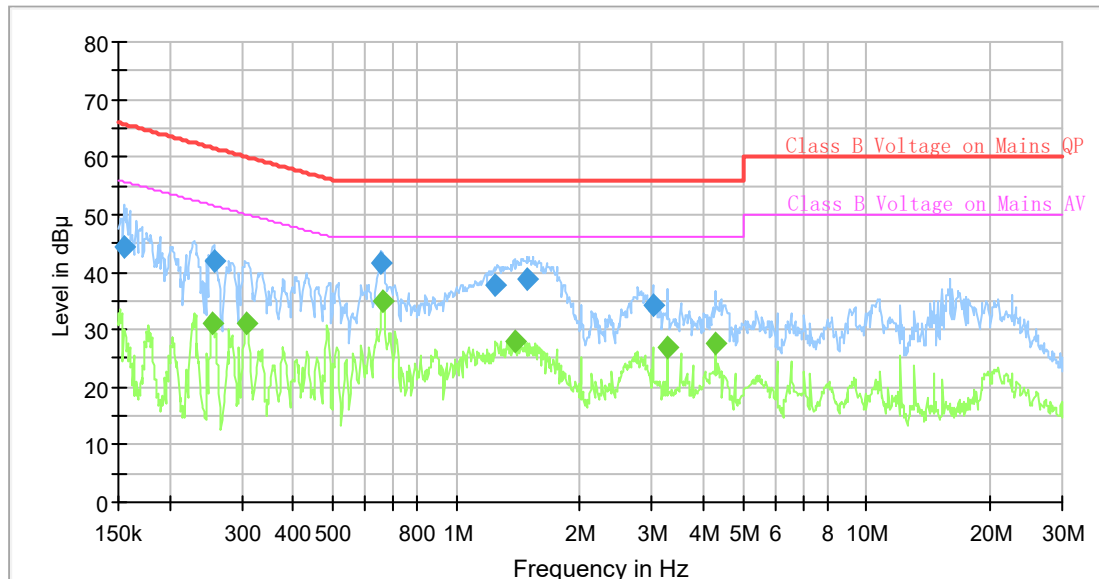
#### Environmental Conditions

<b>Temperature:</b>	25.1℃
<b>Relative Humidity:</b>	69%
<b>ATM Pressure:</b>	100.2kPa
<b>Test Engineer:</b>	Walker Chen
<b>Test Date</b>	2021-06-24

*Test Result: Compliance, please refer to the below plots and table.*

**Test Mode: Full Load****AC 120V, 60 Hz, Line:****Final Result**

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Average (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.150750	45.45	---	65.96	20.51	9.000	L1	9.6
0.254504	---	30.88	51.61	20.73	9.000	L1	9.6
0.307613	---	31.57	50.03	18.46	9.000	L1	9.6
0.431814	38.32	---	57.22	18.90	9.000	L1	9.6
0.656516	42.29	---	56.00	13.71	9.000	L1	9.6
0.663098	---	33.61	46.00	12.39	9.000	L1	9.6
1.387250	---	26.86	46.00	19.14	9.000	L1	9.7
1.510003	37.69	---	56.00	18.31	9.000	L1	9.7
3.271278	---	29.43	46.00	16.57	9.000	L1	9.7
3.525400	36.77	---	56.00	19.23	9.000	L1	9.7
4.282376	---	29.59	46.00	16.41	9.000	L1	9.7
22.654234	41.06	---	60.00	18.94	9.000	L1	10.0

**AC120 V, 60 Hz, Neutral:****Final Result**

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Average (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.154557	44.33	---	65.75	21.42	9.000	N	9.6
0.254504	---	31.25	51.61	20.36	9.000	N	9.6
0.257055	41.78	---	61.53	19.75	9.000	N	9.6
0.307613	---	31.24	50.03	18.79	9.000	N	9.6
0.656516	41.57	---	56.00	14.43	9.000	N	9.6
0.663098	---	34.94	46.00	11.06	9.000	N	9.6
1.243087	37.62	---	56.00	18.38	9.000	N	9.6
1.387250	---	27.93	46.00	18.07	9.000	N	9.6
1.487578	38.78	---	56.00	17.22	9.000	N	9.6
3.020372	34.08	---	56.00	21.92	9.000	N	9.6
3.271278	---	26.78	46.00	19.22	9.000	N	9.6
4.282376	---	27.63	46.00	18.37	9.000	N	9.6



