Project 20900

Model ERT3

Wireless Certification Report
FCC 15.231

Prepared for:

Lift-Tex DBA Boat Hoist USA
PO Box 2883
Longview, TX 75606

By

Professional Testing (EMI), Inc.
1601 North A.W. Grimes Blvd., Suite B
Round Rock, Texas 78665

14 Oct 2021

Reviewed by

Larry Finn
Chief Technical Officer

Written by

Eric Lifsey
EMC Engineer

Revision History

Revision Number	Description	Date
Draft 02	Draft for review. (New hardware data.)	15 Jun 2021
Final1	No changes.	21 Jun 2021
Final2	Minor corrections	14 Oct 2021

Errata:

In all cases reference to Elite Remote or similar it represents the model ERT3.

Table of Contents

Certificate of Compliance

Applicant	Device & Test Identification	
Lift-Tex DBA Boat Hoist USA	FCC ID:	2AU3O-ERT3
PO Box 2883	Industry Canada ID:	Not Applicable
Longview, TX 75606	Model(s):	ERT3
Certificate Date: 15 Jun 2021	Laboratory Project ID:	20900

The device model(s) listed above were tested utilizing the following documents and found to be in compliance with the required criteria.

47 CFR (USA)	
Section Reference FCC	**Parameter**
15.231(a)	Fundamental Field Strength
15.231(a)	Harmonic & Spurious Emissions
15.231(a)(1)	Maximum Transmit Time
15.231(c)	Bandwidth
15.203	Antenna Requirements

I, Eric Lifsey, for Professional Testing (EMI), Inc., being familiar with the above rules and test procedures have reviewed the test setup, measured data, and this report. I believe them to be true and accurate.

NVLAP TESTING
NVLAP LAB CODE 200062-0

Eric Lifsey
EMC Engineer

This report has been reviewed and accepted by the Applicant. The undersigned is responsible for ensuring that this device will continue to comply with the rules listed above.

Representative of Applicant

1.0 Introduction

1.1 Scope

This report describes the extent to which the equipment under test (EUT) conformed to the intentional radiator requirements of USA.

1.2 EUT Description

This device is part of a wireless remote control of a lift mechanism system for boats.

Table 1.2.1: Equipment Under Test

Manufacturer	Model	Serial #	Description
Lift-Tex DBA Boat Hoist USA	ERT3	None	Transmitter

The device form factor is that of a typical key fob. The device only transmits when it receives power while a button is pressed. It has no receive or idle mode.

1.3 EUT Operation

The EUT was exercised in a manner consistent with normal operations.

1.4 Modifications to Equipment

The EUT was modified to reduce power and unwanted spurious emissions.

1.5 Radiated Measurement Calculation

Raw Measured Level + Antenna Factor + Cable Losses – Amplifier Gain = Corrected Level

When measurement distance differs from the specified limit distance the correct extrapolation factor is applied.

2.0 Applicable Documents and Clauses

Table 2.0.1: Applicable Documents	
Document	**Title/Description**
47 CFR (USA)	Part 15 – Section 15.231
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

Table 2.0.2: Supplemental Statements		
Section Number FCC	**Clause Subject**	**Statement**
FCC 15.231(a)(3)	Periodic Transmissions	The EUT makes no periodic transmissions and is strictly activated by the user in a manual fashion by depressing a button. The device only gets power while the user presses a button.

2.1 Test Site

Measurements were made at the PTI semi-anechoic facility designated Site 45 (FCC Test Firm Registration Number 776781, IC 3036B-1, CAB Identifier US 0123) in Austin, Texas. The site is registered with the FCC under Section 2.948 and Industry Canada per RSS-GEN, and is subsequently confirmed by laboratory accreditation (NVLAP). The test site is located at 11400 Burnet Road, Austin, Texas 78758, while the main office is located at 1601 North A.W. Grimes Boulevard, Suite B, Round Rock, Texas, 78665.

Professional Testing (EMI), Inc., (PTI) follows the guidelines of National Institute of Standards and Technology (NIST) for all uncertainty calculations, estimates, and expressions thereof for electromagnetic compatibility testing.

3.0 Fundamental Field Strength

3.1 Test Procedure

EUT is placed on a non-conductive surface 80 cm above a reference plane and measurements of emissions are made to find maximum emission level.

