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Report Template Version: V05
Report Template Revision Date: 2021-11-03

Test Report

Report No.:	CQASZ20240100116E-01
Applicant:	FuelBox Inc. DBA The Empower Project
Address of Applicant:	1311 Anacapa St Santa Barbara California 93101 United States
Equipment Under Test (EUT):	
Product:	Empower Pack
Model No.:	EPS100123, EPC100123
Test Model No.:	EPS100123
Brand Name:	The Empower Project
FCC ID:	2BEWO-EPS100123
Standards:	47 CFR Part 15, Subpart C
Date of Receipt:	2024-1-10
Date of Test:	2024-1-10 to 2024-1-22
Date of Issue:	2024-2-1
Test Result:	**PASS***

***In the configuration tested, the EUT complied with the standards specified above**

Tested By: _____

(Joe Wang)

Reviewed By: _____

(Timo Lei)

Approved By: _____

(Alex Wang)

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20240100116E-01	Rev.01	Initial report	2024-2-1

2 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203	ANSI C63.10 2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 2013	PASS
20dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.215	ANSI C63.10 2013	PASS
Radiated Emission , Radiated Spurious Emissions	47 CFR Part 15, Subpart C Section 15.209	ANSI C63.10 2013	PASS

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4 General Information

4.1 Client Information

Applicant:	FuelBox Inc. DBA The Empower Project
Address of Applicant:	1311 Anacapa St Santa Barbara California 93101 United States
Manufacturer:	Shenzhen Wayto Technology Co., Ltd
Address of Manufacturer:	3rd Floor, Building B, Jinkaijin Industrial Zone, Shilongzai, Shiyan, Bao'an, Shenzhen, GD, CN (518108)
Factory:	Shenzhen Wayto Technology Co., Ltd
Address of Factory:	3rd Floor, Building B, Jinkaijin Industrial Zone, Shilongzai, Shiyan, Bao'an, Shenzhen, GD, CN (518108)

4.2 General Description of EUT

Product Name:	Empower Pack
Model No.:	EPS100123, EPC100123
Test Model No.:	EPS100123
Brand Name:	The Empower Project
Software Version:	V1.0
Hardware Version:	V1.0
EUT Power Supply:	DC 4.5V⎓ 5A/DC 5V ⎓ 4.5A/5V⎓ 3A, DC 9V⎓ 2A, 12V ⎓ 1.5A Battery: 5000mAh(19.25Wh/3.85V)

4.3 Product Specification subjective to this standard

Equipment Category:	Non-ISM frequency
Operation Frequency range:	115kHz-205kHz
Modulation Type:	ASK
Antenna Type:	Induction coil
Antenna Gain:	0dBi

Note:

1. In section 15.31(m), regards to the operating frequency range less 1 MHz.

4.4 Test Environment

Operating Environment:	
Radiated Emissions:	
Temperature:	25.5 °C
Humidity:	53 % RH
Atmospheric Pressure:	1009 mbar
Conducted Emissions:	
Temperature:	25.8 °C
Humidity:	58 % RH
Atmospheric Pressure:	1009 mbar
Radio conducted item test (RF Conducted test room):	
Temperature:	27.1 °C
Humidity:	56 % RH
Atmospheric Pressure:	1009 mbar
Test Mode:	
Mode a:	Keep the EUT Wireless Out Put 5W
Mode b:	Keep the EUT Wireless Out Put 7.5W
Mode c:	Keep the EUT Wireless Out Put 10W
Mode d:	Keep the EUT Wireless Out Put 15W (Max)
Note: The above test modes all include full load,empty load,and half load, The worst-case state reflected in this report is the fully loaded state	

4.5 Description of Support Units

The EUT has been tested with associated equipment below.

1）Support equipment

Description	Manufacturer	Model No.	Certification	Supplied by
Wireless charge load	/	/	/	CQA
Adapter	/	LPL-C010050200Z	/	CQA

2) Cable

Cable No.	Description	Manufacturer	Cable Type/Length	Supplied by
/	/	/	/	/

4.6 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate.

The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the **Shenzhen Huaxia Testing Technology Co., Ltd.** quality system acc. to DIN EN ISO/IEC 17025.

Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CQA laboratory is reported:

No.	Item	Uncertainty	Notes
1	Radiated Emission (Below 1GHz)	5.12dB	(1)
2	Radiated Emission (Above 1GHz)	4.60dB	(1)
3	Occupied Bandwidth	1.1%	(1)
4	Temperature test	0.8℃	(1)
5	Humidity test	2.0%	(1)

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

4.7 Test Location

Shenzhen Huaxia Testing Technology Co., Ltd.

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

4.8 Test Facility

- **A2LA (Certificate No. 4742.01)**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

- **FCC Registration No.: 522263**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.:522263

4.9 Deviation from Standards

None.

