BEC INCORPORATED

CERTIFICATION APPLICATION TEST REPORT

TEST STANDARDS:
FCC Part 15 Subpart C
DTS Intentional Radiator

Lutron JPZ0148
LED Lighting Controller with BLE Radio

FCC ID: JPZ0148

REPORT BEC-2259-02A

TEST DATES: 06/14/2023 – 08/25/2023

CUSTOMER:
Lutron Electronics Company Incorporated
7200 Suter Road
Coopersburg, PA 18036

PREPARED BY: Thomas Koester

Thomas Koester, Test Engineer

REVIEWED and APPROVED BY:

Steve Fanella, Quality Manager

ACCREDITED
Testing Cert #2957.01

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Notice to Customer

This report and any recommendations it contain represent the result of BEC's testing and assessment on behalf of your company. Testing has been conducted according to accepted engineering standards and practices. This report reflects testing and assessment of product samples provided by your company and may not reflect the characteristics of other samples, especially those produced at different times. This report and its findings and recommendations, if implemented, should not be construed as an assurance or implied warranty for the continuing electromagnetic compatibility (EMC) of the product. **BEC shall not be liable for incidental or consequential damages, even if advised of the possibility thereof.**

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The BEC Decision Rule: Measurement Uncertainty is not applied to any testing measurements or test results provided to the customer by BEC Incorporated at this time.

Revision History

Revision #	Description of Changes	Date of Changes	Date Released
0	Test Report Initial Release	N/A	07/28/2023
1	Corrected the Modulation from 2FSK to GFSK. Added Lutron Electronics as the manufacturer of the LED light strip used during testing.	08/04/2023	08/04/2023
2	Removed any RSS references from Section 1.5. Added Radiated Restricted Band-Edge data in Section 4.5.4. Replaced data in Section 4.9.1 Conducted Band-Edge	08/25/2023	08/28/2023

1.0 Administrative Information

1.1 Project Details

Project Number	BEC-2259	
EUT Manufacturer	Lutron Electronics	
EUT Model Number	JPZ0148	
EUT Description	LED Lighting Controller with BLE Radio	
EUT Sample Types	Unmodified Sample (Radiated Emissions Test Samples)	Modified with SMA connector on transmitter output port (Antenna Conducted Test Sample)
EUT Sample Numbers	2259-01	2259-03
EUT Serial Numbers	02F2571A	02F25720
Power Supply Sample Number	2259-05	
Power Supply Manufacturer	Lutron Electronics	
Power Supply Model Number	T120-24DC-15	
Power Supply Serial Number	U4A222502583	
Power Supply Sample Number	2259-06	
Power Supply Manufacturer	Lutron Electronics	
Power Supply Model Number	T120-24DC-15	
Power Supply Serial Number	U4A223400056	
FCC ID	JPZ0148	
Frequency of Operation	2400 – 2480 MHz	
Frequencies Tested (1 Mbps)	Low (2402 MHz), Middle (2440 MHz), High (2480 MHz)	
Frequencies Tested (2 Mbps)	Low (2404 MHz), Middle (2440 MHz), High (2480 MHz)	
Antenna Gain	+ 4.3 dBi or + 2.15 dBd	
Antenna Type	Planar Inverted-F PCB Trace Antenna (PIFA)	
Modulation	GFSK	
FCC Classification	Digital Transmission System (DTS)	
Date Samples Received	06/05/2023	

EUT Firmware Version	lorikeet_app_001.037.003
Sample Types	Production Units Suitable for Test
Applicable FCC Rules	FCC Rules Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System

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
BEC Test Personnel	Tom Koester / Steve Fanella
BEC Laboratory Number FCC Registration	US1118
Test Performed For	Lutron Electronics Company Incorporated 7200 Suter Road Coopersburg, PA 18036
Customer Technical Contacts	Keith Kennedy
Customer Reference Number	PO # 5299727

1.4 Measurement Uncertainty

Measurement	Measurement Distance	Frequency Range	Measurement Limit	Expanded Uncertainty
Radiated Disturbance	3 Meter	30 MHz – 1 GHz	Class B	4.63
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 that 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.

FCC Registered Test Site Number: US1118
ISED Registered Test Site Number: 7342A-1

Test Measurement	ETSI TR 100 028 and CISPR 16-4-2 Limits	BEC Value
Radio Frequency	±0.5 ppm	±0.027 ppm
RF Power, Conducted	±1.5 dB	±1.45 dB
Conducted Spurious Emission of Transmitter, Valid up to 6 GHz	±3 dB	±0.9 dB
Radiated Emission of Transmitter, Valid up to 6 GHz	±5.2 dB	±4.87 dB
Radiated Emission of Receiver, Valid up to 6 GHz	±5.2 dB	±4.87 dB
Radiated Emission of Transmitter, Valid up to 18 GHz	±5.5 dB	±4.90 dB
Radiated Emission of Receiver, Valid up to 18 GHz	±5.5 dB	±4.90 dB
Occupied Bandwidth	±5 %	±2 %
Temperature	±2.5 ° C	±0.5 ^{o}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].

1.5 Test Result Summary Table

The Lutron Model JPZ0148 LED Lighting Controller was tested and found to be compliant to the sections of the FCC Part 15 Subpart C standards listed below:

Report Section	FCC Part 15, Subpart C			Test Description	Result
4.1	15.203			Antenna Requirement	**PASS**
4.2	15.204			External RF power amplifiers and antenna modifications	**PASS**
4.3	ANSI C63.10, Section 11.6				
4.4	15.247(d)			DTS Emissions in non-restricted frequency Bands 30 MHz to 25 GHz Conducted Spurious Emission	**PASS**
4.5	15.205, 15.209 15.35(b)			DTS Emissions in restricted frequency Bands 30 MHz to 25 GHz Radiated Spurious Emission	**PASS**
4.6	15.247(a)(2)			6 dB Occupied Bandwidth	**PASS**
4.7	2.1049(h)			99% Occupied Bandwidth	**PASS**
4.8	15.247(b)(3)			Maximum Conducted Output Power and EIRP	**PASS**
4.9	15.247(e)			Antenna Port, Power Spectral Density	**PASS**
4.10	15.247(d)			Band Edge Measurement	**PASS**
4.11	15.207			AC Mains Conducted Emissions	**PASS**

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°C ± 5° C
Humidity: 50% ± 20%
Barometric Pressure: 1010 – 1050 mb ± 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 JPZ0148 is a LED Lighting Controller. The controller is powered by a Lutron Electronics Model T120-24DC-15 AC to DC power supply.

2.2 Product Category

FCC Part 15, Subpart C (Section 15.247)

2.3 Product Classification

Intentional Radiator Testing Requirements, DTS Operation within the band of 2400 – 2483.5 MHz.

2.4 Test Configuration

The Lutron Model JPZ0148 LED Lighting Controller was powered at 24 V DC by a Lutron Electronics Model T120-24DC-15 AC to DC power supply with an input voltage of 120 VAC / 60 Hz. The Lutron Model JPZ0148 LED Lighting Controller Sample # 2259-03 with Sample # 2259-05 was tested for all antenna conducted measurements. The Lutron Model JPZ0148 LED Lighting Controller Sample # 2259-01 with Sample # 2259-05 was tested for all conducted emission tests. The Lutron Model JPZ0148 LED Lighting Controller Sample # 2259-01 with Sample # 2259-06 was tested for all radiated emissions tests. The radio test software allowed the tester to choose the BLE transmissions of low Channel 37 (2402 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for the 1 Mbps Data Rate and at the low Channel 0 (2404 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for the 2 Mbps Data Rate. The transmission was tested in maximum output power with the choice of transmitting with GFSK Modulation or without Modulation.

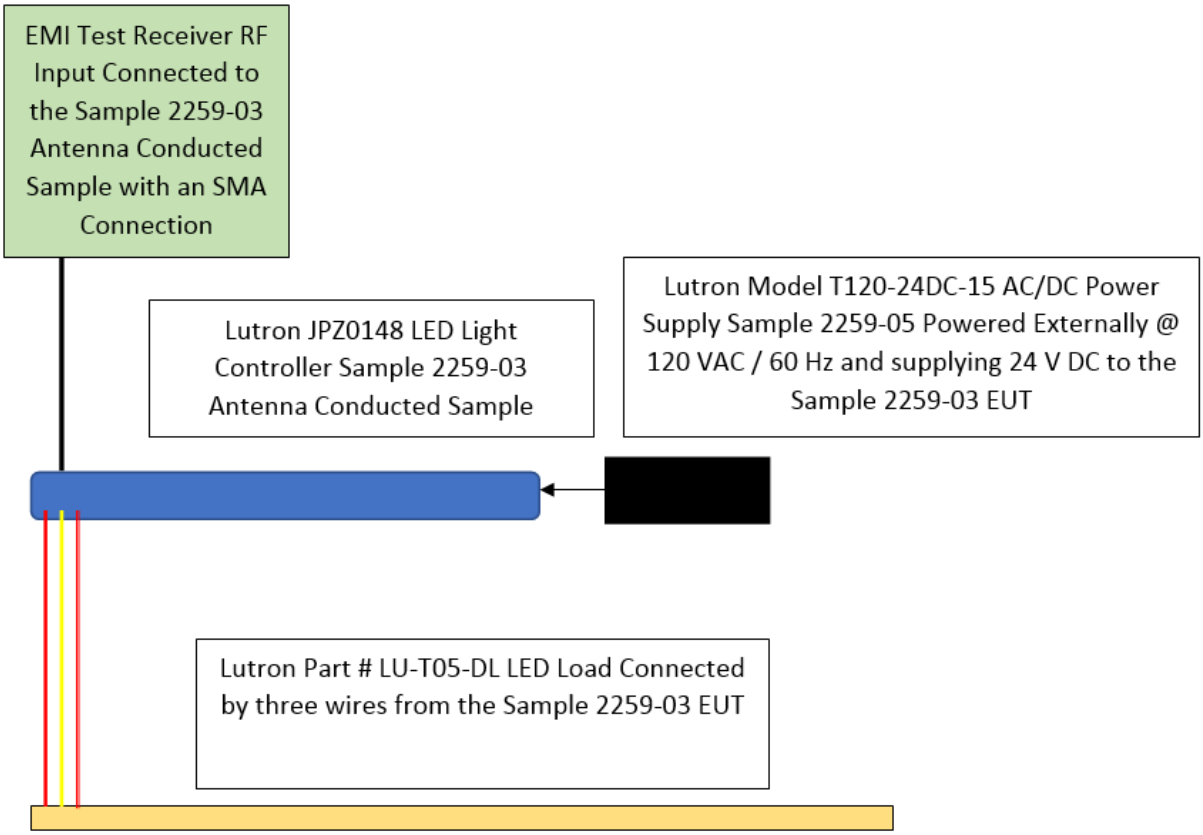
2.5 Test Configuration Rationale

The modified radio of the Lutron Model JPZ0148 LED Lighting Controller allows direct access to the output of the radio without a transmission antenna. The unmodified unit is factory produced with modified software for EMI test purposes.

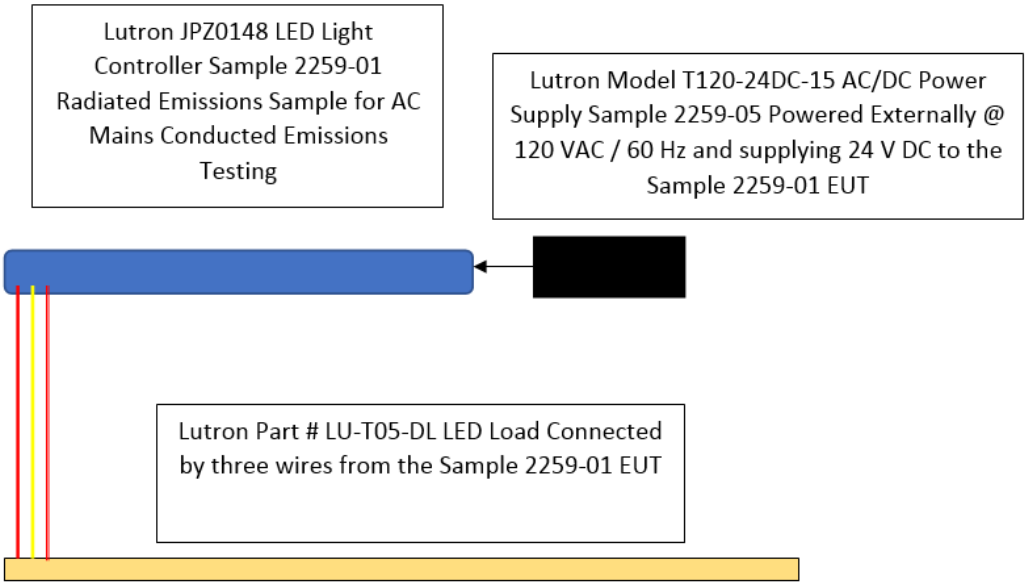
2.6 Test Configuration Diagrams

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

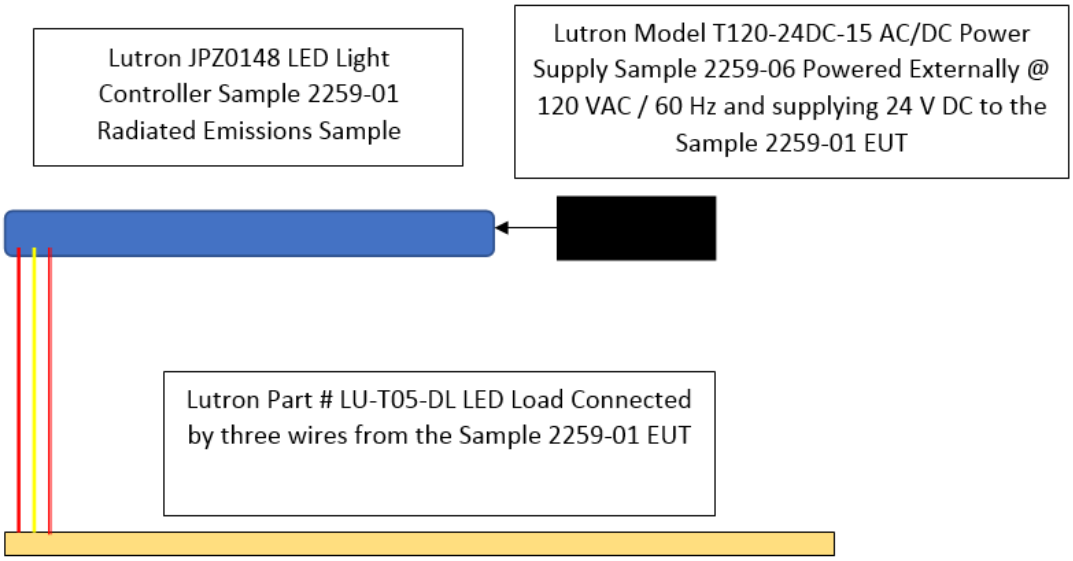
Antenna Conducted Test Configuration (modified with SMA connector in place of antenna)



Conducted Emission AC Mains Test Configuration (un-modified EUT)



Radiated Emission Test Configuration (un-modified EUT)



2.7 EUT Information, Interconnection Cabling and Support Equipment

EUT Hardware

Description	Manufacturer	Model	Serial Number	Sample Number
LED Lighting Controller Radiated Emissions Sample	Lutron	JPZ0148	02F2571A	2259-01
LED Lighting Controller Antenna Conducted Sample	Lutron	JPZ0148	02F25720	2259-03
AC/DC Power Supply	Lutron Electronics	T120-24DC-15	U4A222502583	2259-05
AC/DC Power Supply	Lutron Electronics	T120-24DC-15	U4A223400056	2259-06

Interconnection Cable List

Manufacturer	Model	Type	Shielding	Length	Description
Unknown	Unknown	Unknown	None	20 cm	Power Control Red Wire From JPZ0148 to the LED Light Strip
Unknown	Unknown	Unknown	None	20 cm	Power Control Yellow Wire From JPZ0148 to the LED Light Strip
Unknown	Unknown	Unknown	None	20 cm	Power Control Red/White Wire From JPZ0148 to the LED Light Strip

Support Equipment

Description	Manufacturer	Model	Serial Number
120 Piece LED Strip Light	Lutron Electronics	LU-T05-DL	No Serial Number
Laptop Computer-Programming the EUT Radio Transmitter Software	Dell	Inspiron 15-3567	E4B4B16C-F475-4A3F-9795-A06C5CB4AB43

2.8 Test Signals and Test Modulation

By design this product does not have an external Modulation input connector, therefore, normal operating modulation was used for all testing reported herein. The only test where modulation was not active was during testing of the Maximum Peak Power Output FCC Section 15.247(b) (3) (Section 4.6 of this report) to ensure that the un-modulated carrier was not higher than the modulated carrier.

The control unit in this product is a digital frequency transmitter. The EUT transmits to a discrete frequency on a specific channel. The Lutron Model JPZ0148 LED Lighting Controller has 40 Channels available for 1 Mbps and 39 Channels for 2 Mbps. The Channels and frequencies that can be transmitted by the EUT are as follows:

BLE Channels	Frequency (MHz)		BLE Channels	Frequency (MHz)
37	2402		17	2440
0	2404		18	2442
1	2406		19	2444
2	2408		20	2446
3	2410		21	2448
4	2412		22	2450
5	2414		23	2452
6	2416		24	2454
7	2418		25	2456
8	2420		26	2458
9	2422		27	2460
10	2424		28	2462
38	2426		29	2464
11	2428		30	2466
12	2430		31	2468
13	2432		32	2470
14	2434		33	2472
15	2436		34	2474
16	2438		35	2476
			36	2478
Low- 1 Mbps	2402 MHz		39	2480
Low- 2 Mbps	2404 MHz			
Middle	2440 MHz			
High	2480 MHz			

For the required testing, the EUT was configured to transmit at low Channel 37 (2402 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for 1 Mbps and at the low Channel 0 (2404 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for 2 Mbps. The EUT operates with a 1.1 MHz and 2.1 MHz Operational Channel Bandwidths. The EUT has the option to be programmed to operate with maximum output power with GFSK modulation or with Constant Wave (CW) signal.

2.9 Antenna Gain

The antenna gain was documented by Lutron at + 4.3 dBi or + 2.15 dBd.

2.10 Grounding

The EUT ground is provide by the Lutron Electronics Model T120-24DC-15 AC/DC Power Supply.

2.11 EUT Modifications

An SMA connector was added to replace the antenna on the PCB of the Lutron Model JPZ0148 LED Lighting Controller Antenna Conducted Test Sample 2259-02. No other modifications were done on any of the other samples.

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 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
15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

3.1.2 Basic Test Methods and Test Procedures

KDB Document 558074 D01 15.247 Meas Guidance v05r02, Guidance for Performing Compliance Measurements on Digital Transmission Systems, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating under Section 15.247 of the FCC Rules.

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

3.1.4 Deviations or Exclusions from the Requirements

No deviations or exclusions were made.

4.0 Test Results

4.1 Antenna Requirement (47 CFR 15.203)

The antenna used by the Lutron Model JPZ0148 LED Lighting Controller is a Planar Inverted-F PCB Trace Antenna (PIFA). There are no detachable parts of the antenna. The antenna is not replaceable, nor changeable, and therefore complies with the requirements of this section.

4.2 External RF power amps/antenna modifications (47 CFR 15.204)

There are no RF power amplifier kits available to be used with the Lutron Model JPZ0148 LED Lighting Controller. There are no detachable parts of the antenna. The antenna is not replaceable, nor changeable, and therefore complies with the requirements of this section.

4.3 Duty Cycle of the DTS Fundamental Transmission

The duty cycle of the DTS transmission shall be greater than or equal to 98%. This ensures that the various emissions measured for this certification test will be made with the transmitter fully active. Duty cycles less than 98% can be used and a duty cycle correction factor can be calculated to reduce the peak level of the emission for radiated emission tests. The procedure of ANSI C63.10, Section 11.6 can be used to evaluate the duty cycle of this device.

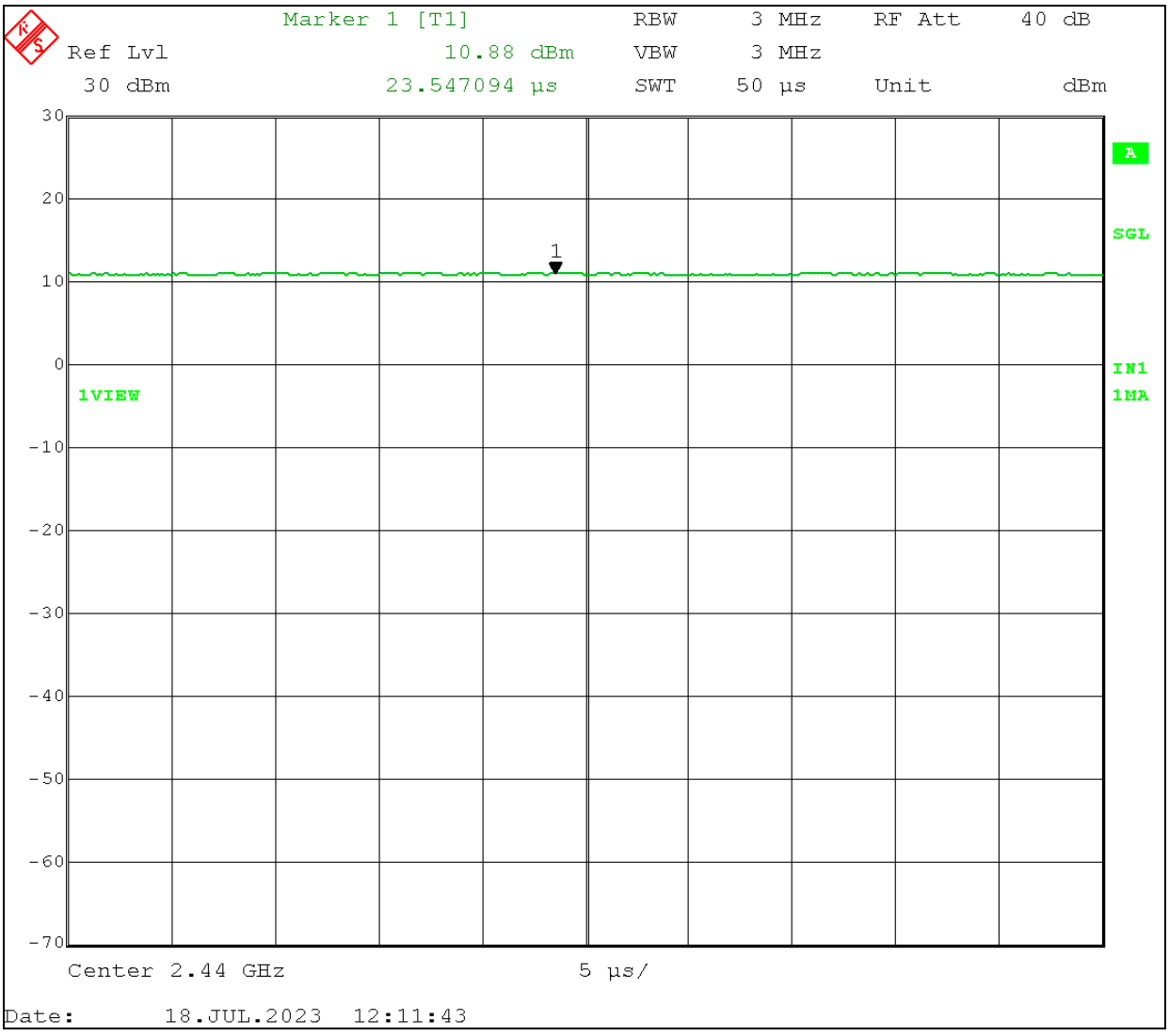
Spectrum Analyzer Settings

OBW	2.3	MHz	
RBW	3	MHz	(RBW≥OBW or as close to this as possible)
VBW	3	MHz	(VBW=RBW)
Span	Zero	MHz	(Zero)
Sweep Time	50	us	
Attenuation	40	dB	
Reference Level	30	dBm	

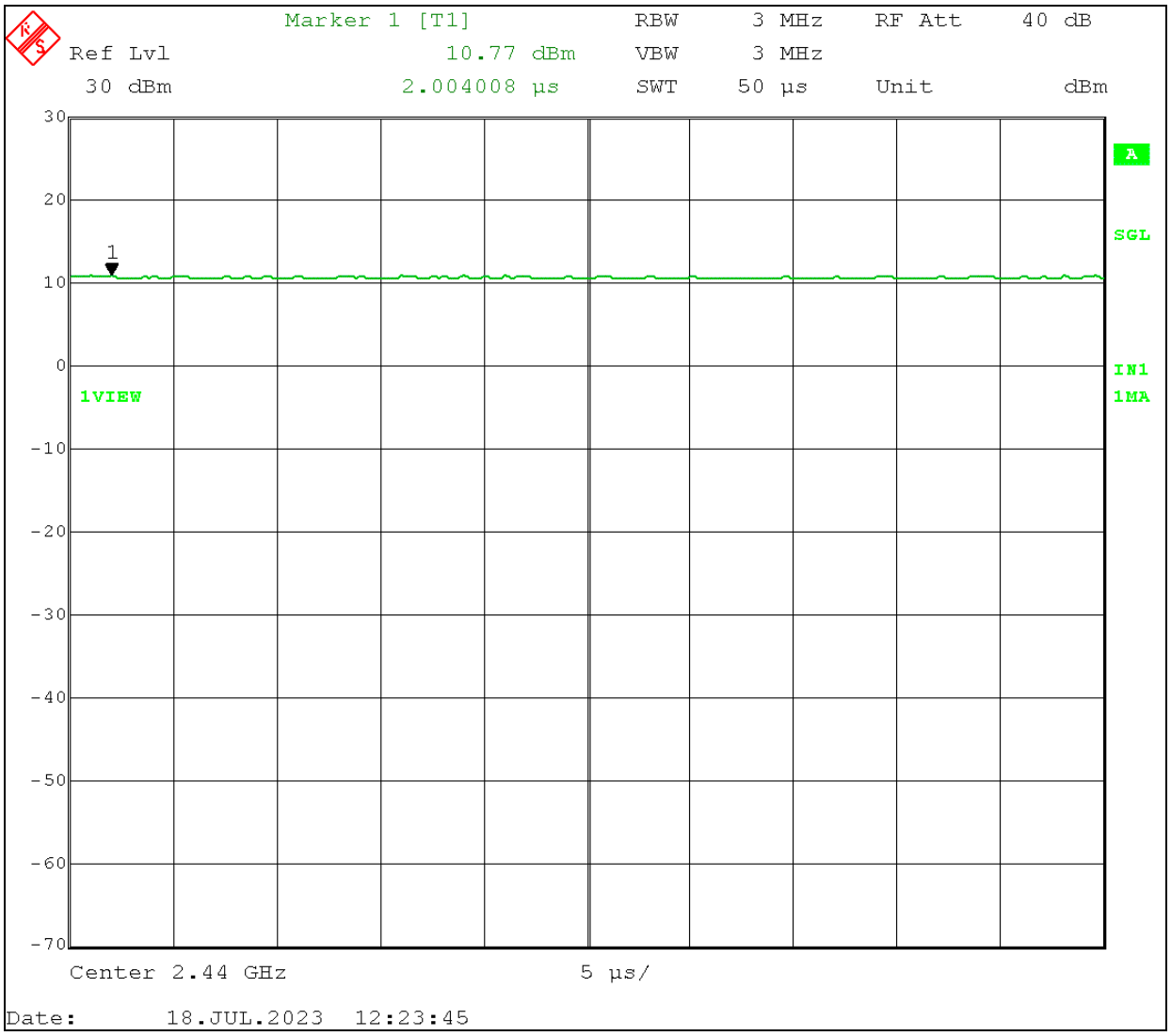
4.3.1 Duty Cycle Measurement Results (07/18/2023)

BEC Incorporated tested the duty cycle of the BLE Radio from the Lutron Model JPZ0148 LED Lighting Controller. Transmission was set to maximum output at middle channel of 2440 MHz with GFSK modulation at 1 Mbps and 2 Mbps using the radio control test software. The Duty Cycle of the transmitter was measured to be 100% and no duty cycle correction factor was required to be calculated.