3.2 Test Criteria

Section Reference FCC	Parameter	Date(s)
15.231(a)	Frequency 372.0 MHz Limit Radiated Output Power$_{avg}$, 8,417 µV/m @ 3 m Restated as 78.5 dBµV/m @ 3 m Or extrapolated as 68.0 dBµV/m @ 10 m	23 Nov 2020

3.3 Test Results

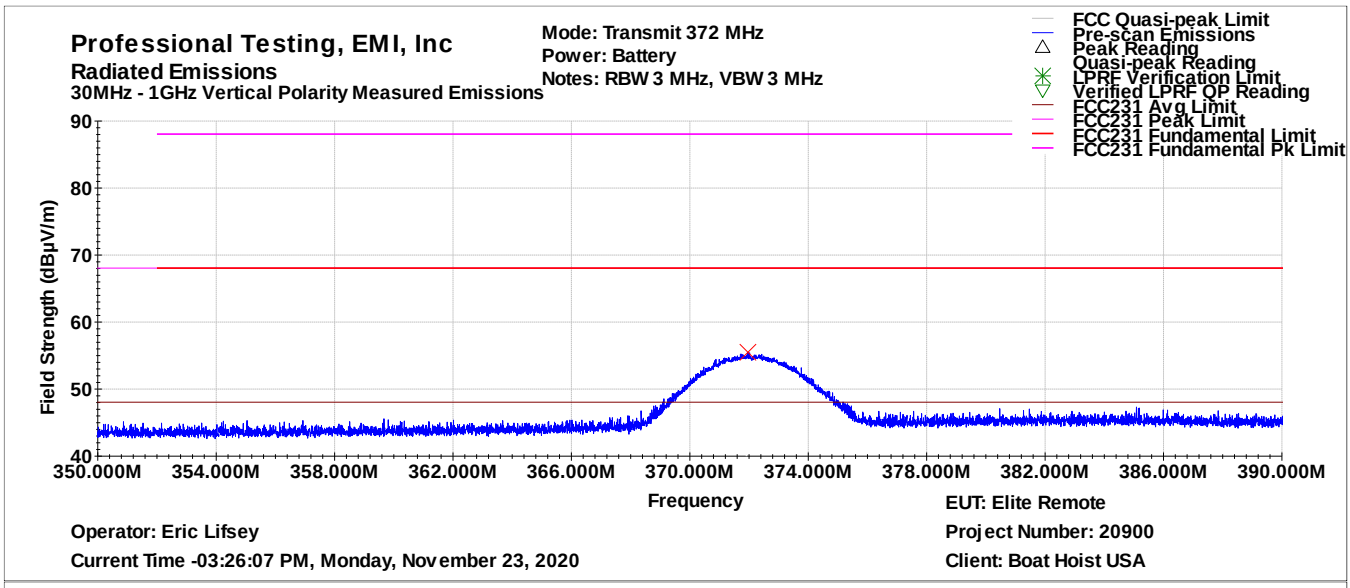
Table 3.3.1: Field Strength at 10 Meters

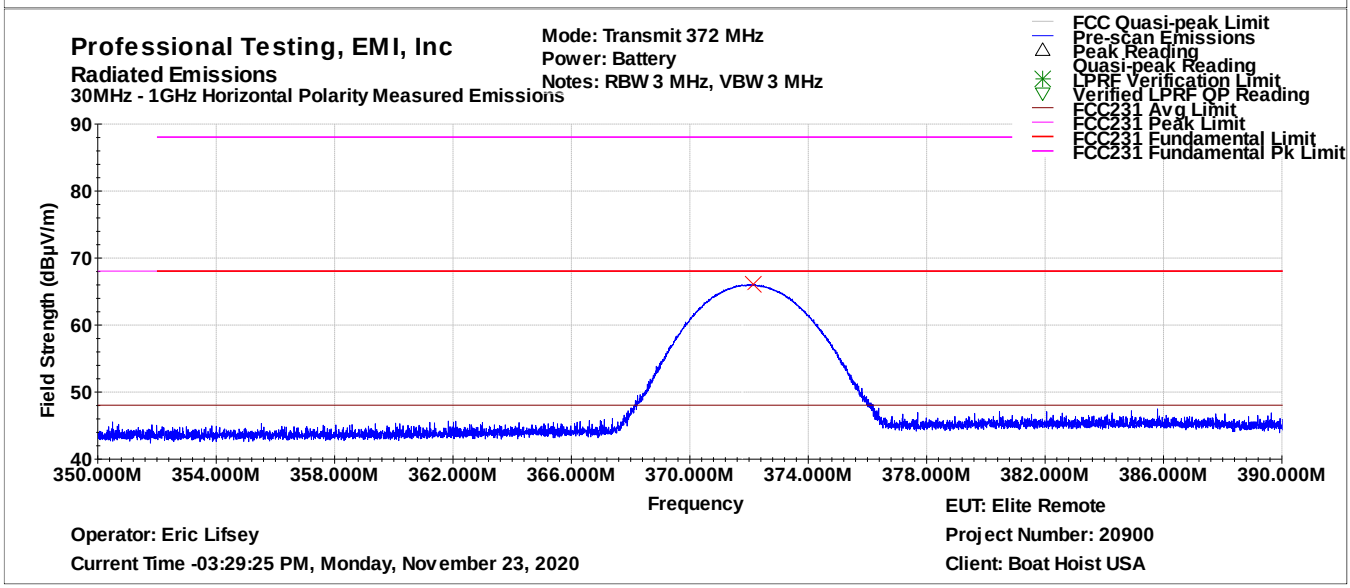
Frequency MHz	Antenna Polarity	Corrected Level (Measured Peak Level) dBµV/m	Detector Mode
372	V	55.4	Peak
372	H	66.1	Peak