4.10 Other Information Requested by the Customer

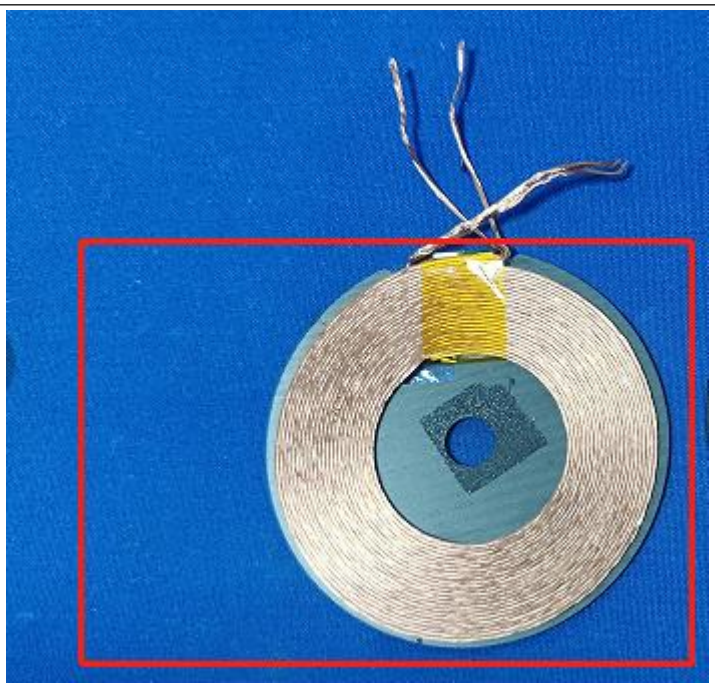
None.

4.11 Equipment List

Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	CQA-005	2023/9/8	2024/9/7
Spectrum analyzer	R&S	FSU26	CQA-038	2023/9/8	2024/9/7
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2023/9/8	2024/9/7
Loop antenna	Schwarzbeck	FMZB1516	CQA-060	2021/9/16	2024/9/15
Bilog Antenna	R&S	HL562	CQA-011	2021/9/16	2024/9/15
Horn Antenna	R&S	HF906	CQA-012	2021/9/16	2024/9/15
Horn Antenna	Schwarzbeck	BBHA 9170	CQA-088	2021/9/16	2024/9/15
Coaxial Cable (Above 1GHz)	CQA	N/A	C007	2023/9/8	2024/9/7
Coaxial Cable (Below 1GHz)	CQA	N/A	C013	2023/9/8	2024/9/7
Antenna Connector	CQA	RFC-01	CQA-080	2023/9/8	2024/9/7
RF cable(9KHz~40GHz)	CQA	RF-01	CQA-079	2023/9/8	2024/9/7
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2023/9/8	2024/9/7
EMI Test Receiver	R&S	ESR7	CQA-005	2023/9/8	2024/9/7
LISN	R&S	ENV216	CQA-003	2023/9/8	2024/9/7
Coaxial cable	CQA	N/A	CQA-C009	2023/9/8	2024/9/7
DC power	KEYSIGHT	E3631A	CQA-028	2023/9/8	2024/9/7

5 Test results and Measurement Data

5.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203
15.203 requirement: 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, 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. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
EUT Antenna:	
The antenna is Induction coil. The best case gain of the antenna is 0dBi.	

5.2 Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207
Test Method:	ANSI C63.10: 2013
Test Frequency Range:	150kHz to 30MHz
Limit:	

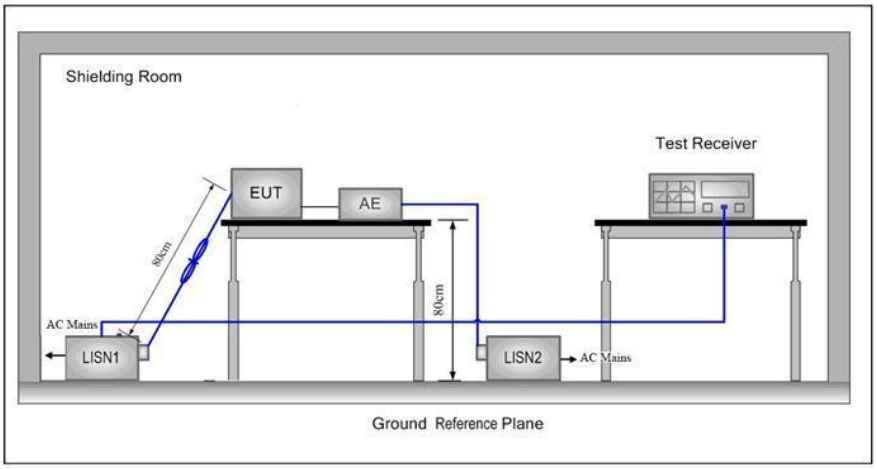
Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Procedure:

1) The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.

