



# FCC PART 15C

## TEST REPORT

For

### Astro Pneumatic Tool Co.

1230 Santa Anita Avenue, Suite E South El Monte, CA 91733

**FCC ID: 2AWSV52SL-WCP**

<b>Report Type:</b> Original Report	<b>Product Name:</b> Wireless charging pad
<b>Report Number:</b> <u>RXM200616050-00</u>	
<b>Report Date:</b>	<u>2020-07-15</u>
<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>		52SL-WCP
<b>Operation Frequency:</b>		110-215kHz
<b>Charger Output Power:</b>		5W
<b>Rated Input Voltage:</b>		DC 5V from adapter
<b>Adapter Information</b>	<b>Model:</b>	DA-0052000UL001
	<b>Input:</b>	AC100-240V/50-60Hz 0.5A
	<b>Output:</b>	DC 5.0V 2.0A
<b>Serial Number:</b>		RXM200616050-RF -S1
<b>EUT Received Date:</b>		2020.06.20
<b>EUT Received Status:</b>		Good

### Objective

This Type approval report is prepared on behalf of **Astro Pneumatic Tool Co.** 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.

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

No related submittal(s)/grant(s).

### 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.69 Pulongcun, Puxinhu Industry Area, Tangxia, 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 “ $\Delta$ ”. 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

### Justification

The system was configured for testing in a test mode

The device is a wireless charger operation on frequency 110 kHz - 215 kHz.

### EUT Exercise Software

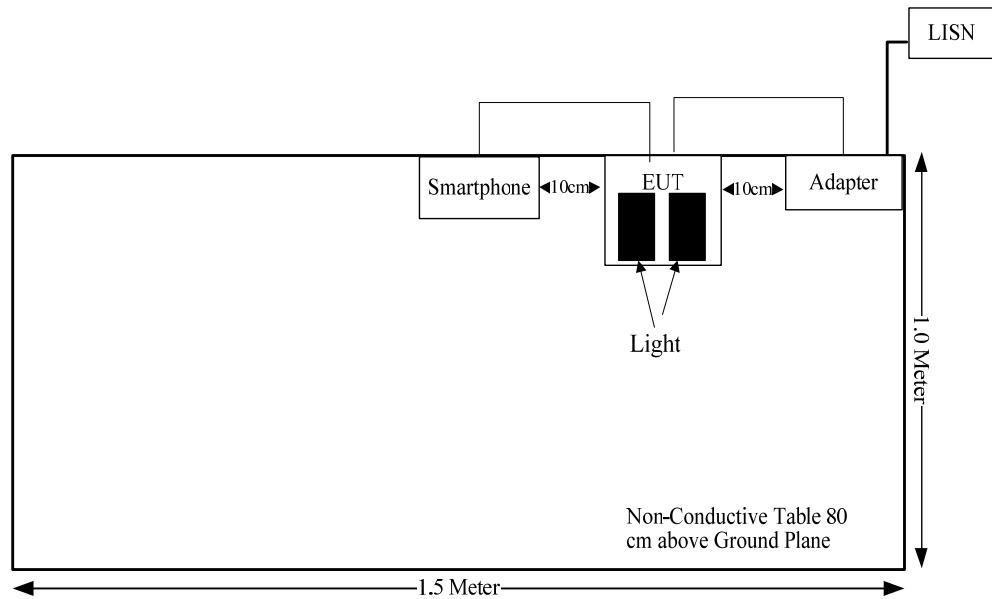
No software used in test.

### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
MI 8 Lite	Phone	M1808D2TE	1260cc2c
Astro Pneumatic Tool Co.	Double Sides Slim Light	Z3220	RXM200616051-EM-S1
Astro Pneumatic Tool Co.	Double Sides Slim Light	Z3220	RXM200616051-EM-S2

### Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From	To
USB Cable	yes	No	0.8	USB Port of adapter	EUT
USB Cable	yes	No	0.8	USB Port of EUT	Phone