Resolution bandwidth 3 MHz. Video bandwidth 3 MHz.

Duty cycle was not measured as the peak signal was under the average limit.

The EUT satisfied the criteria.


Professional Testing, EMI, Inc
Radiated Emissions
30MHz - 1GHz Vertical Polarity Measured Emissions
Mode: Transmit 372 MHz
Power: Battery
Notes: RBW 3 MHz, VBW 3 MHz
FCC Quasi-peak Limit
Pre-scan Emissions
Peak Reading
Quasi-peak Reading
LPRF Verification Limit
Verified LPRF QP Reading
FCC231 Avg Limit
FCC231 Peak Limit
FCC231 Fundamental Limit
FCC231 Fundamental Pk Limit
Field Strength (dBµV/m)
90
80
70
60
50
40
350.000M
354.000M
358.000M
362.000M
366.000M
370.000M
374.000M
378.000M
382.000M
386.000M
390.000M
Frequency
Operator: Eric Lifsey
Current Time -03:26:07 PM, Monday, November 23, 2020
EUT: Elite Remote
Project Number: 20900
Client: Boat Hoist USA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FCC231 Peak Limit
FCC231 Fundamental Limit
FCC231 Fundamental Pk Limit
Field Strength (dBµV/m)
90
80
70
60
50
40
350.000M
354.000M
358.000M
362.000M
366.000M
370.000M
374.000M
378.000M
382.000M
386.000M
390.000M
Frequency
Operator: Eric Lifsey
Current Time -03:29:25 PM, Monday, November 23, 2020
EUT: Elite Remote
Project Number: 20900
Client: Boat Hoist USA

4.0 Transmitter Shutoff Time

4.1 Test Procedure

EUT is placed into normal transmit operation to observe and record transmitter time domain performance when the transmission task is complete.

4.2 Test Criteria

Section Reference FCC	Parameter	Date(s)
15.231(a)(1)	Maximum Transmit Time	24 Oct 2020

4.3 Test Results

Table 4.3.1: Maximum Transmit Shutoff Time, Limit and Measured	
Limit Transmit Time	**Maximum Measured Transmit Time**
5 seconds	Transmission ends immediately as all power is removed when the button(s) are released.

By design the EUT disconnects power when the buttons are not being pressed. No measurement is required.

5.0 Occupied Bandwidth

5.1 Test Procedure

The EUT is configured for best signal/power and the bandwidth then is measured. A recording of the results is included.