Test Setup:

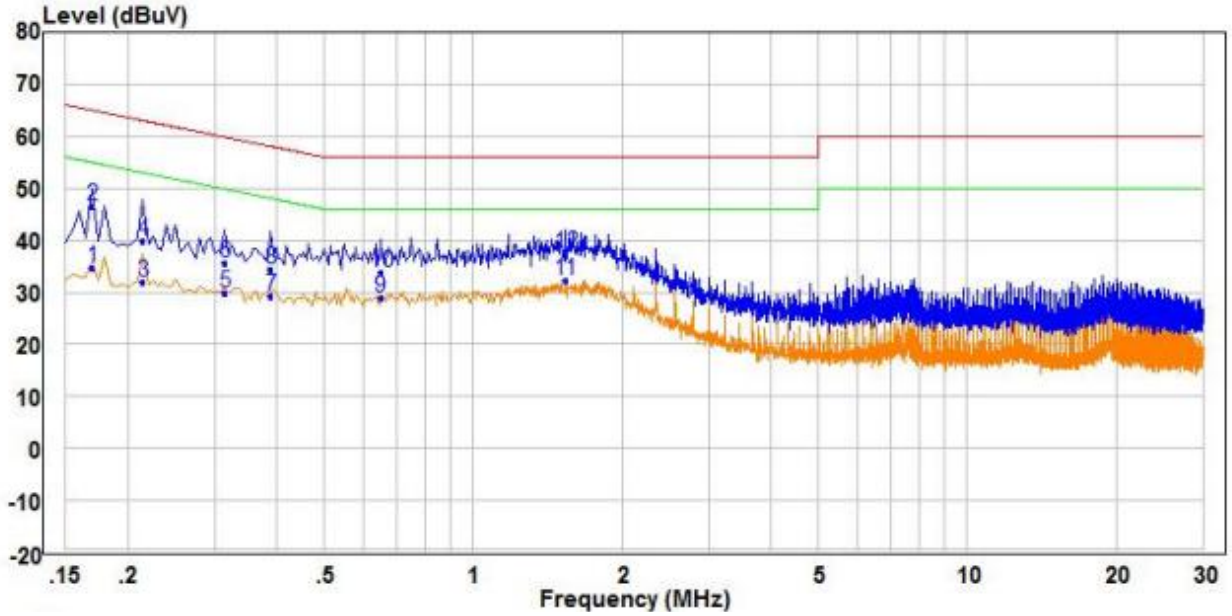


Test Results: Pass

Measurement Data

The worst case:mode d

Live line:



		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.170	25.08	9.66	34.74	54.96	-20.22	Average	Line
2	QP	0.170	37.02	9.66	46.68	64.96	-18.28	QP	Line
3		0.215	22.32	9.59	31.91	53.01	-21.10	Average	Line
4		0.215	30.22	9.59	39.81	63.01	-23.20	QP	Line
5		0.315	20.47	9.51	29.98	49.84	-19.86	Average	Line
6		0.315	26.11	9.51	35.62	59.84	-24.22	QP	Line
7		0.390	19.66	9.60	29.26	48.06	-18.80	Average	Line
8		0.390	24.67	9.60	34.27	58.06	-23.79	QP	Line
9		0.650	19.03	9.85	28.88	46.00	-17.12	Average	Line
10		0.650	23.96	9.85	33.81	56.00	-22.19	QP	Line
11	PP	1.540	21.48	10.91	32.39	46.00	-13.61	Average	Line
12		1.540	26.64	10.91	37.55	56.00	-18.45	QP	Line

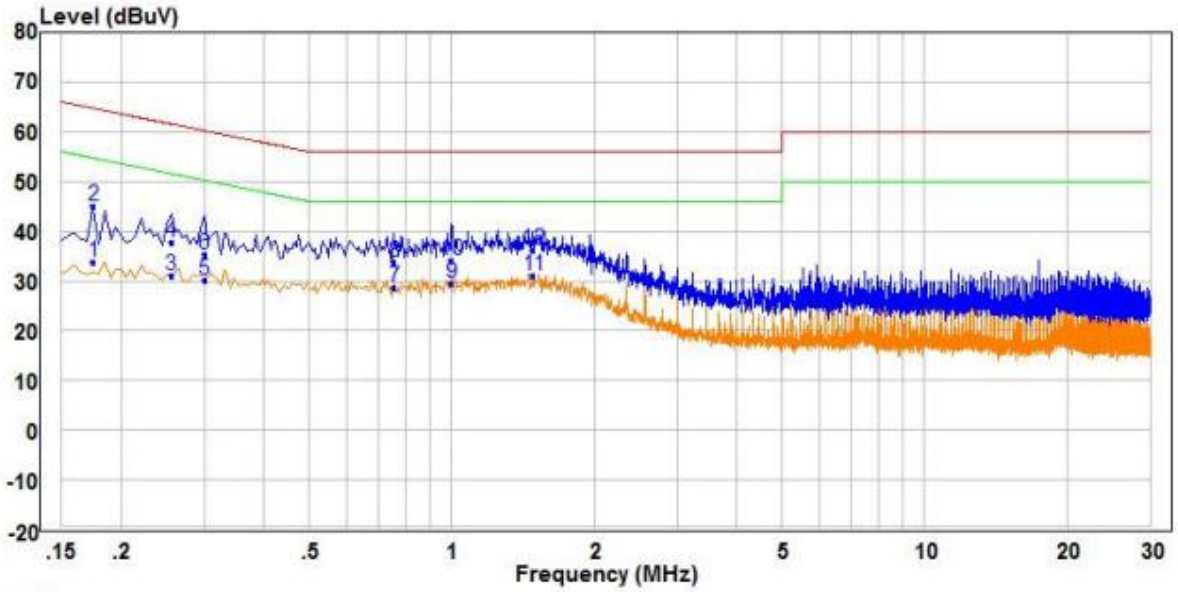
Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

