



BEC INCORPORATED

CERTIFICATION APPLICATION TEST REPORT

**TEST STANDARDS:
FCC Part 15 Subpart C Section 15.231
RSS-Gen/RSS-210 Annex A
Intentional Radiator**

**Lutron Model QSFC-EDU-BP-C
Eagle Owl Remote Blind Controller**

REPORT BEC-2157-01 REV2

TEST DATES: 08/06/2021 – 10/11/2021

**CUSTOMER:
Lutron Electronics Company Incorporated
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Coopersburg, PA 18036**

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Notice to Customer

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Revision History

Revision #	Description of Changes	Date of Changes	Date Released
0	Test Report Initial Release	N/A	09/14/2021
1	Edited the following Sections to reflect new data taken using Constant Packet Mode test code: 4.5 20 dB Bandwidth 4.6 99% Occupied Bandwidth	10/11/2021	10/11/2021
2	Revised the Radiated Spurious Emissions Tables on pages 21 and 22. Changed Restricted Band Limit to 15.209 Average Limit and added DCCF to those signals exceeding the limit. Refined description of limit application in Section 4.3.6.	10/18/2021	10/18/2021



1.0 Administrative Information

1.1 General Project Details

Project Number	BEC-2157
Manufacturer	Lutron Electronics
Model Number Tested	QSFC-EDU-BP-C
EUT Sample Type	FCC Test Code Radiated Sample
EUT Serial Number	04BA0020
EUT Sample Number	2157-01
Model Number Tested	QSFC-EDU-BP-C
EUT Sample Type	FCC Test Code Conducted Sample
EUT Serial Number	04BA000A
EUT Sample Number	2157-02
EUT Firmware Version	1.006
Frequency of Operation	431 MHz to 437 MHz
Antenna Gain	- 2.85 dBi, -5 dBd
Antenna Type	Monopole
Modulation	FSK
FCC Classification	DSR, Part 15 Remote Control/Security Device Transceiver
Date Samples Received	08/05/2021
Sample Type and Condition Received	Prototype Unit Suitable for test
EUT Description	Eagle Owl Remote Blind Controller
FCC ID	JPZ0137
ISED ID	2851A-JPZ0137
ISED HVIN	RFB-A
Applicable FCC and ISED Rules	FCC Rules Part 15.231: Periodic operation in the band 40.66-40.70 MHz and above 70 MHz RSS-210 Annex A-Momentarily operated and remote control devices



1.2 Preface

This report documents product testing conducted to verify compliance of the specified EUT with applicable standards and requirements as identified herein. EUT, test instrument configurations, test procedures, and recorded data are generally described in this report. The reader is referred to the applicable test standards for detailed procedures. The following table summarizes the test results obtained during this evaluation.

1.3 Laboratory and Customer Information

Test Laboratory Location	BEC Incorporated 970 East High Street Pottstown, PA 19464
Test Personnel	Paul Banker / Steve Fanella / JR Fanella
BEC Laboratory Number FCC Registration	US1118
BEC Laboratory Number ISED Registration	7342A-1
Test Performed For	Lutron Electronics Co Incorporated 7200 Suter Road Coopersburg, PA 18036
Customer Technical Contact	Geri Gonzalez
Customer Reference Number	PO # 5248136



1.4 Measurement Uncertainty

Test Measurement	ETSI EN 300 220-1 Limit	BEC Value
Radio Frequency	±0.5 ppm	±0.086 ppm
RF Power, Conducted	±1.5 dB	±1.48 dB
Conducted Spurious Emission of Transmitter, Valid up to 6 GHz	±3 dB	±2.73 dB
Conducted Emission of Receivers	±3 dB	N/A
Radiated Emission of Transmitter, Valid up to 6 GHz	±6 dB	±4.93 dB
Radiated Emission of Receiver, Valid up to 6 GHz	±6 dB	±4.93 dB
RF Level Uncertainty for a given BER	±1.5 dB	N/A
Occupied Bandwidth	±5 %	±2 %
Temperature	±2.5 °C	±0.5 °C
Humidity	±10 %	±2.5%

These uncertainties have a coverage factor of $k = 1.96$ or $k = 2$, (which provide confidence levels of respectively 95 % and 95.45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)). Principles for the calculation of measurement uncertainty are contained in ETSI TR 100 028 [i.3], in particular in annex D of ETSI TR 100 028-2 [i.3].

Measurement	Measurement Distance	Frequency Range	Measurement Limit	Expanded Uncertainty
Radiated Disturbance Open Area Test Site	3 Meter	30 MHz – 1 GHz	Class A or B	3.93
Radiated Disturbance Fully Anechoic Chamber	3 Meter	1 GHz – 18 GHz	Class A or B	4.90
Conducted Disturbance AC Mains	N/A	150 kHz – 30 MHz	Class A or B	2.69

No adjustments to measured data presented in this report are required because all values of uncertainty are less than the CISPR 16-4-2:2018 recommendations. These uncertainties have a coverage factor of $k = 2$, which yields approximately a 95% level of confidence for the near-normal distribution typical of most measurement results.



1.5 Test Result Summary Table

The Lutron QSFC-EDU-BP-C Eagle Owl Remote Blind Controller was tested and found to be compliant to the sections of the FCC Part 15 Subpart C and RSS-210/RSS-Gen standard listed below:

BEC Report Section	FCC: 47 CFR Part	RSS-210	RSS-Gen	IEEE / ANSI C63.10	Test Description	Result
4.1	15.203	-	6.8	-	Antenna Requirement	Compliant
4.2	15.203	-	6.8	-	Antenna Construction	Compliant
4.3	FCC 15.205, 15.209, 15.231(b)	A.1.2	6.13, 7.3 and 8.10	-	Radiated Emissions	PASS
4.4	IEEE/ANSI C63.10	-	-	11.6	Duty Cycle Measurement	Measured
4.5	FCC 15.231(c)	A.1.3	-	-	20 dB Bandwidth	PASS
4.6	-	-	6.7	-	99% Occupied Bandwidth	PASS
4.7	FCC 15.231(a)(1)	A.1.1 (a)	-	-	Deactivation Testing	PASS
4.8	15.207(a)	-	7.2	-	AC Mains Conducted Emissions	NA¹

NA¹: The EUT is a battery powered device and therefore AC Mains Conducted Emissions is Not Applicable.

Interpretation of Test Results: The EUT was tested using typical radio modulation. The resultant data is presented by showing the worst-case levels for each modulation type and/or frequency. All recorded results are maintained at BEC Incorporated and are available upon request.



1.6 Condition of Received Sample

An evaluation of the EUT was conducted in order to verify test subject identity and condition and to ensure suitability for testing. No evidence of physical damage was noted. The test item condition was deemed acceptable for the performance of the requested test services.

1.7 Climatic Environment

The following were the general environmental conditions inside the laboratory during testing:

Temperature: $22^{\circ}\text{C} \pm 5^{\circ}\text{C}$

Humidity: $50\% \pm 20\%$

Barometric Pressure: $1010 - 1050\text{ mb} \pm 20\%$

1.8 Test Equipment

All test equipment is checked to manufacturer's specifications and, when applicable, have current N.I.S.T. traceable, ISO 9002 conforming certificates of calibration. Test equipment used for the tests described herein is listed in Appendix A.



2.0 Equipment Under Test

Unless otherwise noted in the individual test results sections, testing was performed on the EUT as follows.

2.1 EUT Description

The Lutron Model QSFC-EDU-BP-C is a battery-powered shade solution.

2.2 Product Category Standards

47 CFR, Part 15 Subpart C – Section 15.231

RSS-210 Annex A-Momentarily operated and remote-control devices.