5.2 Test Criteria

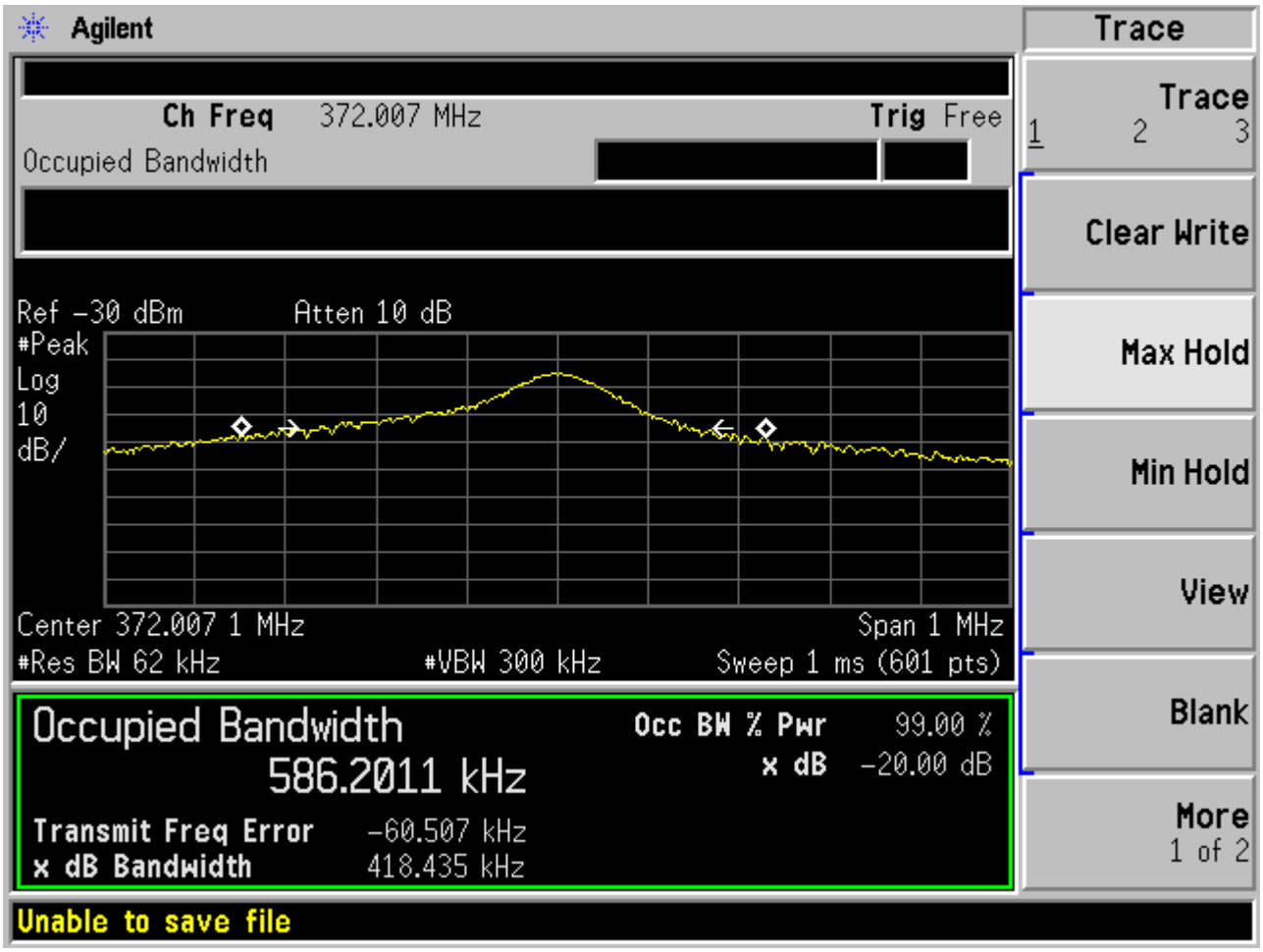
Section Reference FCC	Parameter	Date(s)
15.231(c), 2.1049	Bandwidth, 99% Limit is 0.25% of Fundamental Frequency	24 Oct 2020

5.3 Test Results

Table 5.3.1: Bandwidth Limit and Measurement	
Limit 15.231(c) BW For Fundamental = 372 MHz 0.25% of Fundamental kHz	**Measured BW 99% kHz**
0.0025 · 372,000 = 930	586

EUT was satisfied the criteria.

5.3.1 Bandwidth Plot



6.0 Radiated Spurious Emissions

6.1 Test Procedure

The EUT was placed on a non-conductive table above the ground plane. The EUT placed at a height of 80 cm below 1 GHz and 150 cm for measurements above 1 GHz.

Spurious emissions below 1 GHz were measured with quasi-peak detection with a resolution bandwidth of 120 kHz.

Harmonic emissions above 1 GHz peak were measured with peak detection, a resolution bandwidth of 1 MHz, and at a distance of 3 meters. If peak measurements exceeded average limits, the peak limit was applicable and duty cycle factor was then applied for average level calculation. Emissions were investigated up to at least the 10^{th} harmonic of the transmitter fundamental.

Non-harmonic spurious emissions must satisfy the average limit and the peak limit (20 dB above average).