BLE Transmission at 2440 MHz using 1 Mbps Data Rate



BLE Transmission at 2440 MHz using 2 Mbps Data Rate



4.4 DTS Conducted Spurious Emissions in Non-restricted Frequency Bands (FCC Section 15.247(d)

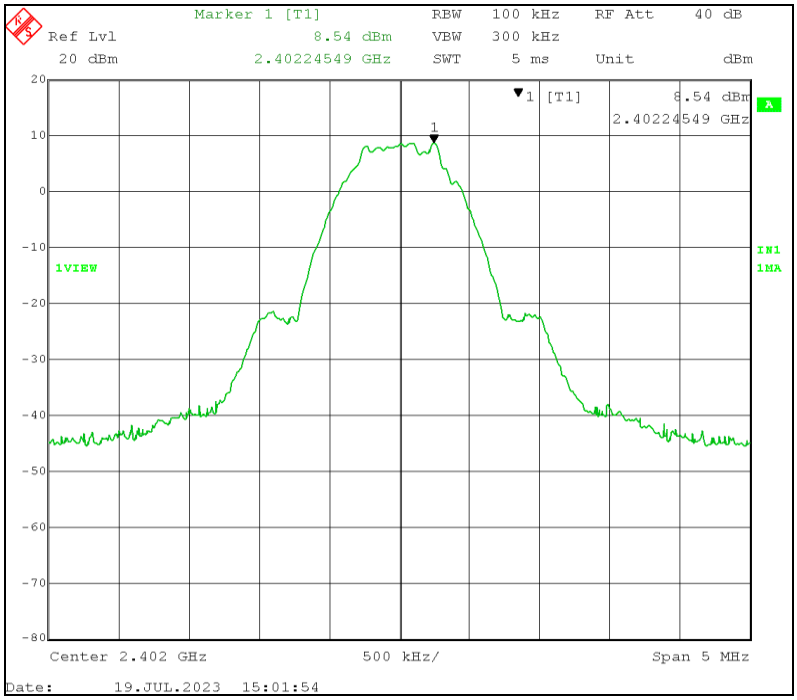
4.4.1 DTS Conducted Spurious Emissions in Non-restricted Frequency Bands Test Procedure

Measurements of the emissions in non-restricted frequency bands were made at the low Channel 37 (2402 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for 1 Mbps and at the low Channel 0 (2404 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for 2 Mbps. The EUT was set to transmit a signal at maximum output power with GFSK modulation. The procedure for the test is ANSI C63.10, Section 11.11. The frequency spectrum from 30 MHz to 25 GHz was divided into three bands: 30-1000 MHz, 1 – 10 GHz and 10 – 25 GHz. Each of the three fundamental test frequencies was measured for the reference value to determine the -20 dBc value.

Spectrum Analyzer Settings

Emission Level: BLE Radio, GFSK modulation			
Spectrum Analyzer Settings			ANSI C63.10 requirement
Span	Varies	-	Encompass spectrum divided into bands
RBW	100 kHz		47 CFR Part 15.247 (d)
VBW	300 kHz		≥ 3 X RBW
Sweep	Varies		Auto

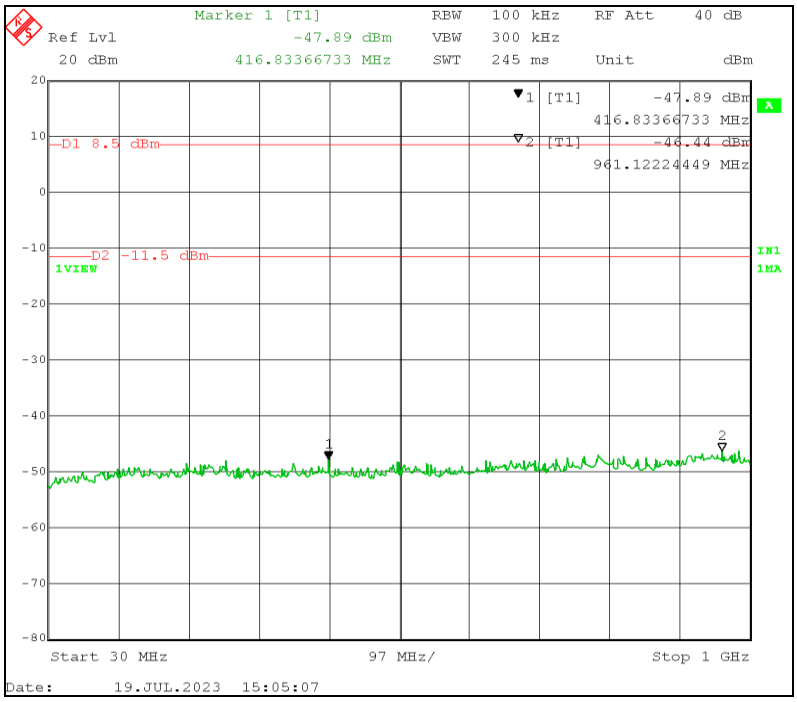
4.4.2 DTS Conducted Spurious Emissions in Non-restricted Frequency Bands Reference Measurement Channel 37, 1 Mbps (07/19/2023)



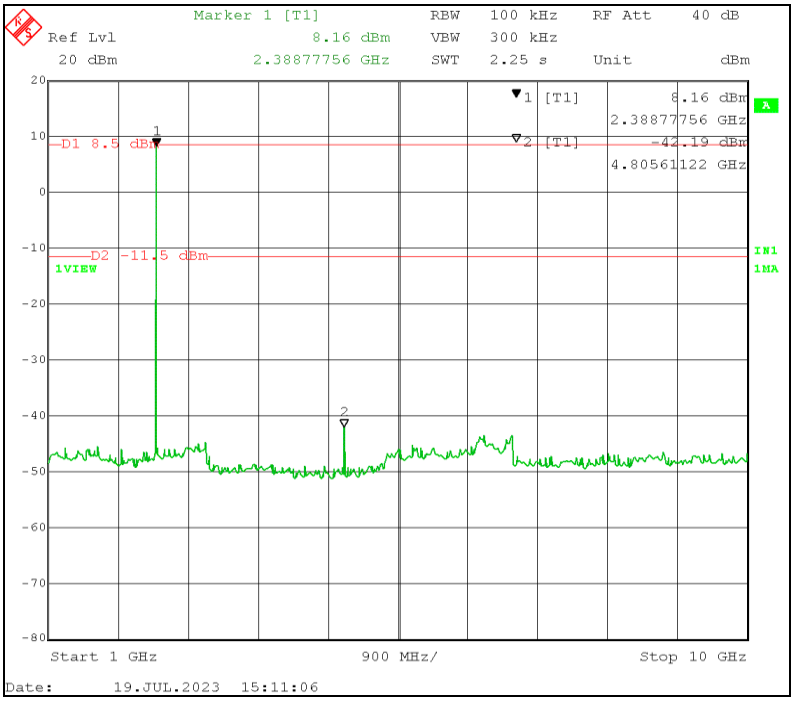
The peak level of 8.5 dBm is the maximum peak output of the Lutron Model JPZ0148 LED Lighting Controller. The conducted spurious emissions from the antenna port must be 20 dB down from this peak. The resultant limit is therefore -11.5 dBm and is displayed on the plots below.

4.4.3 DTS Conducted Spurious Emissions in Non-restricted Frequency Bands Channel 37, 1 Mbps Test Results (07/19/2023)

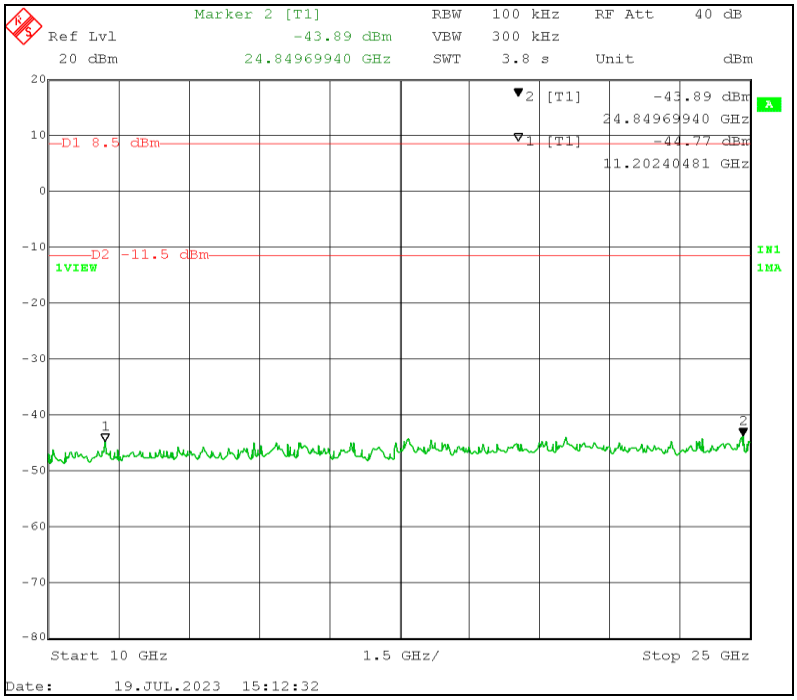
30 MHz – 1000 MHz



1 GHz – 10 GHz



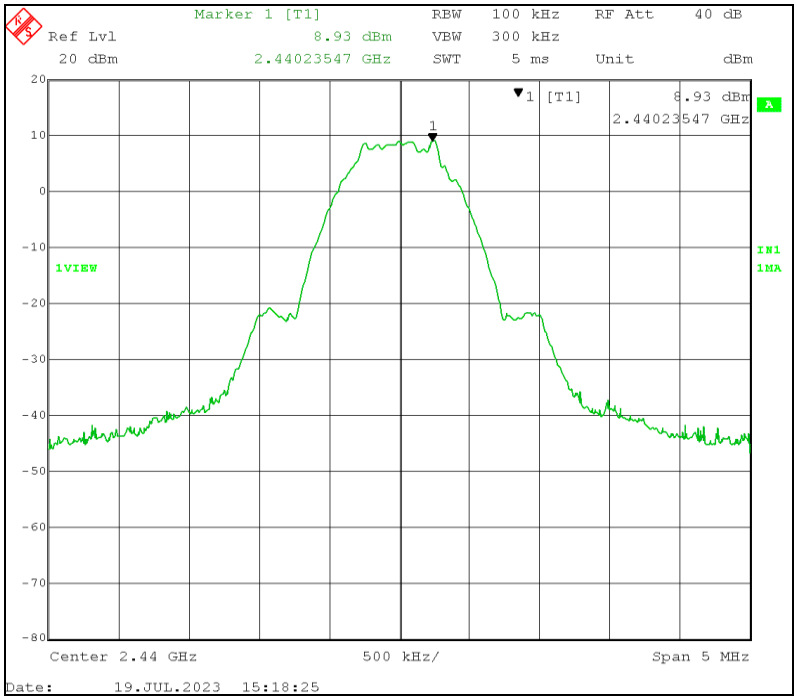
10 GHz – 25 GHz



Test Results of Highest Emissions: Channel 37, 1 Mbps (Frequency 2402 MHz)

Channel Frequency	Frequency	Peak	20 dB below Max Peak Reference	Margin	Result
MHz	MHz	dBm	dBc	dB	
2402.0	416.834	-47.89	-11.50	-36.39	Pass
	4805.611	-42.19	-11.50	-30.69	Pass
	11202.405	-44.77	-11.50	-33.27	Pass
	24849.699	-43.89	-11.50	-32.39	Pass

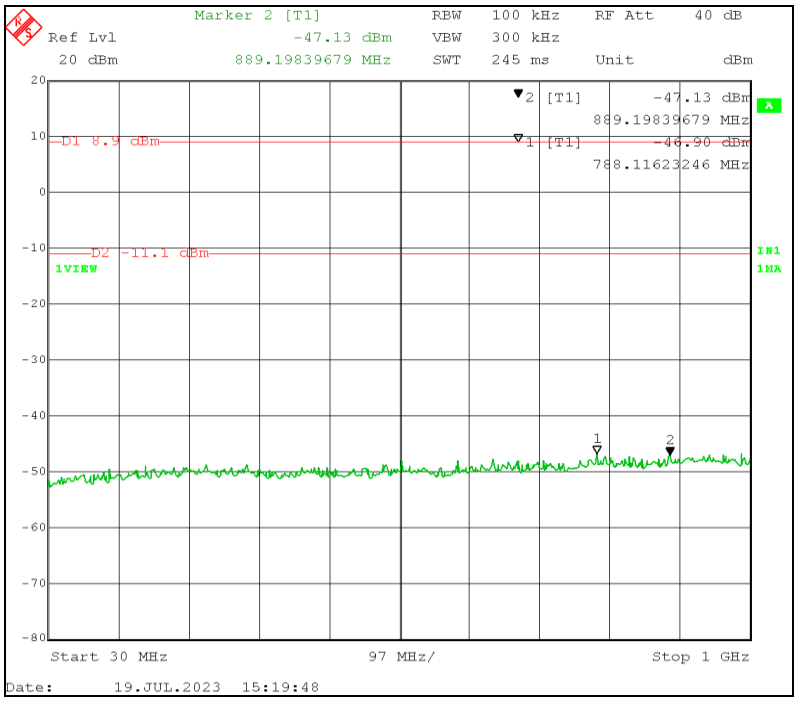
4.4.4 DTS Conducted Spurious Emissions in Non-restricted Frequency Bands Reference Measurement Channel 17, 1 Mbps (07/19/2023)



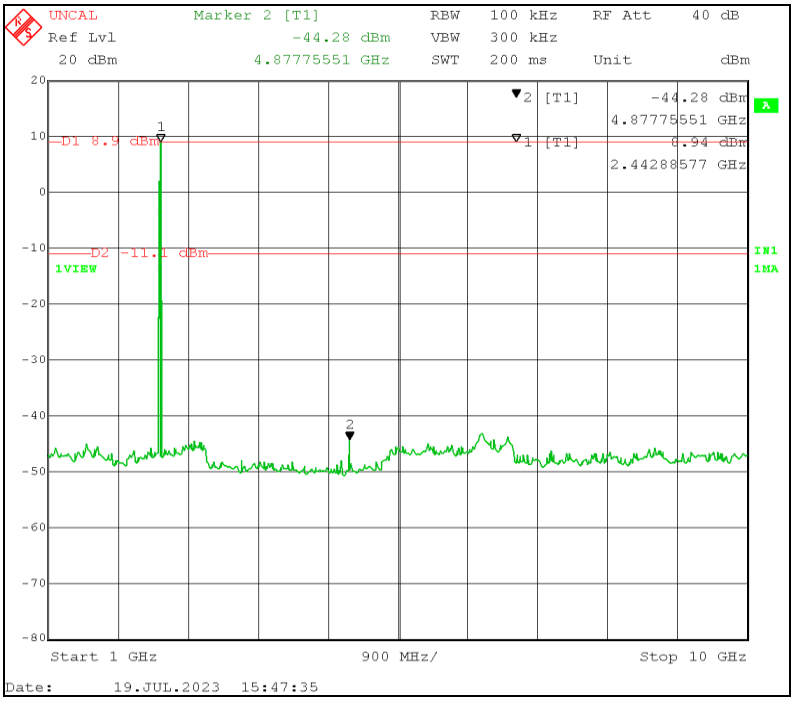
The peak level of 8.9 dBm is the maximum peak output of the Lutron Model JPZ0148 LED Lighting Controller. The conducted spurious emissions from the antenna port must be 20 dB down from this peak. The resultant limit is therefore -11.1 dBm and is displayed on the plots below.

4.4.5 DTS Conducted Spurious Emissions in Non-restricted Frequency Bands Channel 17, 1 Mbps Test Results (07/19/2023)

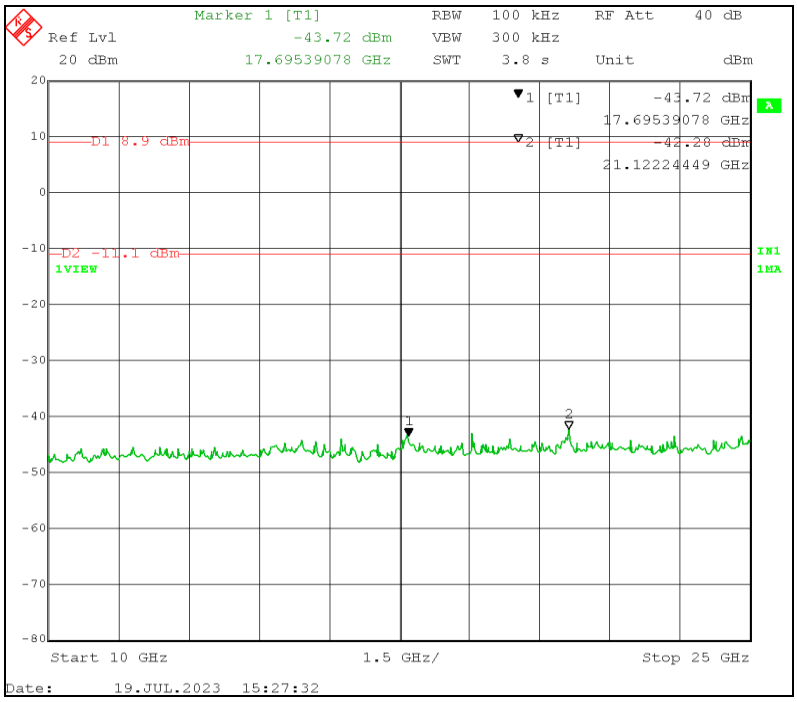
30 MHz – 1000 MHz



1 GHz – 10 GHz



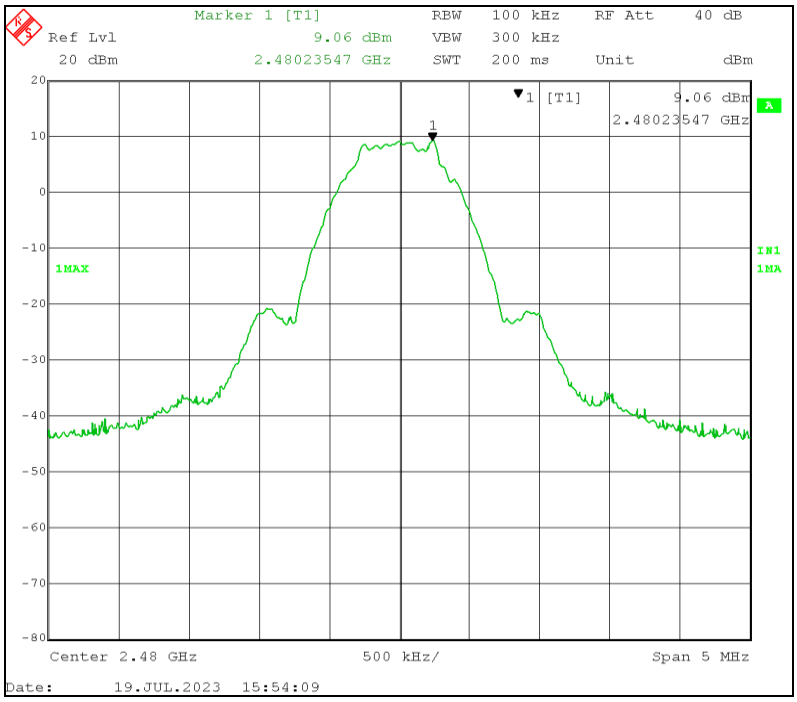
10 GHz – 25 GHz



Test Results Table Highest Emissions: Channel 17, 1 Mbps (2440 MHz)

Channel Frequency	Frequency	Peak	20 dB below Max Peak Reference	Margin	Result
MHz	MHz	dBm	dBc	dB	
2440.0	788.116	-46.90	-11.10	-35.80	Pass
	869.198	-47.13	-11.10	-36.03	Pass
	4877.756	-44.28	-11.10	-33.18	Pass
	17695.391	-43.72	-11.10	-32.62	Pass
	21122.244	-42.20	-11.10	-31.10	Pass

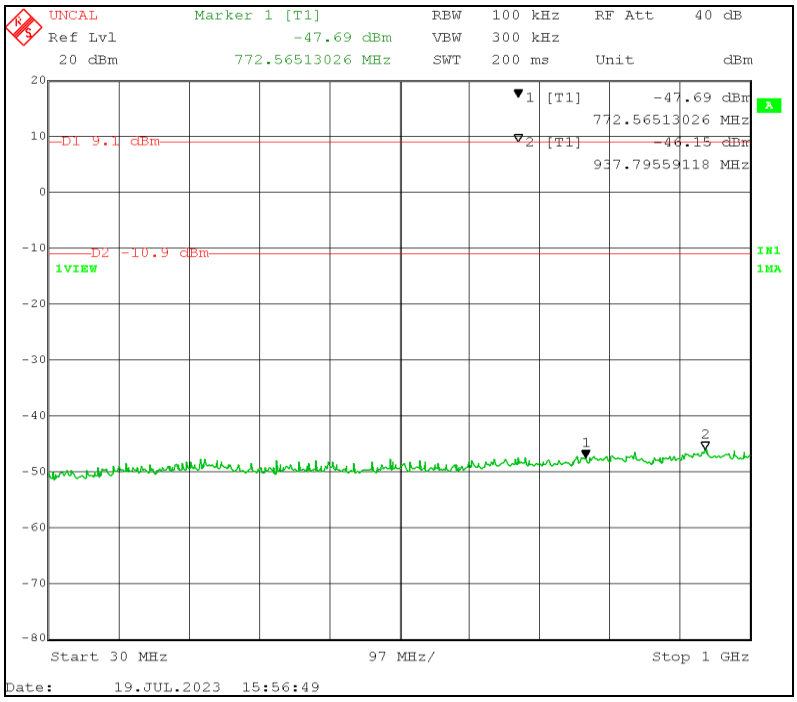
4.4.6 DTS Conducted Spurious Emissions in Non-restricted Frequency Bands Reference Measurement Channel 39, 1 Mbps (07/19/2023)



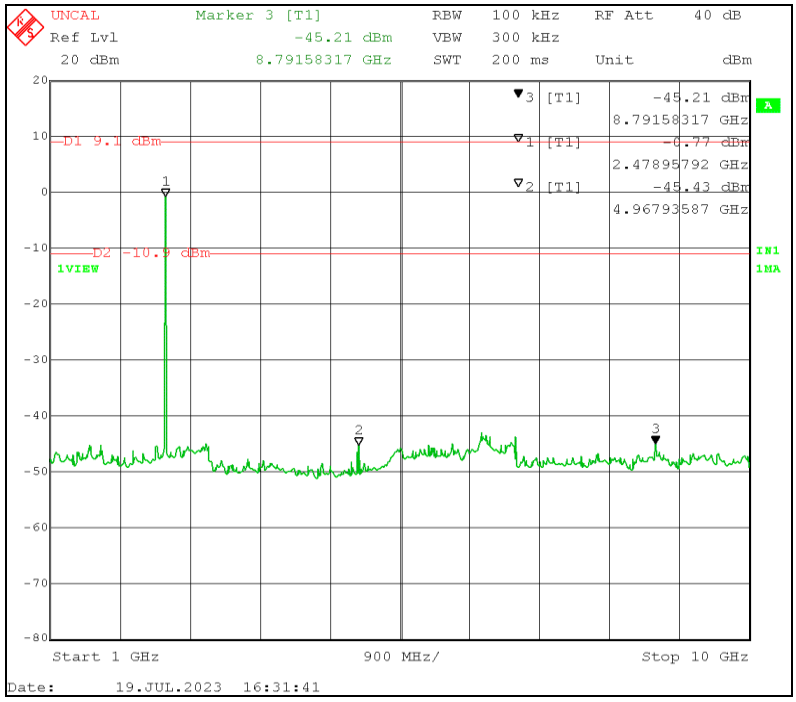
The peak level of 9.1 dBm is the maximum peak output of the Lutron Model JPZ0148 LED Lighting Controller. The conducted spurious emissions from the antenna port must be 20 dB down from this peak. The resultant limit is therefore -10.9 dBm and is displayed on the plots below.

