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EcoFlow Inc.

TEST REPORT

SCOPE OF WORK
FCC TESTING–EFESP32UE

REPORT NUMBER
231010031SZN-002

ISSUE DATE	**[REVISED DATE]**
10 November 2023	[----------]

PAGES
26

DOCUMENT CONTROL NUMBER
FCC ID 249_C

EcoFlow Inc.

Application
For
Certification

FCC ID: 2A2P9-ESP32WROOM32E

WIFI module

Model: EFESP32UE

Brand Name: 

2.4GHz Transceiver

Report No.: 231010031SZN-002

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 15, Subpart C for Intentional Radiator, mention 47 CFR [10-1-21]

Prepared and Checked by:

Draven Li
Project Engineer

Approved by:

Ryan Chen
Sr. Project Engineer
Date: 10 November 2023

Intertek Testing Services Shenzhen Ltd. Longhua Branch
101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, ShenZhen, P.R. China
Tel: (86 755) 8601 6288 Fax: (86 755) 8601 6751

MEASUREMENT/TECHNICAL REPORT

This report concerns (check one:) Original Grant X Class II Change _____

Equipment Type: DXX - Part 15 Low Power Communication Device Transmitter

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Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes _____ No X

If yes, defer until: _____
date

Company Name agrees to notify the Commission by: _____
date
of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes _____ No X

If no, assumed Part 15, Subpart C for intentional radiator – the new 47 CFR [10-1-21 Edition] provision.

Report prepared by:

Draven Li
Intertek Testing Services Shenzhen Ltd. Longhua Branch
101, 201, Building B, No. 308 Wuhe Avenue,
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Table of Contents

1.0 Summary of Test Result

Applicant: EcoFlow Inc.

Address: 1st Floor, Building 1, Plant E, Jiehe Industrial City, Shuitian Community, Shiyan Street, Bao'an District, Shenzhen Guangdong China

Manufacturer: EcoFlow Inc.

Address: 1st Floor, Building 1, Plant E, Jiehe Industrial City, Shuitian Community, Shiyan Street, Bao'an District, Shenzhen Guangdong China

Model: EFESP32UE

FCC ID: 2A2P9-ESP32WROOM32E

Test Specification	Reference	Results
Transmitter Radiated Emission	15.249 &15.209 &15.205	Pass
Conducted Emission	15.207	Pass
Band edge	15.249 &15.209 &15.205	Pass
20dB Bandwidth	15.215(c)	Pass

Note: The EUT uses an Integral Antenna which in accordance to Section 15.203 is considered sufficient to comply with the provisions of this section.

2.0 General Description

2.1 Product Description

The equipment under test (EUT) is a WIFI module with Bluetooth BLE technology operating in 2402-2480MHz. The EUT is powered by DC 3.3V. For more detail information pls. refer to the user manual.

Bluetooth Version: 4.2 (BLE)
Antenna Type: Integral antenna
Antenna Gain: 6.04 dBi max
Modulation Type: GFSK

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

2.2 Related Submittal(s) Grants

This is an application for certification of transceiver for the WIFI module which EDR, BLE and 2.4G WIFI functions. EDR and 2.4G WIFI function were reported in the verification report: 231010031SZN-001, 231010031SZN-003. Other digital functions were reported in the verification report: 231010032SZN-001.

2.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). Radiated emission measurement was performed in Semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst-case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "Justification Section" of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

The Semi-anechoic chamber and shielding room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Longhua Branch** and located at 101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, Shenzhen. This test facility and site measurement data have been fully placed on file with File Number: CN1188.

3.0 System Test Configuration

3.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.10 (2013).

The EUT was powered by DC 3.3V from a laptop during the test, only the worst data was reported in this report.

For maximizing emissions below 30 MHz, the EUT was rotated through 360°, the centre of the loop antenna was placed 1 meter above the ground, and the antenna polarization was changed. For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Section 4.

The EUT and transmitting antenna was centered on the turntable.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was placed on a turn table, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

3.2 EUT Exercising Software

The EUT exercise program (provided by client) used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The worst case configuration is used in all specified testing.

The parameters of test software setting:
During the test, Channel and power controlling software provided by the applicant was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the application and is going to be fixed on the firmware of the end product.

Test Software: espRFTool_2.3

3.3 Special Accessories

No special accessories used.

3.4 Equipment Modification

Any modifications installed previous to testing by EcoFlow Inc. will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd. Longhua Branch.

3.5 Measurement Uncertainty

When determining the test conclusion, the Measurement Uncertainty of test has been considered.