**Block Diagram of Test Setup**

## 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;

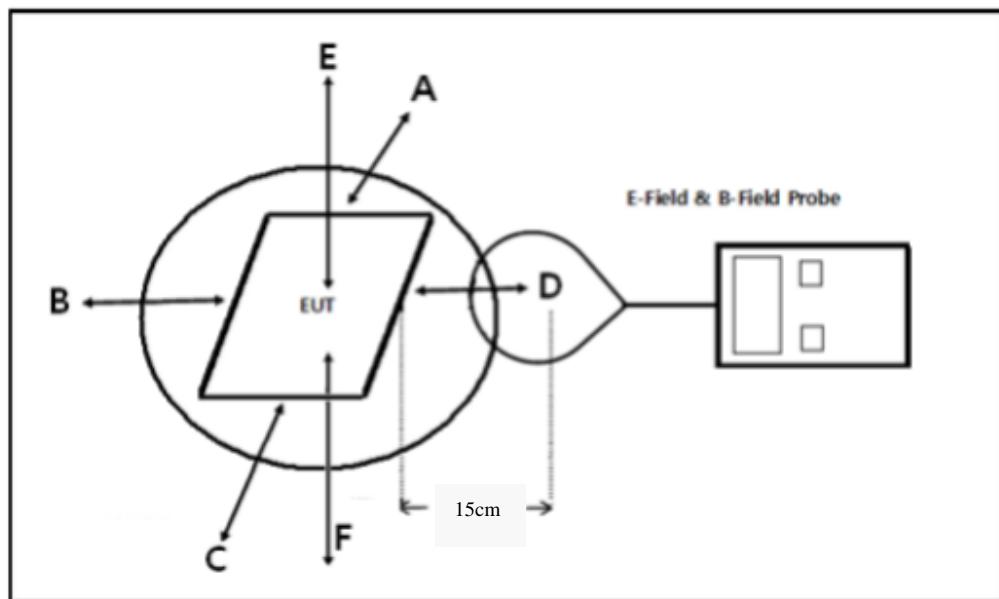
According with KDB 680106 D01 RF Exposure Wireless Charging Apps v03 clause 3 c)

- c) For devices designed for typical desktop applications, such a 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 v03 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	2019-11-15	2022-11-15
Narda	B Field Probe	ELT Probe 100cm <sup>2</sup>	M-0666	2019-11-15	2022-11-15
ETS-Lindgreen	Isotropic Field Probe	HI-6005	6564158	2019-03-06	2021-03-06

\* **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:	24.8°C
Relative Humidity:	51 %
ATM Pressure:	100.3 kPa
Test Engineer:	Jalon Liu
Test Date:	2020-06-19

Test mode: Transmitting

**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 Test (A/m)
110-215	0.085	0.078	0.097	0.096	0.121	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 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 Test (V/m)
110-215	1.37	1.622	2.288	1.344	1.717	307	614

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

**Result: Compliance****Considerations of compliance 680106 D01 RF Exposure Wireless Charging App v03 clause 5 b:**

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

Yes, the operation frequency is 110-215 kHz.

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

Yes, the maximum output power of each coil is **5 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 two coils, 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**

### **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.

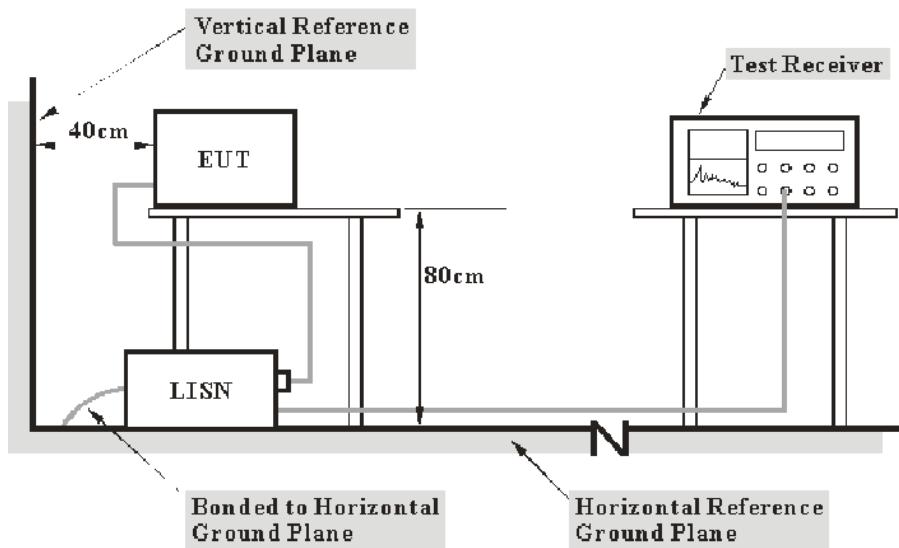
### **Antenna Connected Construction**

The EUT has two integral antennas 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 (AMIN) 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
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2019-09-05	2020-09-05
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
R&S	LISN	ENV 216	101614	2019-09-12	2020-09-12
R&S	EMI Test Receiver	ESCI	101121	2020-05-09	2021-05-09