The worst case:

mode d:

Neutral line:

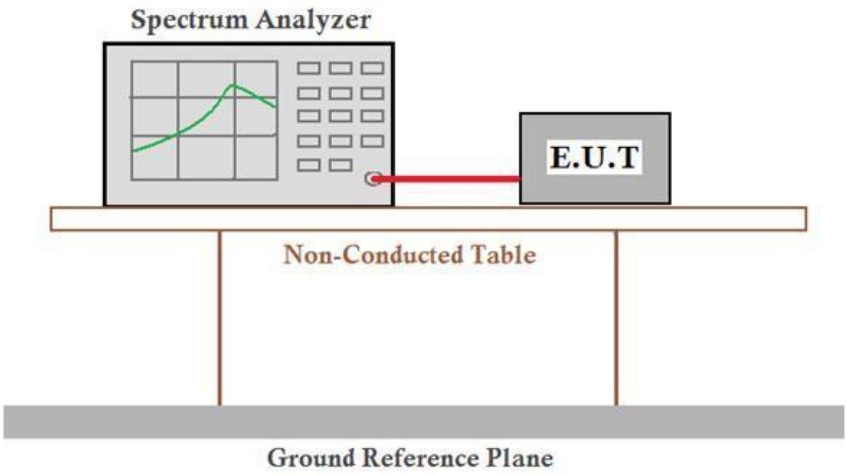


	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.175	24.07	9.65	33.72	54.72	-21.00	Average	Neutral
2 QP	0.175	35.32	9.65	44.97	64.72	-19.75	QP	Neutral
3	0.255	21.55	9.53	31.08	51.59	-20.51	Average	Neutral
4	0.255	28.25	9.53	37.78	61.59	-23.81	QP	Neutral
5	0.300	20.56	9.48	30.04	50.24	-20.20	Average	Neutral
6	0.300	25.90	9.48	35.38	60.24	-24.86	QP	Neutral
7	0.755	18.91	9.86	28.77	46.00	-17.23	Average	Neutral
8	0.755	23.85	9.86	33.71	56.00	-22.29	QP	Neutral
9	1.000	19.94	9.70	29.64	46.00	-16.36	Average	Neutral
10	1.000	24.55	9.70	34.25	56.00	-21.75	QP	Neutral
11 PP	1.485	21.23	9.72	30.95	46.00	-15.05	Average	Neutral
12	1.485	26.40	9.72	36.12	56.00	-19.88	QP	Neutral

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

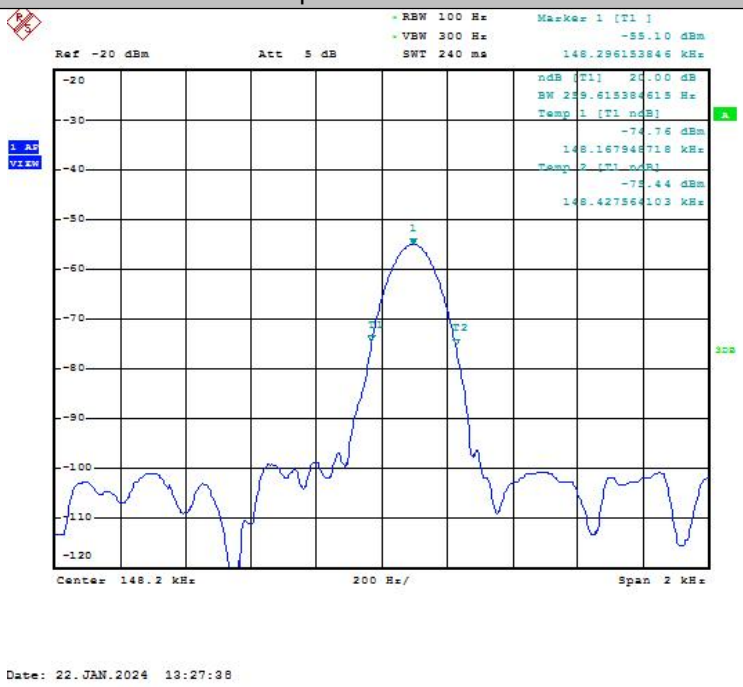
5.3 20dB Occupy Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.215
Test Method:	ANSI C63.10 2013
Test Setup:	 *Remark: Offset=Cable loss+ attenuation factor.*
Test Results:	Pass