2.3 Product Classification

Intentional Radiator Testing Requirements, Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

Momentarily operated transmitters and receivers, and remote-control devices.

2.4 Test Configuration

The Lutron Model QSFC-EDU-BP-C Eagle Owl Remote Blind Controller samples were programmed to provide control of the radio to enable transmission at Low Channel Frequency of 431.5 MHz or at High Channel Frequency of 436.6 MHz in multiple modes. Available transmission modes in the Standard FCC Mode were Constant Wave, Constant Packet or Continuous Constant Packet when transmitting. Receive Mode was also available in the Standard FCC Mode. Range Test Mode provided the ability to Transmit a Single Packet.

Sample 2157-01 FCC Test Code, Standard FCC Mode 2, State 3 Continuous Constant Packet was used during the following tests:

Radiated Fundamental and Spurious Measurement

Sample 2157-02 FCC Test Code Range Test Mode 3, State 1, Operation 2: Single Packet Transmit with Shade Button Tap was used during the following tests:

Duty Cycle Measurement

Automatic transmitter shut off after 5 seconds

Sample 2157-02

FCC Test Code, Standard FCC Mode 2, State 2 Constant Packet was used during the following tests:

Fundamental Measurement

20 dB Bandwidth Measurement

99% Occupied Bandwidth Measurement



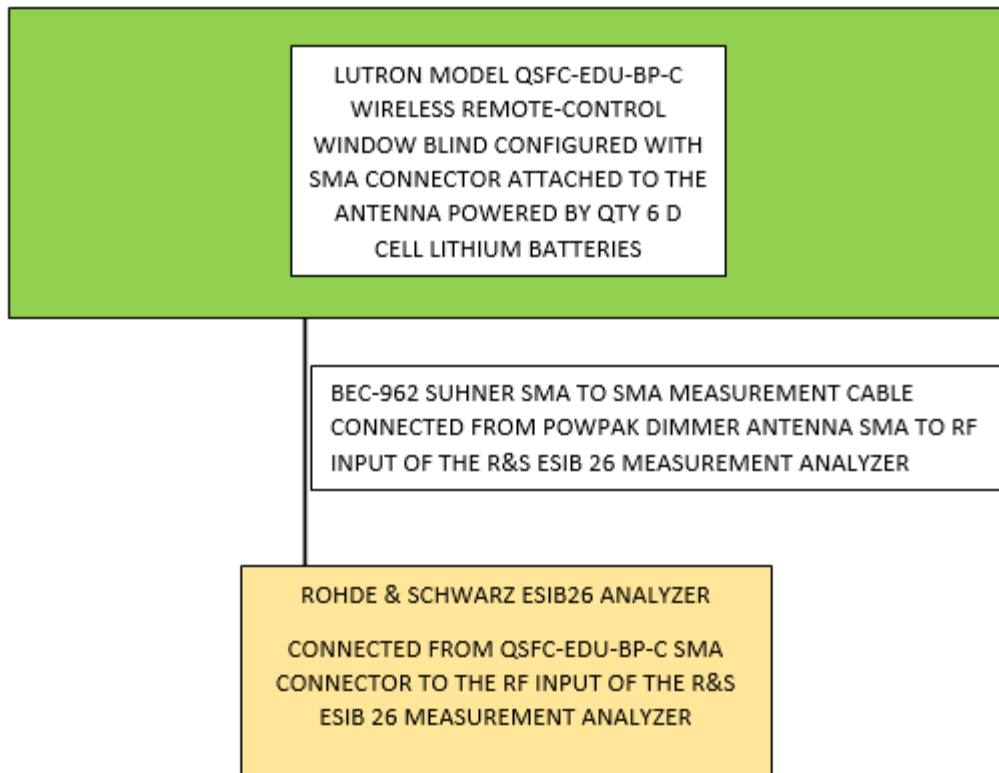
2.5 Test Configuration Rationale

The tested configurations are based on the signal types required to make proper measurements for the testing to FCC Part 15.231 and RSS-210.

2.6 Test Configuration Diagram (Transmitter Conducted Measurements)

A block diagram of the EUT configuration showing interconnection cables is illustrated below. The drawing shows the physical hardware layout used for the tests along with I/O cables and AC power distribution.

LUTRON MODEL QSFC-EDU-BP-C ANTENNA CONDUCTED TEST SETUP DIAGRAM

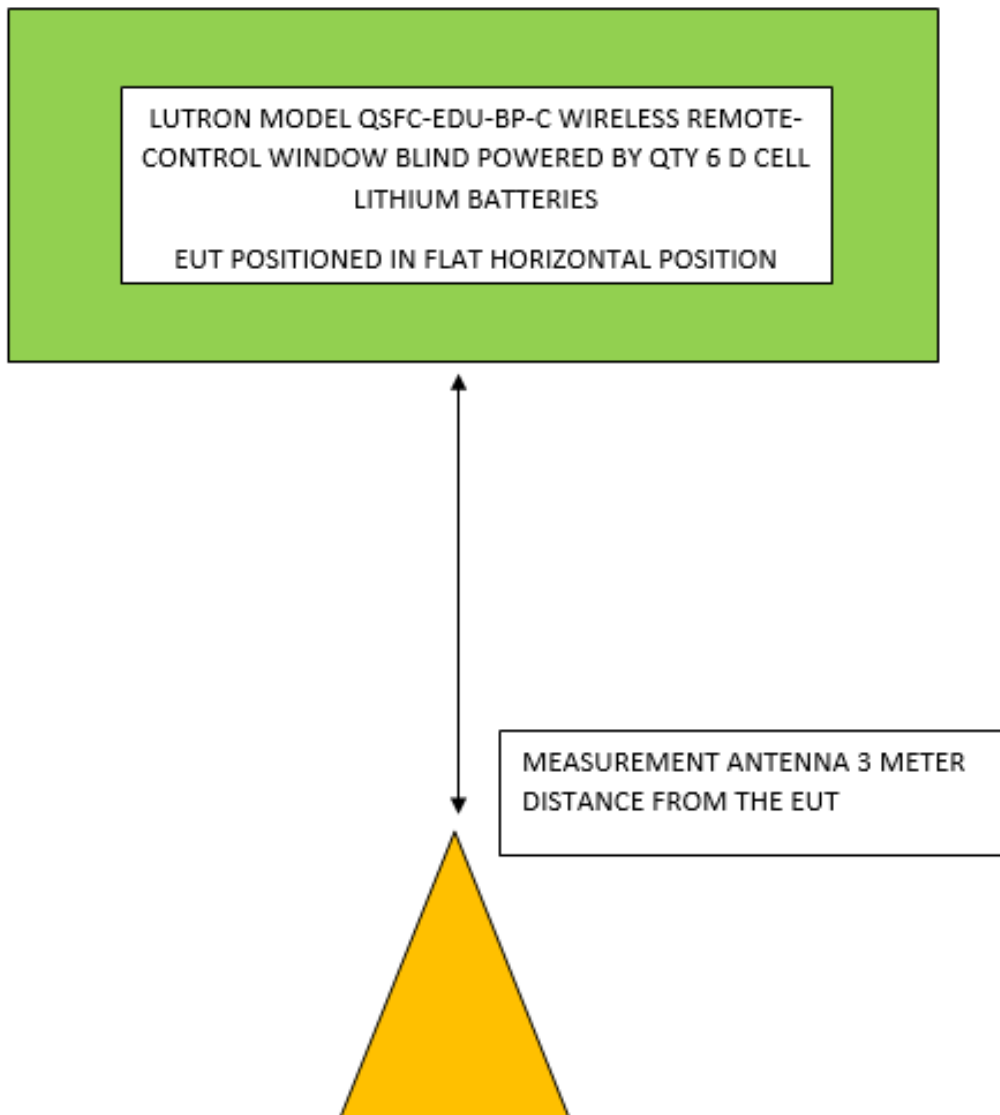




2.7 Test Configuration Diagrams (Radiated Measurements)

A block diagram of the EUT configuration showing interconnection cables is illustrated below. The drawing shows the physical hardware layout used for the tests along with I/O cables and AC power distribution.