4.4.7 DTS Conducted Spurious Emissions in Non-restricted Frequency Bands Channel 39, 1 Mbps Test Results (07/19/2023)

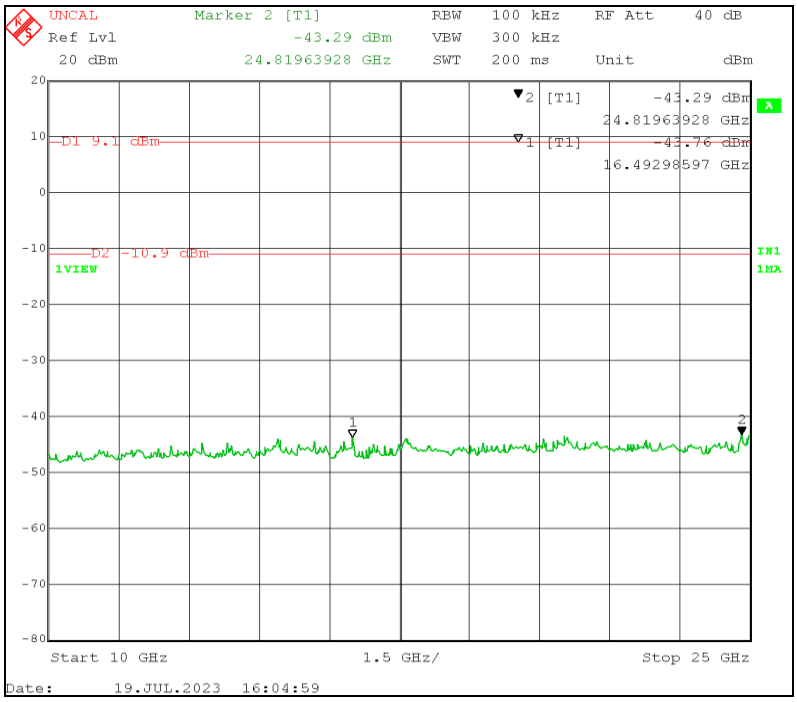
30 MHz – 1000 MHz



1 GHz – 10 GHz



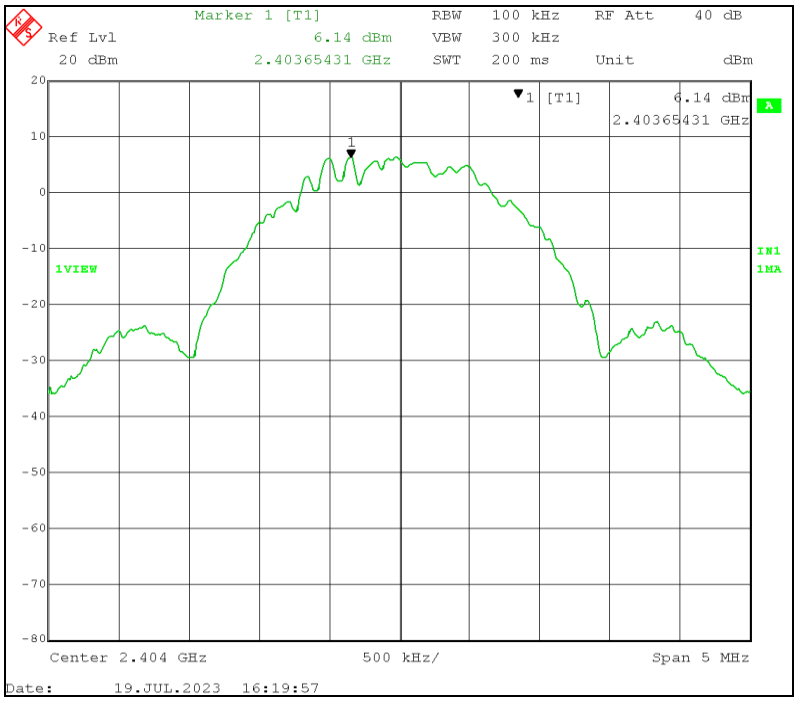
10 GHz – 25 GHz



Test Results of Highest Emissions: Channel 39, 1 Mbps (Frequency 2480 MHz)

Channel Frequency	Frequency	Peak	20 dB below Max Peak Reference	Margin	Result
MHz	MHz	dBm	dBc	dB	
2480.0	772.565	-47.69	-10.90	-36.79	Pass
	937.796	-46.15	-10.90	-35.25	Pass
	4967.936	-45.43	-10.90	-34.53	Pass
	8791.583	-45.21	-10.90	-34.31	Pass
	16492.986	-43.76	-10.90	-32.86	Pass
	24819.639	-43.29	-10.90	-32.39	Pass

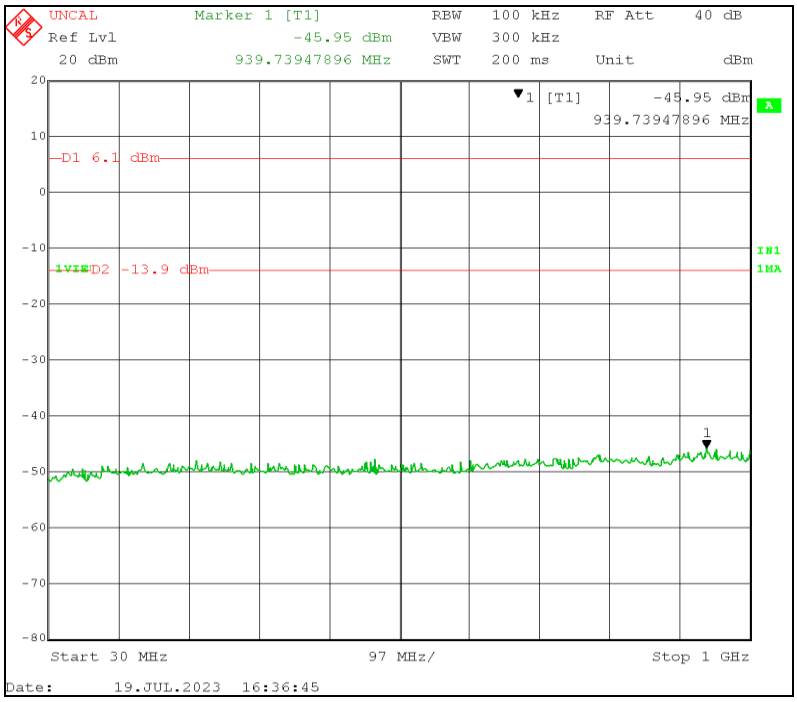
4.4.8 DTS Conducted Spurious Emissions in Non-restricted Frequency Bands Reference Measurement Channel 0, 2 Mbps (07/19/2023)



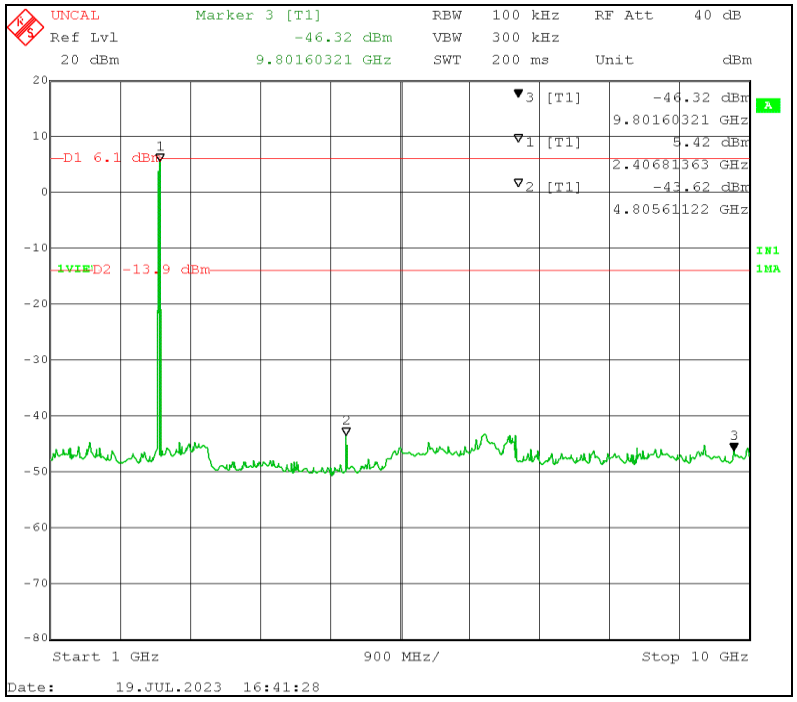
The peak level of 6.1 dBm is the maximum peak output of the Lutron Model JPZ0148 LED Lighting Controller. The conducted spurious emissions from the antenna port must be 20 dB down from this peak. The resultant limit is therefore -13.9 dBm and is displayed on the plots below.

4.4.9 DTS Conducted Spurious Emissions in Non-restricted Frequency Bands Channel 0, 2 Mbps Test Results (07/19/2023)

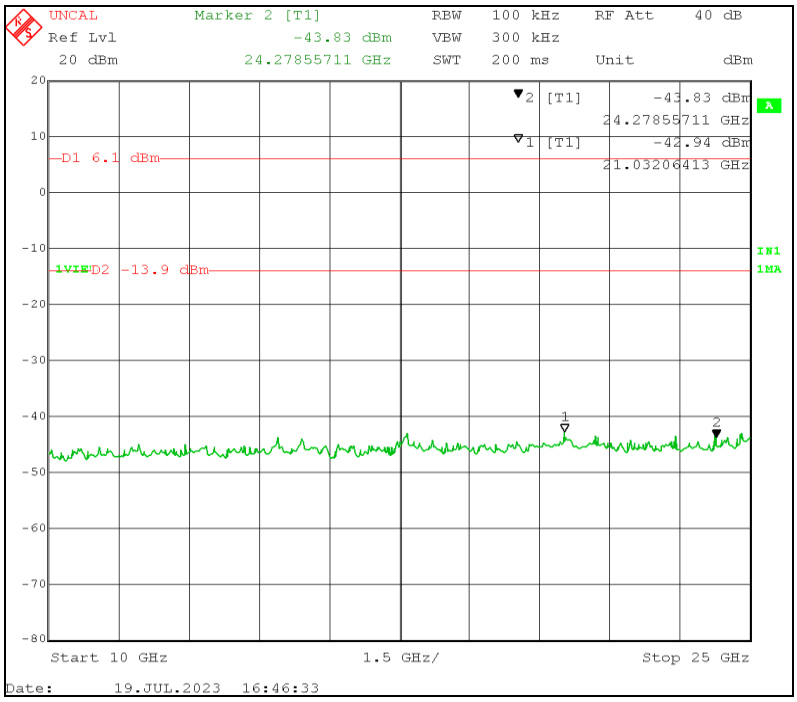
30 MHz – 1000 MHz



1 GHz – 10 GHz



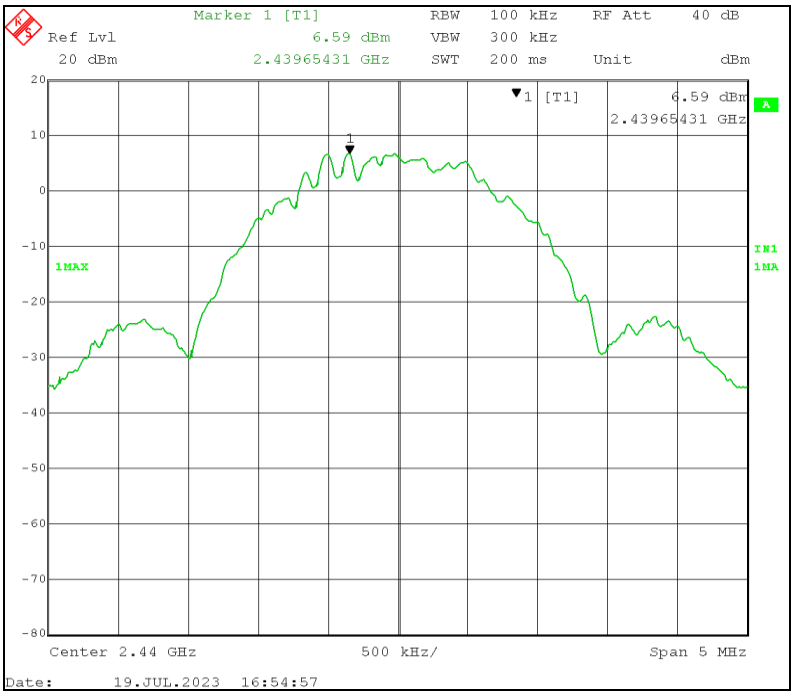
10 GHz – 25 GHz



Test Results of Highest Emissions: Channel 0, 2 Mbps (Frequency 2404 MHz)

Channel Frequency	Frequency	Peak	20 dB below Max Peak Reference	Margin	Result
MHz	MHz	dBm	dBc	dB	
2404.0	939.739	-45.95	-13.90	-32.05	Pass
	4805.611	-43.62	-13.90	-29.72	Pass
	9801.603	-46.32	-13.90	-32.42	Pass
	21032.064	-42.94	-13.90	-29.04	Pass
	24278.557	-43.83	-13.90	-29.93	Pass

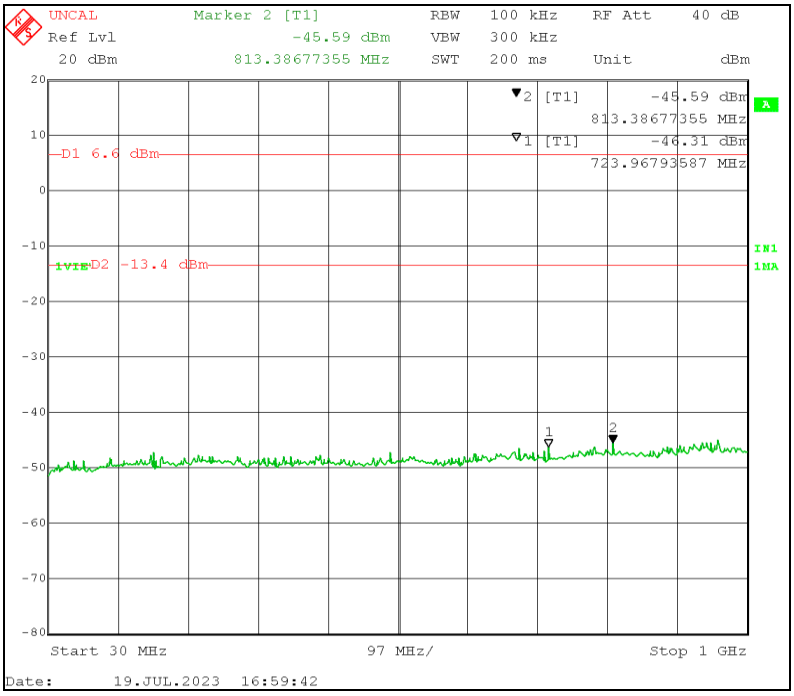
4.4.10 DTS Conducted Spurious Emissions in Non-restricted Frequency Bands Reference Measurement Channel 17, 2 Mbps (07/19/2023)



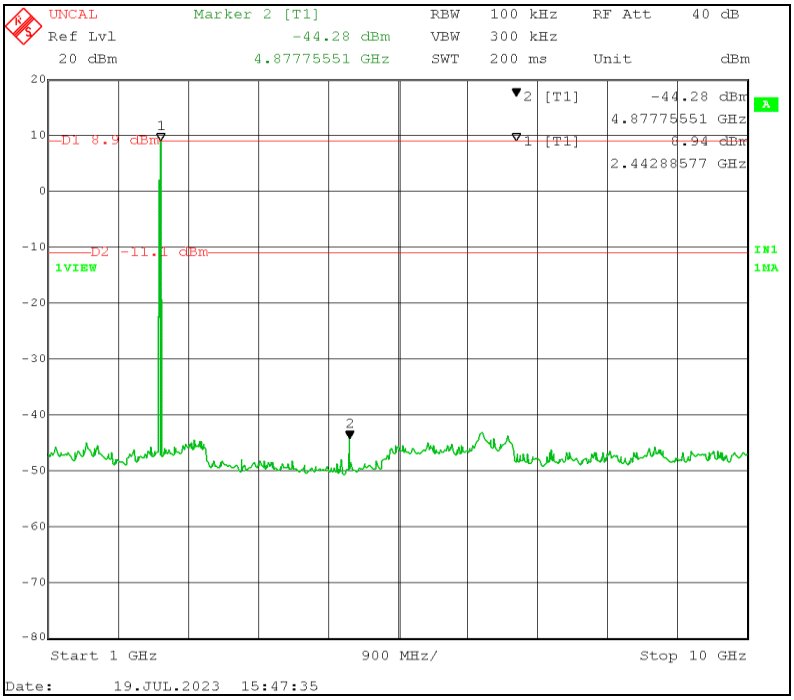
The peak level of 6.6 dBm is the maximum peak output of the Lutron Model JPZ0148 LED Lighting Controller. The conducted spurious emissions from the antenna port must be 20 dB down from this peak. The resultant limit is therefore -13.4 dBm and is displayed on the plots below.

4.4.5 DTS Conducted Spurious Emissions in Non-restricted Frequency Bands Channel 17, 2 Mbps Test Results (07/19/2023)

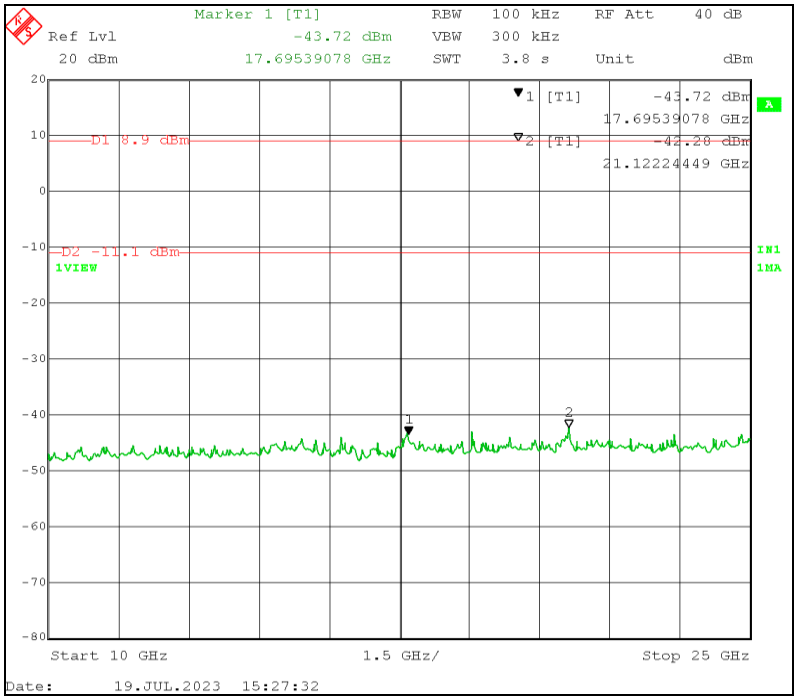
30 MHz – 1000 MHz



1 GHz – 10 GHz



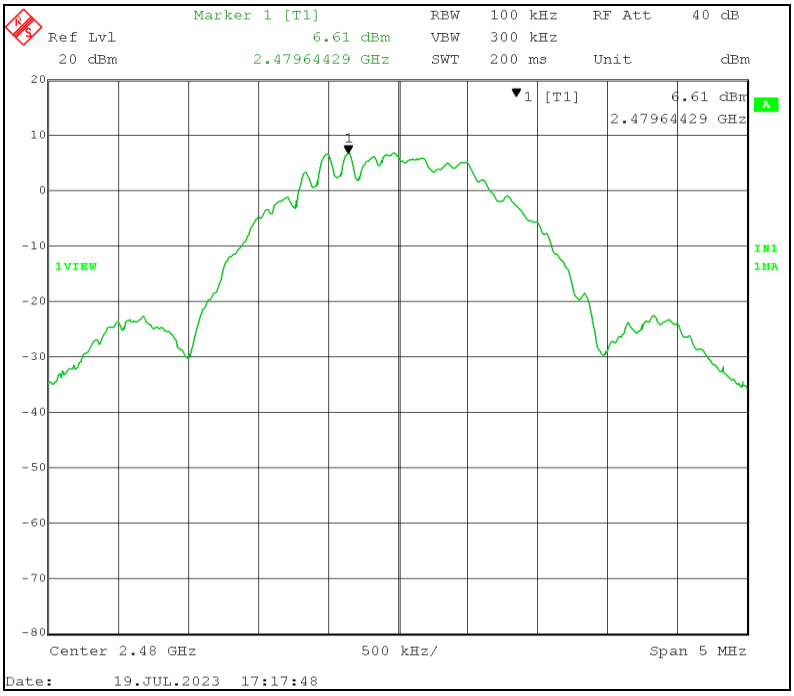
10 GHz – 25 GHz



Test Results of Highest Emissions: Channel 17, 2 Mbps (Frequency 2440 MHz)

Channel Frequency	Frequency	Peak	20 dB below Max Peak Reference	Margin	Result
MHz	MHz	dBm	dBc	dB	
2440.0	723.970	-46.31	-13.40	-32.91	Pass
	813.390	-45.59	-13.40	-32.19	Pass
	4877.755	-44.97	-13.40	-31.57	Pass
	21062.124	-43.43	-13.40	-30.03	Pass
	25000.000	-42.66	-13.40	-29.26	Pass

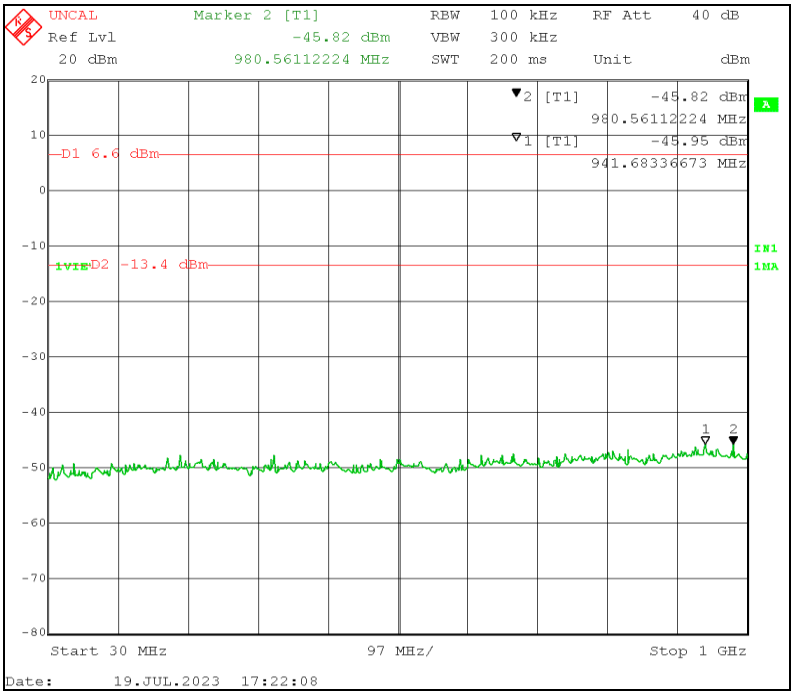
4.4.6 DTS Conducted Spurious Emissions in Non-restricted Frequency Bands Reference Measurement Channel 39, 2 Mbps (07/19/2023)



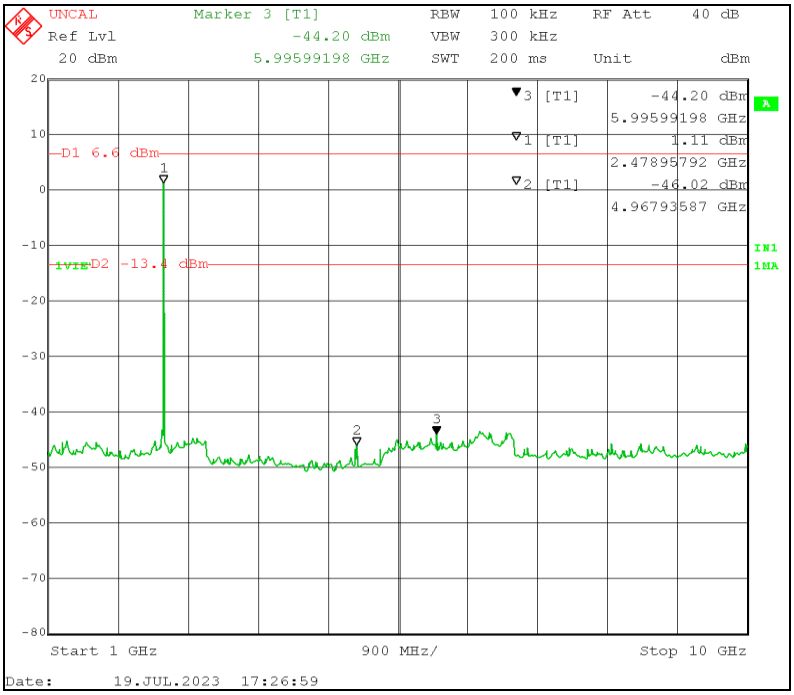
The peak level of 6.6 dBm is the maximum peak output of the Lutron Model JPZ0148 LED Lighting Controller. The conducted spurious emissions from the antenna port must be 20 dB down from this peak. The resultant limit is therefore -13.4 dBm and is displayed on the plots below.

4.4.7 DTS Conducted Spurious Emissions in Non-restricted Frequency Bands Channel 39, 2 Mbps Test Results (07/19/2023)

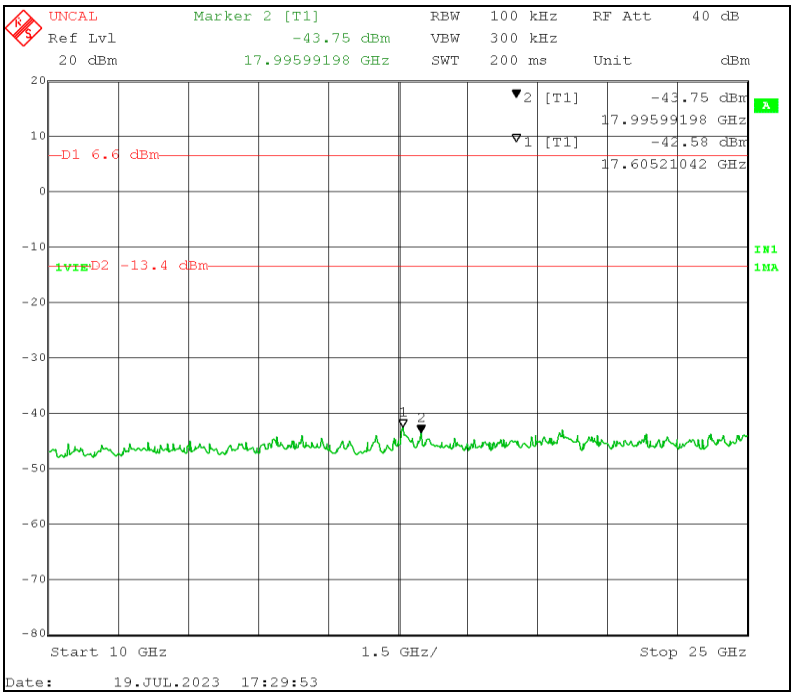
30 MHz – 1000 MHz



1 GHz – 10 GHz



10 GHz – 25 GHz

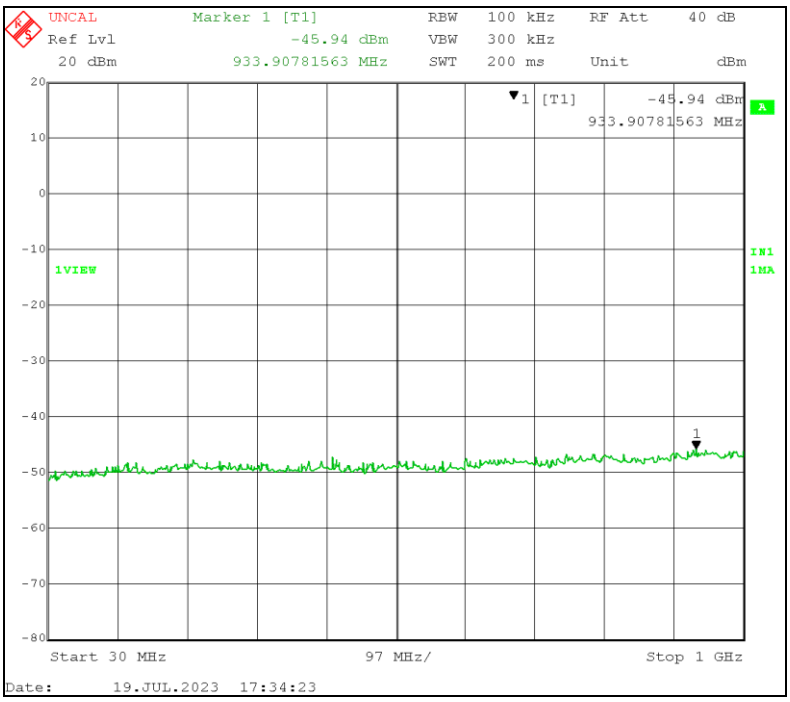


Test Results of Highest Emissions: Channel 39, 2 Mbps (Frequency 2480 MHz)

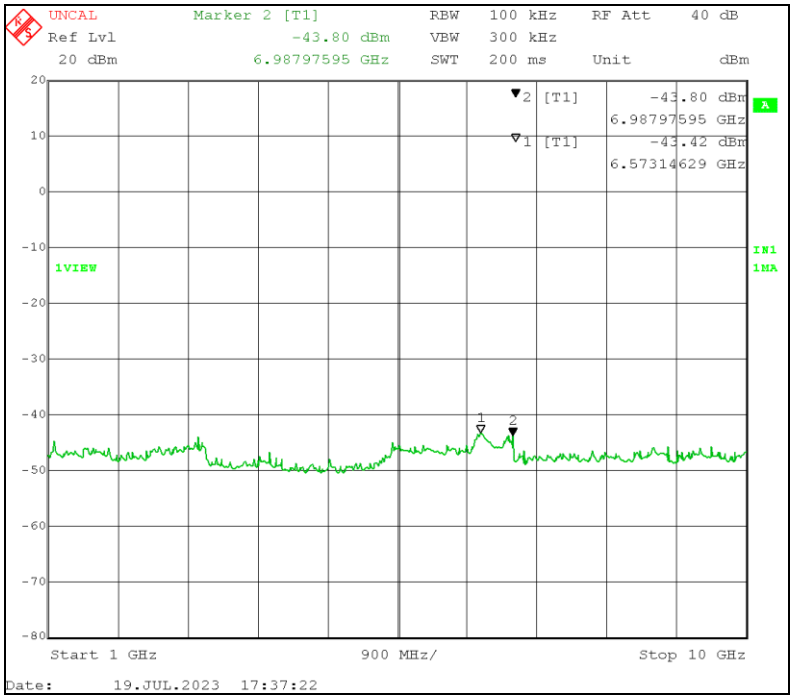
Channel Frequency	Frequency	Peak	20 dB below Max Peak Reference	Margin	Result
MHz	MHz	dBm	dBc	dB	
2480.0	941.683	-45.95	-13.40	-32.55	Pass
	980.561	-45.82	-13.40	-32.42	Pass
	4967.935	-46.02	-13.40	-32.62	Pass
	5995.992	-44.20	-13.40	-30.80	Pass
	27605.210	-42.58	-13.40	-29.18	Pass
	27995.992	-43.75	-13.40	-30.35	Pass

4.4.8 DTS Conducted Spurious Emissions in Non-restricted Frequency Bands Rx Mode Test Results (07/19/2023)

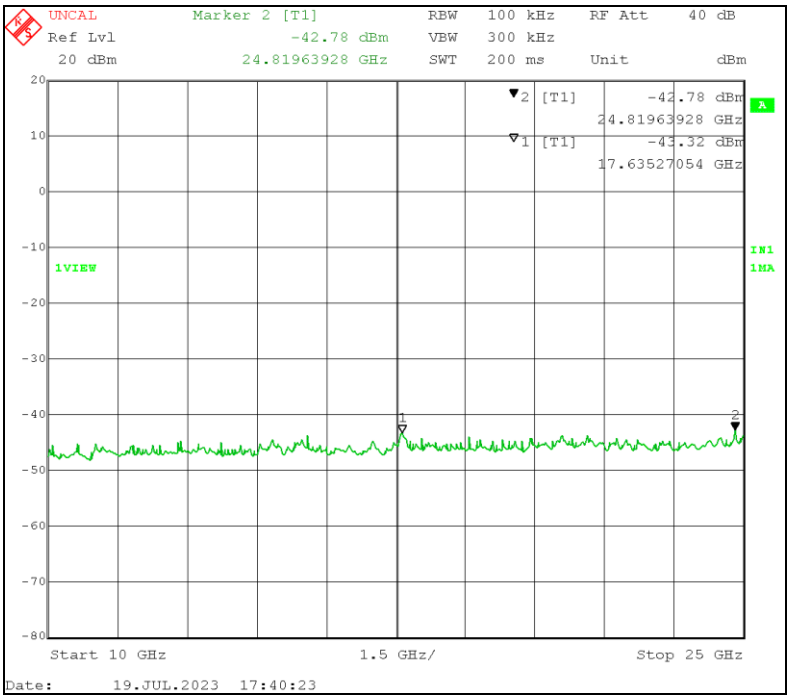
30 MHz – 1000 MHz



1 GHz – 10 GHz



10 GHz – 25 GHz



Test Results: The Antenna Conducted Spurious Emissions of the Lutron Model JPZ0148 LED Lighting Controller, at Low, Middle and High Frequencies, are below the carrier 20 dBc limit and therefore compliant with the limits specified in FCC Section 15.247(d).