Measurement Data

Mode d		
Test Frequency (kHz)	20dB Occupy Bandwidth (Hz)	Result
148.30	259.62	Pass

Test plot as follows:

Graphs	
148.30kHz	

5.4 Radiated Spurious Emission & Restricted bands

5.4.1 Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205
Test Method:	ANSI C63.10 2013
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Test Setup:	

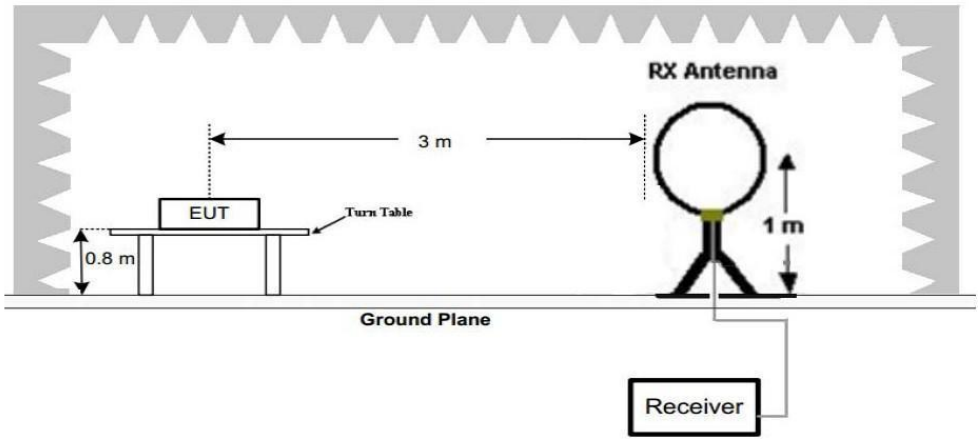


Figure 1. Below 30MHz

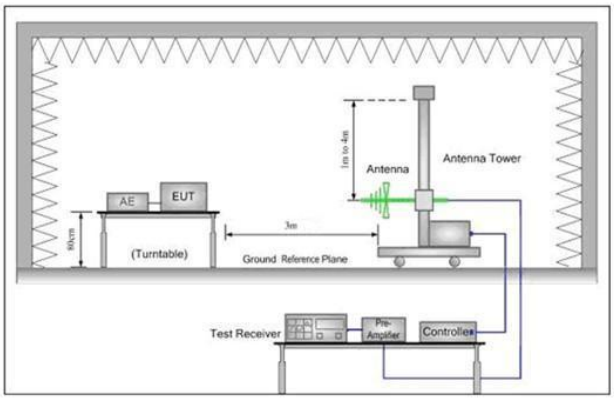


Figure 2. 30MHz to 1GHz

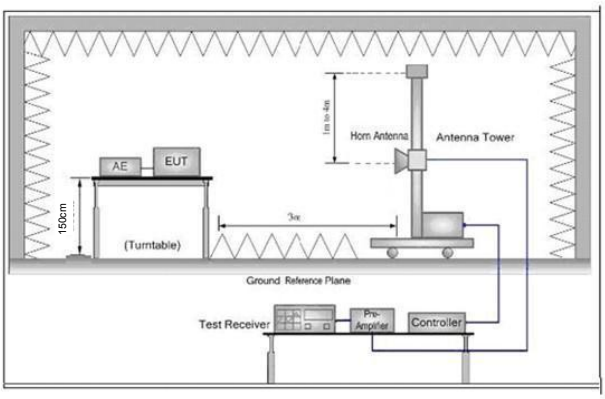
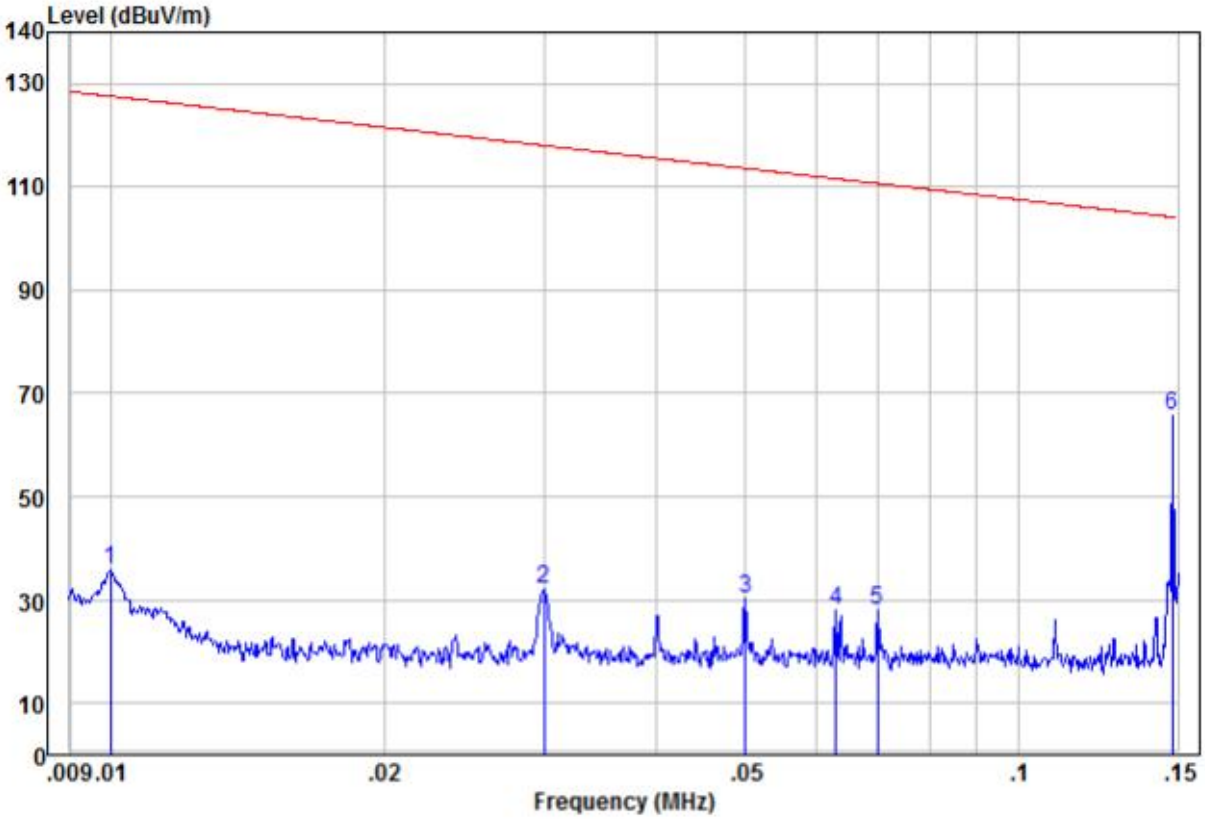