Measurement Uncertainty	Uncertainty
Channel Bandwidth	±3.46%
Spurious emission (Above 18GHz)	±5.3dB
Spurious emission (6GHz to 18GHz)	±5.1dB
Radiated emission (1GHz to 6GHz)	±4.8dB
Radiated emission (Up to 1GHz)	±4.8dB
AC Conducted emission	±3.6 dB
Temperature	±1°C
Humidity	±5%

3.6 Support Equipment List and Description

Description	Manufacturer	Model No.
Laptop (Provided by Intertek)	DELL	Latitude 5420
ComTool (with cable) (Provided by Applicant)	Provided by Applicant	Unshielded, 0.1m
Control mainboard (Provided by Applicant)	ECOFLOW	--

4.0 Emission Results

Data is included worst-case configuration (the configuration which resulted in the highest emission levels).

4.1 Radiated Test Results

A sample calculation, configuration photographs and data tables of the emissions are included.

4.1.1 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD + AV

Where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB/m
AG = Amplifier Gain in dB
PD = Pulse Desensitization in dB
AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD + AV

Assume a receiver reading of 62.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 62.0 dBµV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
PD = 0 dB
AV = -10 dB
FS = 62 + 7.4 + 1.6 - 29 + 0 = 42 dBµV/m

Level in µV/m = Common Antilogarithm [(42 dBµV/m)/20] = 125.9 µV/m

4.1.2 Radiated Emission Configuration Photograph

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: radiated photos. pdf.

4.1.3 Radiated Emissions

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Worst Case Radiated Emission
at
560.525333 MHz

Judgement: Passed by 17.0 dB

TEST PERSONNEL:

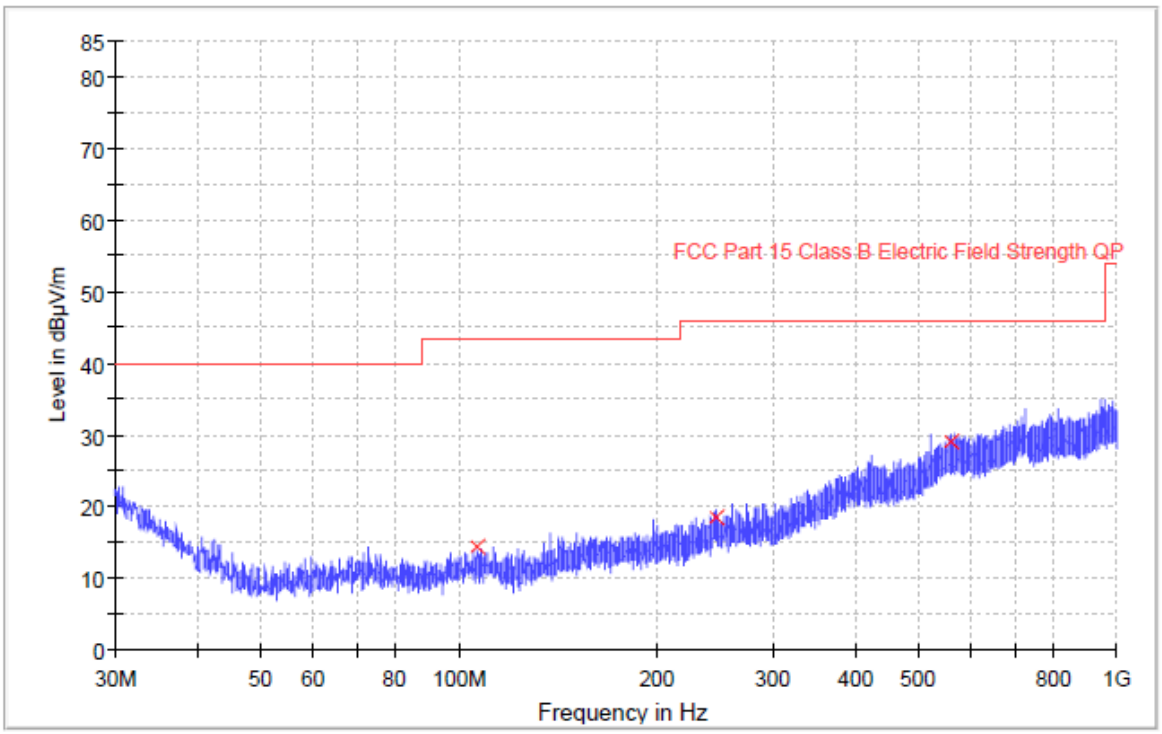
Sign on file

Draven Li, Project Engineer
Typed/Printed Name

12 October 2023
Date

Applicant: EcoFlow Inc.
Date of Test: 12 October 2023 Model: EFESP32UE
Worst Case Operating Mode: Simultaneous Transmission