4.5 DTS Radiated Spurious Emissions in Non-restricted and Restricted Frequency Bands, 30 MHz – 25 GHz (47 CFR 15.205 & 15.209)

The emissions from the Lutron Model JPZ0148 LED Lighting Controller, which fall in the restricted bands of operation and unrestricted bands of operation, detailed in this section, comply with the limits of 15.209. The Lutron Model JPZ0148 LED Lighting Controller was tested at the low Channel 37 (2402 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for 1 Mbps and at the low Channel 0 (2404 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for 2 Mbps. The EUT was set to transmit a signal at maximum output power with GFSK modulation. The EUT was also tested in the Rx Mode.

Measurement of the signals was performed with the EUT on a turntable and a variable height antenna mast at 3 meters distance. The signals residing in restricted bands of operation are indicated in the tables below.

4.5.1 Non-Restricted and Restricted Bands 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 enclosure is free of reflective metallic objects and extraneous electromagnetic signals. This non-metallic enclosure and the 3 meter 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 80 cm high for tabletop equipment or directly on the turntable surface for floor standing equipment. The test site complies with the requirements of ANSI C63.4 and ANSI C63.10.

SR#1

The Semi-Anechoic Shielded Room (SR#1) is a 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. The 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 chamber complies with the requirements of ANSI C63.4 and ANSI C63.10.

4.5.2 Non-restricted and Restricted Bands Radiated Spurious Emissions Test Procedure

Radiated Emissions 30 MHz – 40 GHz
The EMI receiver was set to quasi-peak mode for frequencies from 30 MHz to 1 GHz 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.

Three orthogonal positions of the EUT were evaluated for maximum emissions. The position of the EUT, with the base of the trap placed on the horizontal surface of the 80-cm table, was determined to be the axis that produced the highest emissions.

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 (dBµV/m) = Meter Reading (dBµV) + Antenna Factor (dB/m) + Cable Loss (dB) – Amplifier Gain (dB)

During the testing process, it was determined that the X-axis was the worst-case orientation for the EUT. Therefore, all the tests were carried out with the EUT positioned in the X-axis. The following tables are the highest emissions recorded and summarized. Restricted band signals are marked with an asterisk. Other spurious emissions are shown to demonstrate compliance of the EUT to 15.209 limits.

4.5.3 DTS Radiated Spurious Emissions in Non-restricted and Restricted Bands of Operation, 30 MHz – 1000 MHz Test Results (06/13/2023, 07/19/2023 and 07/20/2023)

Low Channel 37 (2402 MHz) FSK 1 Mbps

CONFIGURATION TESTED	EUT Orientation (X Axis) Tx at Low Channel of 2402 MHz at 1 Mbps and Max Output Power (+12 dBm)

Frequency	Corrected		Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC Part15.205/209 RSS-GEN/247				Result
	Peak Level	QP Level					Peak Limit	Peak Margin	QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
* 248.103	18.88	20.85	H	007	111	-7.35	66.02	-47.14	46.02	-25.17	Pass
* 327.057	24.52	23.72	H	140	120	-4.77	66.02	-41.50	46.02	-22.30	Pass
* 404.92	29.63	26.40	H	228	236	-3.63	66.02	-36.39	46.02	-19.62	Pass
810.620	25.09	23.04	H	192	209	3.13	66.02	-40.93	46.02	-22.98	Pass
* 987.397	24.55	24.21	H	360	157	4.90	73.98	-49.43	53.98	-29.77	Pass
56.989	29.70	29.20	V	266	141	-13.35	60.00	-30.30	40.00	-10.80	Pass
* 111.741	22.92	21.97	V	049	116	-7.31	63.52	-40.60	43.52	-21.55	Pass
* 407.478	21.83	18.17	V	185	231	-3.53	66.02	-44.19	46.02	-27.85	Pass
586.501	20.05	19.47	V	098	225	-0.51	66.02	-45.97	46.02	-26.55	Pass
923.125	28.62	23.85	V	341	208	4.38	66.02	-37.40	46.02	-22.17	Pass

* Restricted Band Signal

Middle Channel 17 (2440 MHz) FSK 1 Mbps

CONFIGURATION TESTED	EUT Orientation (X Axis) Tx at Mid Channel of 2440 MHz at 1 Mbps and Max Output Power (+12 dBm)

Frequency	Corrected		Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC Part15.205/209 RSS-GEN/247				Result
	Peak Level	QP Level					Peak Limit	Peak Margin	QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
104.280	20.51	19.58	H	258	136	-8.70	63.52	-43.01	43.52	-23.94	Pass
* 245.678	20.97	20.38	H	163	139	-7.37	66.02	-45.05	46.02	-25.64	Pass
* 322.624	24.79	23.55	H	344	100	-4.75	66.02	-41.23	46.02	-22.47	Pass
* 405.952	28.70	25.61	H	230	105	-3.63	66.02	-37.32	46.02	-20.41	Pass
622.044	22.36	20.02	H	035	178	-0.34	66.02	-43.66	46.02	-26.00	Pass
912.260	27.15	24.00	H	062	101	4.20	66.02	-38.87	46.02	-22.02	Pass
36.175	25.30	23.31	V	230	136	-4.32	60.00	-34.70	40.00	-16.69	Pass
57.072	32.38	28.51	V	261	104	-13.35	60.00	-27.62	40.00	-11.49	Pass
* 111.646	21.95	21.45	V	032	104	-7.32	63.52	-41.57	43.52	-22.07	Pass
424.813	21.74	20.05	V	125	223	-3.11	66.02	-44.28	46.02	-25.97	Pass
751.755	24.25	21.73	V	220	176	1.75	66.02	-41.77	46.02	-24.29	Pass
948.629	23.83	24.03	V	298	121	4.57	66.02	-42.19	46.02	-21.99	Pass

* Restricted Band Signal

High Channel 39 (2480.0 MHz) FSK 1 Mbps

CONFIGURATION TESTED	EUT Orientation (X Axis) Tx at High Channel of 2480 MHz at 1 Mbps and Max Output Power (+12 dBm)

Frequency	Corrected		Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC Part15.205/209 RSS-GEN/247				Result
	Peak Level	QP Level					Peak Limit	Peak Margin	QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
313.965	23.59	21.26	H	002	101	-4.92	66.02	-42.43	46.02	-24.76	Pass
335.798	27.42	25.34	H	009	111	-4.71	66.02	-38.60	46.02	-20.68	Pass
* 403.875	26.03	23.08	H	304	240	-3.63	66.02	-39.99	46.02	-22.94	Pass
720.033	23.16	20.89	H	010	141	1.54	66.02	-42.86	46.02	-25.13	Pass
800.999	25.20	22.60	H	107	114	2.93	66.02	-40.82	46.02	-23.42	Pass
53.753	32.82	30.43	V	194	104	-13.34	60.00	-27.18	40.00	-9.57	Pass
63.583	22.22	23.64	V	226	104	-12.89	60.00	-37.78	40.00	-16.36	Pass
* 112.129	23.03	21.37	V	012	109	-7.26	63.52	-40.49	43.52	-22.15	Pass
202.930	15.60	13.32	V	091	156	-7.63	63.52	-47.92	43.52	-30.20	Pass
599.651	19.95	19.10	V	165	162	-0.50	66.02	-46.07	46.02	-26.92	Pass
* 961.303	25.88	24.10	V	133	157	4.79	73.98	-48.10	53.98	-29.88	Pass

* Restricted Band Signal

Low Channel 0 (2404 MHz) FSK 2 Mbps

CONFIGURATION TESTED	EUT Orientation (X Axis) Tx at Low Channel of 2404 MHz at 2 Mbps and Max Output Power (+12 dBm)

Frequency	Corrected		Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC Part15.205/209 RSS-GEN/247				Result
	Peak Level	QP Level					Peak Limit	Peak Margin	QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
57.002	19.63	18.22	H	323	157	-13.35	60.00	-40.37	40.00	-21.78	Pass
102.052	21.71	20.05	H	281	251	-9.26	63.52	-41.81	43.52	-23.47	Pass
* 245.93	23.39	20.04	H	173	111	-7.37	66.02	-42.63	46.02	-25.98	Pass
* 324.84	25.16	23.08	H	344	101	-4.76	66.02	-40.86	46.02	-22.94	Pass
* 405.114	27.92	26.69	H	226	242	-3.63	66.02	-38.10	46.02	-19.33	Pass
667.502	22.41	21.95	H	135	131	0.66	66.02	-43.61	46.02	-24.07	Pass
915.390	25.44	23.84	H	072	115	4.24	66.02	-40.58	46.02	-22.18	Pass
35.860	22.15	23.20	V	289	131	-4.11	60.00	-37.85	40.00	-16.80	Pass
57.052	30.48	29.21	V	224	108	-13.35	60.00	-29.52	40.00	-10.79	Pass
* 108.722	21.30	18.53	V	360	100	-7.76	63.52	-42.22	43.52	-24.99	Pass
* 403.764	23.20	21.82	V	181	230	-3.63	66.02	-42.82	46.02	-24.20	Pass
724.518	22.62	21.31	V	188	114	1.59	66.02	-43.40	46.02	-24.71	Pass
950.269	26.12	24.00	V	076	213	4.67	66.02	-39.90	46.02	-22.02	Pass

* Restricted Band Signal

Middle Channel 17 (2440 MHz) FSK 2 Mbps

CONFIGURATION TESTED	EUT Orientation (X Axis) Tx at Mid Channel of 2440 MHz at 2 Mbps and Max Output Power (+12 dBm)

Frequency	Corrected		Antenna	Turntable	Antenna	Correction	FCC Part15.205/209 RSS-GEN/247				Result
	Peak Level	QP Level	Polarity	Angle	Height	Factor	Peak Limit	Peak Margin	QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
64.731	24.00	22.51	H	285	204	-12.81	60.00	-36.00	40.00	-17.49	Pass
* 110.781	20.84	18.66	H	055	203	-7.43	63.52	-42.68	43.52	-24.86	Pass
336.635	24.81	22.23	H	355	225	-4.71	66.02	-41.21	46.02	-23.79	Pass
386.103	21.36	23.61	H	042	245	-4.00	66.02	-44.66	46.02	-22.41	Pass
427.184	21.30	22.77	H	041	245	-3.02	66.02	-44.72	46.02	-23.25	Pass
838.275	23.75	22.72	H	246	220	3.32	66.02	-42.27	46.02	-23.30	Pass
53.751	31.41	30.67	V	196	121	-13.34	60.00	-28.59	40.00	-9.33	Pass
* 110.388	21.09	21.96	V	021	136	-7.51	63.52	-42.43	43.52	-21.56	Pass
* 335.339	19.40	18.24	V	105	234	-4.71	66.02	-46.62	46.02	-27.78	Pass
516.420	20.76	18.40	V	197	230	-1.62	66.02	-45.26	46.02	-27.62	Pass
765.395	22.30	21.23	V	359	198	2.03	66.02	-43.72	46.02	-24.79	Pass
* 969.048	25.30	24.08	V	207	200	4.78	73.98	-48.68	53.98	-29.90	Pass

* Restricted Band Signal

High Channel 39 (2480.0 MHz) FSK 2 Mbps

CONFIGURATION TESTED	EUT Orientation (X Axis) Tx at High Channel of 2480 MHz at 2 Mbps and Max Output Power (+12 dBm)

Frequency	Corrected		Antenna	Turntable	Antenna	Correction	FCC Part15.205/209 RSS-GEN/247				Result
	Peak Level	QP Level	Polarity	Angle	Height	Factor	Peak Limit	Peak Margin	QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
313.987	21.30	20.48	H	359	111	-4.92	66.02	-44.72	46.02	-25.54	Pass
* 333.636	25.76	24.86	H	160	120	-4.70	66.02	-40.26	46.02	-21.16	Pass
382.800	22.29	21.33	H	049	233	-4.09	66.02	-43.73	46.02	-24.69	Pass
794.442	23.63	22.32	H	349	223	2.76	66.02	-42.39	46.02	-23.70	Pass
925.970	24.69	23.59	H	027	225	4.41	66.02	-41.33	46.02	-22.43	Pass
52.666	29.88	27.90	V	217	101	-13.23	60.00	-30.12	40.00	-12.10	Pass
63.633	26.68	25.46	V	249	101	-12.89	60.00	-33.32	40.00	-14.54	Pass
* 112.604	23.23	19.55	V	008	177	-7.21	63.52	-40.29	43.52	-23.97	Pass
382.957	21.02	19.55	V	107	204	-4.09	66.02	-45.00	46.02	-26.47	Pass
720.943	23.45	21.03	V	128	203	1.55	66.02	-42.57	46.02	-24.99	Pass
952.241	26.76	23.78	V	134	249	4.68	66.02	-39.26	46.02	-22.24	Pass

* Restricted Band Signal

Receive Mode

CONFIGURATION TESTED	EUT Orientation (X/Y/Z Axis) EUT in Rx Mode

Frequency	Corrected		Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC Part15.205/209 RSS-GEN/247				Result
	Peak Level	QP Level					Peak Limit	Peak Margin	QP Limit	QP Margin	
MHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
36.160	19.02	18.48	V	278	101	-4.31	60.00	-40.98	40.00	-21.52	Pass
55.918	24.69	21.25	V	221	101	-13.35	60.00	-35.31	40.00	-18.75	Pass
* 109.937	15.66	15.15	H	248	157	-7.60	63.52	-47.86	43.52	-28.37	Pass
* 110.732	19.79	16.52	V	068	189	-7.44	63.52	-43.73	43.52	-27.00	Pass
200.742	15.64	13.11	V	344	205	-6.96	63.52	-47.88	43.52	-30.41	Pass
223.548	14.29	12.97	H	097	151	-8.25	66.02	-51.73	46.02	-33.05	Pass
308.120	17.43	17.09	H	046	163	-4.99	66.02	-48.59	46.02	-28.93	Pass
317.168	18.45	15.72	H	065	226	-4.83	66.02	-47.57	46.02	-30.30	Pass
* 404.755	21.80	17.05	V	007	120	-3.63	66.02	-44.22	46.02	-28.97	Pass
487.953	21.55	19.52	V	062	173	-1.80	66.02	-44.47	46.02	-26.50	Pass
527.203	20.06	20.20	H	356	170	-1.42	66.02	-45.96	46.02	-25.82	Pass
645.137	22.91	21.84	V	342	111	0.48	66.02	-43.11	46.02	-24.18	Pass
692.405	24.58	22.19	H	357	102	0.92	66.02	-41.44	46.02	-23.83	Pass
797.555	24.87	24.17	V	111	115	2.92	66.02	-41.15	46.02	-21.85	Pass
851.758	25.60	24.50	H	055	230	3.48	66.02	-40.42	46.02	-21.52	Pass
* 964.36	26.61	25.67	V	187	173	4.81	73.98	-47.37	53.98	-28.31	Pass
* 974.227	27.03	25.55	H	001	220	4.76	73.98	-46.95	53.98	-28.43	Pass

* Restricted Band Signal

Test Results: The Lutron Model JPZ0148 LED Lighting Controller, operating in DTS mode and receive mode, comply with the requirements of 47 CFR Part 15.205 for restricted bands of operation with a margin of 9.33 dB.

4.5.4 DTS Radiated Spurious Emissions in Non-Restricted and Restricted Bands of Operation, 1 GHz – 18 GHz Test Results (07/18/2023)

Low Channel 37 (2402 MHz) GFSK 1 Mbps

CONFIGURATION TESTED	EUT Orientation (X Axis) Tx at Low Channel of 2402 MHz at 1 Mbps and Max Output Power (+12 dBm)

Frequency	Peak Level	Average Measured	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC 15.205/209: RSS-GEN/RSS-247 Average Limit	FCC 15.205/209: RSS-GEN/RSS-247 Average Margin	FCC 15.205/209: RSS-GEN/RSS-247 Peak Limit	FCC 15.205/209: RSS-GEN/RSS-247 Peak Margin	Result
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
* 4.80368	36.89	27.55	H	356	105	1.65	53.98	-26.43	73.98	-37.09	PASS
7.2052	43.55	32.83	H	216	159	4.14	53.98	-21.15	73.98	-30.43	PASS
9.6135	45.31	36.08	H	132	224	6.31	53.98	-17.90	73.98	-28.67	PASS
* 4.80333	38.26	28.70	V	115	101	1.65	53.98	-25.28	73.98	-35.72	PASS
7.1999	42.76	33.05	V	040	241	4.11	53.98	-20.93	73.98	-31.22	PASS
9.5946	45.32	35.96	V	032	130	6.34	53.98	-18.02	73.98	-28.66	PASS

* Restricted Band Signal

Middle Channel 17 (2440 MHz) GFSK 1 Mbps

CONFIGURATION TESTED	EUT Orientation (X Axis) Tx at Mid Channel of 2440 MHz at 1 Mbps and Max Output Power (+12 dBm)

Frequency	Peak Level	Average Measured	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC 15.205/209: RSS-GEN/RSS-247 Average Limit	FCC 15.205/209: RSS-GEN/RSS-247 Average Margin	FCC 15.205/209: RSS-GEN/RSS-247 Peak Limit	FCC 15.205/209: RSS-GEN/RSS-247 Peak Margin	Result
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
* 4.89143	36.72	28.08	H	099	137	1.91	53.98	-25.90	73.98	-37.27	PASS
* 7.31881	43.66	33.79	H	132	203	4.74	53.98	-20.19	73.98	-30.32	PASS
9.7515	45.36	35.77	H	249	196	6.19	53.98	-18.21	73.98	-28.62	PASS
* 4.87769	37.66	28.23	V	177	140	1.88	53.98	-25.75	73.98	-36.32	PASS
* 7.32871	44.66	33.81	V	197	205	4.76	53.98	-20.18	73.98	-29.32	PASS
9.7701	45.33	36.01	V	103	140	6.14	53.98	-17.97	73.98	-28.65	PASS

* Restricted Band Signal

High Channel 39 (2480 MHz) GFSK 1 Mbps

CONFIGURATION TESTED	EUT Orientation (X Axis) Tx at High Channel of 2480 MHz at 1 Mbps and Max Output Power (+12 dBm)

Frequency	Peak Level	Average Measured	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC 15.205/209: RSS-GEN/RSS-247 Average Limit	FCC 15.205/209: RSS-GEN/RSS-247 Average Margin	FCC 15.205/209: RSS-GEN/RSS-247 Peak Limit	FCC 15.205/209: RSS-GEN/RSS-247 Peak Margin	Result
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
* 4.95974	38.21	27.92	H	216	154	1.83	53.98	-26.06	73.98	-35.77	PASS
* 7.43954	44.81	33.85	H	063	100	4.75	53.98	-20.13	73.98	-29.17	PASS
9.9251	45.52	36.56	H	208	206	6.31	53.98	-17.42	73.98	-28.46	PASS
* 4.96951	36.42	26.82	V	148	134	1.84	53.98	-27.16	73.98	-37.56	PASS
* 7.44653	42.73	33.66	V	034	227	4.76	53.98	-20.32	73.98	-31.26	PASS
9.9257	46.58	36.47	V	226	215	6.31	53.98	-17.51	73.98	-27.40	PASS

* Restricted Band Signal

Low Channel 0 (2404 MHz) GFSK 2 Mbps

CONFIGURATION TESTED	EUT Orientation (X Axis) Tx at Low Channel of 2404 MHz at 2 Mbps and Max Output Power (+12 dBm)

Frequency	Peak Level	Average Measured	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC 15.205/209: RSS-GEN/RSS-247 Average Limit	FCC 15.205/209: RSS-GEN/RSS-247 Average Margin	FCC 15.205/209: RSS-GEN/RSS-247 Peak Limit	FCC 15.205/209: RSS-GEN/RSS-247 Peak Margin	Result
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
* 4.8141	36.79	27.23	H	262	135	1.69	53.98	-26.75	73.98	-37.19	PASS
7.2044	43.07	33.10	H	146	101	4.14	53.98	-20.88	73.98	-30.91	PASS
9.6203	45.20	35.82	H	201	188	6.29	53.98	-18.16	73.98	-28.78	PASS
* 4.8195	36.79	27.24	V	321	187	1.71	53.98	-26.74	73.98	-37.19	PASS
7.2158	45.55	32.61	V	038	126	4.20	53.98	-21.37	73.98	-28.43	PASS
9.6209	45.94	35.44	V	117	127	6.29	53.98	-18.54	73.98	-28.04	PASS

* Restricted Band Signal

Middle Channel 17 (2440 MHz) GFSK 2 Mbps

CONFIGURATION TESTED	EUT Orientation (X Axis) Tx at Mid Channel of 2440 MHz at 2 Mbps and Max Output Power (+12 dBm)

Frequency	Peak Level	Average Measured	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC 15.205/209: RSS-GEN/RSS-247 Average Limit	FCC 15.205/209: RSS-GEN/RSS-247 Average Margin	FCC 15.205/209: RSS-GEN/RSS-247 Peak Limit	FCC 15.205/209: RSS-GEN/RSS-247 Peak Margin	Result
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
* 4.87965	39.24	28.44	H	287	187	1.88	53.98	-25.54	73.98	-34.74	PASS
* 7.31775	43.88	33.80	H	344	132	4.74	53.98	-20.18	73.98	-30.11	PASS
9.7568	45.66	35.87	H	185	108	6.17	53.98	-18.11	73.98	-28.32	PASS
* 4.88018	39.63	28.31	V	176	114	1.88	53.98	-25.67	73.98	-34.35	PASS
* 7.31884	44.59	33.94	V	089	167	4.74	53.98	-20.04	73.98	-29.39	PASS
9.7646	46.49	36.08	V	115	160	6.15	53.98	-17.90	73.98	-27.49	PASS

* Restricted Band Signal

High Channel 39 (2480 MHz) GFSK 2 Mbps

CONFIGURATION TESTED	EUT Orientation (X Axis) Tx at High Channel of 2480 MHz at 2 Mbps and Max Output Power (+12 dBm)

Frequency	Peak Level	Average Measured	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC 15.205/209: RSS-GEN/RSS-247 Average Limit	FCC 15.205/209: RSS-GEN/RSS-247 Average Margin	FCC 15.205/209: RSS-GEN/RSS-247 Peak Limit	FCC 15.205/209: RSS-GEN/RSS-247 Peak Margin	Result
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
* 4.95871	36.30	27.02	H	058	128	1.83	53.98	-26.97	73.98	-37.68	PASS
* 7.43573	43.43	33.60	H	248	179	4.75	53.98	-20.39	73.98	-30.55	PASS
9.9255	46.13	36.01	H	159	106	6.31	53.98	-17.97	73.98	-27.85	PASS
* 4.9653	36.70	26.81	V	254	146	1.84	53.98	-27.17	73.98	-37.29	PASS
* 7.43257	44.30	33.62	V	004	217	4.75	53.98	-20.36	73.98	-29.68	PASS
9.9277	46.84	36.53	V	095	129	6.32	53.98	-17.46	73.98	-27.15	PASS

* Restricted Band Signal

Receive Mode

CONFIGURATION TESTED	EUT Orientation (X Axis) EUT in Rx Mode

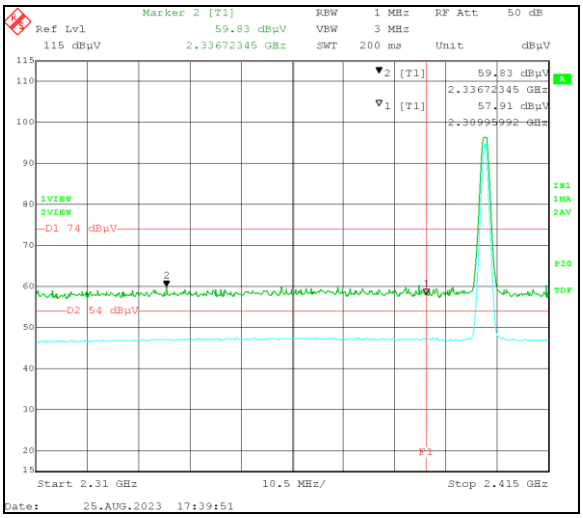
Frequency	Peak Level	Average Measured	Antenna Polarity	Turntable Angle	Antenna Height	Correction Factor	FCC 15.205/209: RSS-GEN/RSS-247 Average Limit	FCC 15.205/209: RSS-GEN/RSS-247 Average Margin	FCC 15.205/209: RSS-GEN/RSS-247 Peak Limit	FCC 15.205/209: RSS-GEN/RSS-247 Peak Margin	Result
GHz	dBuV/m	dBuV/m	H/V	degrees	cm	dB	dBuV/m	dB	dBuV/m	dB	
1.2907	29.70	19.94	V	155	101	-11.46	53.98	-34.04	73.98	-44.28	PASS
1.8566	31.38	21.74	H	050	155	-7.58	53.98	-32.25	73.98	-42.60	PASS
6.9147	44.51	32.86	V	001	103	3.67	53.98	-21.12	73.98	-29.47	PASS
7.8832	44.81	34.90	H	000	198	5.03	53.98	-19.08	73.98	-29.17	PASS
*11.1314	47.96	37.69	V	321	200	6.43	53.98	-16.29	73.98	-26.02	PASS
*11.2904	47.80	37.83	H	021	137	6.51	53.98	-16.15	73.98	-26.18	PASS

*Restricted Band Signal

Test Results: The Lutron Model JPZ0148 LED Lighting Controller, operating in DTS and receive modes, comply with the requirements of 47 CFR Part 15.205 with a margin of 16.15 dB.