6.2 Test Criteria

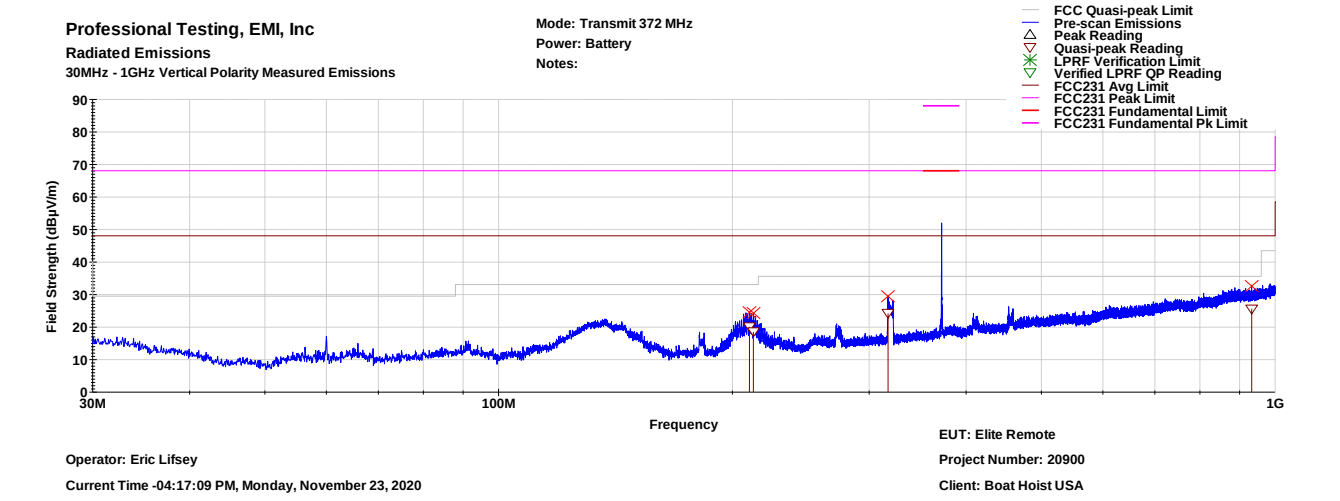
Section Number FCC	Clause Subject	Date
15.231(a), 15.209	Field Strength of Radiated Spurious/Harmonic Emissions For 372 MHz: Limit @ 10 m is 48 dBuV/m Limit @ 3m is 58.5 dBuV/m	22 Nov 2020

6.3 Test Results

Limits of FCC 15.209 were applied except where noted (15.231).

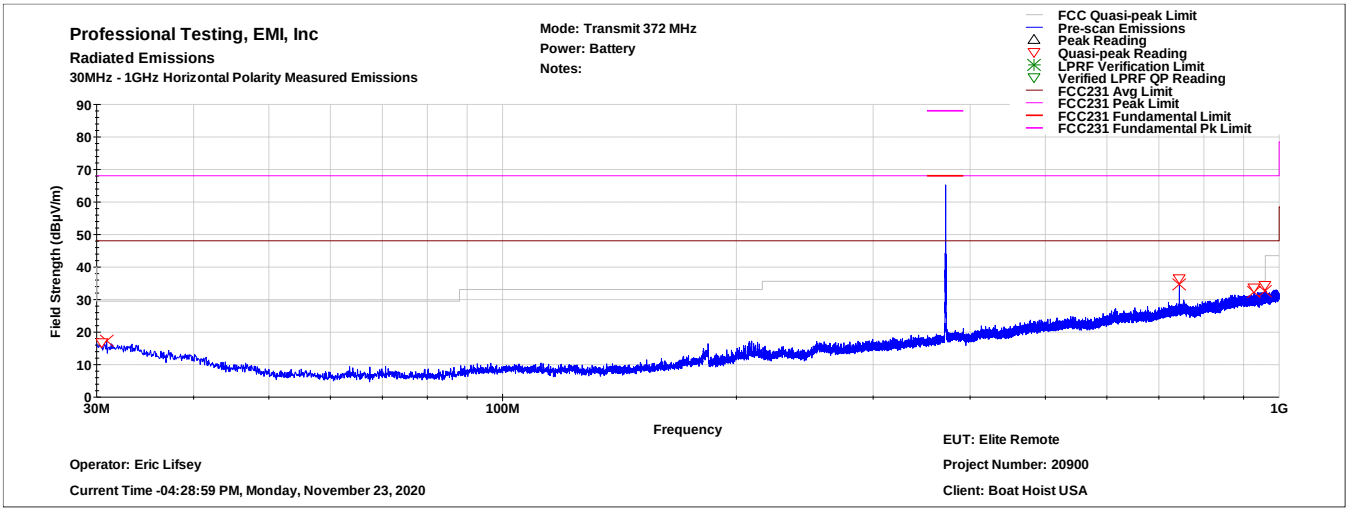
The EUT satisfied the criteria.