ANT Polarity: Horizontal

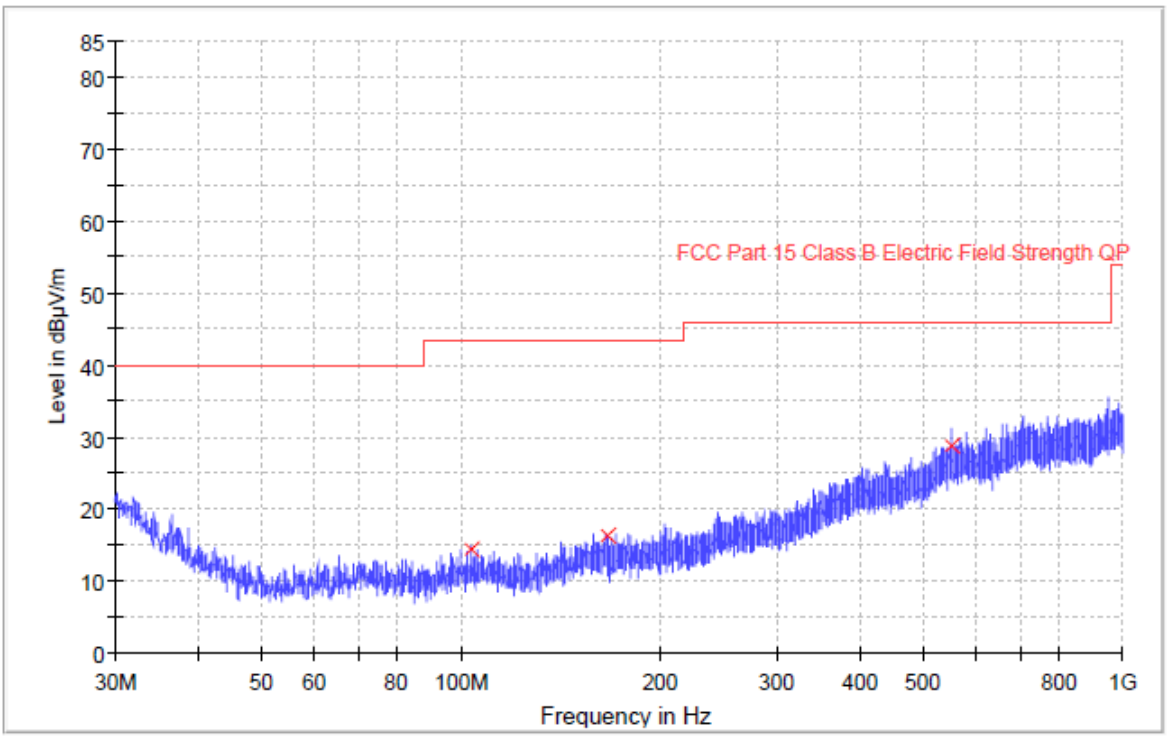


Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
106.440000	14.4	1000.0	120.000	100.0	H	15.1	29.1	43.5
245.825000	18.4	1000.0	120.000	100.0	H	19.1	27.6	46.0
560.525333	29.0	1000.0	120.000	100.0	H	29.0	17.0	46.0

Remark:
1. Corr. (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBµV/m) = Corr. (dB/m) + Read Level (dBµV)
3. Margin (dB) = Limit Line(dBµV/m) – Level (dBµV/m)

Applicant: EcoFlow Inc.
Date of Test: 12 October 2023 Model: EFESP32UE
Worst Case Operating Mode: Simultaneous Transmission

ANT Polarity: Vertical



Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
103.687667	14.3	1000.0	120.000	100.0	V	15.0	29.2	43.5
166.080000	16.3	1000.0	120.000	100.0	V	16.7	27.2	43.5
551.666000	28.9	1000.0	120.000	100.0	V	29.0	17.1	46.0

Remark:
1. Corr. (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBµV/m) = Corr. (dB/m) + Read Level (dBµV)
3. Margin (dB) = Limit Line(dBµV/m) – Level (dBµV/m)

4.1.4 Transmitter Spurious Emissions (Radiated)

Worst Case Radiated Emission
at
9920.000 MHz

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: radiated photos. pdf.

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit. Simultaneous transmission has been tested, but only the worst-case testing data were recorded in the report.

Judgement: Passed by 5.7 dB

TEST PERSONNEL:

Sign on file

Draven Li, Project Engineer
Typed/Printed Name

12 October 2023
Date

Applicant: EcoFlow Inc.
Date of Test: 12 October 2023 Model: EFESP32UE
Worst Case Operating Mode: Transmitting

Table 1

Radiated Emissions

(2402MHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2402.000	105.6	36.7	28.1	97.0	114.0	-17.0
Vertical	4804.000	49.1	36.7	35.5	47.9	74.0	-26.1
Vertical	7206.000	54.4	36.1	36.5	54.8	74.0	-19.2
Vertical	9608.000	57.2	36.2	37.0	58.0	74.0	-16.0

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m	Margin (dB)
Vertical	2402.000	96.6	36.7	28.1	88.0	94.0	-6.0
Vertical	4804.000	35.9	36.7	35.5	34.7	54.0	-19.3
Vertical	7206.000	41.4	36.1	36.5	41.8	54.0	-12.2
Vertical	9608.000	44.1	36.2	37.0	44.9	54.0	-9.1

Notes:
1. Peak detector is used for the emission measurement (RBW=1MHz / VBW=3MHz for Peak value, and RBW=1MHz / VBW=10Hz for Average value; RBW=3MHz is used for fundamental emission measurement).