Figure 3. Above 1 GHz

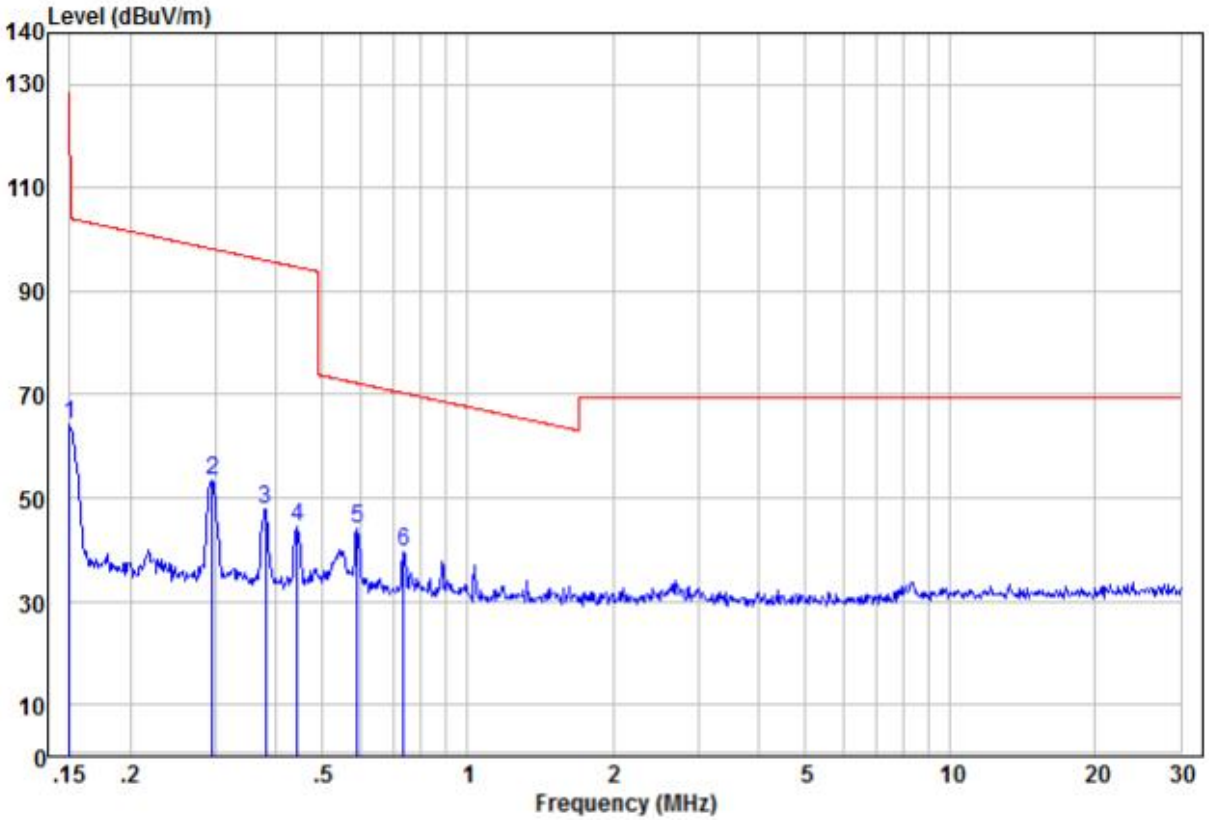
Test Procedure:	a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. Note: For the radiated emission test above 1GHz: Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the

	measurement. d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. g. Repeat above procedures until all frequencies measured was complete.
Test Results:	Pass