## FCC §15.205 & §15.209 - RADIATED EMISSIONS TEST

### Applicable Standard

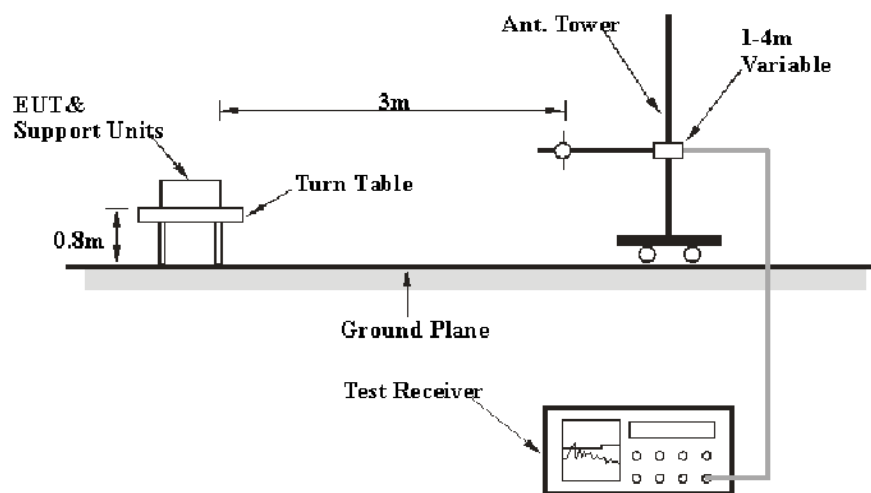
As per FCC Part 15.209

(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 (microvolts/meter)	Measurement distance (meters)
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

\*\*Except as provided in paragraph (g), 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., §§15.231 and 15.241.

### EUT Setup



The radiated emission tests were performed in the 3-meter chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part Subpart C limits.

The spacing between the peripherals was 10 cm.

## EMI Test Receiver Setup

The system was investigated from 9 kHz to 1 GHz.

During the radiated emission test, the EMI test Receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	Measurement
9 kHz – 150 kHz	200 Hz	1 kHz	QP/Average
150 kHz – 30 MHz	9 kHz	30 kHz	QP/Average
30 MHz – 1000 MHz	120 kHz	300 kHz	QP

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

If the maximized peak measured value complies with the limit, then it is unnecessary to perform an QP/Average measurement

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corr. Ampl.}$$

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
TESEQ	Passive Loop	HLA6120	33561	2021-02-03	2022-02-02
Sunol Sciences	Antenna	JB3	A060611-1	2020-11-10	2023-11-10
R&S	EMI Test Receiver	ESR3	102453	2020-09-12	2021-09-12
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1400-01	2021-05-06	2022-05-05
HP	Amplifier	8447D	2727A05902	2020-09-05	2021-09-05
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