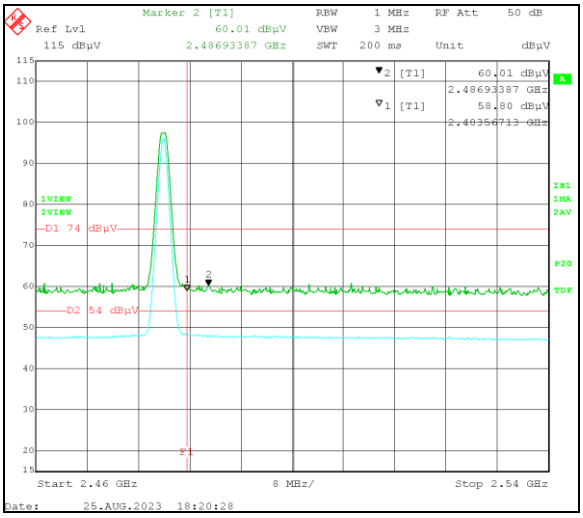
Radiated Band-Edge Low Channel 37 (2402.0 MHz @ 1 Mbps)

Transmit Channel and Frequency (GHz)	Frequency Measured	Modulation	Peak Measured	Average Measured	Peak Corrected	Average Corrected	Correction Factor	FCC Part 15.205/15/209	FCC Part 15.205/15/209 Average Limit	Peak Margin	Average Margin
			dBuV	dBuV	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dBuV
2.402 (Channel 37)	2.390	O-QPSK	57.91	47.06	52.51	41.66	-5.40	73.98	53.98	-21.47	-12.32
2.402 (Channel 37)	2.336		59.83	46.99	54.43	41.59	-5.40	73.98	53.98	-19.55	-12.39



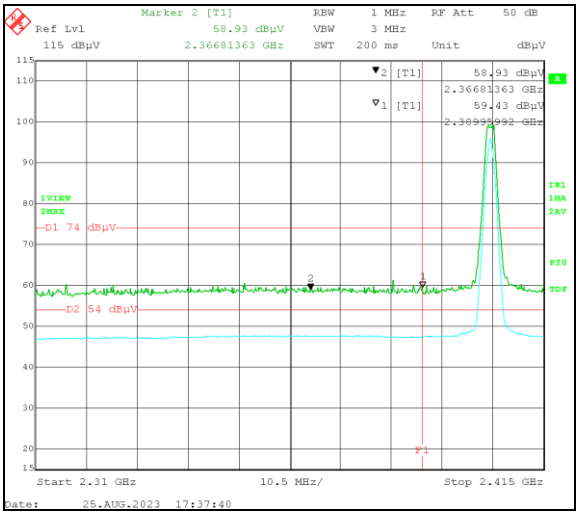
Radiated Band-Edge High Channel 39 (2480.0 MHz @ 1 Mbps)

Transmit Channel and Frequency (GHz)	Frequency Measured	Modulation	Peak Measured	Average Measured	Peak Corrected	Average Corrected	Correction Factor	FCC Part 15.205/15/209	FCC Part 15.205/15/209 Average Limit	Peak Margin	Average Margin
			dBuV	dBuV	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dBuV
2.480 (Channel 39)	2.484	O-QPSK	58.80	48.01	53.40	42.61	-5.40	73.98	53.98	-20.58	-11.37
2.480 (Channel 39)	2.487		60.01	47.84	54.61	42.44	-5.40	73.98	53.98	-19.37	-11.54



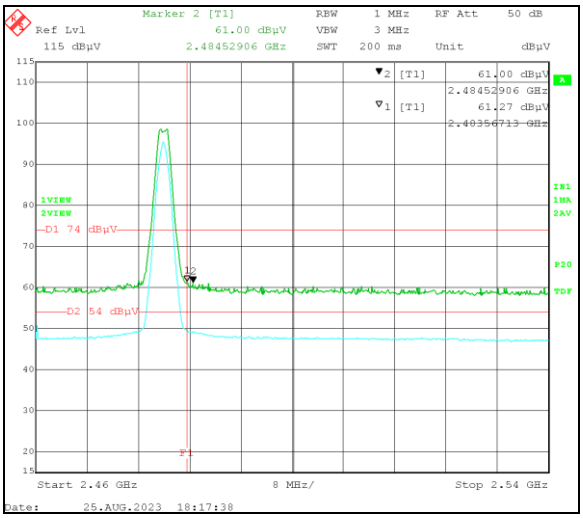
Radiated Band-Edge Low Channel 0 (2404.0 MHz @ 2 Mbps)

Transmit Channel and Frequency (GHz)	Frequency Measured	Modulation	Peak Measured	Average Measured	Peak Corrected	Average Corrected	Correction Factor	FCC Part 15.205/15.209 Average Limit	FCC Part 15.205/15/209 Average Limit	Peak Margin	Average Margin
			dBuV	dBuV	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dBuV
2.404 (Channel 0)	2.390	O-QPSK	59.43	47.06	54.03	41.66	-5.40	73.98	53.98	-19.95	-12.32
2.404 (Channel 0)	2.367		58.93	47.27	53.53	41.87	-5.40	73.98	53.98	-20.45	-12.11



Radiated Band-Edge High Channel 39 (2480.0 MHz @ 2 Mbps)

Transmit Channel and Frequency (GHz)	Frequency Measured	Modulation	Peak Measured	Average Measured	Peak Corrected	Average Corrected	Correction Factor	FCC Part 15.205/15.209 Average Limit	FCC Part 15.205/15/209 Average Limit	Peak Margin	Average Margin
			dBuV	dBuV	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dBuV
2.480 (Channel 39)	2.484	O-QPSK	61.27	49.30	55.87	43.90	-5.40	73.98	53.98	-18.11	-10.08
2.480 (Channel 39)	2.485		61.00	49.15	55.60	43.75	-5.40	73.98	53.98	-18.38	-10.23



4.5.5 DTS Radiated Spurious Emissions in Non-Restricted and Restricted Bands of Operation, 18 GHz – 25 GHz Test Results (07/18/2023 and 07/19/2023)

Measurements were made in the frequency range of 18 GHz to 25 GHz for the Lutron Model JPZ0148 LED Lighting Controller. The sample was tested at the low Channel 37 (2402 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for 1 Mbps and at the low Channel 0 (2404 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for 2 Mbps. The EUT was set to transmit a signal at maximum output power with GFSK modulation. The EUT was also tested in the Rx Mode. There were no significant signals found when testing the EUT in this frequency range. Test results for all configurations tested are available upon request.

4.6 DTS 6 dB Occupied Bandwidth (FCC Section 15.247(a)(2))

4.6.1 6 dB Occupied Bandwidth – Test Procedure

The minimum DTS (6 dB) bandwidth, specified in FCC Section 15.247(a) (2) and RSS-247 Section 5.5 was measured using a Spectrum Analyzer with 100 kHz resolution bandwidth and 300 kHz video bandwidth. Transmission frequencies at low Channel 37 (2402 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for 1 Mbps and at the low Channel 0 (2404 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for 2 Mbps were tested. The EUT was set to transmit a signal at maximum output power with GFSK modulation. The test procedure of ANSI C63.10, Section 11.8, Option 1, was used.

Spectrum Analyzer Settings:

RBW	100	kHz
VBW	300	kHz
Span	5	MHz
Sweep Time (Auto)	5	ms

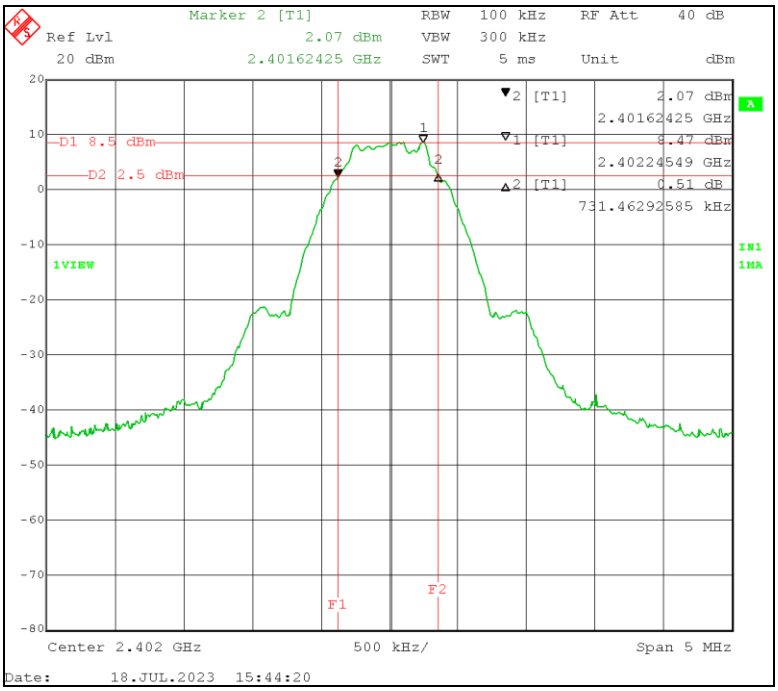
4.6.2 DTS (6 dB) Occupied Bandwidth Test Results (07/18/2023)

Tx Channel With 2FSK Modulation and 1 Mbps Data Rate	Frequency	Measured 6 dB BW	47 CFR 15.247(a)(2) & RSS-247 5.2 Minimum Limit	Margin	Result
	MHz	kHz	kHz	kHz	
37	2402.0	731.46	500.00	231.46	PASS
17	2440.0	721.44	500.00	221.44	PASS
39	2480.0	721.44	500.00	221.44	PASS

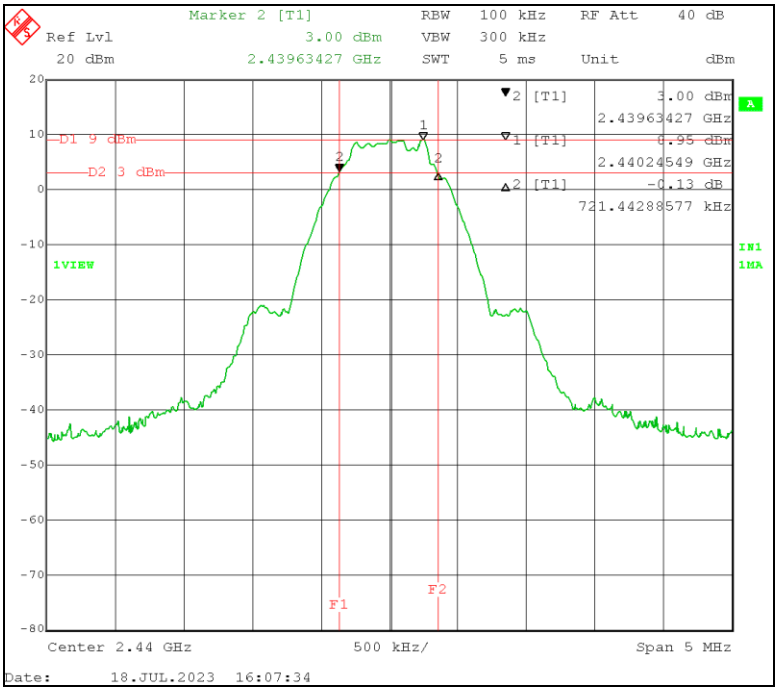
Tx Channel With 2FSK Modulation and 2 Mbps Data Rate	Frequency	Measured 6 dB BW	47 CFR 15.247(a)(2) & RSS-247 5.2 Minimum Limit	Margin	Result
	MHz	kHz	kHz	kHz	
0	2404.0	1362.72	500.00	862.72	PASS
17	2440.0	1362.72	500.00	862.72	PASS
39	2480.0	1342.69	500.00	842.69	PASS

4.6.3 DTS (6 dB) Occupied Bandwidth Analyzer Screen Captures

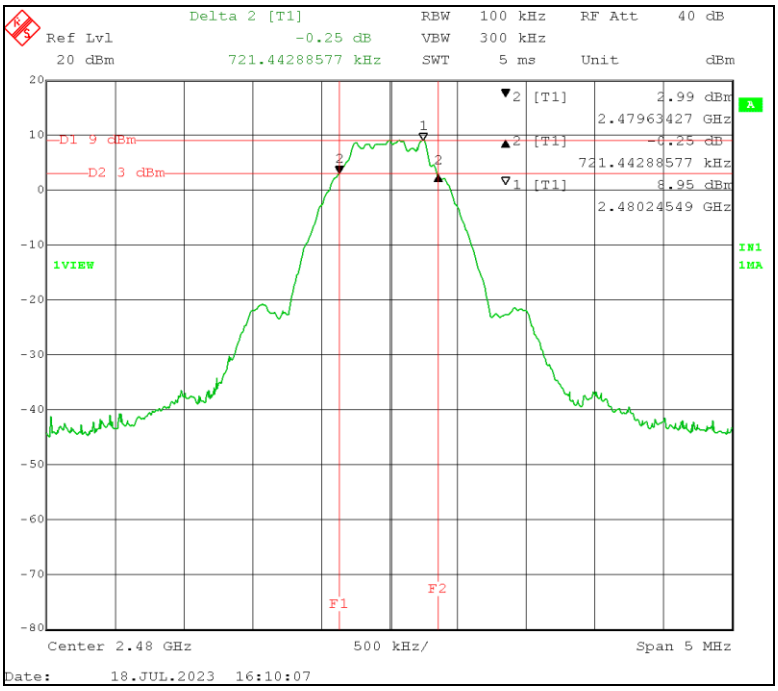
Channel 37: 2402 MHz GFSK 1 Mbps



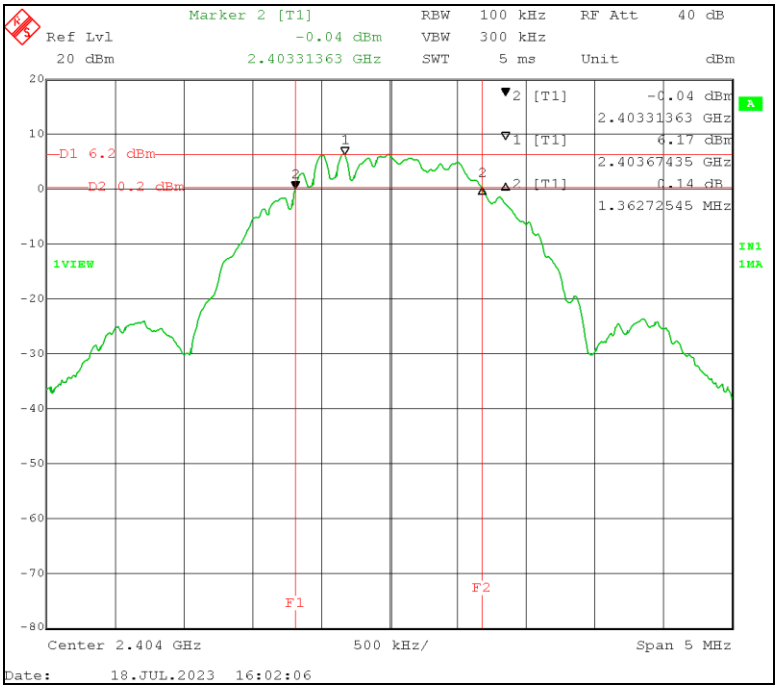
Channel 17: 2440 MHz GFSK 1 Mbps



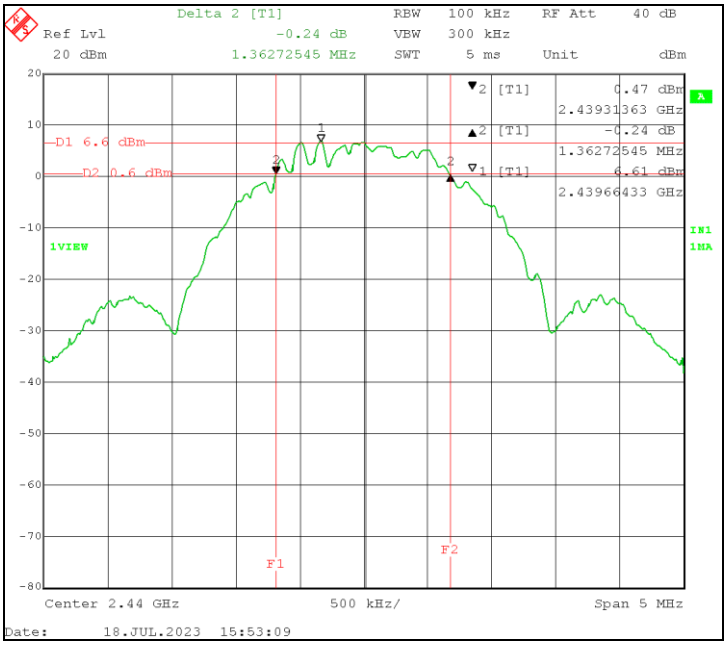
Channel 39: 2480 MHz GFSK 1 Mbps



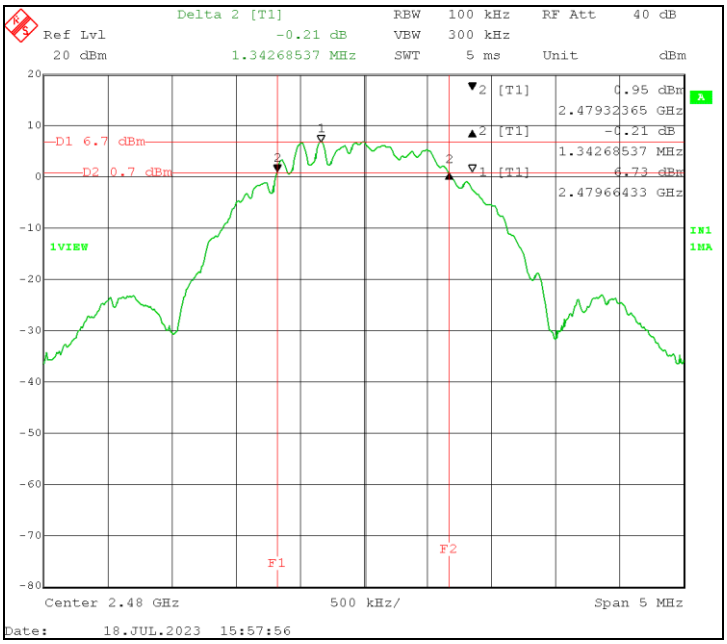
Channel 0: 2404 MHz GFSK 2 Mbps



Channel 17: 2440 MHz GFSK 2 Mbps



Channel 39: 2480 MHz GFSK 2 Mbps



Test Results: The DTS, 6 dB Occupied Bandwidth measurements for the Lutron Model JPZ0148 LED Lighting Controller were measured and are compliant to FCC requirements.

4.7 Maximum Conducted Output Power (FCC Part 15.247(b)(3))

4.7.1 Maximum Conducted Output Power Test Procedure

A conducted power measurement of the output frequency was measured according to ANSI C63.10, Section 11.9.1.1. Spectrum Analyzer Resolution Bandwidth and Frequency Span were based upon the Operating Bandwidth (OBW) measured in the previous section. Transmission frequencies at low Channel 37 (2402 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for 1 Mbps and at the low Channel 0 (2404 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for 2 Mbps were tested. The EUT was set to transmit a signal at maximum output power with GFSK modulation or without modulation.

Spectrum Analyzer Settings:

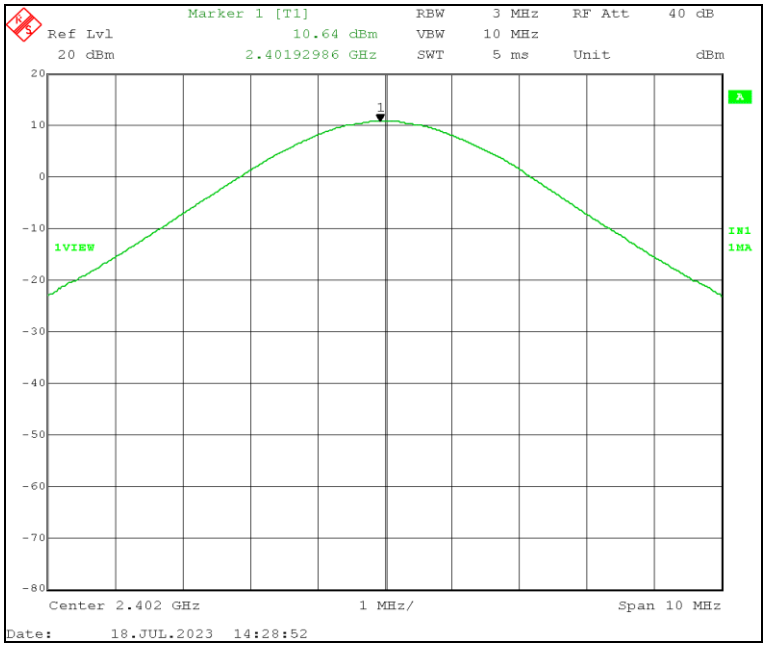
Measurement Analyzer Settings	
Span	10 MHz
RBW	3 MHz
VBW	10 MHz
Sweep Time (Auto)	5 ms

4.7.2 Maximum Conducted Output Power Test Results (07/18/2023)

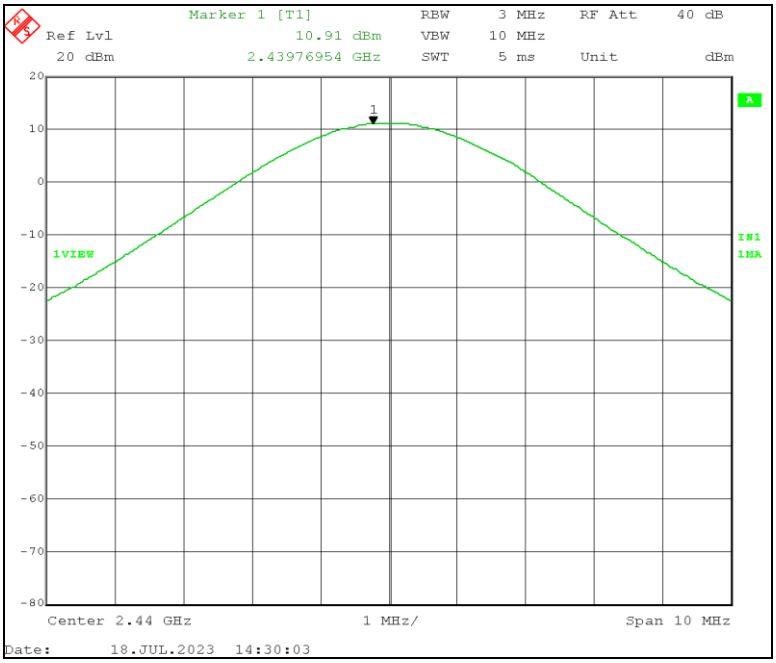
BLE Tx Channel	Modulation	Frequency (MHz)	Measured Level (dBm)	Cable # 962 Loss (dB)	Corrected Measured Level		Limit		Margin	
					dBm	Watts	dBm	Watts	dBm	Watts
37	None	2402.0	10.64	0.377	11.02	0.013	30.00	1.000	-18.98	-0.987
17		2440.0	10.91	0.375	11.29	0.013	30.00	1.000	-18.72	-0.987
39		2480.0	11.07	0.377	11.45	0.014	30.00	1.000	-18.55	-0.986
37	1 Mbps with 2FSK	2402.0	10.50	0.377	10.88	0.012	30.00	1.000	-19.12	-0.988
17		2440.0	10.91	0.375	11.29	0.013	30.00	1.000	-18.72	-0.987
39		2480.0	10.91	0.377	11.29	0.013	30.00	1.000	-18.71	-0.987
0	2 Mbps with 2FSK	2404.0	10.50	0.377	10.88	0.012	30.00	1.000	-19.12	-0.988
17		2440.0	10.91	0.375	11.29	0.013	30.00	1.000	-18.72	-0.987
39		2480.0	11.07	0.377	11.45	0.014	30.00	1.000	-18.55	-0.986

4.7.3 Maximum Conducted Output Power Analyzer Screen Captures

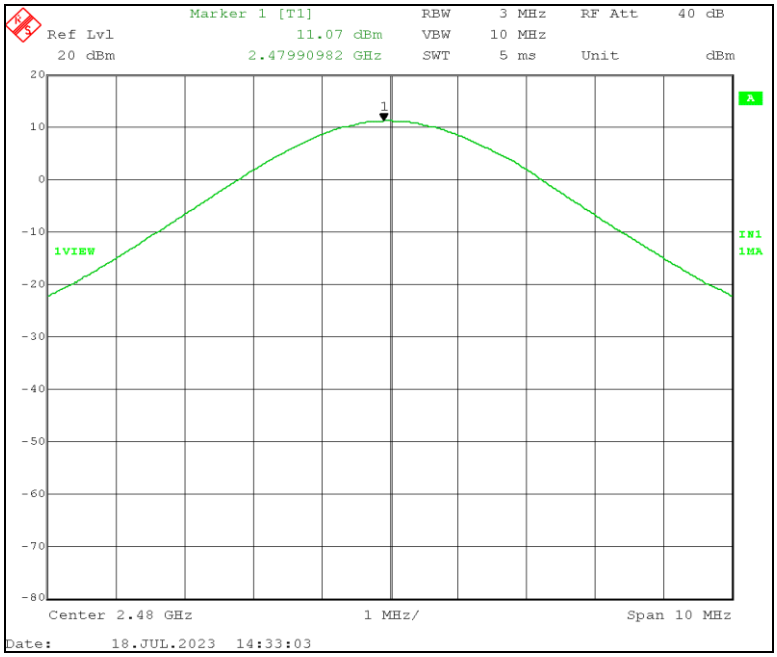
Channel 37: 2402 MHz No Modulation



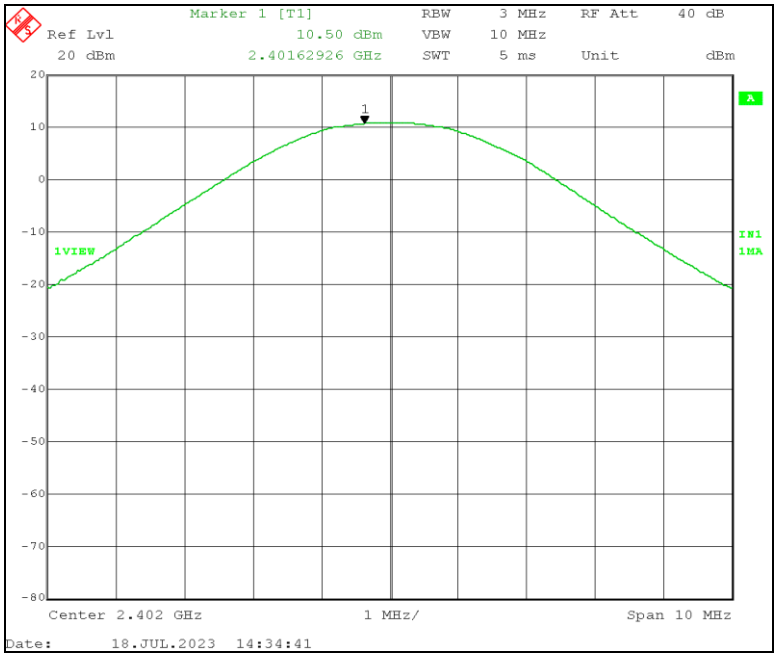
Channel 17: 2440 MHz No Modulation



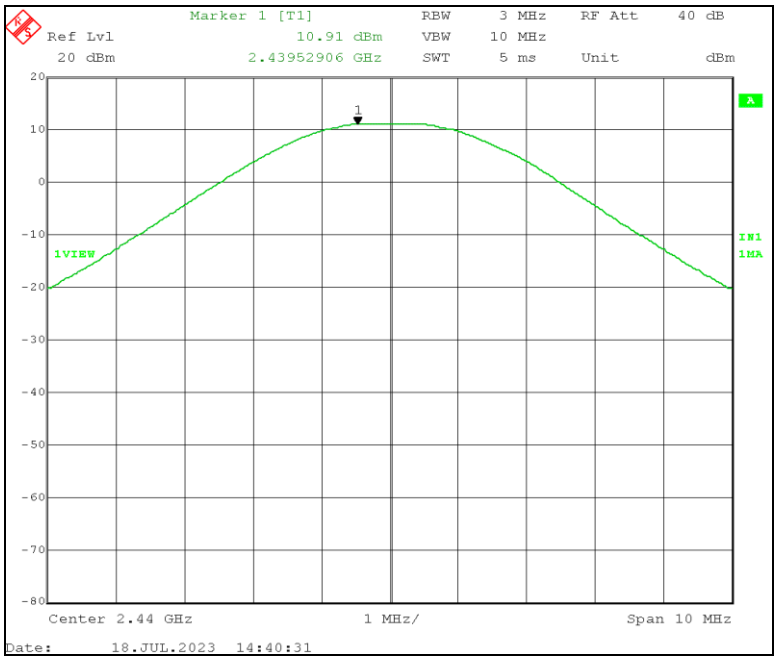
Channel 39: 2480 MHz No Modulation



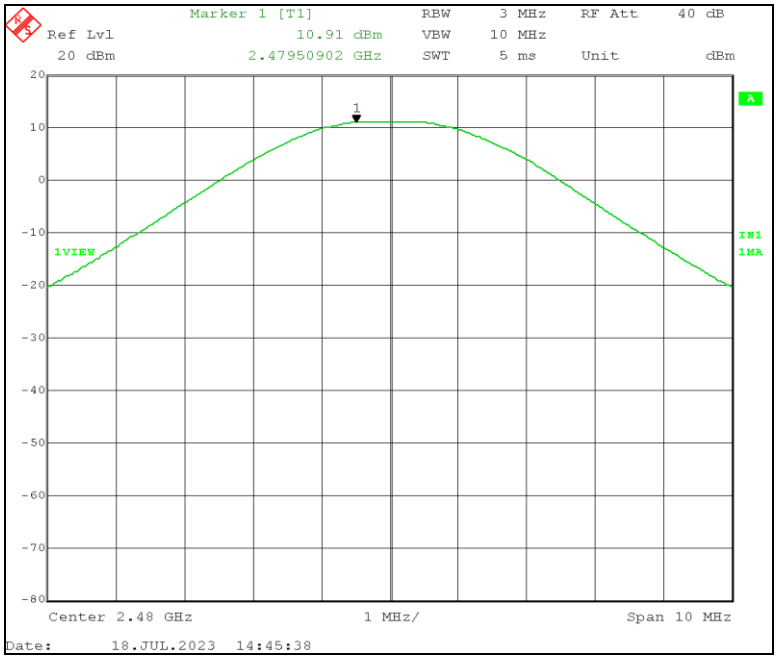
Channel 37: 2402 MHz GFSK Modulation 1 Mbps