\* **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 Procedure

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

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

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

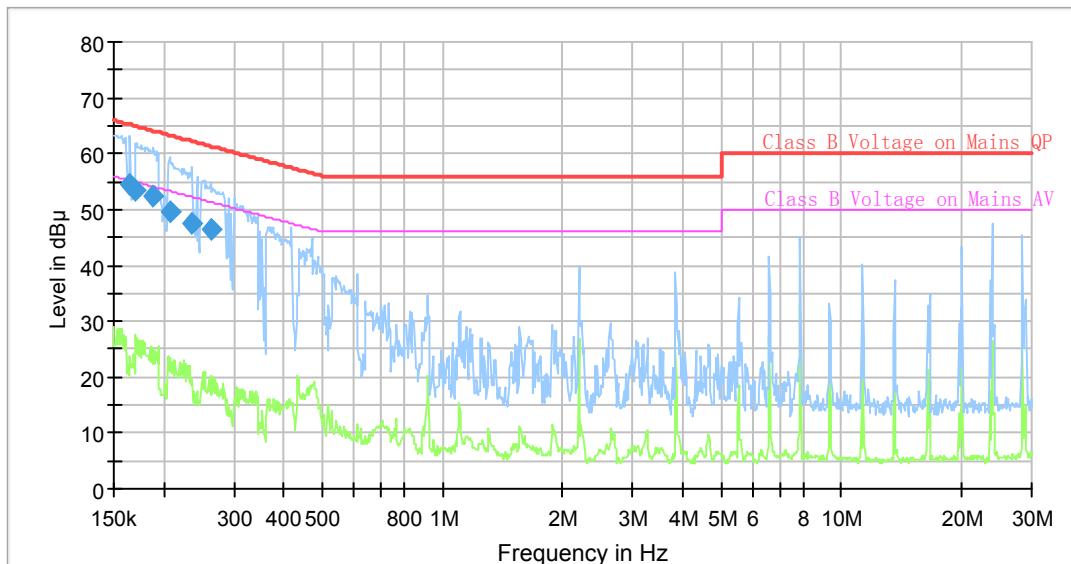
### Environmental Conditions

Temperature:	28.2 °C
Relative Humidity:	60 %
ATM Pressure:	100.9 kPa
Test Engineer:	Barry Yang
Test Date	2020-06-18

*Test Mode: Charging*

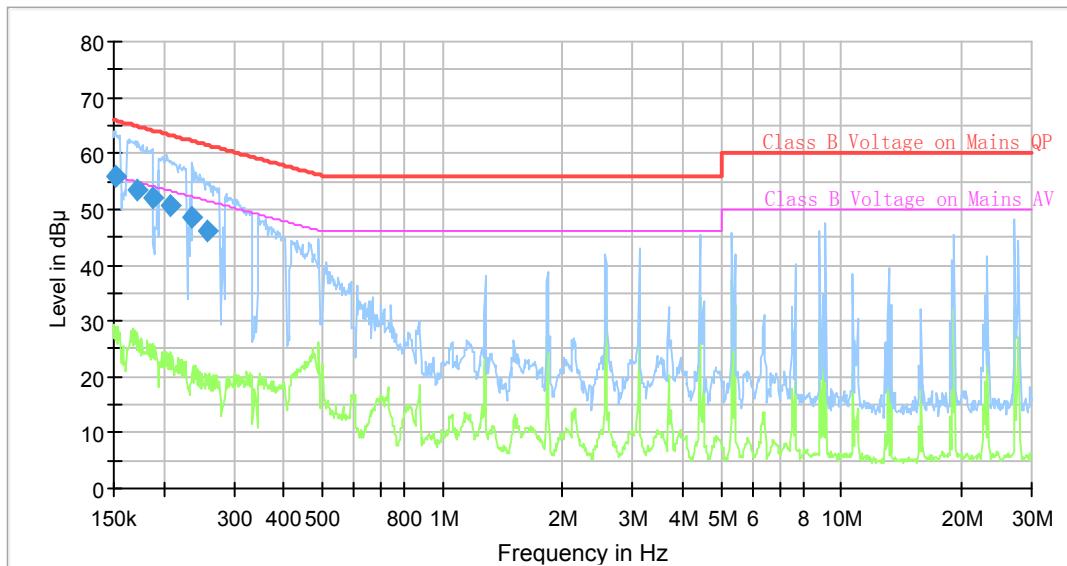
*Test Result: Compliance, please refer to the below plots and table.*