**Test Results Summary**

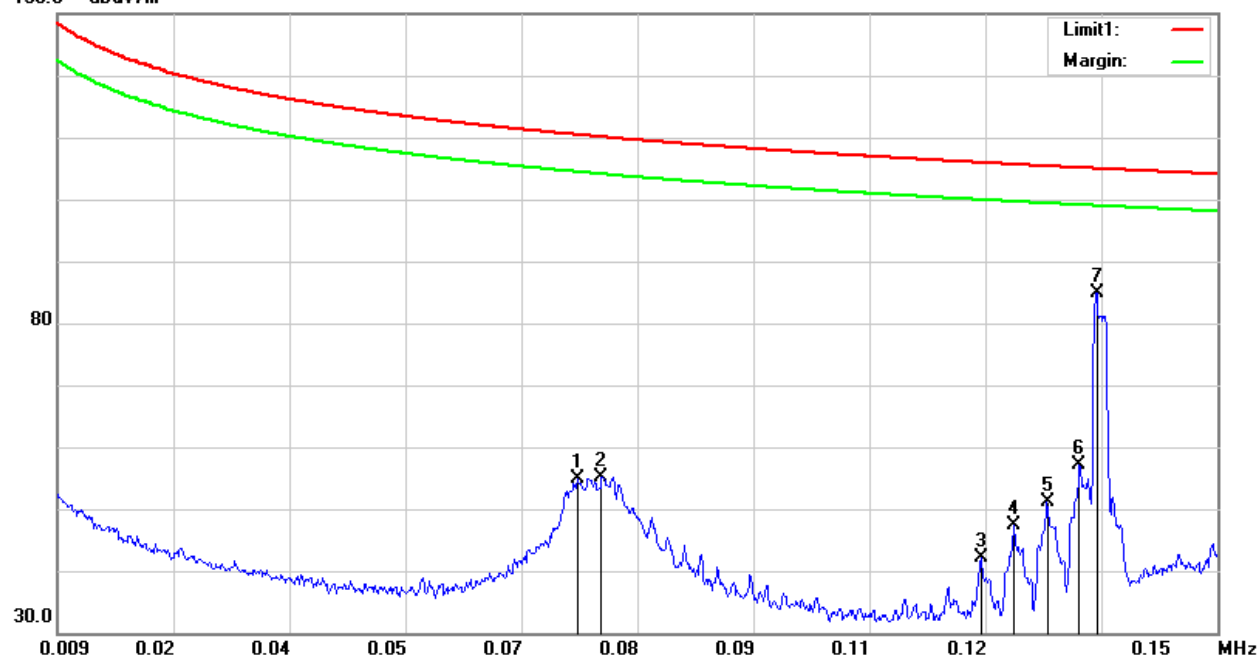
According to the data in the following table, the EUT complied with the FCC Part 15.209&15.205.

**Test Data****Environmental Conditions**

<b>Temperature:</b>	26.9°C
<b>Relative Humidity:</b>	62%
<b>ATM Pressure:</b>	100.6kPa
<b>Test Engineer:</b>	Joker Chen
<b>Test date:</b>	2021-06-30

*Test mode: Full Load*

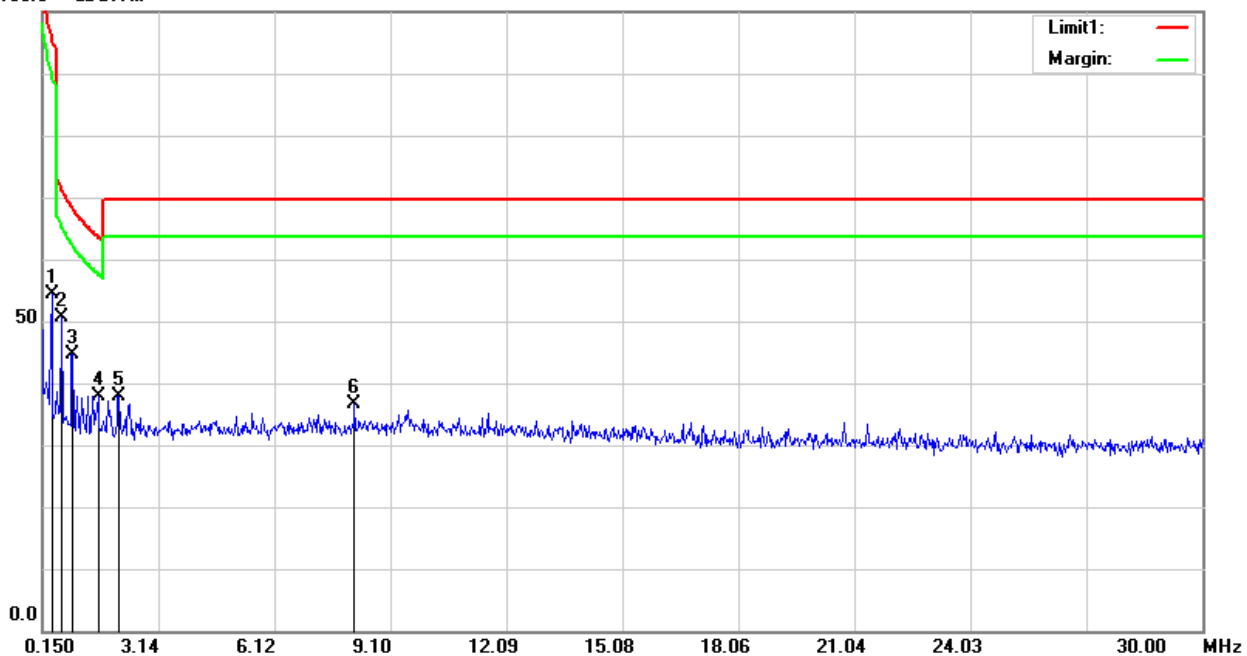
1) 9-150 kHz:

130.0 dB $\mu$ V/m

Frequency (MHz)	Receiver Reading (dB $\mu$ V)	Detector	Correction Factor (dB/m)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
0.0722	34.35	peak	20.41	54.76	110.43	55.67
0.0751	34.74	peak	20.39	55.13	110.09	54.96
0.1212	21.99	peak	20.22	42.21	105.93	63.72
0.1253	27.12	peak	20.22	47.34	105.64	58.30
0.1293	30.79	peak	20.22	51.01	105.37	54.36
0.1332	37.00	peak	20.22	57.22	105.11	47.89
0.1353*	64.67	peak	20.22	84.89	104.98	20.09

\*: Fundamental

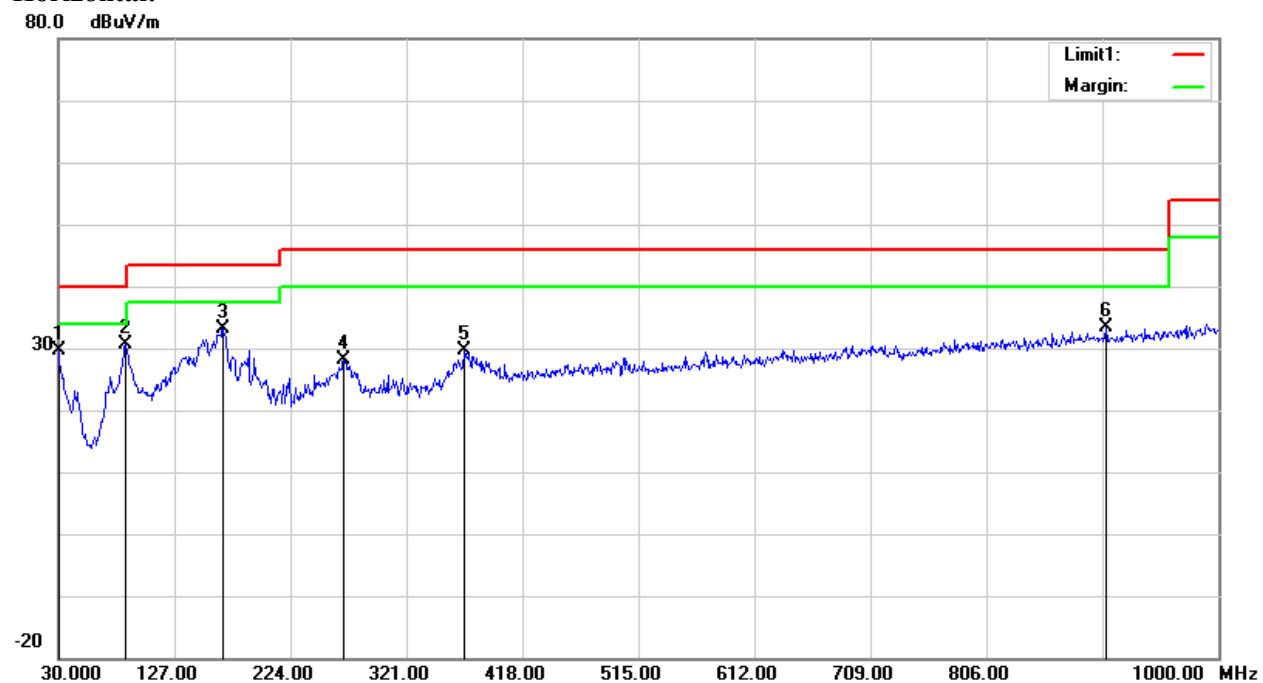
## 2) 150kHz-30 MHz:

100.0 dB $\mu$ V/m

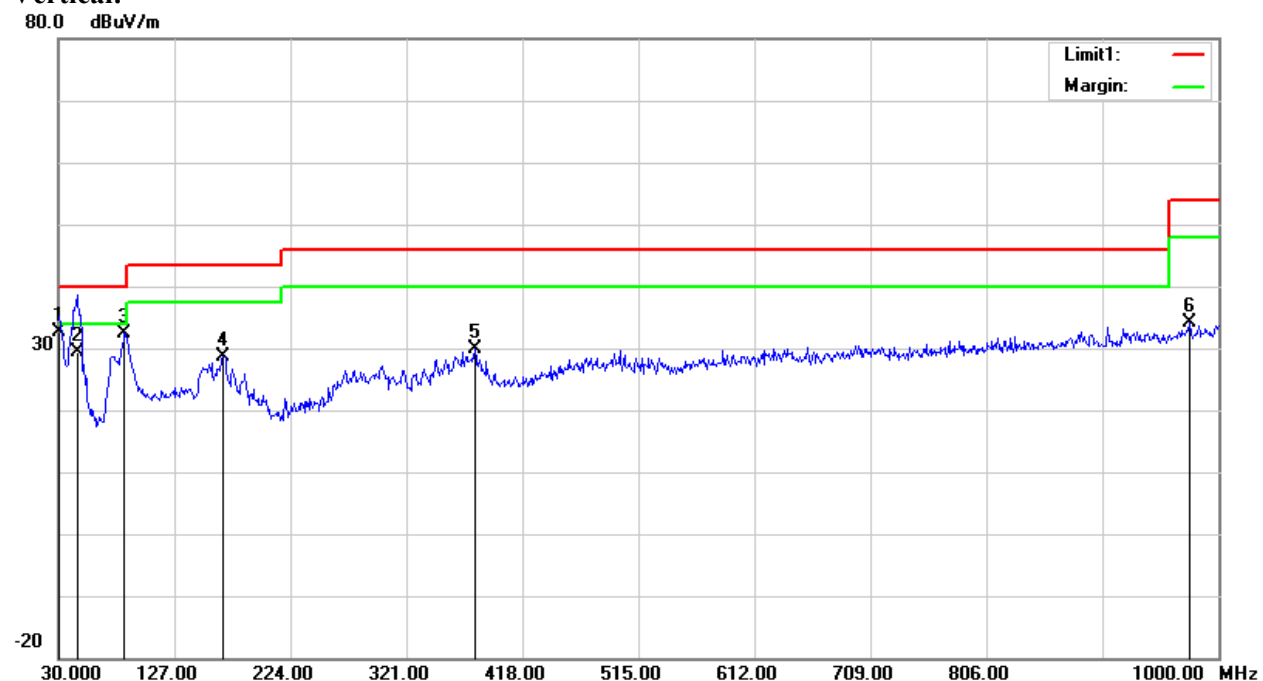
Frequency (MHz)	Receiver Reading (dB $\mu$ V)	Detector	Correction Factor (dB/m)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
0.3887	34.22	peak	20.10	54.32	95.81	41.49
0.6574	30.68	peak	20.05	50.73	71.25	20.52
0.9261	24.68	peak	20.06	44.74	68.27	23.53
1.5827	17.88	peak	19.99	37.87	63.61	25.74
2.1200	17.85	peak	20.02	37.87	69.54	31.67
8.1797	16.38	peak	20.31	36.69	69.54	32.85

## 3)30MHz- 1GHz

## Horizontal:



Frequency (MHz)	Receiver Reading (dB $\mu$ V)	Detector	Correction Factor (dB/m)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
30.0000	28.25	peak	1.46	29.71	40.00	10.29
86.2600	42.18	peak	-11.62	30.56	40.00	9.44
167.7400	39.85	peak	-6.60	33.25	43.50	10.25
268.6200	32.53	peak	-4.32	28.21	46.00	17.79
369.5000	32.32	peak	-2.72	29.60	46.00	16.40
905.9100	33.87	peak	-0.60	33.27	46.00	12.73

**Vertical:**

Frequency (MHz)	Receiver Reading (dB $\mu$ V)	Detector	Correction Factor (dB/m)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
30.9700	31.90	QP	0.74	32.64	40.00	7.36
45.5200	38.90	QP	-9.63	29.27	40.00	10.73
85.2900	43.87	peak	-11.60	32.27	40.00	7.73
167.7400	35.33	peak	-6.60	28.73	43.50	14.77
378.2300	32.41	peak	-2.54	29.87	46.00	16.13
975.7500	33.63	peak	0.43	34.06	54.00	19.94

\*\*\*\*\* END OF REPORT \*\*\*\*\*