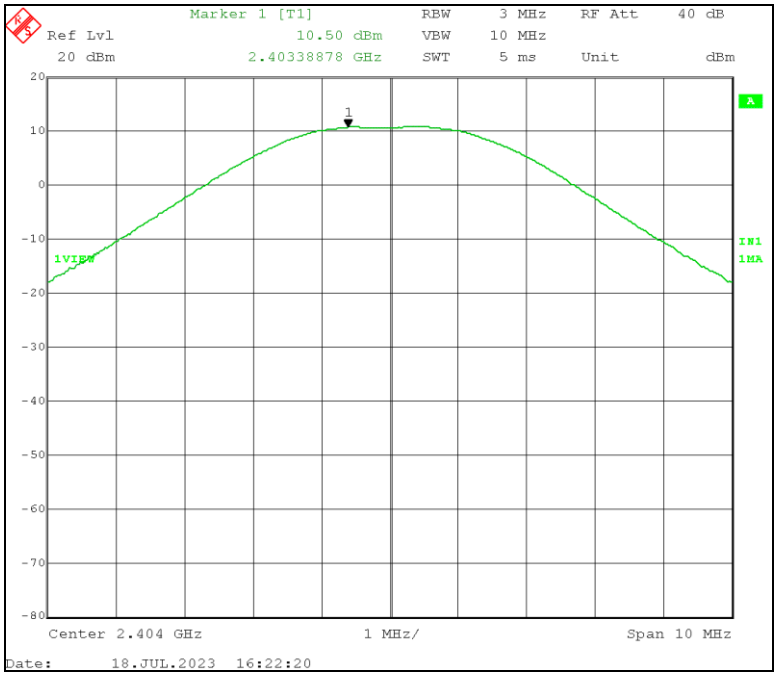
Channel 17: 2440 MHz GFSK Modulation 1 Mbps



Channel 39: 2480 MHz GFSK Modulation 1 Mbps

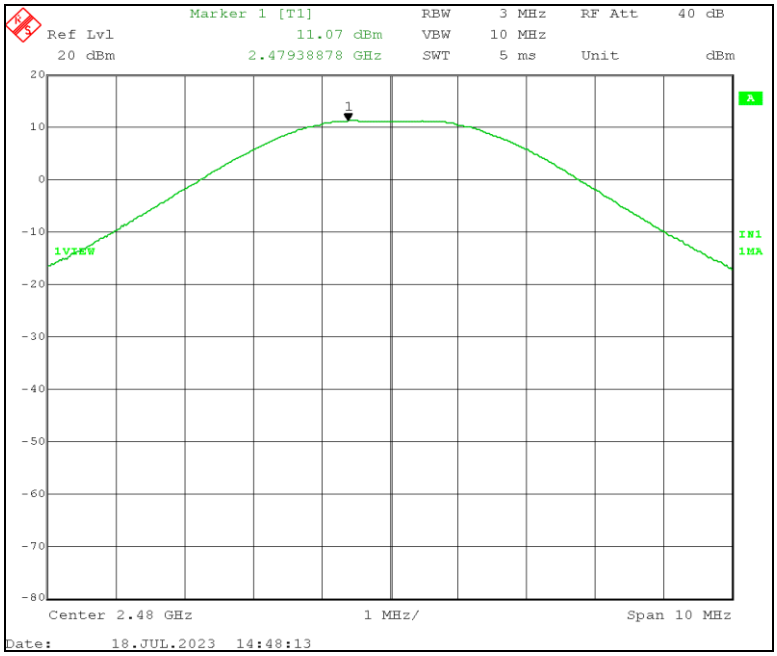


Channel 0: 2404 MHz GFSK Modulation 2 Mbps



Channel 17: 2440 MHz GFSK Modulation 2 Mbps

Channel 39: 2480 MHz GFSK Modulation 2 Mbps



Test Results: The Maximum Conducted Output Power peak measurements for the Lutron Model JPZ0148 LED Lighting Controller, with and without modulation, are compliant with the limits specified in FCC Section 15.247(b)(3).

4.8 Power Spectral Density (FCC Section 15.247(e))

4.8.1 Power Spectral Density Test Procedure

A conducted power measurement of the output frequency was measured using a peak detector for the Lutron Model JPZ0148 LED Lighting Controller BLE transmitter. Transmission frequencies at low Channel 37 (2402 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for 1 Mbps and at the low Channel 0 (2404 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for 2 Mbps were tested. The EUT was set to transmit a signal at maximum output power with GFSK modulation. The test procedure of ANSI C63.10, Section 11.10.2 (PKPSD) was used.

Spectrum Analyzer Settings:

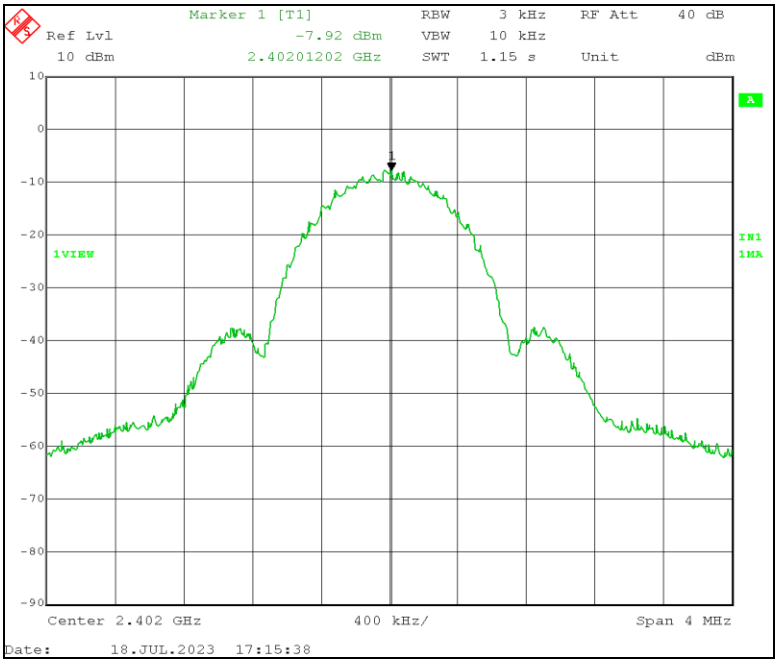
Measurement Analyzer Settings		
RBW (Between 3 kHz and 100 kHz)	3	kHz
VBW (3 X RBW)	10	kHz
Span (>1.5 X the DTS Bandwidth)	2 MHz for 1 Mbps and 4 MHz for 2 Mbps	MHz
Sweep (Auto)	1.15	sec
Attenuation	40	dB
Ref Level	10	dBm

4.8.2 Power Spectral Density Test Results (07/18/2023)

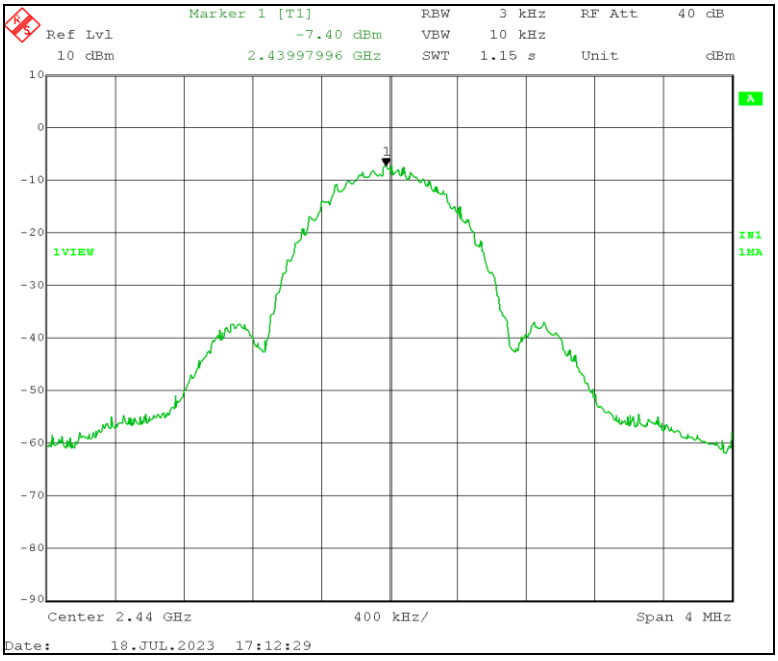
Channel	Modulation Information	Frequency (MHz)	Measured Level	Cable #BEC-962 Correction Factor	Total	Limit	Margin
			dBm	dB	dBm	dBm	dBm
37	1 Mbps Data Rate with 2FSK Modulation	2402.0	-7.92	0.377	-7.54	8.00	-15.54
17		2440.0	-7.40	0.375	-7.03	8.00	-15.03
39		2480.0	-7.38	0.377	-7.00	8.00	-15.00
0	2 Mbps Data Rate with 2FSK Modulation	2404.0	-10.56	0.377	-10.18	8.00	-18.18
17		2440.0	-10.11	0.375	-9.74	8.00	-17.74
39		2480.0	-9.98	0.377	-9.60	8.00	-17.60

4.8.3 Power Spectral Density Analyzer Screen Captures

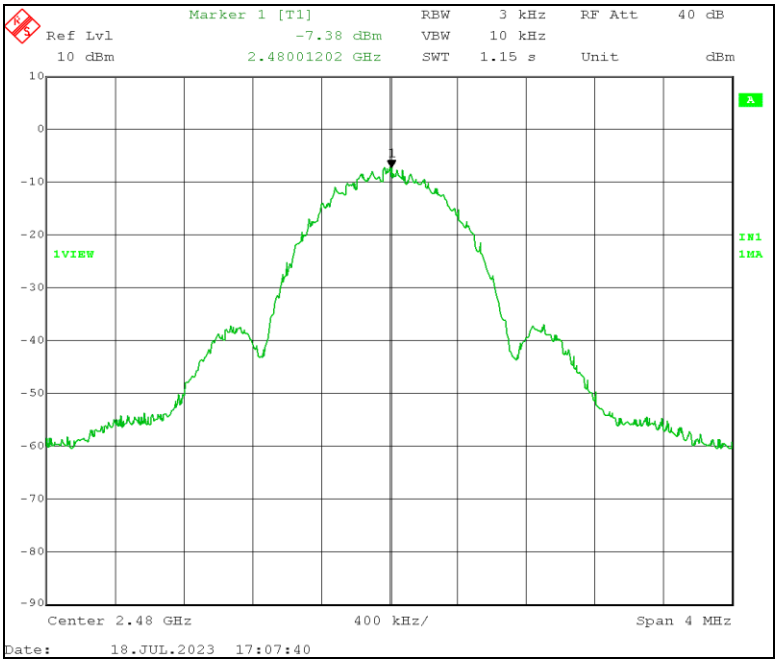
Channel 39, 2402 MHz, GFSK Modulation 1 Mbps



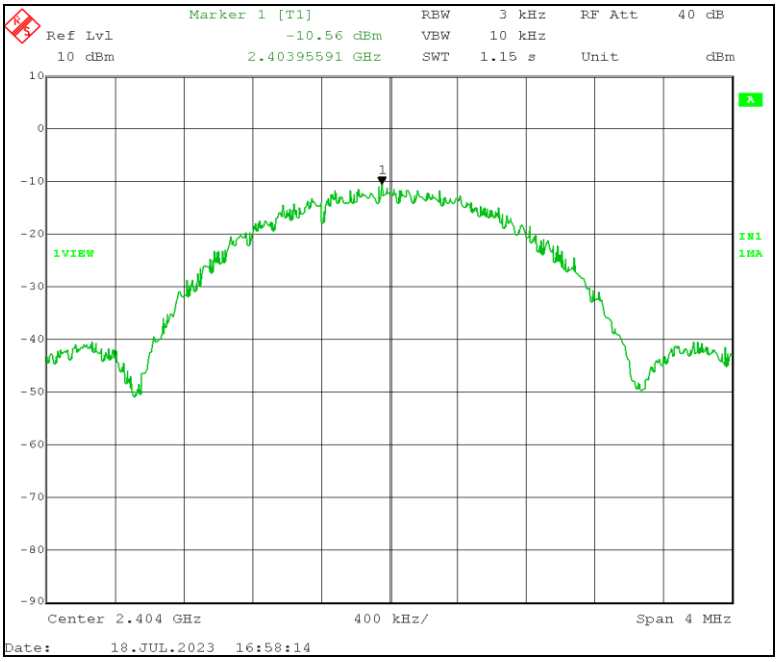
Channel 17, 2440 MHz, GFSK Modulation 1 Mbps



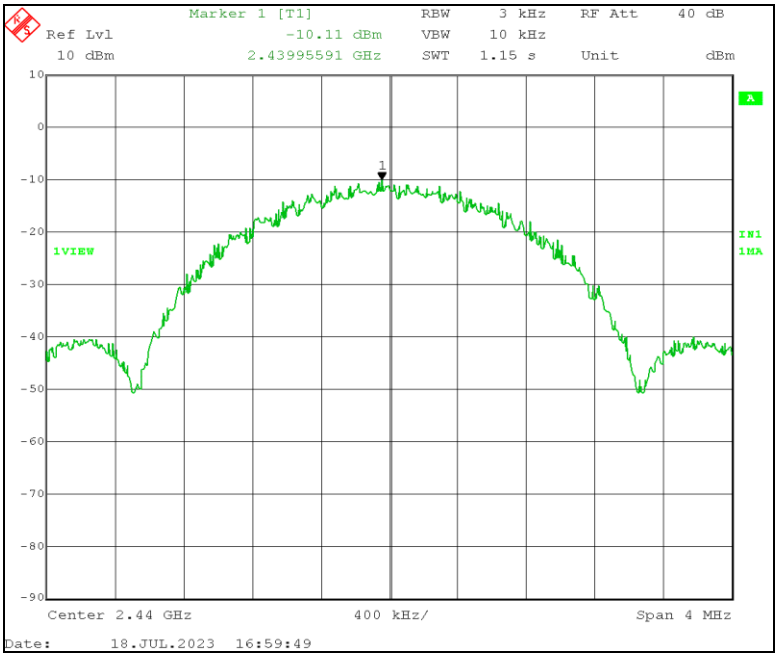
Channel 37, 2480 MHz, GFSK Modulation 1 Mbps



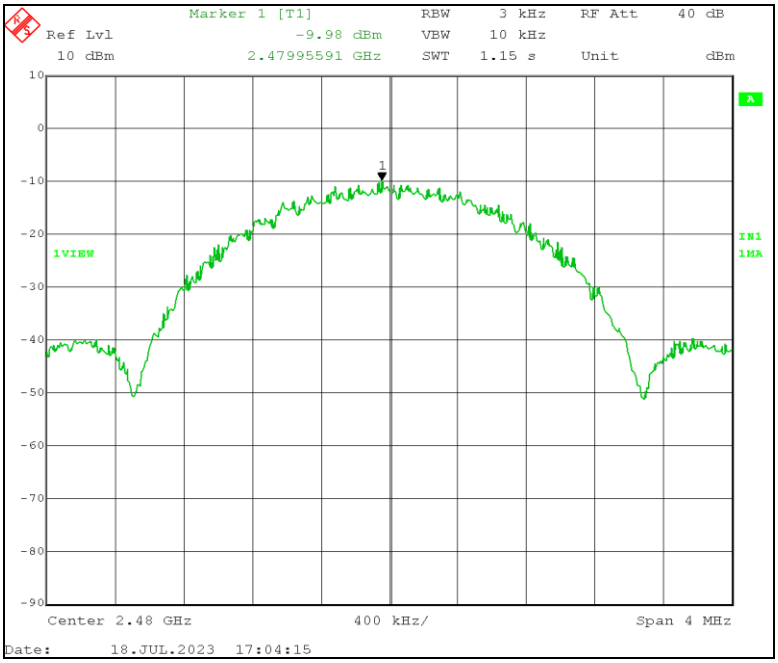
Channel 0, 2404 MHz, GFSK Modulation 2 Mbps



Channel 17, 2440 MHz, GFSK Modulation 2 Mbps



Channel 37, 2480 MHz, GFSK Modulation 2 Mbps



Test Results: The Power Spectral Density measurements of the Lutron Model JPZ0148 LED Lighting Controller are compliant with the limits specified in FCC Section 15.247(e).

4.9 Band Edge Measurement (FCC Part 15.247(d))

4.9.1 Band Edge Measurement Test Procedure

Band edge measurements were recorded on the EUT while operating with a modulated carrier at the low transmitter channel of 2402 MHz (Channel 37) and high transmitter channel of 2480 MHz (Channel 39) for the 1 Mbps Data Rate. Band edge measurements were recorded on the EUT while operating with a modulated carrier at the low transmitter channel of 2404 MHz (Channel 0) and high transmitter channel of 2480 MHz (Channel 39) for the 2 Mbps Data Rate. The Authorized Band Edge measurements were made using the Relative Method of Section 6.10.4 of ANSI C63.10. The Spectrum Analyzer Screens below show emissions between the modulated carrier, at low and high frequencies and the lower and upper band edges.

Spectrum Analyzer Settings:

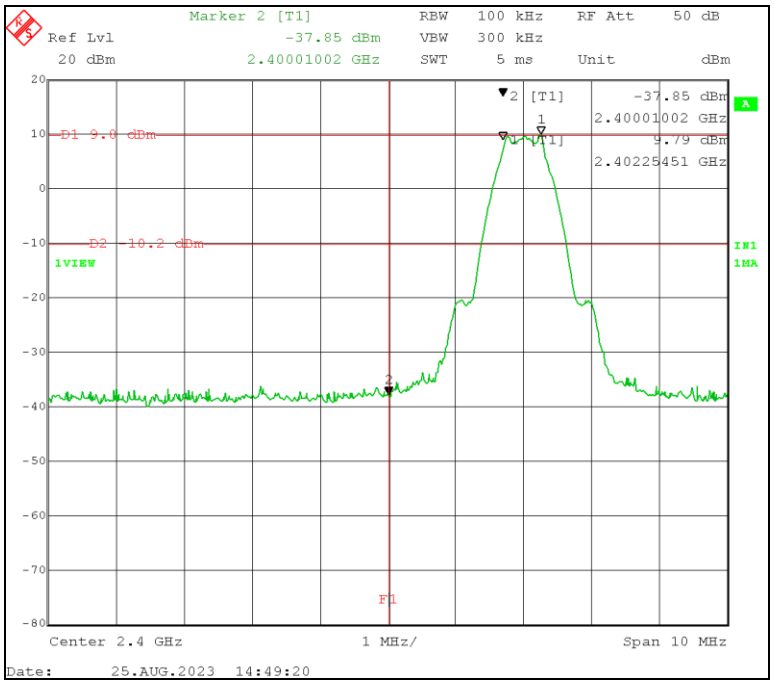
Measurement Analyzer Settings	
RBW	100 kHz
VBW	300 kHz
Span	10 MHz on the Low End (1 Mbps) and 20 MHz on the Low End (2 Mbps); 10 MHz on the High End (2 Mbps) and 15 MHz on the High End (2 Mbps)
Sweep	5 ms

4.9.2 Band Edge Measurement Test Results (08/25/2023)

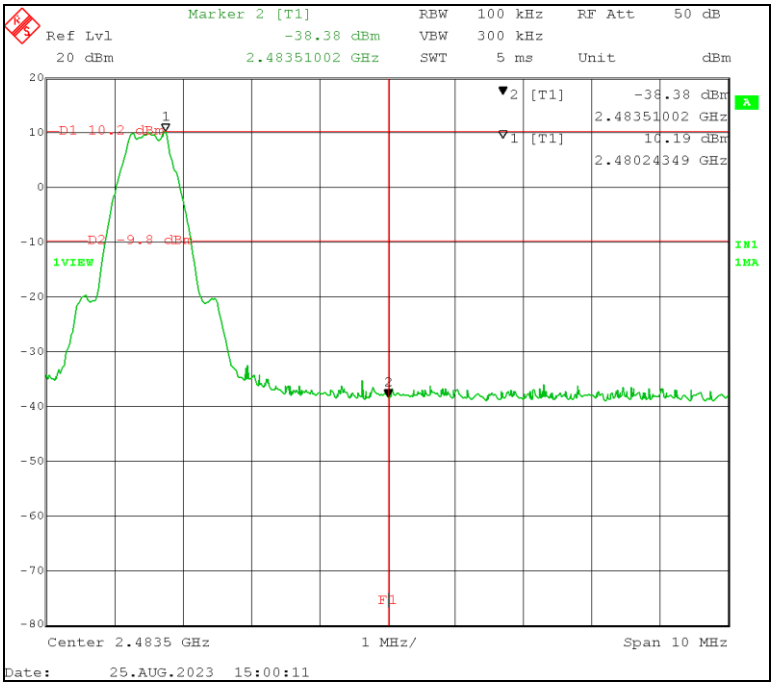
Test Mode	Frequency (MHz)	Peak Transmit Measurement	Band Edge Measurement				Result
			Peak Level @ 100 kHz Below the Lower Band or Peak Level @ 100 kHz Above the Higher Band	Limit (dB)	Delta	Margin	
Tx at Maximum Output Power 1 Mbps Data Rate	2402.0	9.79	-37.85	20.00	47.64	-27.64	PASS
Tx at Maximum Output Power 1 Mbps Data Rate	2480.0	10.19	-38.38	20.00	48.57	-28.57	PASS
Tx at Maximum Output Power 2 Mbps Data Rate	2404.0	7.60	-36.29	20.00	43.89	-23.89	PASS
Tx at Maximum Output Power 2 Mbps Data Rate	2480.0	7.93	-34.99	20.00	42.92	-22.92	PASS

4.9.3 Band Edge Measurement Analyzer Screen Captures

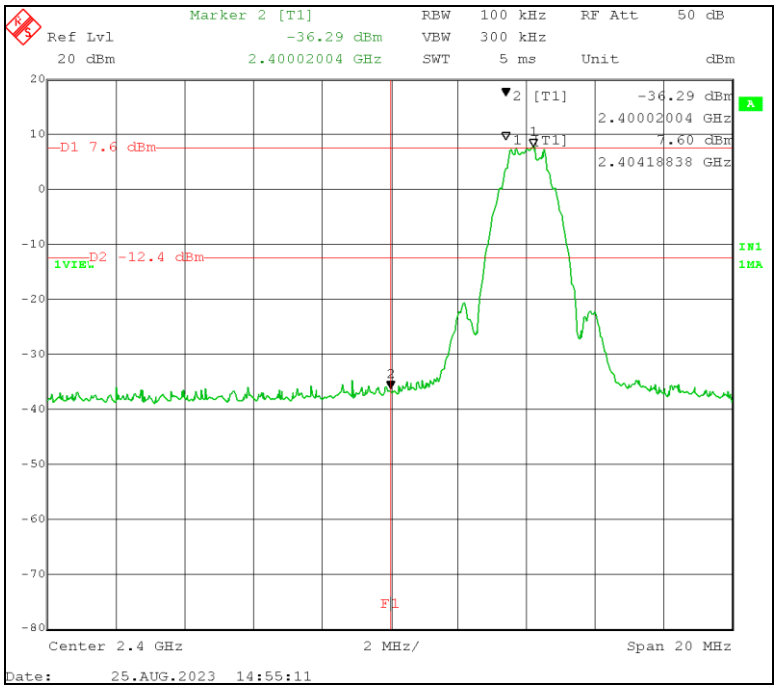
Channel 37, 2402 MHz, GFSK Modulation 1 Mbps



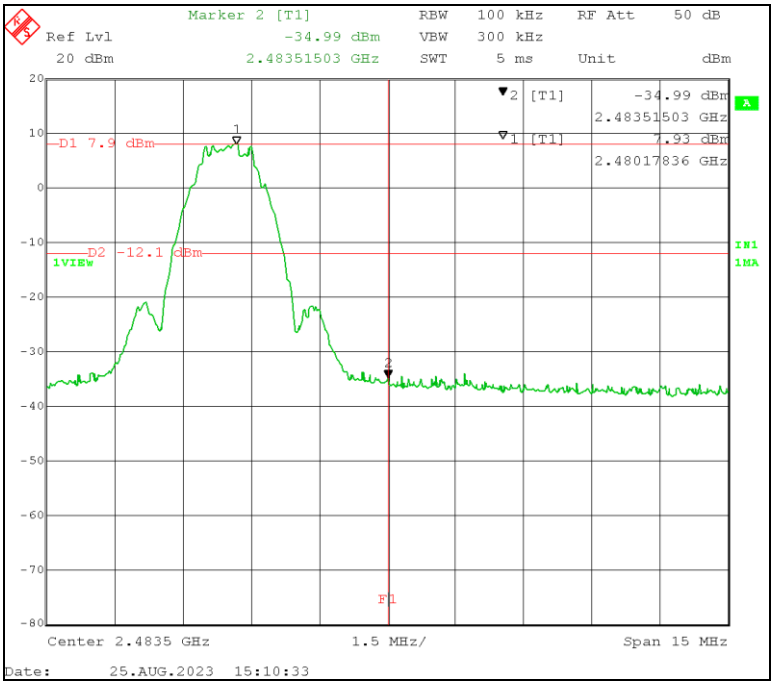
Channel 39, 2480 MHz, GFSK Modulation 1 Mbps



Channel 0, 2404 MHz, GFSK Modulation 2 Mbps



Channel 37, 2480 MHz, GFSK Modulation 2 Mbps



Test Results: The Band Edge measurements of the Lutron Model JPZ0148 LED Lighting Controller show that emissions at the band edges of the Operating Frequency Bandwidth are below the Carrier Peak Level – 20 dBc required by 47 CFR Part 15.247(d).