2. All measurements were made at 3 meter. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna is used for the emission over 1000MHz.

Test Engineer: Draven Li

Applicant: EcoFlow Inc.
Date of Test: 12 October 2023 Model: EFESP32UE
Worst Case Operating Mode: Transmitting

Table 2

Radiated Emissions

(2440MHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2440.000	104.7	36.7	28.1	96.1	114.0	-17.9
Vertical	4880.000	49.0	36.7	35.5	47.8	74.0	-26.2
Vertical	7320.000	52.1	36.1	37.2	53.2	74.0	-20.8
Vertical	9760.000	56.4	36.2	37.0	57.2	74.0	-16.8

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2440.000	96.1	36.7	28.1	87.5	94.0	-6.5
Vertical	4880.000	37.6	36.7	35.5	36.4	54.0	-17.6
Vertical	7320.000	42.8	36.1	37.2	43.9	54.0	-10.1
Vertical	9760.000	47.1	36.2	37.0	47.9	54.0	-6.1

Notes:
1. Peak detector is used for the emission measurement (RBW=1MHz / VBW=3MHz for Peak value, and RBW=1MHz / VBW=10Hz for Average value; RBW=3MHz is used for fundamental emission measurement).

2. All measurements were made at 3 meter. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna is used for the emission over 1000MHz.

Test Engineer: Draven Li

Applicant: EcoFlow Inc.
Date of Test: 12 October 2023 Model: EFESP32UE
Worst Case Operating Mode: Transmitting

Table 3

Radiated Emissions

(2480MHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2480.000	103.9	36.7	28.1	95.3	114.0	-18.7
Vertical	4960.000	48.2	36.7	35.5	47.0	74.0	-27.0
Vertical	7440.000	53.1	36.1	37.2	54.2	74.0	-19.8
Vertical	9920.000	54.0	36.3	38.9	56.6	74.0	-17.4

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB/m)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2480.000	93.7	36.7	28.1	85.1	94.0	-8.9
Vertical	4960.000	40.9	36.7	35.5	39.7	54.0	-14.3
Vertical	7440.000	41.9	36.1	37.2	43.0	54.0	-11.0
Vertical	9920.000	45.7	36.3	38.9	48.3	54.0	-5.7

Notes:
1. Peak detector is used for the emission measurement (RBW=1MHz / VBW=3MHz for Peak value, and RBW=1MHz / VBW=10Hz for Average value; RBW=3MHz is used for fundamental emission measurement).

2. All measurements were made at 3 meter. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna is used for the emission over 1000MHz.

Test Engineer: Draven Li

4.2 Conducted Emission Configuration Photograph

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: conducted photos.pdf.

4.2.1 Conducted Emission

Worst Case Conducted Configuration
at
0.158000MHz

Judgement: Passed by 12.1dB margin

TEST PERSONNEL:

Sign on file

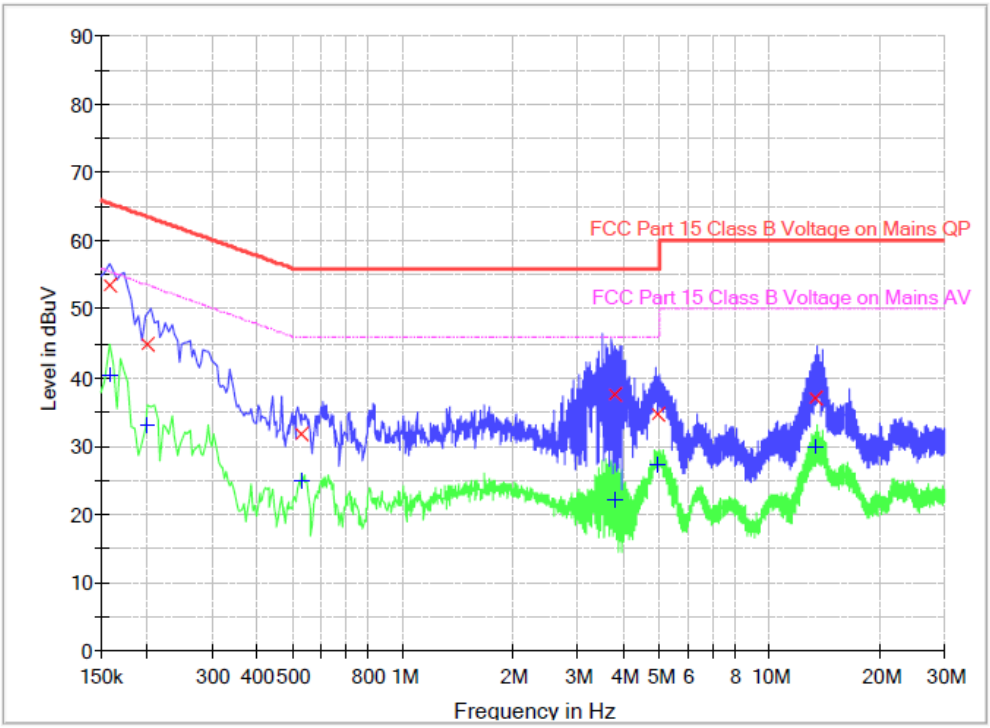
Draven Li, Project Engineer
Typed/Printed Name