LUTRON MODEL QSFC-EDU-BP-C RADIATED TEST SETUP DIAGRAM





2.8 EUT Information, Interconnection Cabling and Support Equipment

EUT Hardware and Software/Firmware

EUT Description	Manufacturer	Model	Serial Number	Software Firmware Version	Sample Number
EUT Radiated Sample with FCC Test Code	Lutron	QSFC-EDU-BP-C	04BA0020	V1.006	2157-01
EUT Antenna Conducted Sample with FCC Test Code	Lutron	QSFC-EDU-BP-C	04BA000A	V1.006	2157-02

Interconnection Cable List (Conducted Test Setup)

Manufacturer	Model	Type	Shielding	Length	Description
Suhner	S 04272B	SMA Cable for Antenna Conducted Test Setup	Double Braid	1 Meter	Measurement Cable from the Antenna SMA Connector to the Rohde and Schwarz ESIB26 Receiver. Asset # BEC-962

2.9 Test Signals and Test Modulation

Testing was performed at either 431.5 MHz Low Transmit or 436.6 MHz High Transmit or both Low and High Transmit Frequencies. Specific signal type configurations tested are detailed in the sections within this report. Continuous Constant Packet Mode or Single Packet Transmit Mode using the Shade Button were used during specific testing as detailed in Section 2.4 of this Report (EUT Configuration). Transmission Modulation for this product utilizes FSK.

2.10 Grounding

There was no ground connection used; the EUT is battery powered and self-contained.

2.11 EUT Power

The Lutron Model QSFC-EDU-BP-C Eagle Owl Remote Blind Controller was powered at by Qty six (6) DC Cell Lithium Batteries.

2.12 EUT Modifications

No physical modifications were made to the EUTs tested to achieve compliance.



3.0 Applicable Requirements, Methods, and Procedures

3.1 Applicable Requirements

The results of the measurement of the radio disturbance characteristics of the EUT described herein may be applied and where appropriate, provide a presumption of compliance to one or more of the following requirements or to other requirements at the discretion of the customer, regulatory agencies, or other entities.

3.1.1 FCC and ISED Requirements

Code of Federal Regulations: Title 47 – Telecommunication

Chapter I - Federal Communications Commission

Sub-chapter A – General

Part 15 – Radio Frequency Devices

Subpart C - Intentional Radiators

15.231 Periodic operation in the band 40.66-40.70 MHz and above 70 MHz

RSS-210 Issue 10 December 2019 Licence-Exempt Radio Apparatus: Annex A-Momentarily operated and remote control devices.

RSS-Gen Issue 5 April 2018, General Requirements for Compliance of Radio Apparatus

TRC-43 Issue 3 November 2012, Designation of Emissions, Class of Station and Nature of Service

3.1.2 Basic Test Methods and Test Procedures

IEEE/ANSI C63.4: 2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

IEEE/ANSI C63.10: 2020, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

3.2 Deviations or Exclusions from the Requirements

No deviations or exclusions were made.



4.0 Test Results

4.1 Antenna Requirement (47 CFR 15.203) (RSS-Gen, 6.2)

According to Section 15.203, 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 antenna used by the Lutron Model QSFC-EDU-BP-C is a Monopole type antenna mounted perpendicular to the PCB inside the enclosure. There are no detachable parts of the antenna. The antenna is not replaceable, nor changeable, and therefore complies with the antenna requirements of FCC Part 15 C Section 15.203.

4.2 Antenna Construction (47 CFR 15.203) (RSS-Gen, 6.2)

The device is equipped with permanent attached antenna, which is not displaced by any other antenna. The Antenna gain of the EUT is -2.85 dBi. Therefore, the equipment complies with the antenna requirements of FCC Part 15 C Section 15.203.

4.3 Radiated Emissions (47 CFR 15.209 and 15.231 (b) and 15.35(b)) (RSS-210 A.1.2)

According to FCC Part 15 C Section 15.231(b) and RSS-210 Annex A.1.2 the field strength of emissions from the intentional radiators operated under this section shall not exceed the following limits:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	¹ 1,250 to 3,750	¹ 125 to 375
174-260	3,750	375
260-470	¹ 3,750 to 12,500	¹ 375 to 1,250
Above 470	12,500	1,250

¹Linear interpolations.

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.



4.3.1 Radiated Emissions Test Facility

OATS

The Open Area Test Site (OATS) is an all-weather facility with a wooden enclosure that contains a ground level 4-foot diameter turntable capable of rotating equipment 360 degrees. The site is free of reflective metallic objects and extraneous electromagnetic signals. This non-metallic enclosure and the 3 and 10 meter test range existing outside the enclosure rest upon a protective insulating material, which in turn covers a flat, metal, continuous ground plane.

Instrumentation for remote control of the antenna mast, turntable, and other equipment are controlled by personnel indoors. The EUT and support peripherals required for EUT operation were placed on a table at a height of 150 cm.

The test site complies with the attenuation measurements specified in ANSI C63.4.

SR#1

The Semi-Anechoic Shielded Room (SR#1) is an ferrite and absorber lined chamber which houses a 5-foot diameter turntable capable of rotating equipment 360 degrees and antenna mast for Horizontal and Vertical polarity measurements. The enclosure is free of reflective metallic objects and extraneous electromagnetic signals. This 3 meter shielded enclosure has a raised computer floor with metal tile bottoms providing a continuous ground plane.

Instrumentation for remote control of the antenna mast, turntable, and other equipment are controlled by personnel outside the chamber. The EUT and support peripherals required for EUT operation were placed on a table 80 cm high for tabletop equipment or directly on the turntable surface for floor standing equipment.

The test site complies with the attenuation measurements specified in ANSI C63.4.

See Appendix B and Appendix C for Test Site Diagrams.



4.3.2 Restricted and Non-restricted Bands Radiated Emissions Test Procedure

Radiated Emissions 9 kHz – 40 GHz

The EMI receiver was set to quasi-peak mode for frequencies from 9 kHz to 1000 MHz and the appropriate CISPR bandwidths were employed. The receiver was set to average mode for frequencies above 1 GHz with the appropriate CISPR bandwidths were employed. Significant emissions found during the preliminary scans were maximized by rotating the turntable and varying the antenna height. Both horizontal and vertical antenna polarities were also investigated for suspect emissions. The signals are maximized and measured using the in house generated RADE or off the shelf TILE software. The support equipment and test item(s) were powered off in turn to determine the source of the emissions where appropriate.

Field strengths were calculated as follows:

Field Strength (dB μ V/m) = Meter Reading (dB μ V) + Antenna Factor (dB/m) + Cable Loss (dB) – Amplifier Gain (dB) - Duty Cycle Correction Factor

The Duty Cycle measurement and calculation of the Duty Cycle Correction Factor are contained in Section 4.4 of this report.

Measurements were made with the Lutron Model QSFC-EDU-BP-C transmitting at low frequency of 431.5 MHz and high frequency of 436.6 MHz. The transmit frequencies were configured in Continuous Constant Packet Test Mode.

The following tables are the highest emissions recorded and summarized. The emissions are separated into signals in the restricted bands, described in FCC Part 15.205 and RSS-Gen, and signals not within restricted bands subject to the limits specified in 15.231 and RSS-210 A.1.2.