4.10 Conducted Emissions

4.10.1 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 µH 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 (dBµV) = Meter Reading (dBµv) + Cable Loss (dB) + LISN Factor (dB) + Limiter Loss (dB)

The Lutron JPZ0148 Sample 2259-01 was powered by the Lutron Electronics Model T120-24DC-15 Sample 2259-05 at 120 Vac / 60 Hz. Transmission frequencies at low Channel 37 (2402 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for 1 Mbps and at the low Channel 0 (2404 MHz), middle Channel 17 (2440 MHz) and high Channel 39 (2480 MHz) for 2 Mbps were tested. The EUT was set to transmit a signal at maximum output power with GFSK modulation and also tested while operating in the Receive Mode (Rx).

Fundamental Frequencies	Tx Low Channel at 2402 MHz for the 1 Mbps Data Rate and 2404 MHz for the 2 Mbps Data Rate, Tx Middle Channel at 2440 MHz and Tx High Channel at 2480 MHz	Receive Mode (Rx)
Test Standards / Limits	47 CFR 15.207	
EUT Type	Radiated Sample transmitting in Constant Stream Mode	Radiated Sample in Receive Mode
Manufacturer	Lutron Electronics	
Model	T120-24DC-15	
Sample Number	2259-05	
EUT Power	120 Vac / 60 Hz	
Test Date	06/12/2023, 07/20/2023	
Temperature / Humidity	25°C / 51% RH, 23°C / 53% RH	
Test Configuration	Lutron Model JPZ0148 Sample 2259-01 was powered by the Lutron Electronics AC/DC Power Supply. EUT was configured to be either in a transmit mode or the receive mode during testing.	

4.11.2 Conducted Emissions AC Power Port Test Results (06/14/2023 and 07/20/2023)

Tx @ Low Channel, 2402 MHz FSK with 1 Mbps Data Rate, Neutral Line

BEC Incorporated
Neutral Line Conducted Emissions
01:56:50 PM, Thursday, July 20, 2023

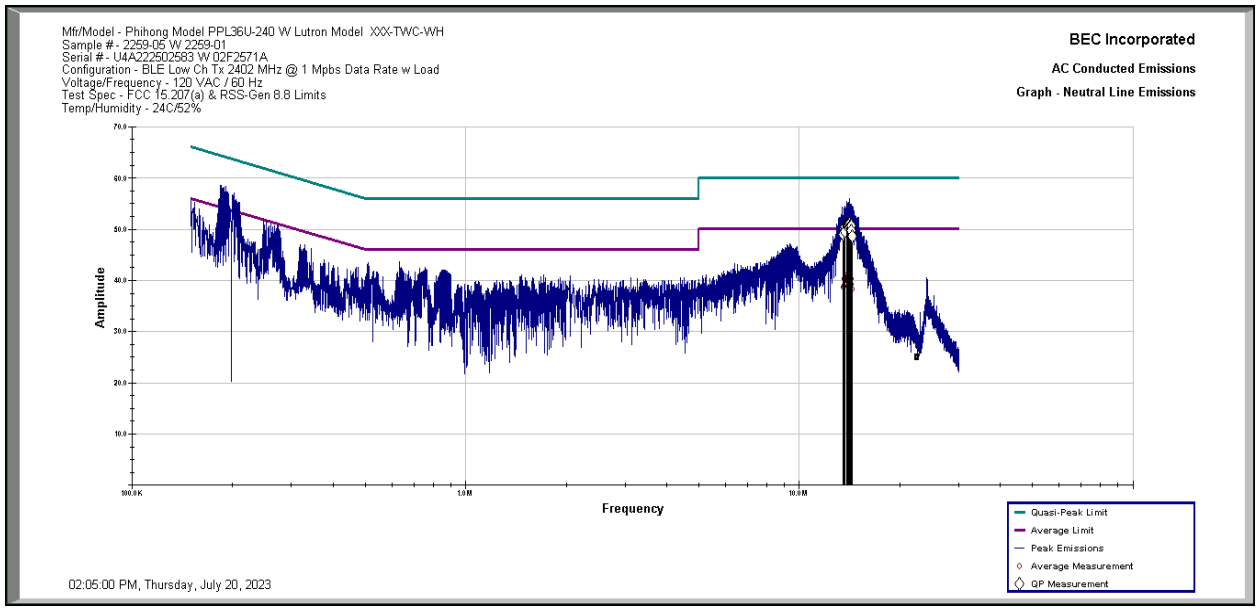
	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
13.474 MHz	38.74	50.00	-11.26	48.93	60.00	-11.07	10.50
13.554 MHz	40.27	50.00	-9.73	49.84	60.00	-10.16	10.50
13.590 MHz	38.77	50.00	-11.23	50.09	60.00	-9.91	10.50
13.594 MHz	39.09	50.00	-10.91	50.12	60.00	-9.88	10.50
13.706 MHz	40.99	50.00	-9.01	50.35	60.00	-9.65	10.50
13.717 MHz	39.38	50.00	-10.62	49.55	60.00	-10.45	10.50
13.823 MHz	40.32	50.00	-9.68	50.80	60.00	-9.20	10.50
13.903 MHz	40.92	50.00	-9.08	50.75	60.00	-9.25	10.50
13.990 MHz	39.74	50.00	-10.26	50.37	60.00	-9.63	10.50
13.991 MHz	40.40	50.00	-9.60	50.80	60.00	-9.20	10.50
14.035 MHz	39.97	50.00	-10.03	50.88	60.00	-9.12	10.50
14.047 MHz	40.55	50.00	-9.45	50.76	60.00	-9.24	10.50
14.047 MHz	40.50	50.00	-9.50	50.59	60.00	-9.41	10.50
14.160 MHz	40.63	50.00	-9.37	50.92	60.00	-9.08	10.50
14.182 MHz	39.36	50.00	-10.64	50.40	60.00	-9.60	10.50
14.188 MHz	40.14	50.00	-9.86	50.58	60.00	-9.42	10.50
14.190 MHz	40.26	50.00	-9.74	50.42	60.00	-9.58	10.50
14.281 MHz	40.25	50.00	-9.75	50.63	60.00	-9.37	10.50
14.318 MHz	39.31	50.00	-10.69	49.79	60.00	-10.21	10.50
14.378 MHz	38.31	50.00	-11.69	48.56	60.00	-11.44	10.50
Mfr/Model - Phihong Model PPL36U-240 W Lutron Model XXX-TWC-WH							
Sample # - 2259-05 W 2259-01							
Serial # - U4A222502583 W 02F2571A							
Configuration - BLE Low Ch Tx 2402 MHz @ 1 Mpbs Data Rate w Load							
Voltage/Frequency - 120 VAC / 60 Hz							

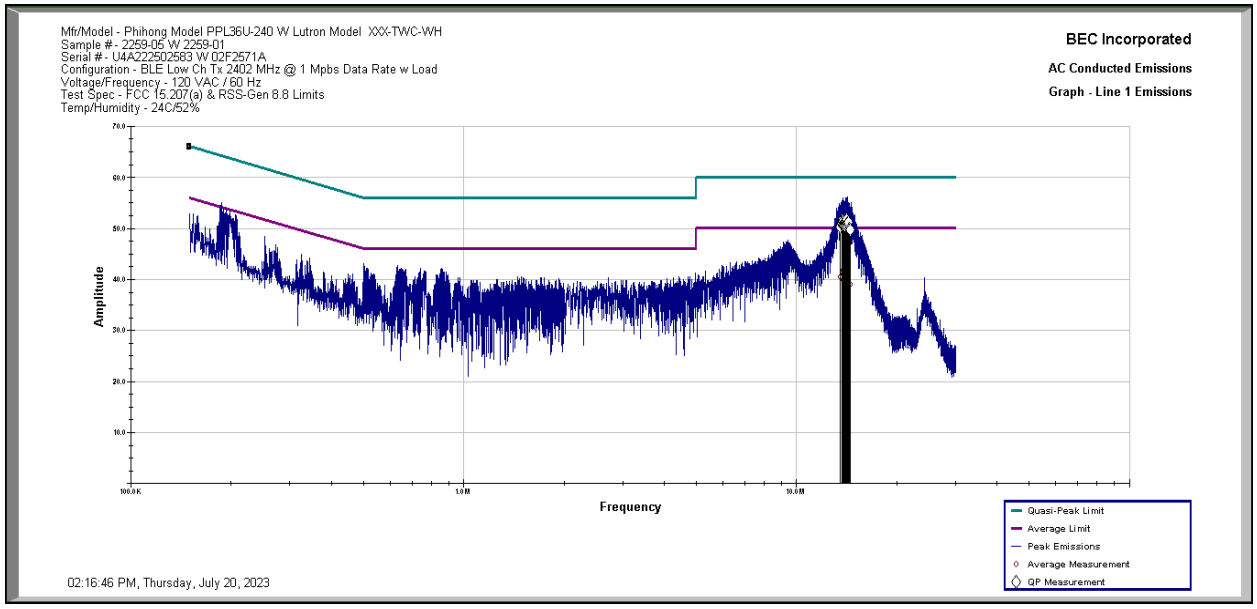
Tx @ Low Channel, 2402 MHz FSK with 1 Mbps Data Rate, Phase Line

BEC Incorporated
Line 1 Conducted Emissions
02:08:35 PM, Thursday, July 20, 2023

	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
13.540 MHz	40.42	50.00	-9.58	50.25	60.00	-9.75	10.48
13.674 MHz	41.21	50.00	-8.79	50.88	60.00	-9.12	10.48
13.677 MHz	41.60	50.00	-8.40	51.50	60.00	-8.50	10.48
13.700 MHz	41.40	50.00	-8.60	51.14	60.00	-8.86	10.48
13.716 MHz	41.25	50.00	-8.75	51.07	60.00	-8.93	10.48
13.730 MHz	39.92	50.00	-10.08	50.86	60.00	-9.14	10.48
13.758 MHz	41.73	50.00	-8.27	51.33	60.00	-8.67	10.48
13.795 MHz	41.07	50.00	-8.93	50.81	60.00	-9.19	10.48
13.898 MHz	41.61	50.00	-8.39	50.96	60.00	-9.04	10.48
13.941 MHz	40.32	50.00	-9.68	50.99	60.00	-9.01	10.48
13.944 MHz	39.75	50.00	-10.25	50.60	60.00	-9.40	10.48
14.070 MHz	41.93	50.00	-8.07	51.41	60.00	-8.59	10.48
14.095 MHz	41.08	50.00	-8.92	51.15	60.00	-8.85	10.48
14.138 MHz	42.00	50.00	-8.00	51.78	60.00	-8.22	10.48
14.146 MHz	40.59	50.00	-9.41	50.81	60.00	-9.19	10.48
14.157 MHz	39.41	50.00	-10.59	50.60	60.00	-9.40	10.48
14.239 MHz	41.30	50.00	-8.70	51.06	60.00	-8.94	10.48
14.313 MHz	40.28	50.00	-9.72	51.14	60.00	-8.86	10.48
14.354 MHz	39.29	50.00	-10.71	49.99	60.00	-10.01	10.48
14.528 MHz	39.08	50.00	-10.92	49.69	60.00	-10.31	10.47
Mfr/Model - Phihong Model PPL36U-240 W Lutron Model XXX-TWC-WH							
Sample # - 2259-05 W 2259-01							
Serial # - U4A222502583 W 02F2571A							
Configuration - BLE Low Ch Tx 2402 MHz @ 1 Mpbs Data Rate w Load							
Voltage/Frequency - 120 VAC / 60 Hz							

Graphs Tx @ Low Channel, 2402 MHz FSK with 1 Mbps Data Rate, Neutral & Phase Lines





Tx @ Middle Channel, 2440 MHz FSK with 1 Mbps Data Rate, Neutral Line

BEC Incorporated
Neutral Line Conducted Emissions
03:32:21 PM, Thursday, July 20, 2023

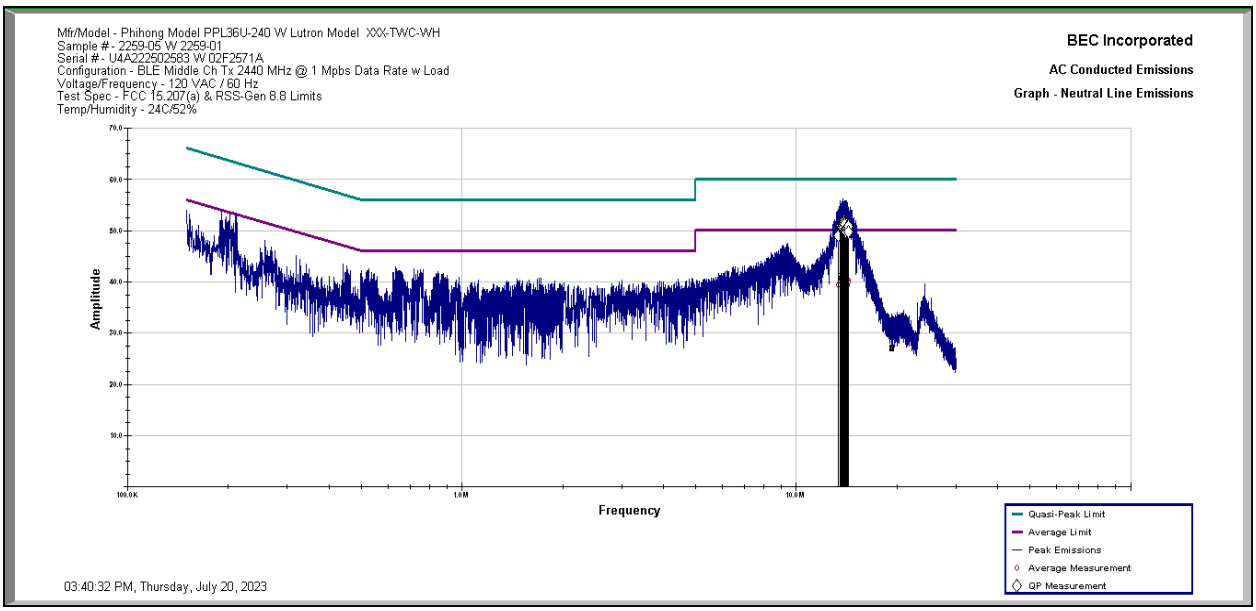
	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
13.307 MHz	39.36	50.00	-10.64	48.99	60.00	-11.01	10.50
13.534 MHz	41.31	50.00	-8.69	50.82	60.00	-9.18	10.50
13.625 MHz	40.86	50.00	-9.14	50.81	60.00	-9.19	10.50
13.627 MHz	40.54	50.00	-9.46	50.96	60.00	-9.04	10.50
13.671 MHz	41.55	50.00	-8.45	51.09	60.00	-8.91	10.50
13.676 MHz	41.06	50.00	-8.94	51.41	60.00	-8.59	10.50
13.676 MHz	41.70	50.00	-8.30	51.30	60.00	-8.70	10.50
13.753 MHz	41.11	50.00	-8.89	51.38	60.00	-8.62	10.50
13.789 MHz	39.89	50.00	-10.11	50.92	60.00	-9.08	10.50
13.842 MHz	41.61	50.00	-8.39	51.80	60.00	-8.20	10.50
13.847 MHz	42.00	50.00	-8.00	51.46	60.00	-8.54	10.50
13.914 MHz	41.31	50.00	-8.69	51.15	60.00	-8.85	10.50
14.057 MHz	39.62	50.00	-10.38	49.98	60.00	-10.02	10.50
14.082 MHz	41.17	50.00	-8.83	50.36	60.00	-9.64	10.50
14.138 MHz	39.53	50.00	-10.47	50.21	60.00	-9.79	10.50
14.166 MHz	39.34	50.00	-10.66	50.23	60.00	-9.77	10.50
14.200 MHz	39.39	50.00	-10.61	50.48	60.00	-9.52	10.50
14.284 MHz	40.27	50.00	-9.73	50.79	60.00	-9.21	10.50
14.347 MHz	39.88	50.00	-10.12	49.67	60.00	-10.33	10.50
Mfr/Model - Phihong Model PPL36U-240 W Lutron Model XXX-TWC-WH							
Sample # - 2259-05 W 2259-01							
Serial # - U4A222502583 W 02F2571A							
Configuration - BLE Middle Ch Tx 2440 MHz @ 1 Mpbs Data Rate w Load							
Voltage/Frequency - 120 VAC / 60 Hz							
Test Spec - FCC 15.207(a) & RSS-Gen 8.8 Limits							

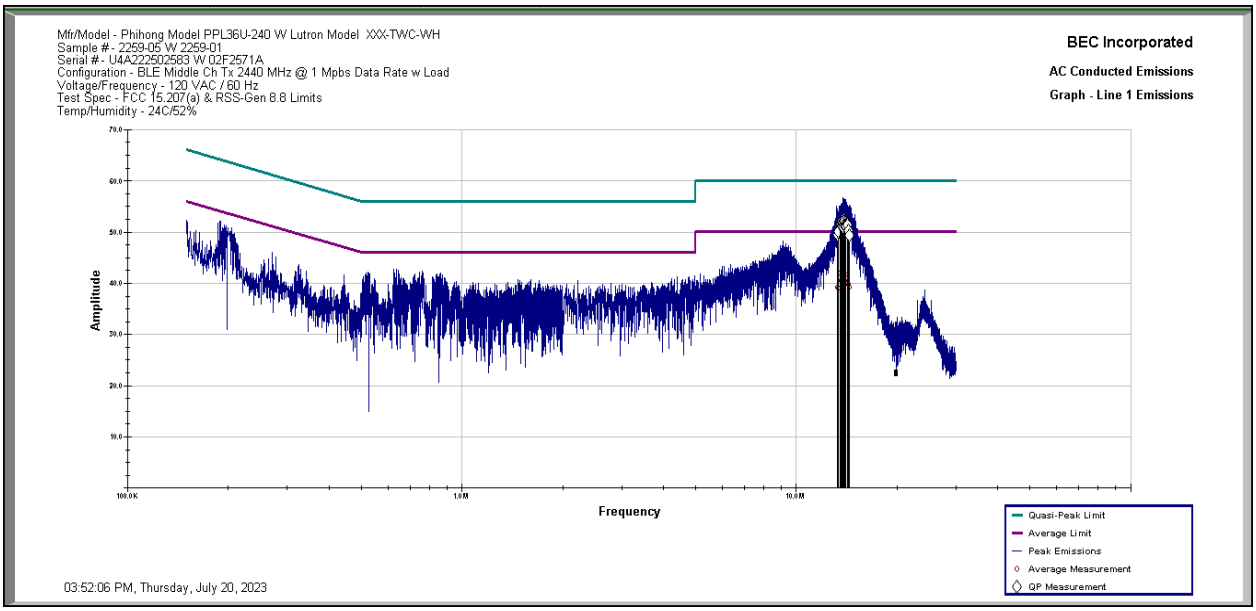
Tx @ Middle Channel, 2440 MHz FSK with 1 Mbps Data Rate, Phase Line

BEC Incorporated
Line 1 Conducted Emissions
03:43:56 PM, Thursday, July 20, 2023

	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
13.258 MHz	39.31	50.00	-10.69	49.62	60.00	-10.38	10.48
13.323 MHz	38.97	50.00	-11.03	50.15	60.00	-9.85	10.48
13.535 MHz	41.95	50.00	-8.05	51.55	60.00	-8.45	10.48
13.557 MHz	40.56	50.00	-9.44	51.52	60.00	-8.48	10.48
13.644 MHz	40.73	50.00	-9.27	51.66	60.00	-8.34	10.48
13.662 MHz	42.62	50.00	-7.38	52.02	60.00	-7.98	10.48
13.708 MHz	41.42	50.00	-8.58	52.03	60.00	-7.97	10.48
13.748 MHz	40.79	50.00	-9.21	51.41	60.00	-8.59	10.48
13.778 MHz	41.19	50.00	-8.81	51.73	60.00	-8.27	10.48
13.783 MHz	40.12	50.00	-9.88	50.92	60.00	-9.08	10.48
13.830 MHz	41.87	50.00	-8.13	52.16	60.00	-7.84	10.48
13.867 MHz	42.95	50.00	-7.05	52.28	60.00	-7.72	10.48
13.872 MHz	42.17	50.00	-7.83	51.87	60.00	-8.13	10.48
13.916 MHz	40.50	50.00	-9.50	51.53	60.00	-8.47	10.48
13.980 MHz	40.50	50.00	-9.50	51.14	60.00	-8.86	10.48
14.043 MHz	41.04	50.00	-8.96	51.20	60.00	-8.80	10.48
14.171 MHz	41.68	50.00	-8.32	51.59	60.00	-8.41	10.48
14.181 MHz	41.01	50.00	-8.99	51.35	60.00	-8.65	10.48
14.289 MHz	39.68	50.00	-10.32	50.28	60.00	-9.72	10.48
14.406 MHz	39.25	50.00	-10.75	49.29	60.00	-10.71	10.47
Mfr/Model - Phihong Model PPL36U-240 W Lutron Model XXX-TWC-WH							
Sample # - 2259-05 W 2259-01							
Serial # - U4A222502583 W 02F2571A							
Configuration - BLE Middle Ch Tx 2440 MHz @ 1 Mpbs Data Rate w Load							
Voltage/Frequency - 120 VAC / 60 Hz							

Graphs Tx @ Middle Channel, 2440 MHz FSK with 1 Mbps Data Rate, Neutral & Phase Lines





Tx @ High Channel, 2480 MHz FSK with 1 Mbps Data Rate, Neutral Line

BEC Incorporated
Neutral Line Conducted Emissions
03:58:50 PM, Thursday, July 20, 2023

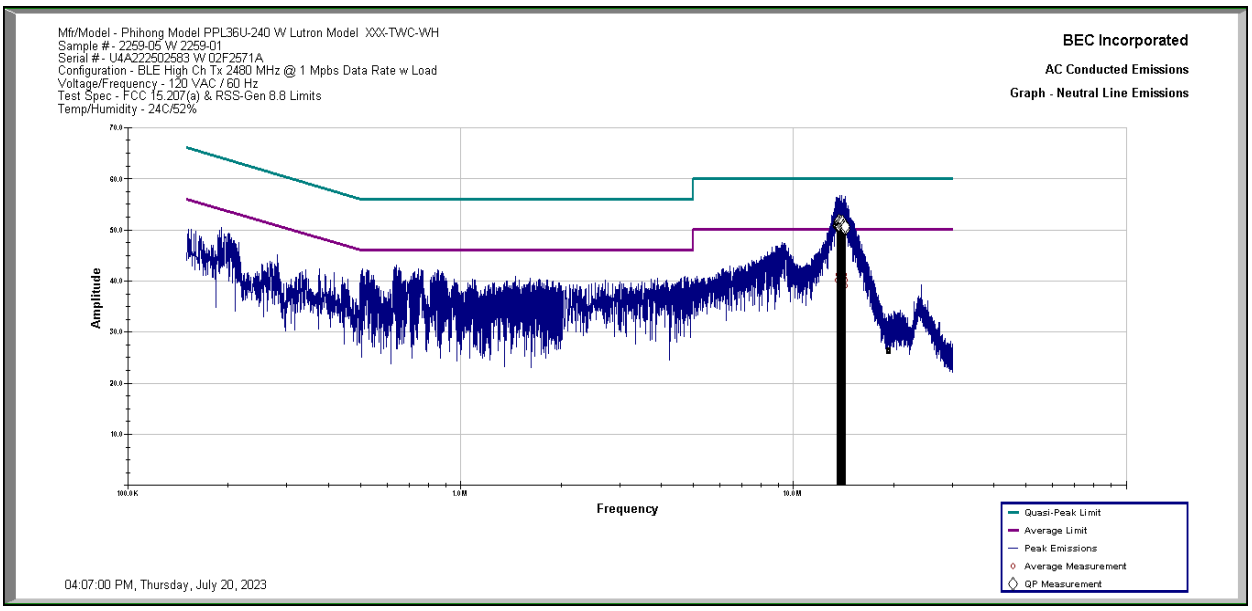
	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
13.495 MHz	40.22	50.00	-9.78	50.87	60.00	-9.13	10.50
13.586 MHz	41.30	50.00	-8.70	51.60	60.00	-8.40	10.50
13.607 MHz	41.19	50.00	-8.81	50.79	60.00	-9.21	10.50
13.659 MHz	39.39	50.00	-10.61	50.96	60.00	-9.04	10.50
13.700 MHz	40.26	50.00	-9.74	50.70	60.00	-9.30	10.50
13.707 MHz	41.29	50.00	-8.71	51.14	60.00	-8.86	10.50
13.723 MHz	40.59	50.00	-9.41	51.64	60.00	-8.36	10.50
13.724 MHz	41.48	50.00	-8.52	51.76	60.00	-8.24	10.50
13.729 MHz	39.88	50.00	-10.12	50.71	60.00	-9.29	10.50
13.767 MHz	40.07	50.00	-9.93	51.37	60.00	-8.63	10.50
13.896 MHz	40.76	50.00	-9.24	51.58	60.00	-8.42	10.50
13.927 MHz	40.75	50.00	-9.25	51.06	60.00	-8.94	10.50
13.939 MHz	39.70	50.00	-10.30	50.87	60.00	-9.13	10.50
13.994 MHz	40.76	50.00	-9.24	51.54	60.00	-8.46	10.50
14.080 MHz	40.43	50.00	-9.57	50.78	60.00	-9.22	10.50
14.189 MHz	41.30	50.00	-8.70	51.07	60.00	-8.93	10.50
14.213 MHz	39.88	50.00	-10.12	50.10	60.00	-9.90	10.50
14.228 MHz	40.43	50.00	-9.57	50.52	60.00	-9.48	10.50
14.268 MHz	38.97	50.00	-11.03	50.08	60.00	-9.92	10.50
14.325 MHz	40.10	50.00	-9.90	50.68	60.00	-9.32	10.50
Mfr/Model - Phihong Model PPL36U-240 W Lutron Model XXX-TWC-WH							
Sample # - 2259-05 W 2259-01							
Serial # - U4A222502583 W 02F2571A							
Configuration - BLE High Ch Tx 2480 MHz @ 1 Mpbs Data Rate w Load							
Voltage/Frequency - 120 VAC / 60 Hz							

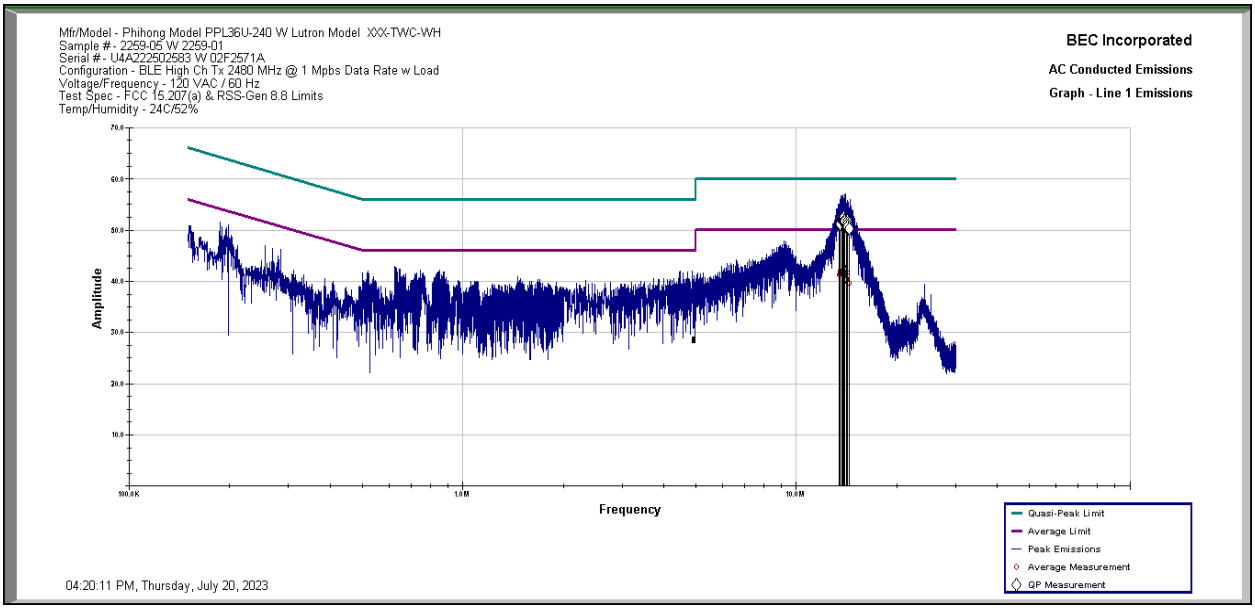
Tx @ High Channel, 2480 MHz FSK with 1 Mbps Data Rate, Phase Line