12 October 2023
Date

Applicant: EcoFlow Inc.
Date of Test: 12 October 2023 Model: EFESP32UE
Worst Case Operating Mode: Simultaneous Transmission
Phase: Live
Test Voltage: AC 120V/60Hz

Graphic / Data Table

Conducted Emissions
Pursuant to FCC 15.207: Emissions Requirement



Result Table QP

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.158000	53.5	9.000	L1	9.6	12.1	65.6
0.202000	44.9	9.000	L1	9.6	18.6	63.5
0.530000	31.6	9.000	L1	9.7	24.4	56.0
3.774000	37.6	9.000	L1	9.8	18.4	56.0
4.986000	34.8	9.000	L1	9.8	21.2	56.0
13.402000	36.9	9.000	L1	10.1	23.1	60.0

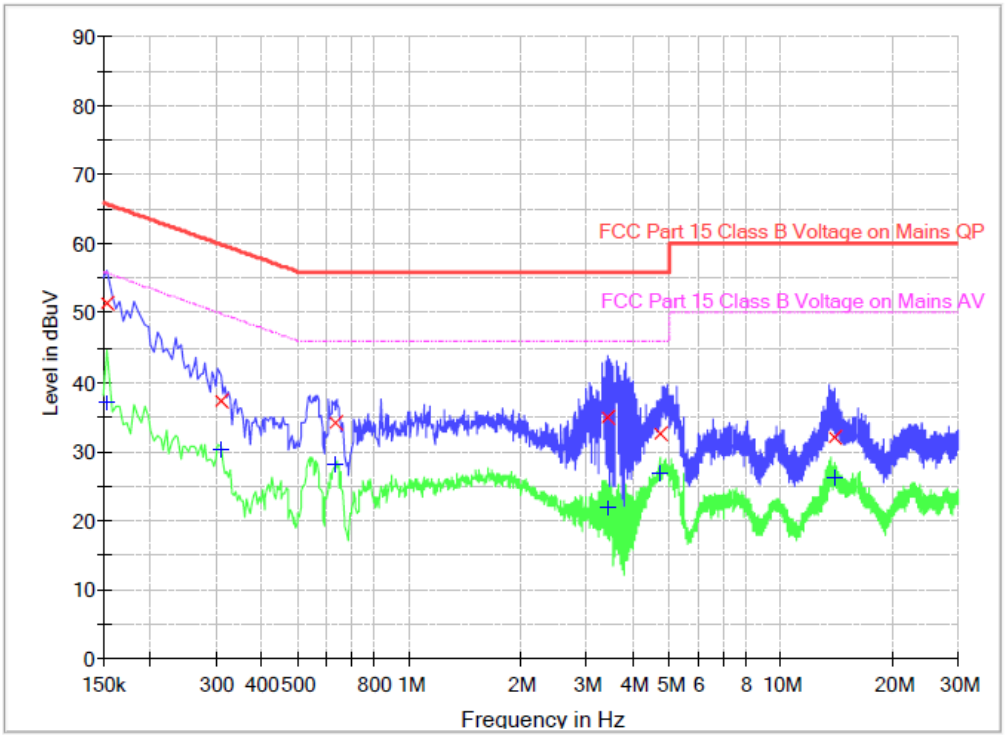
Result Table AV

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.158000	40.3	9.000	L1	9.6	15.3	55.6
0.202000	33.0	9.000	L1	9.6	20.5	53.5
0.530000	24.8	9.000	L1	9.7	21.2	46.0
3.774000	22.2	9.000	L1	9.8	23.8	46.0
4.986000	27.4	9.000	L1	9.8	18.6	46.0
13.402000	30.0	9.000	L1	10.1	20.0	50.0

Applicant: EcoFlow Inc.
Date of Test: 12 October 2023 Model: EFESP32UE
Worst Case Operating Mode: Simultaneous Transmission
Phase: Neutral
Test Voltage: AC 120V/60Hz

Graphic / Data Table

Conducted Emissions
Pursuant to FCC 15.207: Emissions Requirement



Result Table QP

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.154000	51.5	9.000	N	9.6	14.3	65.8
0.310000	37.2	9.000	N	9.6	22.8	60.0
0.634000	34.2	9.000	N	9.6	21.8	56.0
3.422000	34.9	9.000	N	9.7	21.1	56.0
4.754000	32.5	9.000	N	9.8	23.5	56.0
14.038000	32.1	9.000	N	10.1	27.9	60.0

Result Table AV

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.154000	37.0	9.000	N	9.6	18.8	55.8
0.310000	30.2	9.000	N	9.6	19.8	50.0
0.634000	28.0	9.000	N	9.6	18.0	46.0
3.422000	21.8	9.000	N	9.7	24.2	46.0
4.754000	26.9	9.000	N	9.8	19.1	46.0
14.038000	26.3	9.000	N	10.1	23.7	50.0

5.0 Equipment Photographs

For electronic filing, the photographs of the tested EUT are saved with filename: external photos.pdf & internal photos.pdf.