**AC 120V, 60 Hz, Line:**



## Final Result

Frequency (MHz)	QuasiPeak (dB μV)	Average (dB μV)	Limit (dB μV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.164910	54.33	---	65.21	10.88	9.000	L1	9.7
0.169919	53.30	---	64.96	11.66	9.000	L1	9.7
0.188682	52.45	---	64.09	11.64	9.000	L1	9.7
0.207437	49.46	---	63.31	13.85	9.000	L1	9.7
0.236158	47.36	---	62.23	14.87	9.000	L1	9.7
0.262235	46.37	---	61.36	14.99	9.000	L1	9.7

**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)
0.151504	55.74	---	65.92	10.18	9.000	N	9.7
0.172481	53.45	---	64.84	11.39	9.000	N	9.7
0.186809	52.18	---	64.18	12.00	9.000	N	9.7
0.208474	50.73	---	63.27	12.54	9.000	N	9.7
0.236158	48.57	---	62.23	13.66	9.000	N	9.7
0.257055	46.02	---	61.53	15.51	9.000	N	9.7

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

### Applicable Standard

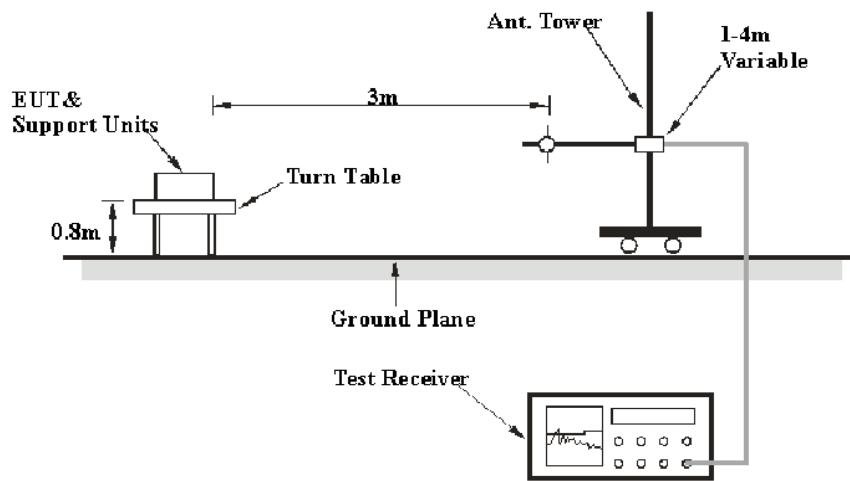
As per FCC Part 15.209

(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
EMCO	Passive Loop	6512	9706-1206	2020-03-05	2023-03-05
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
R&S	EMI Test Receiver	ESR3	102453	2019-09-12	2020-09-12
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-1400-01	2020-05-06	2021-05-06
HP	Amplifier	8447D	2727A05902	2019-09-05	2020-09-05
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.