4.3.3 Radiated Emissions General Test Information

The following information is related to the testing performed for Radiated Emissions in the frequency range of 30 MHz to 1000 MHz.

Frequency Range	9 kHz to 5 GHz
Test Standards	FCC Part 15.209, FCC Part 15.231 (b) and RSS-210
Class Limits	FCC Part 15.209, FCC Part 15.231 (b) and RSS-210 A.1.2
EUT Type	Remote Window Blind Controller-Radiated Sample
Manufacturer/Model	Lutron Model QSFC-EDU-BP-C
Sample Number	2157-01
Port Tested	Enclosure
Temperature	27°C (08/09/21), 22°C (08/11/21), 22°C (08/12/21), 21°C (08/16/21)
Humidity	67% (08/09/21), 44% (08/11/21), 46% (08/12/21), 44% (08/16/21)
EUT Power	Battery Powered (Qty 6 D Cell Lithium)
Test Date(s)	08/09/2021, 08/11/2021,08/12/2021 and 08/16/2021

4.3.4 Radiated Emissions 9 kHz – 30 MHz Test Results (08/11/2021 and 08/12/2021)

Measurements were made in the frequency range of 9 kHz to 30 MHz with the Lutron Model QSFC-EDU-BP-C transmitting at low frequency of 431.5 MHz and high frequency of 436.6 MHz. The transmit frequencies were configured in a Continuous Constant Packet Test Mode.

The measured signals from the EUT were noise floor measurements. The table below depicts the highest measured levels of the EUT transmitting at 436.6 MHz. All other polarizations and transmit frequencies and receive modes showed noise floor measurements.

Frequency	Peak Level	QP Level	Azimuth	Axis	Corr. Factor	Limit	QP Margin	Result
MHz	dBuV/m	dBuV/m	degrees	XYZ	dB	dBuV/m	dB	Pass/Fail
1.500	32.47	33.37	000	X	-19.14	64.08	-30.72	Pass
1.576	32.77	32.81	000	Y	-19.13	63.65	-30.84	Pass
1.421	32.81	33.69	000	X	-19.15	64.56	-30.86	Pass
1.468	34.94	33.40	000	Y	-19.14	64.27	-30.87	Pass
1.605	32.34	32.59	000	X	-19.13	63.50	-30.90	Pass
1.541	30.79	32.93	001	Y	-19.14	63.85	-30.92	Pass

Test Results: The Lutron Model QSFC-EDU-BP-C Eagle Owl Remote Blind Controller complies with the requirements of 47 CFR Part 15.205, RSS-Gen Sections 6.13 and 7.3 and 47 CFR Part 15.231 RSS-210 A.1.2 for radiated emissions in the frequency range of 9 kHz to 30 MHz. The margin of compliance is 30.72 dB.



4.3.5 Radiated Emissions 30 – 1000 MHz Test Results (08/09/2021 and 08/11/2021)

Measurements were made in the frequency range of 30 MHz to 1000 MHz with the Lutron Model QSFC-EDU-BP-C transmitting at low frequency of 431.5 MHz and high frequency of 436.6 MHz. The transmit frequencies were configured in a Continuous Constant Packet Test Mode.

The following tables are the highest emissions recorded and summarized. The tables are sorted by transmission frequency. The signals, comprised of signals in and out of the restricted bands described in 47 CFR Part 15.205, are compared to the limits of 47 CFR Part 15.209, RSS-Gen Sections 6.13 and 7.3 and 47 CFR Part 15.231 and RSS-210 A.1.2 for fundamental and the spurious Emissions. The measured Fundamental and Spurious signal Peak amplitudes were adjusted using the Duty Cycle Correction factor as calculated in Section 4.4 of this test report.

TX FREQUENCY OF 431.5 MHZ FCC PART 15.209 RSS-Gen LIMITS

Frequency	Peak	QP	Polarity	TT angle	Antenna Height	Correction Factor	15.209 Limit	Margin	Result
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	Pass / Fail
30.156	26.97	25.06	V	154	200	-0.57	40.00	-14.94	Pass
214.960	19.99	17.23	V	307	236	-8.71	43.52	-26.29	Pass
215.770	17.14	16.64	V	347	151	-8.70	43.52	-26.88	Pass
433.034	38.26	36.22	H	220	102	-2.87	46.02	-9.80	Pass
709.404	35.07	34.66	H	000	100	1.18	46.02	-11.36	Pass
960.643*	33.01	30.14	H	239	173	4.74	53.98	-23.84	Pass

*Restricted Band Signal

TX FREQUENCY OF 436.6 MHZ FCC PART 15.209 RSS-Gen LIMITS

Frequency	Peak	QP	Polarity	TT angle	Antenna Height	Correction Factor	15.209 Limit	Margin	Result
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	Pass / Fail
225.212	28.08	27.64	H	035	100	-8.22	43.52	-15.88	Pass
296.579	29.58	28.34	V	127	100	-5.30	46.02	-17.68	Pass
959.459	32.36	30.20	H	026	115	4.72	46.02	-15.82	Pass
959.945	30.48	30.17	H	001	147	4.73	46.02	-15.85	Pass
959.645	32.99	30.21	V	093	131	4.73	46.02	-15.81	Pass
971.014*	31.24	30.36	V	296	164	4.88	53.98	-23.62	Pass

*Restricted Band Signal



TX FREQUENCY OF 431.5 MHZ FCC PART 15.231 RSS-210 A.1.2 LIMITS

Frequency	Peak	QP	Antenna Polarity	TT angle	Ant Height	Measurement Correction Factor	Peak Corrected	Duty Cycle Correction	Peak w/ Duty Cycle Correction	FCC Part 15.231 Limit-	Margin
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dBuV/m	dB
431.530	99.86	99.70	H	041	100	-2.96	96.90	19.98	76.92	80.75	-3.83
431.530	88.82	88.65	V	212	159	-2.96	85.86	19.98	65.88	80.75	-14.87
863.070	51.82	51.08	H	224	100	3.50	55.32	0.00	55.32	60.75	-5.43
863.080	42.25	40.35	V	122	159	3.50	45.75	0.00	45.75	60.75	-15.00

TX FREQUENCY OF 436.6 MHZ FCC PART 15.231 RSS-210 A.1.2 LIMITS

Frequency	Peak	QP	Polarity	TT angle	Ant Height	Measurement Correction Factor	Peak Corrected	Duty Cycle Correction	Peak w/ Duty Cycle Correction	FCC Part 15.231 Limit-	Margin
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dBuV/m	dB
436.600	95.68	95.52	H	041	194	-2.78	92.90	19.98	72.92	80.91	-7.99
436.600	91.90	91.74	V	088	195	-2.78	89.12	19.98	69.14	80.91	-11.77
873.270	49.57	48.67	H	315	100	3.60	53.17	0.00	53.17	60.91	-7.74
873.275	41.57	39.47	V	055	176	3.60	45.17	0.00	45.17	60.91	-15.74

Test Results: The Lutron Model QSFC-EDU-BP-C Eagle Owl Remote Blind Controller BEC Sample #2157-01 complies with the requirements of 47 CFR Part 15.231 RSS-210 A.1.2 for radiated emissions in the frequency range of 30 MHz to 1000 MHz with a margin of 3.83 dB for the fundamental emission frequency limit.



4.3.6 Radiated Emissions 1 – 5 GHz Test Results (08/16/2021)

Measurements were made in the frequency range of 1 GHz to 5 GHz with the Lutron Model QSFC-EDU-BP-C transmitting at low frequency of 431.5 MHz and high frequency of 436.6 MHz. The transmit frequencies were configured in a Continuous Constant Packet Test Mode.