6.3.1 Below 1 GHz, Vertical Polarity



Frequency (MHz)	EUT Direction (Degrees)	Antenna Height (cm)	Quasi-peak Reading (dBµV)	Quasi-peak Limit (dBµV)	Quasi-peak Margin (dB)	Quasi-peak Results
210.385	264.000	127.000	20.055	33.100	-13.045	PASS
212.873	239.000	126.000	18.544	33.100	-14.556	PASS
317.365	303.000	126.000	24.184	35.600	-11.416	PASS
932.976	60.000	126.000	25.623	35.600	-9.977	PASS

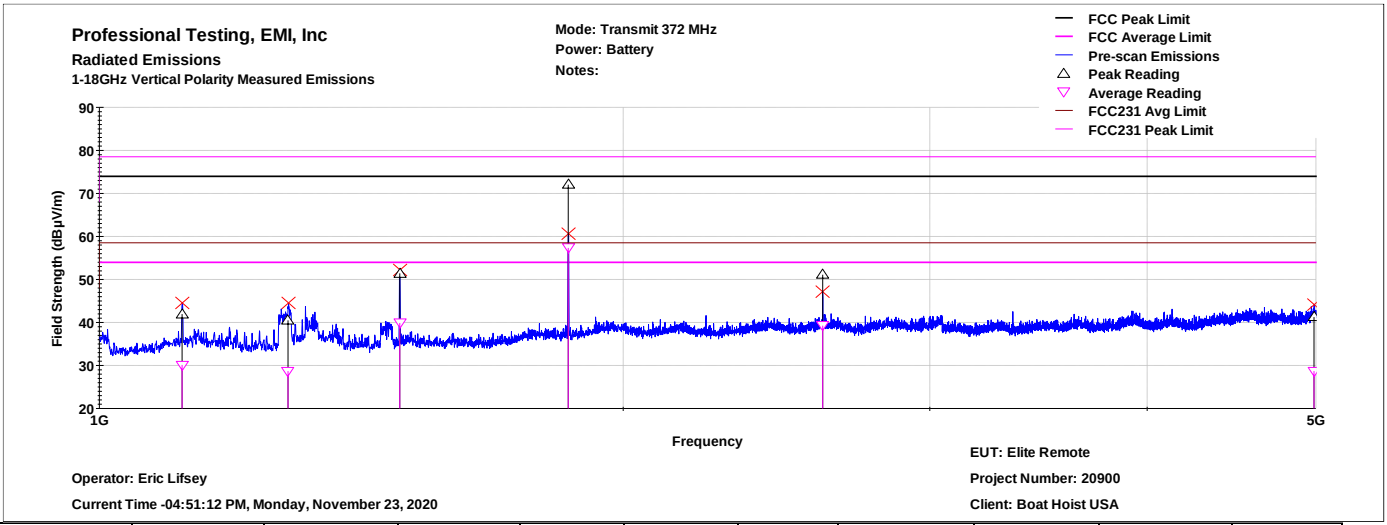
6.3.2 Below 1 GHz, Horizontal Polarity



Frequency (MHz)	EUT Direction (Degrees)	Antenna Height (cm)	Quasi-peak Reading (dBµV)	Quasi-peak Limit (dBµV)	Quasi-peak Margin (dB)	Quasi-peak Results
30.484	188.000	126.000	16.684	29.500	-12.816	PASS
744.009	160.000	150.000	36.524	48.000*	-11.476	PASS
928.491	314.000	137.000	33.694	35.600	-1.906	PASS
959.268	98.000	253.000	34.286	35.600	-1.314	PASS

*15.231 spurious limit.