Radiated Emission below 9k~30MHz	
the worst case	
Test mode:	Mode d



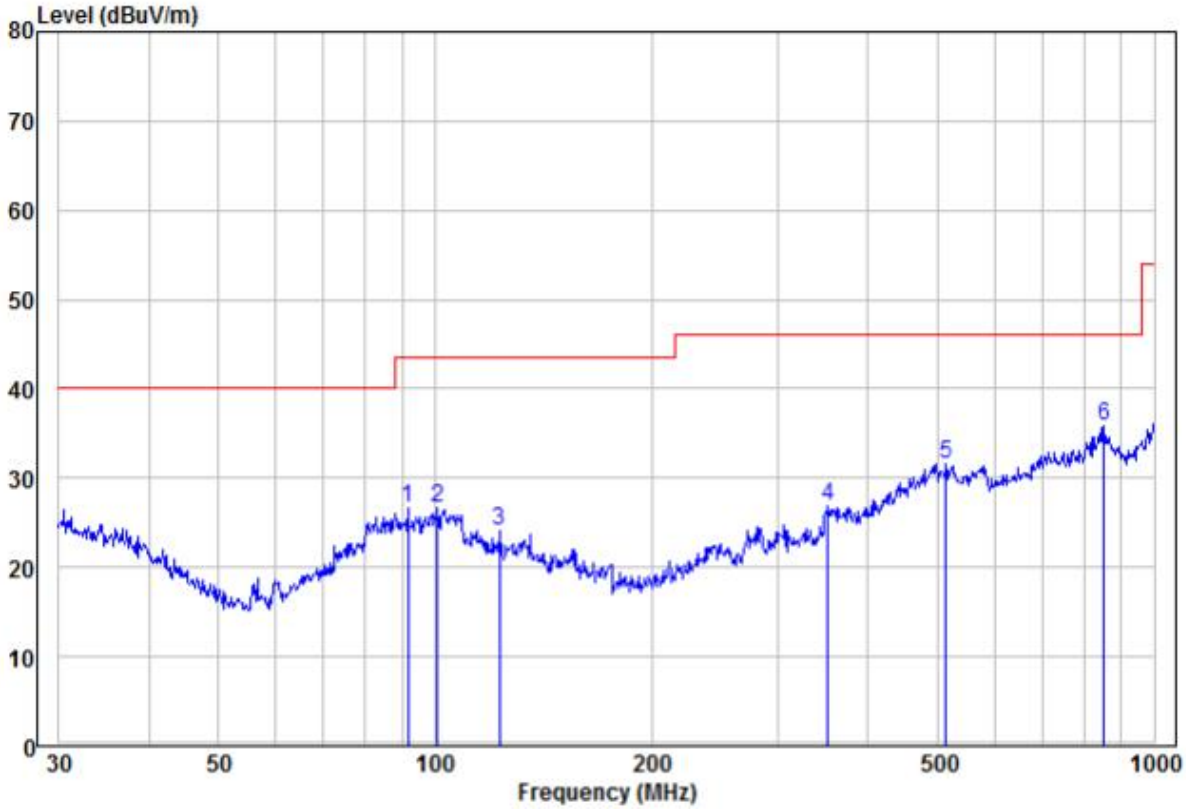
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	0.01	16.16	19.67	35.83	127.60	-91.77	Peak	HORIZONTAL
2	0.03	12.68	19.54	32.22	118.05	-85.83	Peak	HORIZONTAL
3	0.05	10.80	19.60	30.40	113.60	-83.20	Peak	HORIZONTAL
4	0.06	8.28	19.66	27.94	111.60	-83.66	Peak	HORIZONTAL
5	0.07	8.29	19.68	27.97	110.70	-82.73	Peak	HORIZONTAL
6 pp	0.15	46.16	19.54	65.70	104.20	-38.50	Peak	HORIZONTAL



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	0.15	44.69	19.54	64.23	104.08	-39.85	Peak	HORIZONTAL
2	0.30	33.87	19.60	53.47	98.19	-44.72	Peak	HORIZONTAL
3	0.38	28.19	19.65	47.84	95.98	-48.14	Peak	HORIZONTAL
4	0.44	24.66	19.68	44.34	94.65	-50.31	Peak	HORIZONTAL
5 pp	0.59	24.35	19.74	44.09	72.17	-28.08	Peak	HORIZONTAL
6	0.74	19.67	19.80	39.47	70.29	-30.82	Peak	HORIZONTAL

Note: No other emissions found between lowest internal used/generated frequencies to 30MHz. The peak level of the emission is less than the average limit, so the average level shall be less than1 the limit without test.