Only the spurious harmonic signals, related to the transmit frequency, were detected in the range between 1.0 and 5.0 GHz. The tables below show the measured levels of non-restricted, spurious emissions compared to Table 1 of 47CFR Part 15.231 and RSS A.1.2. The measured levels of restricted, spurious emissions (marked with an asterisk) compared to the average limit of 15.209, as directed by 15.205.

TX FREQUENCY OF 431.5 MHZ FCC PART 15.231 RSS-210 A.1.2 LIMITS

Frequency	Peak Measured	Antenna Polarity	Turntable Angle	Antenna Height	Antenna, Cable, Amp Gain Correction Factor	Duty Cycle Correction Factor	Final Peak Measurement Corrected With Duty Cycle Correction Factor	FCC Part 15.231 Spurious Limit or 15.209 Avg Limit	FCC Part 15.231 Spurious Margin
GHz	dBuV/m	H/V	degrees	cm	dB	dB	dBuV/m	dBuV/m	dB
1.2944	53.20	H	295	145	-11.90	0.00	53.20	60.75	-7.55
1.2944	51.27	V	093	171	-11.90	0.00	51.27	60.75	-9.48
1.7258	54.80	H	053	146	-9.11	0.00	54.80	60.75	-5.95
1.7259	52.71	V	087	203	-9.11	0.00	52.71	60.75	-8.04
2.1573	48.55	V	245	101	-6.61	0.00	48.55	60.75	-12.20
2.1573	47.76	H	241	111	-6.61	0.00	47.76	60.75	-12.99
2.5892	45.74	V	070	108	-4.94	0.00	45.74	60.75	-15.01
2.5925	33.47	H	100	102	-4.92	0.00	33.47	60.75	-27.28
3.0204	55.58	V	100	178	-2.71	0.00	55.58	60.75	-5.17
3.0208	44.65	H	115	101	-2.71	0.00	44.65	60.75	-16.10
3.4517	47.02	V	131	124	-1.71	0.00	47.02	60.75	-13.73
3.4523	54.04	H	023	207	-1.70	0.00	54.04	60.75	-6.71
3.8832*	58.77	V	237	212	0.49	19.98	38.79	54.00	-15.21
3.8838*	66.60	H	088	230	0.50	19.98	46.62	54.00	-7.38
4.3145*	46.62	V	269	213	0.33	0.00	46.62	54.00	-7.38
4.3145*	51.14	H	034	200	0.33	0.00	51.14	54.00	-2.86
4.7469*	52.41	V	088	144	1.39	19.98	32.43	54.00	-21.57
4.7469*	56.26	H	100	191	1.39	19.98	36.28	54.00	-17.72

*Restricted Band Signal



TX FREQUENCY OF 436.6 MHZ FCC PART 15.231 RSS-210 A.1.2 LIMITS

Frequency	Peak Measured	Antenna Polarity	Turntable Angle	Antenna Height	Antenna, Cable, Amp Gain Correction Factor	Duty Cycle Correction Factor	Final Peak Measurement Corrected With Duty Cycle Correction Factor	FCC Part 15.231 Spurious Limit or 15.209 Avg Limit	FCC Part 15.231 Spurious Margin
GHz	dBuV/m	H/V	degrees	cm	dB	dB	dBuV/m	dBuV/m	dB
1.3099*	51.92	V	085	175	-11.84	0.00	51.92	54.00	-2.08
1.3099*	52.20	H	034	188	-11.84	0.00	52.20	54.00	-1.80
1.7462	53.78	V	094	185	-8.73	0.00	53.78	60.91	-7.13
1.7463	52.35	H	050	172	-8.73	0.00	52.35	60.91	-8.56
2.1830	46.39	H	121	103	-6.60	0.00	46.39	60.91	-14.52
2.1831	51.14	V	294	101	-6.60	0.00	51.14	60.91	-9.77
2.6194	45.87	V	059	117	-4.78	0.00	45.87	60.91	-15.04
2.6197	48.30	H	079	200	-4.78	0.00	48.30	60.91	-12.61
3.0564	51.43	V	001	178	-2.54	0.00	51.43	60.91	-9.48
3.0564	51.63	H	168	205	-2.54	0.00	51.63	60.91	-9.28
3.4926	55.23	V	130	125	-1.60	0.00	55.23	60.91	-5.68
3.4930	58.79	H	019	199	-1.60	0.00	58.79	60.91	-2.12
3.9290*	56.04	V	256	125	0.60	19.98	36.06	54.00	-17.94
3.9291*	60.91	H	056	214	0.60	19.98	40.93	54.00	-13.07
4.3656*	52.77	H	117	194	0.42	0.00	52.77	54.00	-1.23
4.3658*	50.97	V	263	207	0.42	0.00	50.97	54.00	-3.03
4.8027*	51.30	V	091	151	1.58	19.98	31.32	54.00	-22.68
4.8031*	54.13	H	097	207	1.58	19.98	34.15	54.00	-19.85

*Restricted Band Signal

Test Results: The Lutron Model QSFC-EDU-BP-C Eagle Owl Remote Blind Controller BEC Sample #2157-01 complies with the requirements of 47 CFR Part 15.231 RSS-210 A.1.2 for non-restricted radiated emissions and Part 47 CFR Part 15.209 RSS-Gen restricted radiated emissions in the frequency range of 1 GHz to 5 GHz with a margin of 1.23 dB at 4.3656 GHz.



4.4 Duty Cycle Measurement (ANSI C63.10)

4.4.1 Duty Cycle Measurement – Test Procedure

The duty cycle was measured by using the methods of ANSI C63.10. The spectrum analyzer screen images and tables related to the duty cycle measurements are shown below. The Lutron Model QSFC-EDU-BP-C transmitted at 433.6 MHz using Packet Transmit Mode of the FCC Test Software and activating the EUT transmitter by tapping a button located on the Model QSFC-EDU-BP-C Sample 2157-02.

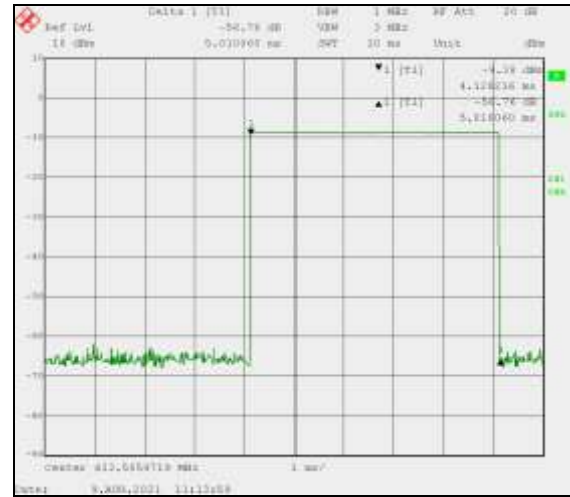
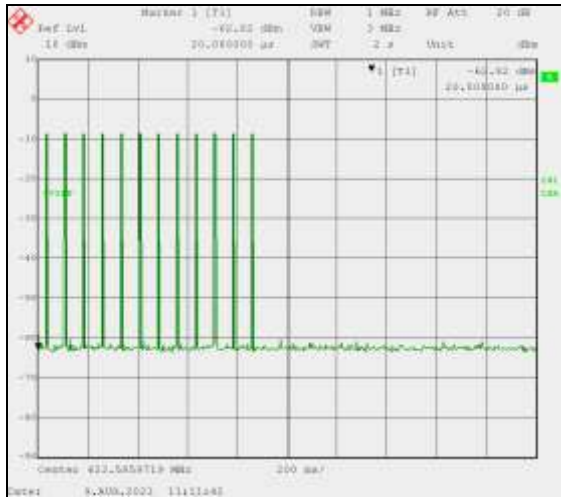
4.4.2 Duty Cycle Measurement General Test Information

The following information is related to the testing performed for Duty Cycle.