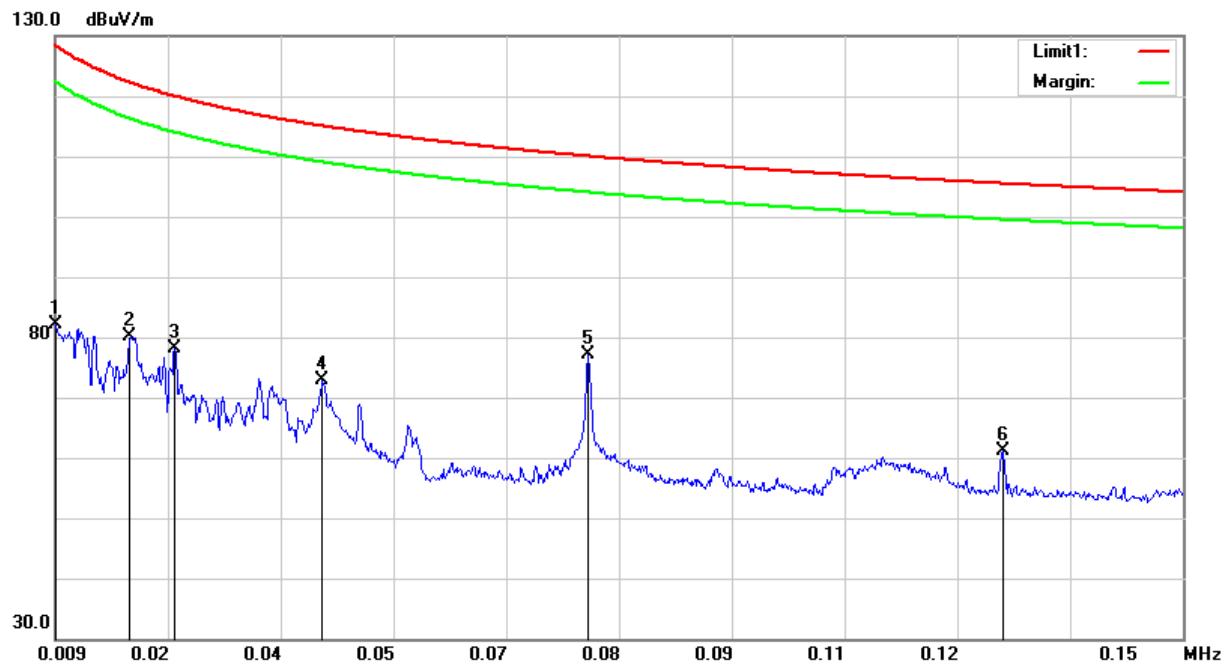
## Test Data

### Environmental Conditions

<b>Temperature:</b>	25.5°C
<b>Relative Humidity:</b>	53 %
<b>ATM Pressure:</b>	100.5 kPa
<b>Test Engineer:</b>	Joker Chen
<b>Test date:</b>	2020-06-19