Radiated Emission		
30MHz~1GHz, the worst case		
Test mode:	Mode d	Horizontal



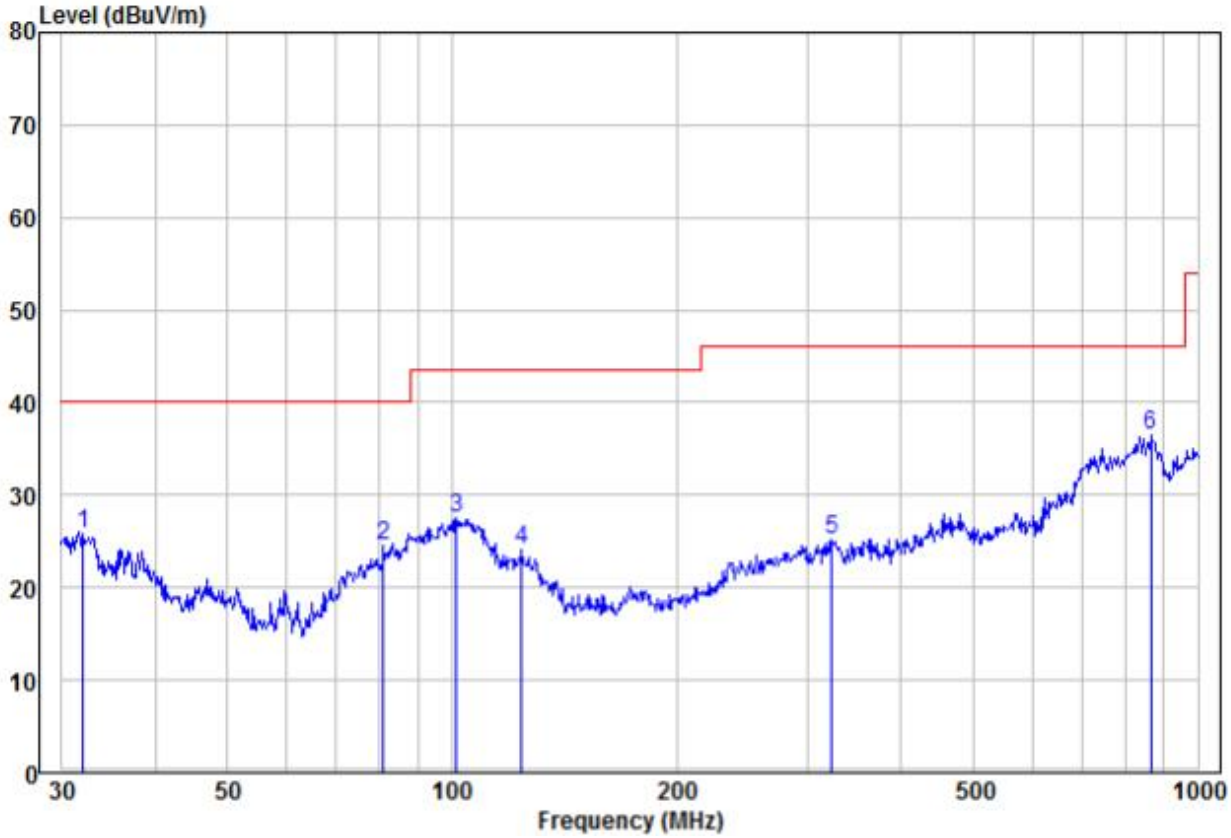
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	91.82	16.45	10.13	26.58	43.50	-16.92	Peak	HORIZONTAL
2	100.93	15.98	10.60	26.58	43.50	-16.92	Peak	HORIZONTAL
3	122.83	13.46	10.59	24.05	43.50	-19.45	Peak	HORIZONTAL
4	351.71	11.84	14.99	26.83	46.00	-19.17	Peak	HORIZONTAL
5	513.63	13.18	18.42	31.60	46.00	-14.40	Peak	HORIZONTAL
6 pp	851.04	11.76	24.04	35.80	46.00	-10.20	Peak	HORIZONTAL

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor

30MHz~1GHz, the worst case		
Test mode:	Mode d	Vertical



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	32.07	10.36	15.38	25.74	40.00	-14.26	Peak	VERTICAL
2	80.93	14.67	9.81	24.48	40.00	-15.52	Peak	VERTICAL
3	101.29	17.00	10.59	27.59	43.50	-15.91	Peak	VERTICAL
4	124.13	13.49	10.54	24.03	43.50	-19.47	Peak	VERTICAL
5	323.32	10.82	14.30	25.12	46.00	-20.88	Peak	VERTICAL
6 pp	866.09	12.41	23.98	36.39	46.00	-9.61	Peak	VERTICAL

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor

6 Photographs - EUT Test Setup

6.1 Radiated Emission

9kHz~30MHz:

30MHz~1GHz:

6.2 Conducted Emission

7 Photographs - EUT Constructional Details