Frequency Range	433.6 MHz
Test Standards	ANSI C63.10
Class Limits	None
EUT Type	Remote Window Blind Controller-Antenna Conducted Sample
Manufacturer/Model	Lutron Model QSFC-EDU-BP-C
Sample Number	2157-02
Temperature	21°C (08/09/21)
Humidity	44% (08/09/21)
EUT Power	Battery Powered (Qty 6 D Cell Lithium)
Test Date(s)	08/09/2021



4.4.3 Duty Cycle Measurement Test Results (08/09/2021)



The measured on-times depicted on the spectrum analyzer screens above are used to calculate the Duty Cycle Correction Factor. This factor is used to reduce the emission level of spurious emissions measured and displayed in Section 4.3.

4.4.4 Duty Cycle Correction Factor Calculation

On Time pulse	5.01	ms
Number of Pulses	2	
Total On Time	10.02	ms
Period (T)	100	ms
Duty Cycle = On Time / T (100 ms)	0.1002	
	10.02	%
Duty Cycle Correction = 20Log(On Time/Period)	-19.98	dB

Test Results: The duty cycle measurement of the Lutron Model QSFC-EDU-BP-C Eagle Owl Remote Blind Controller BEC Sample #2157-02 produces a value of 10.02 %. The calculated Duty Cycle Correction Factor is 19.98 dB.



4.5 20 dB Bandwidth (47 CFR 15.231(c) RSS-210 A.1.3)

4.5.1 20 dB Bandwidth Measurement – Test Procedure

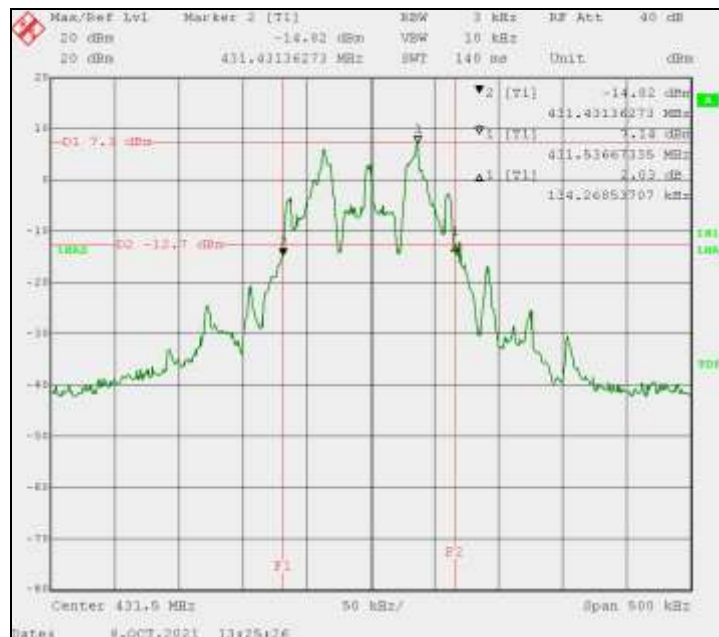
The 20 dB Bandwidth was measured by using the methods called out for in FCC Part 15.231(c) and RSS-210 A.1.23. The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier. Below are the screen captures and tables related to the 20 dB Bandwidth measurements. The Transmit frequencies tested were 431.5 MHz and 436.6 MHz with the radio programmed to transmit in Constant Packet Test Mode.

4.5.2 20 dB Bandwidth Measurement General Test Information

Frequency Range	431.5 MHz and 436.6 MHz
Test Standards	47 CFR 15.231(c) and RSS-210 A.1.3
Limits	Bandwidth Measurement
EUT Type	Remote Window Blind Controller-Antenna Conducted Sample
Manufacturer/Model	Lutron Model QSFC-EDU-BP-C
Sample Number	2157-02
Temperature / Humidity	22°C / 44%
EUT Power	Battery Powered (Qty 6 D Cell Lithium)
Test Date	10/08/2021

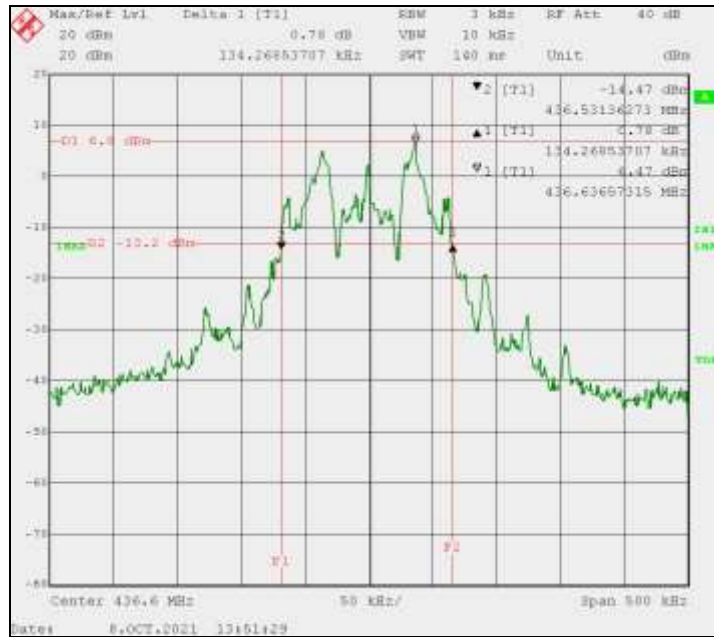
4.5.3 20 dB Bandwidth Measurement Test Results (10/08/2021)

TX FREQUENCY OF 431.5 MHZ, (CP) CONSTANT PACKET MODE





TX FREQUENCY OF 436.6 MHZ, (CP) CONSTANT PACKET MODE



Frequency MHz	Modulation	Measured BW kHz	20 dB BW Limit kHz	BW Margin kHz
431.5	Constant Packet	134.27	1078.75	-944.48
436.6	Constant Packet	134.27	1091.50	-957.23

Test Results: The Lutron Model QSFC-EDU-BP-C Eagle Owl Remote Blind Controller BEC Sample #2157-02 complies with the requirements of 47 CFR Part 15.231 RSS-210 A.1.3 for 20 dB Bandwidth Measurement.



4.6 99% Occupied Bandwidth (RSS-Gen 6.7)

4.6.1 99% Occupied Bandwidth Measurement – Test Procedure

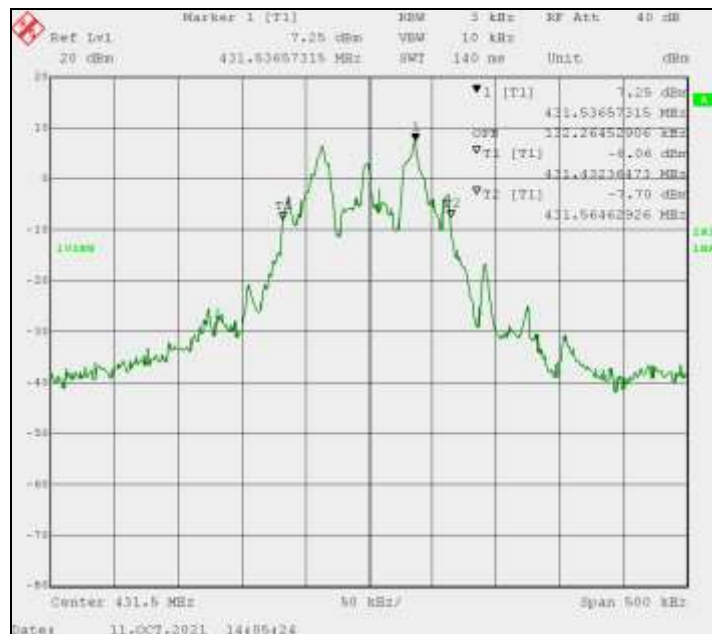
The 99% Occupied Bandwidth was measured using the specifications of RSS-Gen Section 6.7. Below are the screen captures and tables related to the 99% Occupied Bandwidth measurements. The Transmit frequencies tested were 431.5 MHz and 436.6 MHz with the radio programmed to transmit in Continuous Constant Packet Test Mode.