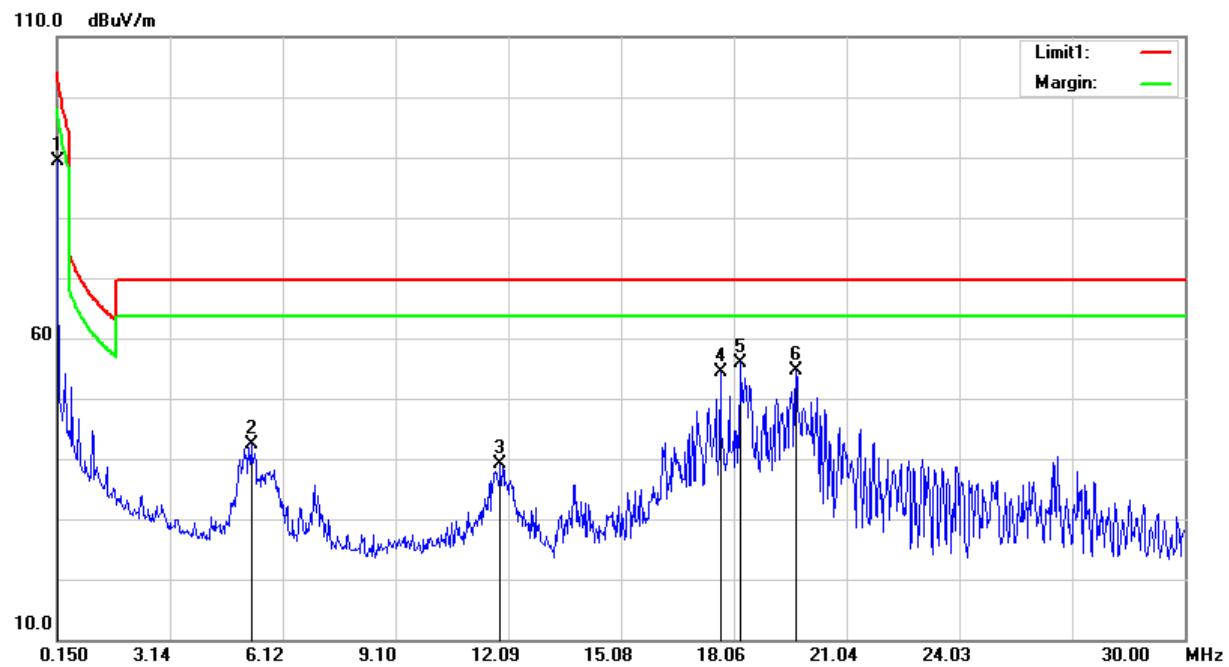
*Test mode: Charging*

1) 9 kHz~0.15 MHz:



Frequency (MHz)	Receiver Reading (dB $\mu$ V)	Detector	Corrected (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
0.0090	-6.59	peak	88.67	82.08	128.52	46.44
0.0183	-1.76	peak	81.79	80.03	122.36	42.33
0.0240	-0.78	peak	79.02	78.24	120.00	41.76
0.0424	-1.87	peak	74.78	72.91	115.06	42.15
0.0756	7.84	peak	69.17	77.01	110.03	33.02
0.1274	-4.13	peak	65.25	61.12	105.50	44.38