6.0 Product Labelling

For electronic filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

7.0 Technical Specifications

For electronic filing, the block diagram and schematics of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

8.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

9.0 Miscellaneous Information

This miscellaneous information includes details of the measured bandedge, 20dB Bandwidth, the test procedure and calculation of factor such as pulse desensitization.

9.1 Bandedge Plot

The test plots are attached as below. From the below plots, the field strength of any emissions outside of the specified frequency band are attenuated to the general radiated emission limits in section 15.209. It fulfils the requirement of 15.249(d).

Peak Measurement

Bandedge compliance is determined by applying marker-delta method, i.e (Bandedge Plot).

(i) Lowest frequency channel (2402MHz):

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the bandedge plot

= 97.0 dBµv/m-49.69 dB
= 47.31 dBµv/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the bandedge plot

= 88.0 dBµv/m-49.69 dB
= 38.31 dBµv/m

(ii) Highest frequency channel (2480MHz):

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the bandedge plot

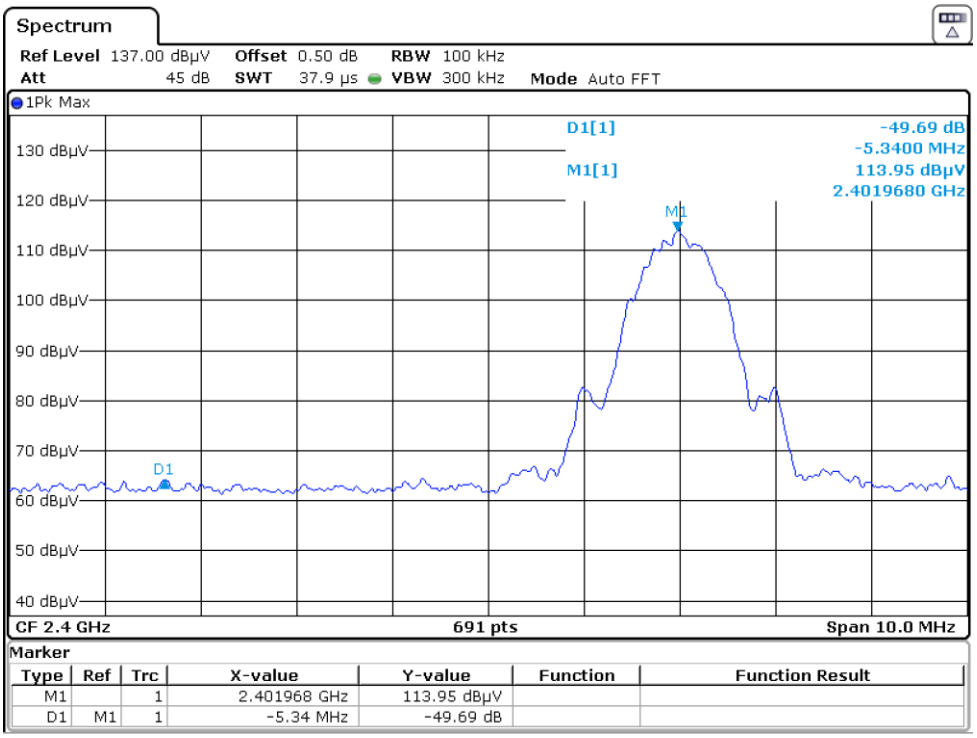
= 95.3 dBµv/m-51.31 dB
= 43.99 dBµv/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the bandedge plot