4.6.2 99% Occupied Bandwidth Measurement General Test Information

Channel Frequencies	431.5 MHz and 436.6 MHz
Test Standards	RSS-Gen Section 6.7
EUT Type	Remote Window Blind Controller-Antenna Conducted Sample
Manufacturer/Model	Lutron Model QSFC-EDU-BP-C
Sample Number	2157-02
Temperature / Humidity	21°C / 62%
EUT Power	Battery Powered (Qty 6 D Cell Lithium)
Test Date	10/11/2021

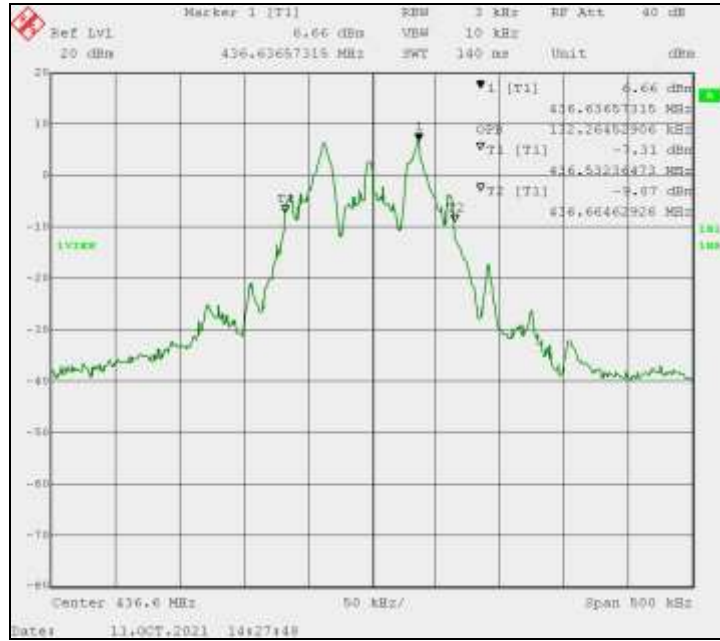
4.6.3 99% Occupied Bandwidth Measurement Test Results (10/11/2021)

TX FREQUENCY OF 431.5 MHz, (CP) CONSTANT PACKET MODE





TX FREQUENCY OF 436.6 MHz, (CP) CONSTANT PACKET MODE



Frequency MHz	Modulation	Measured BW kHz
431.5	(CP) Constant Packet Mode	132.26
436.6		132.26

Test Results: The Lutron Model QSFC-EDU-BP-C Eagle Owl Remote Blind Controller BEC Sample #2157-02 has a maximum 99% Occupied Bandwidth of 132.26 kHz.



4.7 Automatic Deactivation Testing (FCC Section 15.231(a)(1) RSS-210 A.1.1 (a))

4.7.1 Automatic Deactivation Testing Test Procedure

The Automatic Deactivation Testing was measured by using the methods called out for in FCC Part 15.231(a)(1) and RSS-210 A.1.1 (a).

FCC Part 15.231(a)(1)

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

RSS-210 A.1.1 (a).

A manually operated transmitter shall be equipped with a push-to-operate switch and be under manual control at all times during transmission. When released, the transmitter shall cease transmission within no more than 5 seconds of being released.

The Lutron Model QSFC-EDU-BP-C transmitted at 431.5 MHz and 436.6 MHz using the Packet Transmit Mode of the FCC Test Software and activating the EUT transmitter by tapping a button located on the Model QSFC-EDU-BP-C Sample 2157-02.

4.7.2 Automatic Deactivation Testing General Test Information

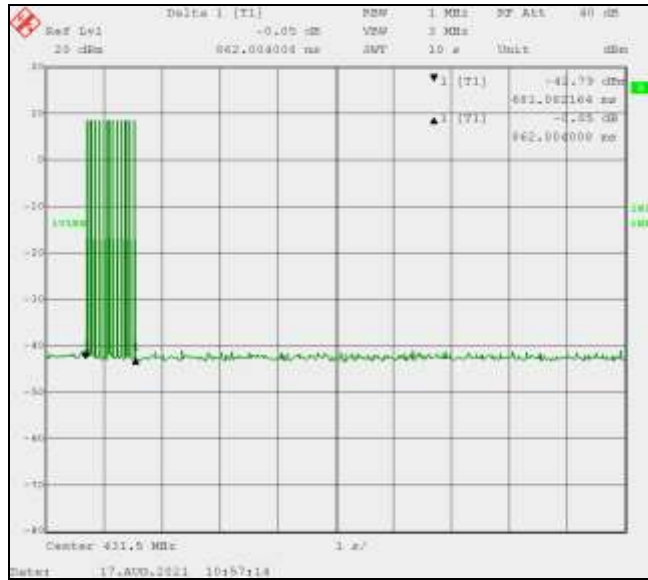
The following information is related to the testing performed for Automatic Deactivation.

Frequency Range	431.5 MHz and 436.6 MHz
Test Standards	47 CFR 15.231(a)(1) and RSS-210 A.1.1 (a)
Limits	Automatic Deactivation 5 Seconds
EUT Type	Remote Window Blind Controller-Antenna Conducted Sample
Manufacturer/Model	Lutron Model QSFC-EDU-BP-C
Sample Number	2157-02
Temperature	22°C
Humidity	44%
EUT Power	Battery Powered (Qty 6 D Cell Lithium)
Test Date	08/17/2021

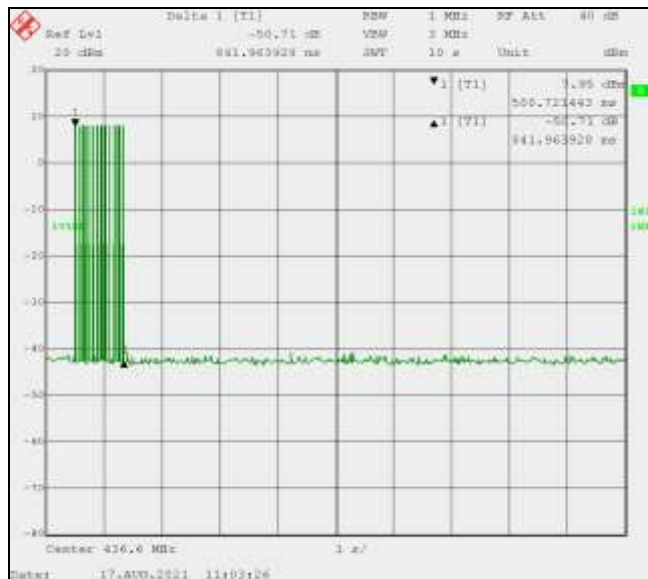


4.7.3 Deactivation Testing Test Results (08/17/2021)

TX FREQUENCY 431.5 MHZ FCC PART 15.231(a)(1) RSS-210 A.1.1(a) 5 SECOND DEACTIVATION



TX FREQUENCY OF 436.6 MHZ FCC PART 15.231(a)(1) RSS-210 A.1.1(a) 5 SECOND DEACTIVATION



Test Results: The Lutron Model QSFC-EDU-BP-C Eagle Owl Remote Blind Controller BEC Sample #2157-02 complies with the 5 second deactivation requirements of 47 CFR Part 15.231 (a)(1) for Automatic Deactivation Measurement.