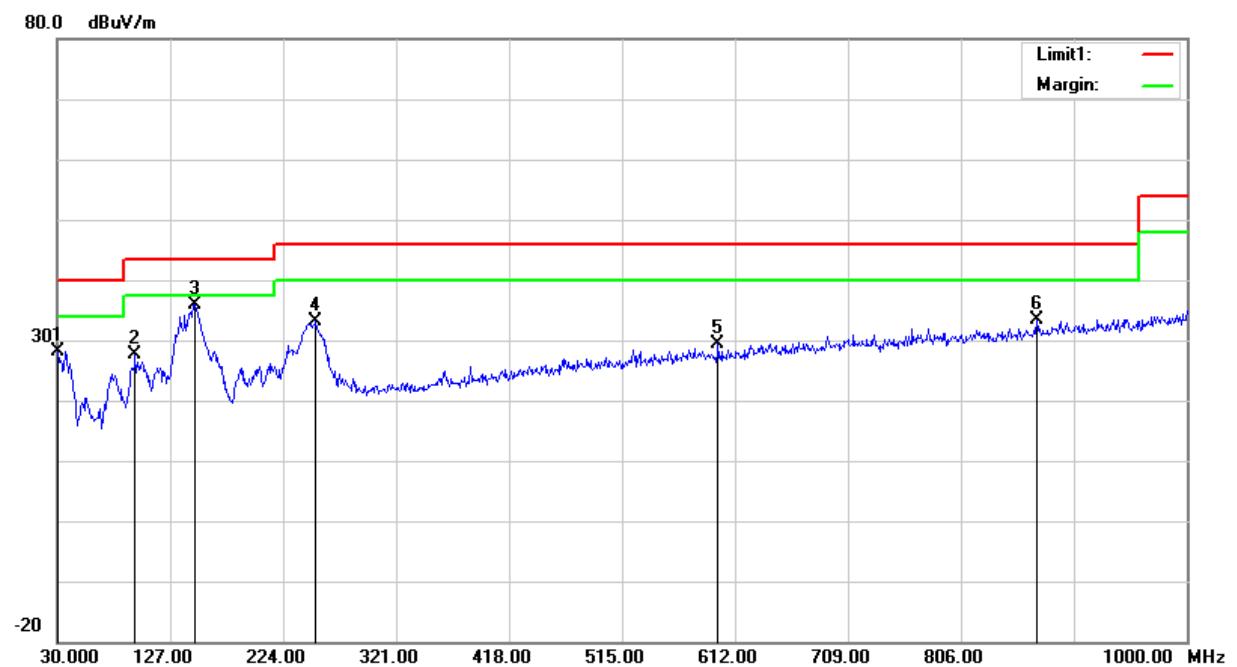
2) 0.15~30 MHz



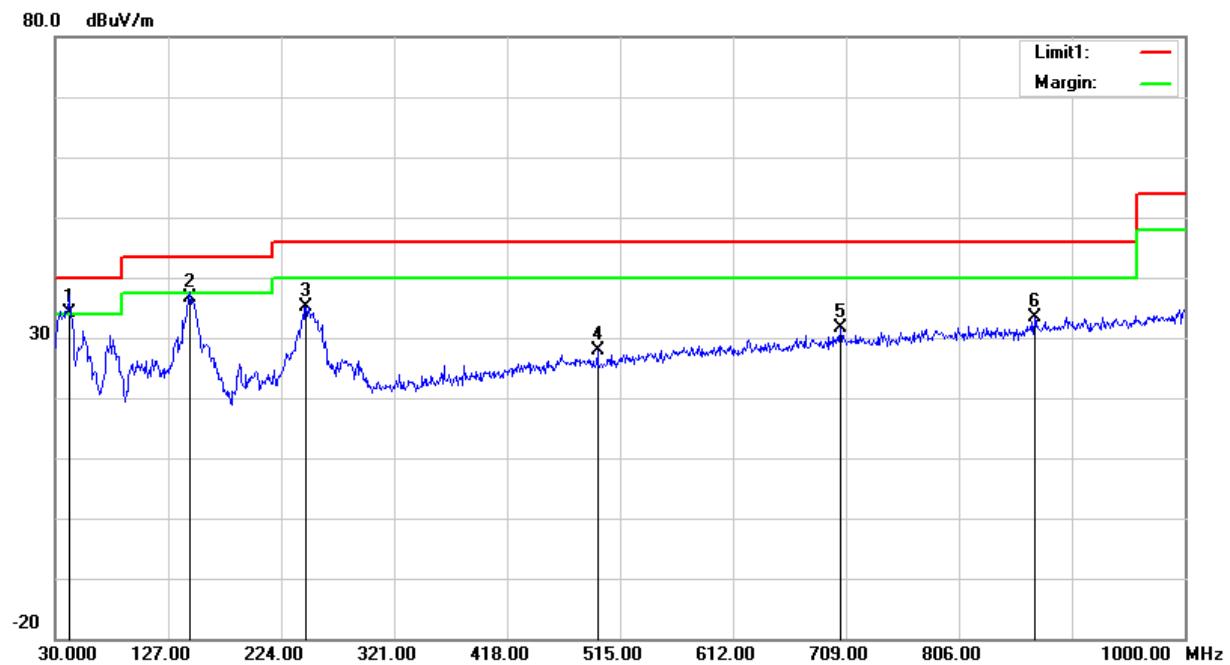
Frequency (MHz)	Receiver Reading (dB $\mu$ V)	Detector	Corrected (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
0.1500*	50.74	peak	38.62	89.36	104.08	14.72
5.2842	31.86	peak	10.58	42.44	69.54	27.10
11.8810	29.73	peak	9.43	39.16	69.54	30.38
17.7017	45.16	peak	9.19	54.35	69.54	15.19
18.2391	46.59	peak	9.17	55.76	69.54	13.78
19.7017	45.40	peak	9.12	54.52	69.54	15.02

\* Fundamental.

3) 30 MHz-1GHz

**Horizontal**

Frequency (MHz)	Receiver Reading (dB $\mu$ V)	Detector	Corrected (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
30.9700	27.17	peak	0.91	28.08	40.00	11.92
96.9300	37.33	peak	-9.77	27.56	43.50	15.94
148.3400	41.94	peak	-6.05	35.89	43.50	7.61
252.1300	39.04	peak	-6.02	33.02	46.00	12.98
597.4500	28.38	peak	0.93	29.31	46.00	16.69
870.9900	27.85	peak	5.45	33.30	46.00	12.70

**Vertical**

Frequency (MHz)	Receiver Reading (dB $\mu$ V)	Detector	Corrected (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
41.6400	41.00	QP	-6.96	34.04	40.00	5.96
145.4300	42.59	QP	-6.01	36.58	43.50	6.92
245.3400	41.19	peak	-5.97	35.22	46.00	10.78
495.6000	28.06	peak	-0.26	27.80	46.00	18.20
704.1500	28.44	peak	3.15	31.59	46.00	14.41
870.9900	27.82	peak	5.45	33.27	46.00	12.73

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