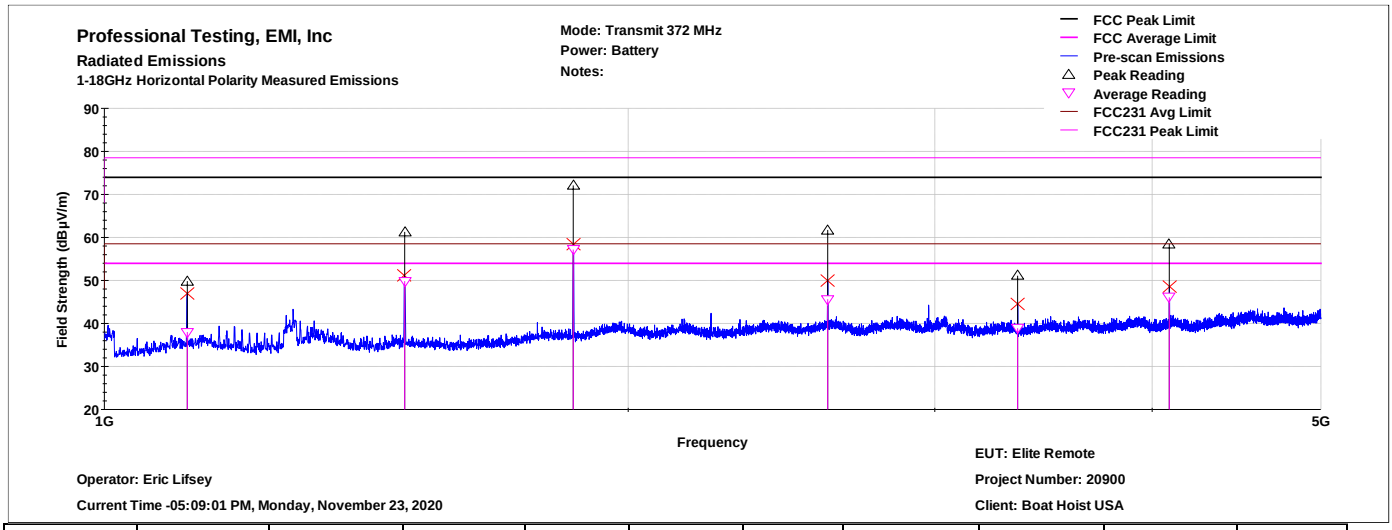
6.3.3 Above 1 GHz, Vertical Polarity



Frequency (MHz)	EUT Direction (Degrees)	Antenna Height (cm)	Peak Reading (dBµV)	Peak Limit (dBµV)	Peak Margin (dB)	Peak Results	Average Reading (dBµV)	Average Limit (dBµV)	Average Margin (dB)	Average Results
1115.77	19	343	41.923	73.958	-32.035	PASS	30.111	53.958	-23.847	PASS
1283.52	313	210	40.471	73.958	-33.487	PASS	28.687	53.958	-25.271	PASS
1488.18	46	337	51.402	73.958	-22.556	PASS	39.873	53.958	-14.085	PASS
1859.65	249	331	72.003	73.958	-1.955	PASS	57.317	58.000*	-0.683	PASS
2603.81	166	338	51.084	73.958	-22.874	PASS	39.256	53.958	-14.702	PASS
4987.69	308	301	41.236	73.958	-32.722	PASS	28.690	53.958	-25.268	PASS

*Limit of FCC 15.231.

6.3.4 Above 1 GHz, Horizontal Polarity



Frequency (MHz)	EUT Direction (Degrees)	Antenna Height (cm)	Peak Reading (dBµV)	Peak Limit (dBµV)	Peak Margin (dB)	Peak Results	Average Reading (dBµV)	Average Limit (dBµV)	Average Margin (dB)	Average Results
1116.08	210	335	49.820	73.958	-24.138	PASS	37.994	53.958	-15.964	PASS
1487.96	144	160	61.281	73.958	-12.677	PASS	49.837	53.958	-4.121	PASS
1859.67	3	263	72.081	73.958	-1.877	PASS	57.156	58.000*	-0.844	PASS
2603.77	194	290	61.734	73.958	-12.224	PASS	45.621	53.958	-8.337	PASS
3347.73	269	257	51.083	73.958	-22.875	PASS	38.869	53.958	-15.089	PASS
4091.39	100	213	58.485	73.958	-15.473	PASS	46.069	53.958	-7.889	PASS

*Limit of FCC 15.231.

7.0 Antenna Construction Requirements

7.1 Procedure

A direct examination of the antenna construction is performed and compared to rule criteria that prevents wireless device antennas from being modified by end users in ways that would void their authorization to use the device.

7.2 Criteria

Section Number FCC	Clause Subject	Date
15.203	Antenna Construction	14 Oct 2020

7.3 Results

Antenna Manufacturer, Details	
Manufactured by: Lift-Tex DBA Boat Hoist USA Antenna is a printed circuit trace that follows the edge of three sides of the board. No external connector is present.	

The antenna is not subject to user replacement or substitution.

The antenna design satisfies the criteria.