4.8 Conducted Emissions

4.8.1 Conducted Emissions AC Power Port Test Procedure

AC Power Line

Conducted emissions at the power line input of the EUT were measured with an EMI receiver set to the appropriate detector and CISPR bandwidth, which was connected to the RF output of a 50 Ω , 50 μ H Line Impedance Stabilization Network (LISN) installed in each power line. Measurements were made over the frequency range of 150 kHz to 30 MHz while the EUT was operating as described in the EUT section of this report. The significant amplitudes of emissions measured on the AC power lines of the EUT were recorded as follows:

Emission (dB μ V) = Meter Reading (dB μ v) + Cable Loss (dB) + LISN Factor (dB) + Limiter Loss (dB)

Results: The Lutron Model QSFC-EDU-BP-C Eagle Owl Remote Blind Controllers are battery powered and therefore do not need to meet these requirements. Not testing required.

5.0 EUT and Test Setup Pictures

5.1 EUT Pictures Are Included in The Grant Submission

5.2 Test Setup Pictures Are Included in The Grant Submission

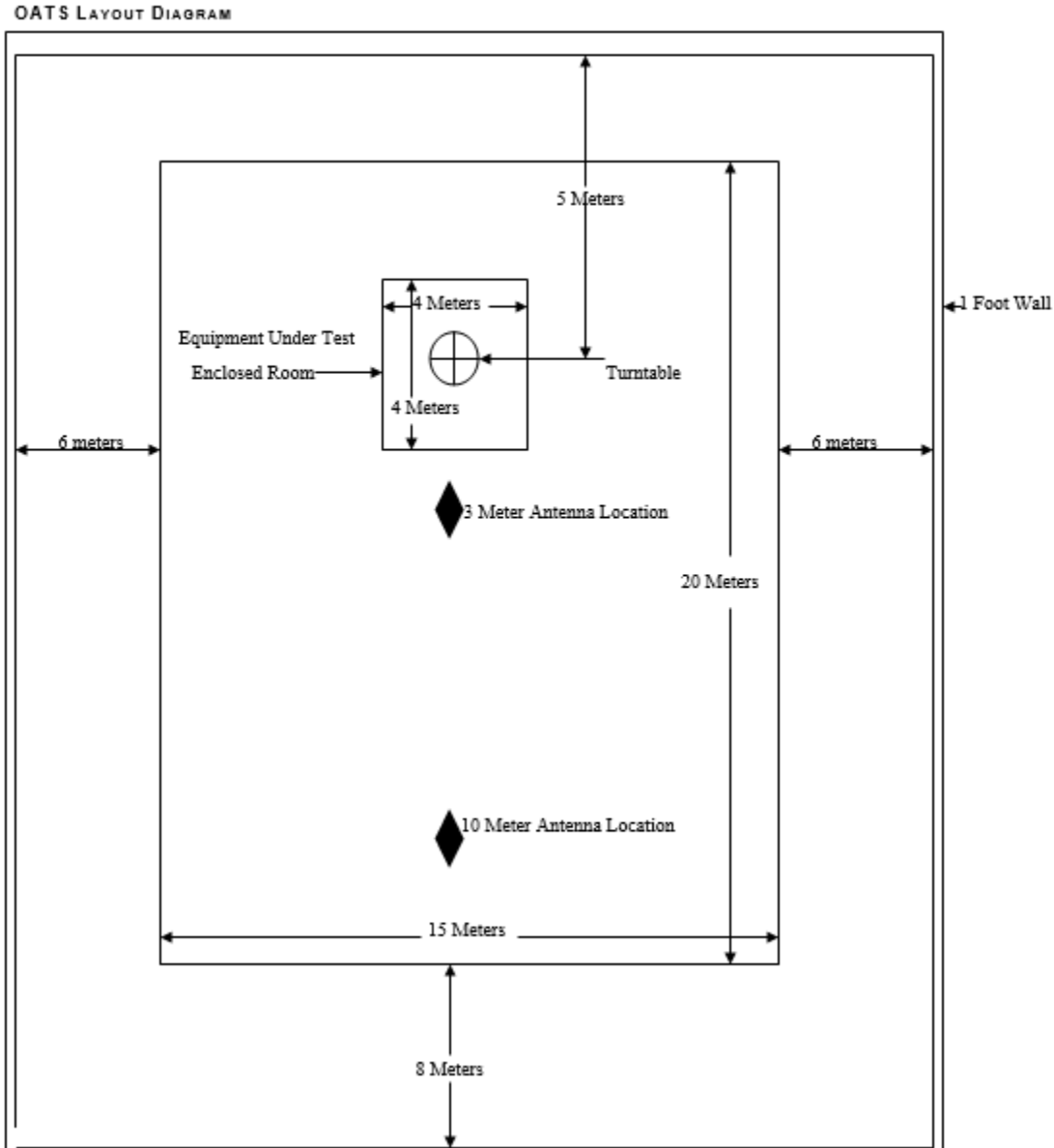


Appendix A – Test Equipment

Equipment	Manufacturer	Model #	Serial #	BEC #	Calibration Date	Calibration Cycle	Calibration Due Date
Antenna (30 MHz - 6 GHz)	Sunol Sciences	JB6	A022108	712	06/21/21	3 Years	06/21/24
EMI Receiver (20 Hz – 26.5 GHz)	Rohde & Schwarz	ESIB 26	836119/006	1010	07/02/19	3 Years	07/02/22
OATS Site (30 MHz – 1 GHz)	BEC	N/A	N/A	705	08/03/21	1 Year	08/03/22
Antenna (30 MHz - 6 GHz)	Sunol Sciences	JB6	A020714	882	05/24/21	3 Years	05/24/24
EMC Analyzer (9 kHz - 3 GHz)	Agilent	E7402A	US39440162	883	06/21/21	3 Years	06/21/24
Amplifier (.09 – 1300 MHz)	Hewlett Packard	8447F	3313A06658	807	01/13/21	2 Years	01/13/23
EMC Analyzer (9 kHz - 26.5 GHz)	Hewlett Packard	8593EM	3710A00214	1026	03/23/20	3 Years	03/23/23
Amplifier System (0.5 – 50 GHz)	Hewlett Packard	83015A 83017A	3123A00360 & 3332A00219	1027	10/13/20	2 Years	10/13/22
Double Ridged Horn Antenna (1 - 18 GHz)	EMCO	3115	9705-5225	1028	11/19/18	3 Years	11/19/21
Shielded Room #1	ETS Lindgren	12-2/2-0	4078	859	08/17/19	3 Years	08/17/22
Software (TILE)	Quantum Change/EMC Systems	Version 3	N/A	N/A	No Cal. Required	No Cal. Required	No Cal. Required
Radiated Emissions Test Software	BEC	RADE	2.2	N/A	No Cal. Required	No Cal. Required	No Cal. Required



Appendix B – Open Area Test Site Layout Diagram





Appendix C – Emissions Shielded Room Layout Diagram

SITE DESCRIPTION

The chamber is a 3 Meter semi-anechoic chamber with the ferrite absorbers on all walls and ceiling and is re-categorized as a Fully anechoic chamber when absorbers are added in between the test area and measurement antenna. The turn-table and mast are controlled externally by the ETS Lindgren 2090 Controller. The metal computer floor provides the ground plane for the site. Inside room dimensions are 22' Long by 13' Wide by 11'5" High. Outside room dimensions are 22'8" Long by 14' Wide by 12'9" High.