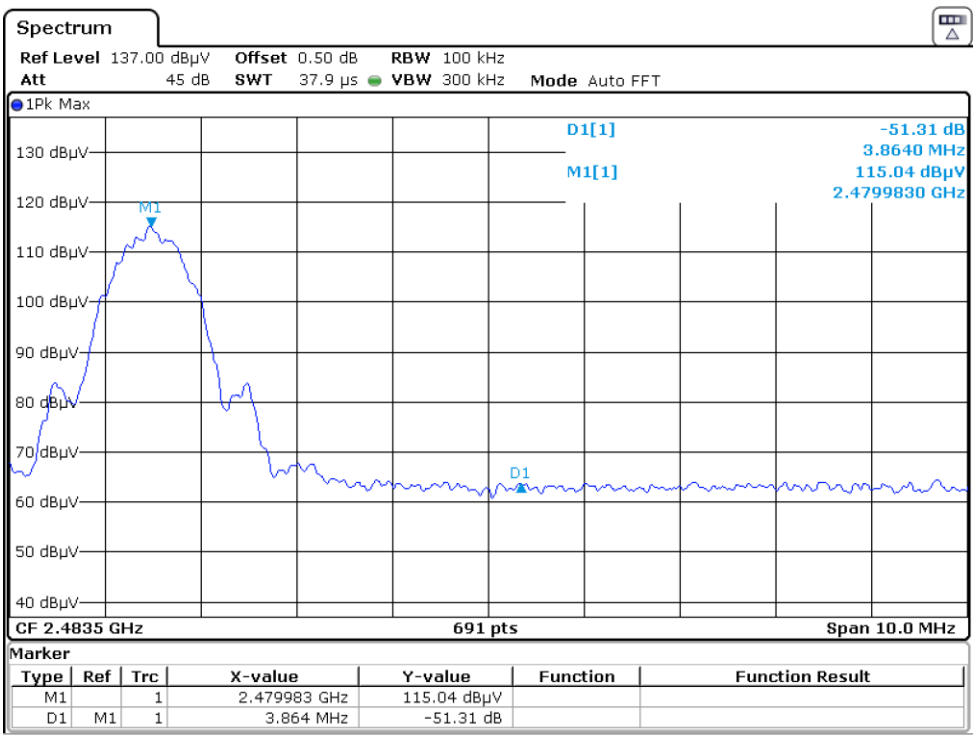
= 85.1 dBµv/m-51.31 dB
= 33.79 dBµv/m

The resultant field strength meets the general radiated emission limit in section 15.209, which does not exceed 74dBµv/m (Peak Limit) and 54dBµv/m (Average Limit).