8.0 Equipment Lists

8.1 Equipment for Fundamental Power and Spurious Radiated Emissions

Radiated Emissions Test Equipment List					
Tile! Software Version:	**Version: 7.1.2.17 (Jan 08, 2016 - 02:12:48 PM) or 4.1.A.0, April 14, 2009, 11:01:00PM**				
Test Profile:	**2020_RE_Unintentional_TILE7_v2.7.til**				
Asset #	**Manufacturer**	**Model**	**Equipment Nomenclature**	**Serial Number**	**Calibration Due Date**
1509A	Braden	TDK 10M	TDK 10M Chamber, NSA < 1 GHz	DAC-012915-005	9/17/2021
1890	HP	8447F-H64	Preamp/Amp, 9kHz-1300MHz, 28/25dB	3313A05298	1/9/2022
2295	Keysight	E4440A-AYZ	PSA Spectrum Analyzer	MY46186204	11/10/2021
1926	ETS-Lindgren	3142D	Antenna, Biconilog, 26 MHz - 6 GHz	135454	3/11/2021
C027	none	RG214	Cable Coax, N-N, 25m, 25MHz - 1GHz	None	9/8/2021
1327	EMCO	1050	Controller, Antenna Mast	none	N/A
0942	HP	6448B	Power Supply, DC, 600V	2952A05001	N/A
1969	HP	11713A	Attenuator/Switch Driver	3748A04113	N/A
1509B	Braden	TDK 10M	TDK 10M Chamber,sVSWR > 1 GHz	DAC-012915-005	9/21/2021
2004	Miteq	AFS44-00101800-2S-10P-44	Amplifier, 40dB, 100MHz-18GHz	None	1/9/2022
C030	none	none	Cable Coax, N-N, 30m, 1 - 18GHz	None	9/8/2021
1325	EMCO	1050	Controller, Antenna Mast	9003-1461	N/A
1780	ETS-Lindgren	3117	Antenna, Double Ridged Guide Horn, 1 - 18 GHz	110313	3/11/2021

8.2 Equipment for Timings and Bandwidth

Asset #	Manufacturer	Model #	Description	Calibration Due
None	PTI	None	SMA Sleeve Antenna	Not Required
2295	Agilent	E4440A	Spectrum Analyzer	11 Nov 2020

Appendix: Policy, Rationale, and Evaluation of EMC Measurement Uncertainty

All uncertainty calculations, estimates and expressions thereof shall be in accordance with NIST policy. Since PTI operates in accordance with NIST (NVLAP) Handbook 150-11: 2007, all instrumentation having an effect on the accuracy or validity of tests shall be periodically calibrated or verified traceable to national standards by a competent calibration laboratory. The certificates of calibration or verification on this instrumentation shall include estimates of uncertainty as required by NIST Handbook 150-11.

1. Rationale and Summary of Expanded Uncertainty.

Each piece of instrumentation at PTI that is used in making measurements for determining conformance to a standard (or limit), shall be assessed to evaluate its contribution to the overall uncertainty of the measurement in which it is used. The assessment of each item will be based on either a type A evaluation or a type B evaluation. Most of the evaluations will be type B, since they will be based on the manufacturer's statements or specifications of the calibration tolerances, or uncertainty will be stated along with a brief rationale for the type of evaluation and the resulting stated uncertainties.

The individual uncertainties included in the combined standard uncertainty for a specific test result will depend on the configuration in which the item of instrumentation is used. The combination will always be based on the law of propagation of uncertainty. Any systematic effects will be accommodated by including their uncertainties, in the calculation of the combined standard uncertainty; except that if the direction and amount of the systematic effect cannot be determined and separated from its uncertainty, the whole effect will be treated as uncertainty and combined along with the other elements of the test setup.

Type A evaluations of standard uncertainty will usually be based on calculating the standard deviation of the mean of a series of independent observations, but may be based on a least-squares curve fit or the analysis of variance for unusual situations. Type B evaluations of standard uncertainty will usually be based on manufacturer's specifications, data provided in calibration reports, and experience. The type of probability distribution used (normal, rectangular, a priori, or u-shaped) will be stated for each Type B evaluation.

In the evaluation of the uncertainty of each type of measurement, the uncertainty caused by the operator will be estimated. One notable operator contribution to measurement uncertainty is the manipulation of cables to maximize the measured values of radiated emissions. The operator contribution to measurement uncertainty is evaluated by having several operators independently repeat the same test. This results in a Type A evaluation of operator-contributed measurement uncertainty.

A summary of the expanded uncertainties of PTI measurements is shown as Table 1. These are the worst-case uncertainties considering all operative influence factors.

Table 1: Summary of Measurement Uncertainties for Site 45

Type of Measurement	Frequency Range	Meas. Dist.	Expanded Uncertainty U, dB (k=2)
Mains Conducted Emissions	150 kHz to 30 MHz	N/A	2.9
Telecom Conducted Emissions	150 kHz to 30 MHz	N/A	2.8
Radiated Emissions	30 to 1,000 MHz	10 m	4.8
	1 to 18 GHz	3 m	5.7

End of Report