Lowest frequency Channel

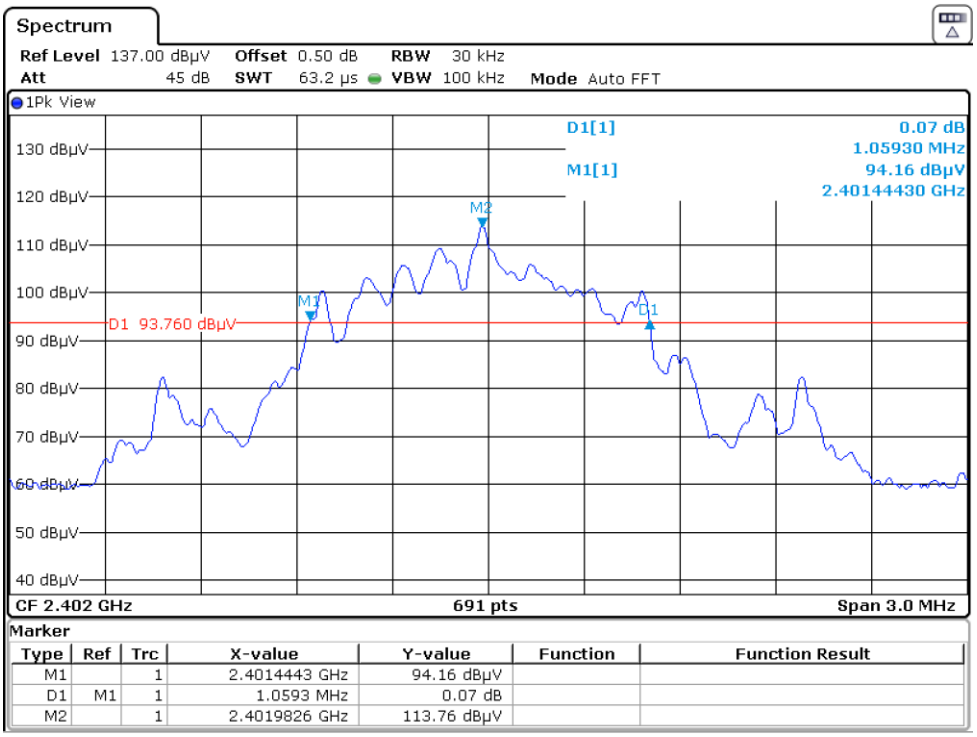


Highest frequency Channel



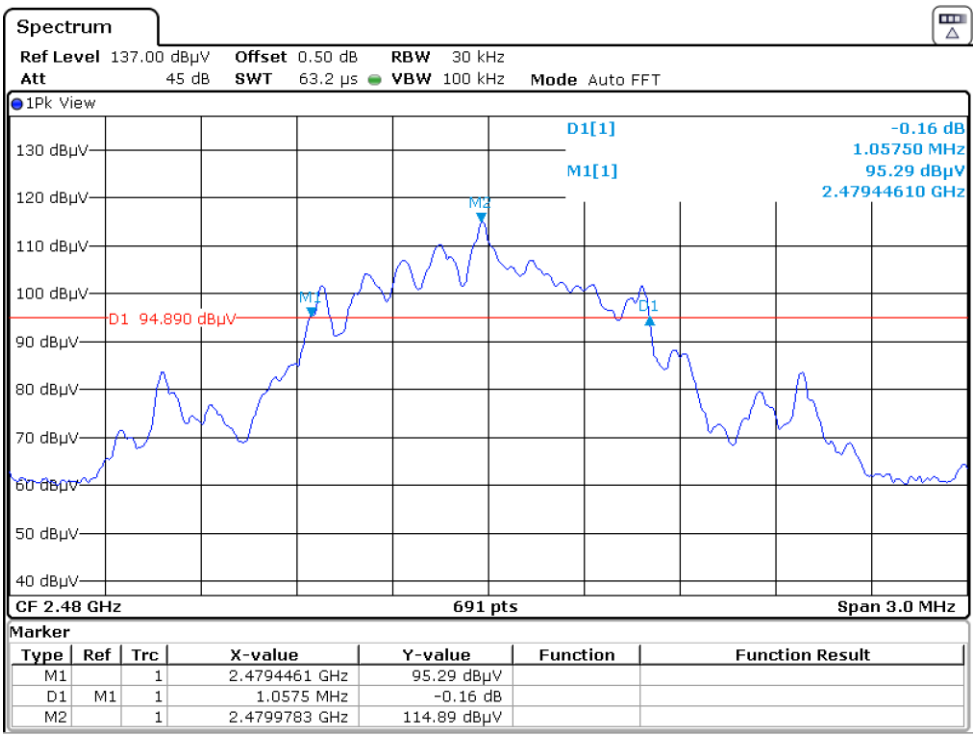
9.2 20dB bandwidth

Pursuant to FCC part 15 Section 15.215(c), the 20dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered. The test plots are reported as below.



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4014443 GHz	94.16 dBµV		
D1	M1	1	1.0593 MHz	0.07 dB		
M2		1	2.4019826 GHz	113.76 dBµV		



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4794461 GHz	95.29 dBµV		
D1	M1	1	1.0575 MHz	-0.16 dB		
M2		1	2.4799783 GHz	114.89 dBµV		

9.3 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device since the transmitter transmits the RF signal continuously.

9.4 Transmitter Duty Cycle Calculation, FCC Rule 15.35(b, c)

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEP function on the analyzer was set to ZERO SPAN. The Transmitter ON time was determined from the resultant time-amplitude display:

	See attached spectrum analyzer chart (s) for Transmitter timing
	See Transmitter timing diagram provided by manufacturer
x	Not applicable, duty cycle was not used.

9.5 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services in the measurements of transmitters operating under Part 15, Subpart C rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.10 - 2013.

The transmitting equipment under test (EUT) is placed on a styrene turntable which is four feet in diameter and approximately 0.8 meter up to 1GHz and 1.5 meter above 1GHz in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjust through all three orthogonal axes to obtain maximum emission levels. The antenna height and polarization are varied during the testing to search for maximum signal levels.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in section 9.4.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.

Detector function for conducted emissions is in QP & AV mode and IFBW setting is 9 kHz from the frequency band 150 kHz to 30MHz.

9.5 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements are made as described in ANSI C63.10 - 2013.

The IF bandwidth used for measurement of radiated signal strength was 10 kHz for emission below 30 MHz and 120 kHz for emission from 30 MHz to 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. Above 1000 MHz, a resolution bandwidth of 1 MHz is used (RBW 3MHz used for fundamental emission).

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the restricted bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, but those measurements taken at a closer distance are so marked.

10.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-12	BiConiLog Antenna	ETS	3142E	00166158	04-Aug-2021	04-Aug-2024
SZ185-03	EMI Receiver	R&S	ESCI	100547	27-Apr-2023	27-Apr-2024
SZ061-08	Horn Antenna	ETS	3115	00092346	05-Sep-2021	05-Sep-2024
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	27-Apr-2023	27-Apr-2024
SZ056-06	Signal Analyzer	R&S	FSV 40	101101	19-Dec-2022	19-Dec-2023
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	27-Apr-2023	27-Apr-2024
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	12-Dec-2021	12-Dec-2024
SZ062-23	RF Cable	RADIALL	SF104PE	--	26-Sep-2023	26-Sep-2024
SZ062-35	RF Cable	RADIALL	A50-3.5M3.5M-8M	--	17-Oct-2022	17-Oct-2023
SZ062-30	RF Cable	RADIALL	A50-3.5M3.5M-4.5M	--	25-Sep-2023	25-Sep-2024
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	27-Apr-2023	27-Apr-2024
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	11-Jul-2023	11-Jul-2024
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	24-Oct-2022	24-Oct-2023
SZ187-02	Two-Line V-Network	R&S	ENV216	100072	27-Apr-2023	27-Apr-2024
SZ062-16	RF Cable	HUBER+SUHNER	CBL2-BN-1m	110127-2231000	11-Jul-2023	11-Jul-2024
SZ188-03	Shielding Room	ETS	RFD-100	4100	20-Dec-2022	20-Dec-2025

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