BEC Incorporated
Line 1 Conducted Emissions
04:12:01 PM, Thursday, July 20, 2023

	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
13.390 MHz	41.23	50.00	-8.77	51.15	60.00	-8.85	10.48
13.495 MHz	41.49	50.00	-8.51	51.25	60.00	-8.75	10.48
13.551 MHz	41.92	50.00	-8.08	51.12	60.00	-8.88	10.48
13.700 MHz	41.84	50.00	-8.16	51.84	60.00	-8.16	10.48
13.731 MHz	41.94	50.00	-8.06	52.08	60.00	-7.92	10.48
13.788 MHz	42.15	50.00	-7.85	52.13	60.00	-7.87	10.48
13.795 MHz	41.59	50.00	-8.41	51.91	60.00	-8.09	10.48
13.797 MHz	41.35	50.00	-8.65	52.04	60.00	-7.96	10.48
13.819 MHz	42.83	50.00	-7.17	52.30	60.00	-7.70	10.48
13.883 MHz	41.96	50.00	-8.04	52.17	60.00	-7.83	10.48
13.887 MHz	42.92	50.00	-7.08	52.44	60.00	-7.56	10.48
13.900 MHz	41.06	50.00	-8.94	51.92	60.00	-8.08	10.48
13.902 MHz	41.29	50.00	-8.71	51.93	60.00	-8.07	10.48
13.904 MHz	40.89	50.00	-9.11	51.71	60.00	-8.29	10.48
14.135 MHz	40.38	50.00	-9.62	50.58	60.00	-9.42	10.48
14.186 MHz	40.80	50.00	-9.20	51.07	60.00	-8.93	10.48
14.192 MHz	41.65	50.00	-8.35	51.65	60.00	-8.35	10.48
14.196 MHz	41.11	50.00	-8.89	51.23	60.00	-8.77	10.48
14.238 MHz	39.68	50.00	-10.32	50.72	60.00	-9.28	10.48
14.391 MHz	39.59	50.00	-10.41	50.25	60.00	-9.75	10.47
Mfr/Model - Phihong Model PPL36U-240 W Lutron Model XXX-TWC-WH							
Sample # - 2259-05 W 2259-01							
Serial # - U4A222502583 W 02F2571A							
Configuration - BLE High Ch Tx 2480 MHz @ 1 Mpbs Data Rate w Load							
Voltage/Frequency - 120 VAC / 60 Hz							

Graphs Tx @ High Channel, 2480 MHz FSK with 1 Mbps Data Rate, Neutral & Phase Lines





Tx @ Low Channel, 2404 MHz FSK with 2 Mbps Data Rate, Neutral Line

BEC Incorporated
Neutral Line Conducted Emissions
02:22:37 PM, Thursday, July 20, 2023

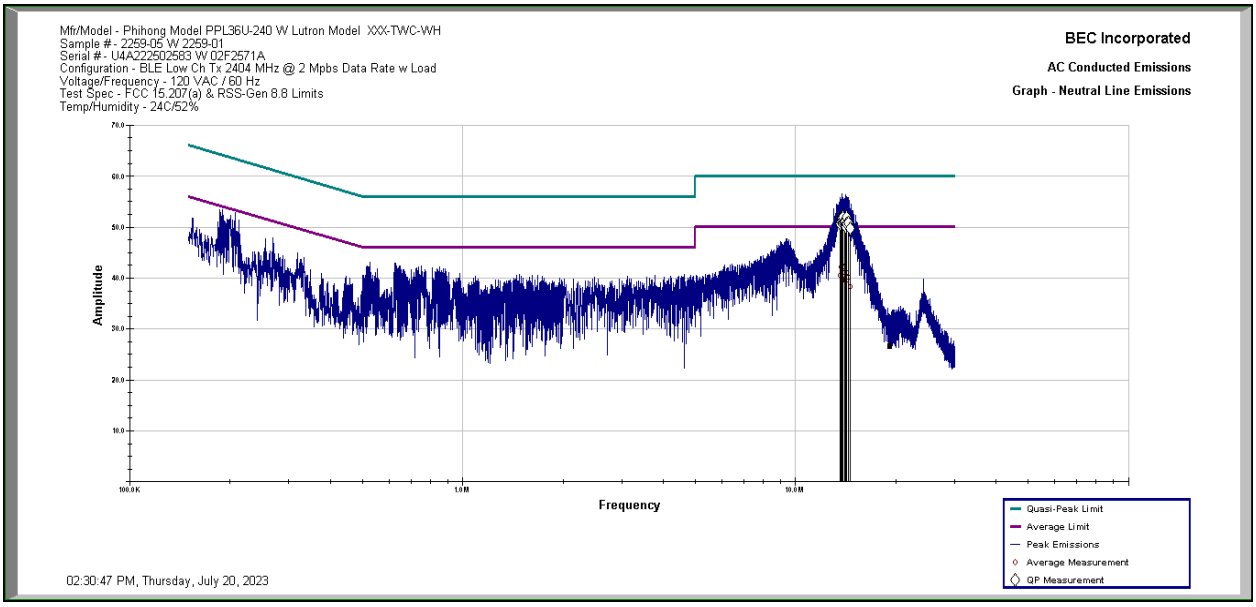
	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
13.641 MHz	40.56	50.00	-9.44	50.72	60.00	-9.28	10.50
13.657 MHz	42.14	50.00	-7.86	51.75	60.00	-8.25	10.50
13.741 MHz	39.95	50.00	-10.05	50.84	60.00	-9.16	10.50
13.759 MHz	41.17	50.00	-8.83	51.65	60.00	-8.35	10.50
13.766 MHz	40.83	50.00	-9.17	51.30	60.00	-8.70	10.50
13.767 MHz	40.61	50.00	-9.39	51.16	60.00	-8.84	10.50
13.788 MHz	42.45	50.00	-7.55	51.98	60.00	-8.02	10.50
13.795 MHz	41.55	50.00	-8.45	51.71	60.00	-8.29	10.50
13.847 MHz	41.45	50.00	-8.55	51.41	60.00	-8.59	10.50
13.856 MHz	42.13	50.00	-7.87	51.88	60.00	-8.12	10.50
14.000 MHz	40.63	50.00	-9.37	51.10	60.00	-8.90	10.50
14.065 MHz	40.49	50.00	-9.51	50.51	60.00	-9.49	10.50
14.068 MHz	41.05	50.00	-8.95	51.05	60.00	-8.95	10.50
14.078 MHz	39.73	50.00	-10.27	50.52	60.00	-9.48	10.50
14.114 MHz	39.37	50.00	-10.63	50.41	60.00	-9.59	10.50
14.142 MHz	39.83	50.00	-10.17	50.00	60.00	-10.00	10.50
14.171 MHz	41.02	50.00	-8.98	51.88	60.00	-8.12	10.50
14.215 MHz	39.55	50.00	-10.45	50.60	60.00	-9.40	10.50
14.362 MHz	40.12	50.00	-9.88	50.89	60.00	-9.11	10.50
14.555 MHz	38.39	50.00	-11.61	49.78	60.00	-10.22	10.50
Mfr/Model - Phihong Model PPL36U-240 W Lutron Model XXX-TWC-WH							
Sample # - 2259-05 W 2259-01							
Serial # - U4A222502583 W 02F2571A							
Configuration - BLE Low Ch Tx 2404 MHz @ 2 Mpbs Data Rate w Load							
Voltage/Frequency - 120 VAC / 60 Hz							

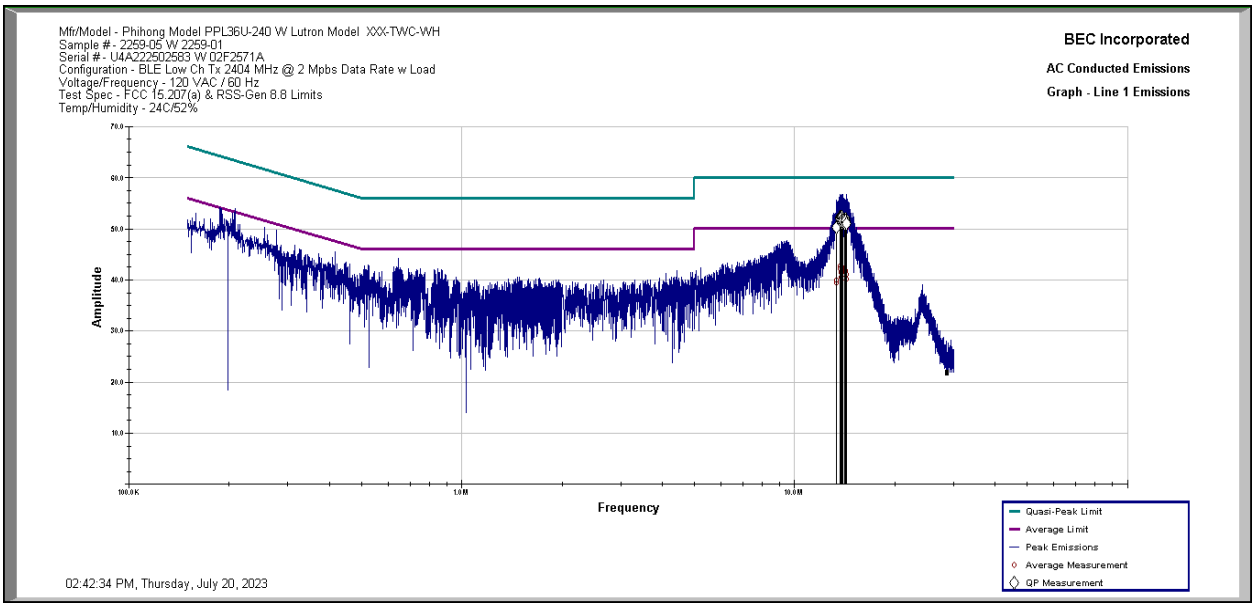
Tx @ Low Channel, 2404 MHz FSK with 2 Mbps Data Rate, Phase Line

BEC Incorporated
Line 1 Conducted Emissions
02:34:23 PM, Thursday, July 20, 2023

	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
13.354 MHz	39.37	50.00	-10.63	50.27	60.00	-9.73	10.48
13.367 MHz	39.99	50.00	-10.01	50.22	60.00	-9.78	10.48
13.670 MHz	42.62	50.00	-7.38	52.30	60.00	-7.70	10.48
13.672 MHz	42.76	50.00	-7.24	52.05	60.00	-7.95	10.48
13.675 MHz	42.68	50.00	-7.32	52.34	60.00	-7.66	10.48
13.709 MHz	42.08	50.00	-7.92	51.93	60.00	-8.07	10.48
13.755 MHz	40.45	50.00	-9.55	51.43	60.00	-8.57	10.48
13.778 MHz	41.50	50.00	-8.50	52.22	60.00	-7.78	10.48
13.816 MHz	41.52	50.00	-8.48	51.67	60.00	-8.33	10.48
13.874 MHz	42.47	50.00	-7.53	52.24	60.00	-7.76	10.48
13.876 MHz	42.18	50.00	-7.82	52.19	60.00	-7.81	10.48
13.885 MHz	40.86	50.00	-9.14	51.22	60.00	-8.78	10.48
13.968 MHz	41.00	50.00	-9.00	51.89	60.00	-8.11	10.48
13.970 MHz	41.65	50.00	-8.35	51.36	60.00	-8.64	10.48
13.983 MHz	40.89	50.00	-9.11	51.60	60.00	-8.40	10.48
14.084 MHz	40.34	50.00	-9.66	51.03	60.00	-8.97	10.48
14.173 MHz	41.83	50.00	-8.17	51.97	60.00	-8.03	10.48
14.213 MHz	41.61	50.00	-8.39	51.48	60.00	-8.52	10.48
14.288 MHz	40.12	50.00	-9.88	51.05	60.00	-8.95	10.48
14.306 MHz	41.06	50.00	-8.94	51.06	60.00	-8.94	10.48
Mfr/Model - Phihong Model PPL36U-240 W Lutron Model XXX-TWC-WH							
Sample # - 2259-05 W 2259-01							
Serial # - U4A222502583 W 02F2571A							
Configuration - BLE Low Ch Tx 2404 MHz @ 2 Mpbs Data Rate w Load							
Voltage/Frequency - 120 VAC / 60 Hz							

Graphs Tx @ Low Channel, 2404 MHz FSK with 2 Mbps Data Rate, Neutral & Phase Lines





Tx @ Middle Channel, 2440 MHz FSK with 2 Mbps Data Rate, Neutral Line

BEC Incorporated
Neutral Line Conducted Emissions
02:47:46 PM, Thursday, July 20, 2023

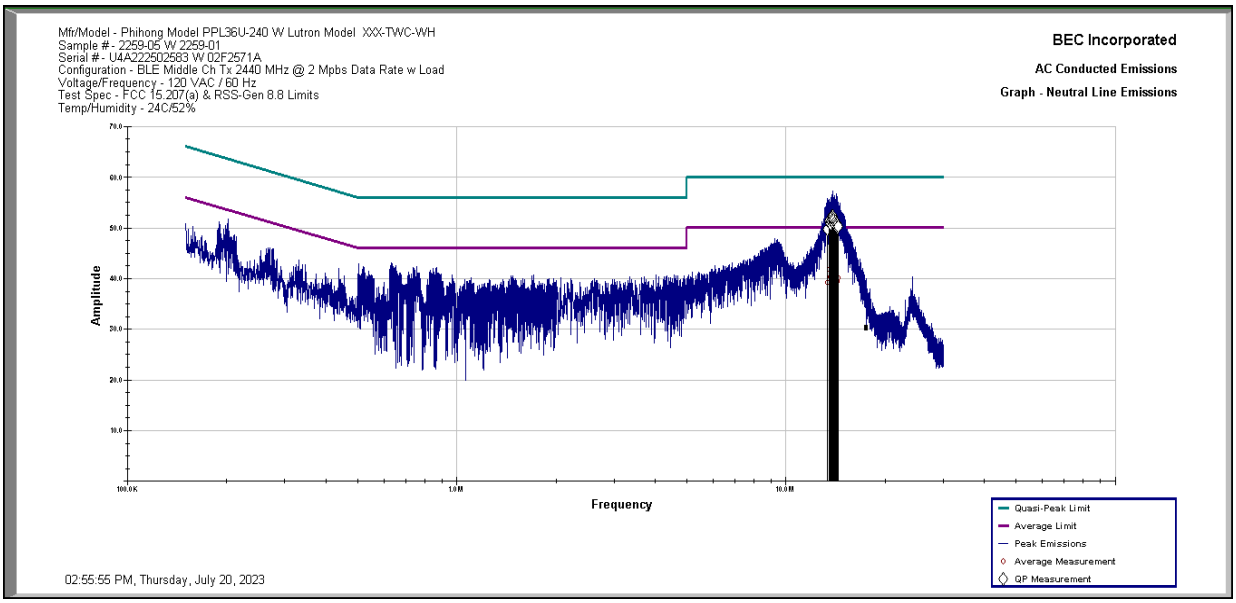
	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
13.340 MHz	39.23	50.00	-10.77	49.72	60.00	-10.28	10.50
13.552 MHz	41.83	50.00	-8.17	51.27	60.00	-8.73	10.50
13.603 MHz	40.39	50.00	-9.61	50.82	60.00	-9.18	10.50
13.660 MHz	40.09	50.00	-9.91	51.37	60.00	-8.63	10.50
13.736 MHz	40.30	50.00	-9.70	50.52	60.00	-9.48	10.50
13.815 MHz	42.69	50.00	-7.31	52.04	60.00	-7.96	10.50
13.816 MHz	42.90	50.00	-7.10	52.38	60.00	-7.62	10.50
13.816 MHz	42.63	50.00	-7.37	52.13	60.00	-7.87	10.50
13.828 MHz	41.28	50.00	-8.72	51.38	60.00	-8.62	10.50
13.846 MHz	41.76	50.00	-8.24	52.01	60.00	-7.99	10.50
13.885 MHz	41.99	50.00	-8.01	52.27	60.00	-7.73	10.50
13.896 MHz	40.76	50.00	-9.24	51.76	60.00	-8.24	10.50
13.901 MHz	39.77	50.00	-10.23	50.74	60.00	-9.26	10.50
13.915 MHz	41.74	50.00	-8.26	51.51	60.00	-8.49	10.50
14.007 MHz	39.86	50.00	-10.14	50.68	60.00	-9.32	10.50
14.128 MHz	40.63	50.00	-9.37	51.13	60.00	-8.87	10.50
14.232 MHz	39.40	50.00	-10.60	50.84	60.00	-9.16	10.50
14.280 MHz	40.31	50.00	-9.69	50.55	60.00	-9.45	10.50
14.307 MHz	39.34	50.00	-10.66	50.10	60.00	-9.90	10.50
14.352 MHz	40.07	50.00	-9.93	50.25	60.00	-9.75	10.50
Mfr/Model - Phihong Model PPL36U-240 W Lutron Model XXX-TWC-WH							
Sample # - 2259-05 W 2259-01							
Serial # - U4A222502583 W 02F2571A							
Configuration - BLE Middle Ch Tx 2440 MHz @ 2 Mpbs Data Rate w Load							
Voltage/Frequency - 120 VAC / 60 Hz							

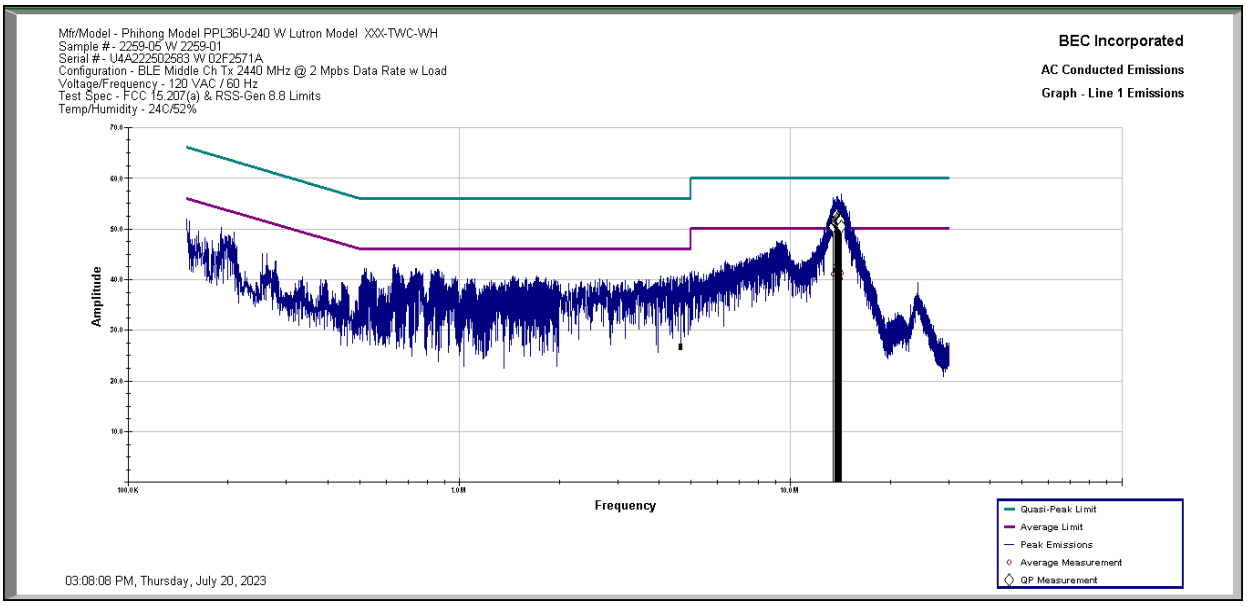
Tx @ Middle Channel, 2440 MHz FSK with 2 Mbps Data Rate, Phase Line

BEC Incorporated
Line 1 Conducted Emissions
02:59:57 PM, Thursday, July 20, 2023

	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
13.422 MHz	41.08	50.00	-8.92	50.47	60.00	-9.53	10.48
13.624 MHz	42.55	50.00	-7.45	51.79	60.00	-8.21	10.48
13.640 MHz	41.04	50.00	-8.96	51.32	60.00	-8.68	10.48
13.659 MHz	42.01	50.00	-7.99	51.86	60.00	-8.14	10.48
13.715 MHz	41.81	50.00	-8.19	51.44	60.00	-8.56	10.48
13.753 MHz	43.00	50.00	-7.00	52.73	60.00	-7.27	10.48
13.765 MHz	41.77	50.00	-8.23	51.81	60.00	-8.19	10.48
13.892 MHz	42.27	50.00	-7.73	52.14	60.00	-7.86	10.48
13.909 MHz	40.18	50.00	-9.82	50.78	60.00	-9.22	10.48
13.916 MHz	41.64	50.00	-8.36	51.65	60.00	-8.35	10.48
13.923 MHz	41.76	50.00	-8.24	51.50	60.00	-8.50	10.48
13.950 MHz	42.13	50.00	-7.87	51.87	60.00	-8.13	10.48
13.998 MHz	41.22	50.00	-8.78	51.73	60.00	-8.27	10.48
13.999 MHz	40.94	50.00	-9.06	51.51	60.00	-8.49	10.48
14.040 MHz	39.67	50.00	-10.33	50.57	60.00	-9.43	10.48
14.099 MHz	40.20	50.00	-9.80	50.56	60.00	-9.44	10.48
14.131 MHz	41.13	50.00	-8.87	51.70	60.00	-8.30	10.48
14.155 MHz	41.33	50.00	-8.67	51.20	60.00	-8.80	10.48
14.157 MHz	41.55	50.00	-8.45	51.47	60.00	-8.53	10.48
14.253 MHz	41.31	50.00	-8.69	50.39	60.00	-9.61	10.48
Mfr/Model - Phihong Model PPL36U-240 W Lutron Model XXX-TWC-WH							
Sample # - 2259-05 W 2259-01							
Serial # - U4A222502583 W 02F2571A							
Configuration - BLE Middle Ch Tx 2440 MHz @ 2 Mpbs Data Rate w Load							
Voltage/Frequency - 120 VAC / 60 Hz							

Graphs Tx @ Middle Channel, 2440 MHz FSK with 2 Mbps Data Rate, Neutral & Phase Lines





Tx @ High Channel, 2480 MHz FSK with 2 Mbps Data Rate, Neutral Line

BEC Incorporated
Neutral Line Conducted Emissions
04:24:41 PM, Thursday, July 20, 2023

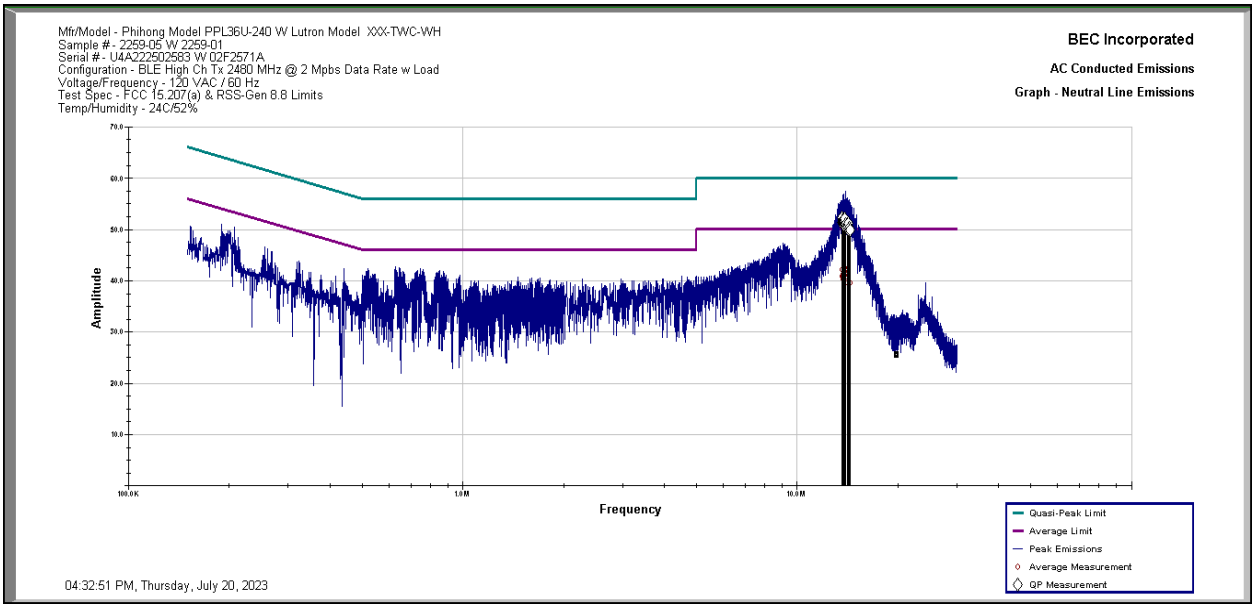
	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
13.586 MHz	40.94	50.00	-9.06	51.38	60.00	-8.62	10.50
13.634 MHz	42.24	50.00	-7.76	52.29	60.00	-7.71	10.50
13.678 MHz	40.30	50.00	-9.70	51.02	60.00	-8.98	10.50
13.705 MHz	40.93	50.00	-9.07	51.37	60.00	-8.63	10.50
13.717 MHz	40.68	50.00	-9.32	51.79	60.00	-8.21	10.50
13.720 MHz	41.30	50.00	-8.70	51.58	60.00	-8.42	10.50
13.752 MHz	41.70	50.00	-8.30	51.55	60.00	-8.45	10.50
13.857 MHz	41.77	50.00	-8.23	52.03	60.00	-7.97	10.50
13.872 MHz	40.89	50.00	-9.11	51.50	60.00	-8.50	10.50
13.892 MHz	42.57	50.00	-7.43	52.09	60.00	-7.91	10.50
13.912 MHz	39.95	50.00	-10.05	50.75	60.00	-9.25	10.50
13.919 MHz	40.43	50.00	-9.57	50.88	60.00	-9.12	10.50
13.973 MHz	40.05	50.00	-9.95	50.96	60.00	-9.04	10.50
13.975 MHz	39.57	50.00	-10.43	50.50	60.00	-9.50	10.50
14.163 MHz	40.88	50.00	-9.12	50.64	60.00	-9.36	10.50
14.169 MHz	40.62	50.00	-9.38	50.51	60.00	-9.49	10.50
14.196 MHz	41.05	50.00	-8.95	51.17	60.00	-8.83	10.50
14.290 MHz	39.86	50.00	-10.14	49.71	60.00	-10.29	10.50
14.306 MHz	39.73	50.00	-10.27	50.30	60.00	-9.70	10.50
14.371 MHz	39.62	50.00	-10.38	49.87	60.00	-10.13	10.50
Mfr/Model - Phihong Model PPL36U-240 W Lutron Model XXX-TWC-WH							
Sample # - 2259-05 W 2259-01							
Serial # - U4A222502583 W 02F2571A							
Configuration - BLE High Ch Tx 2480 MHz @ 2 Mpbs Data Rate w Load							
Voltage/Frequency - 120 VAC / 60 Hz							

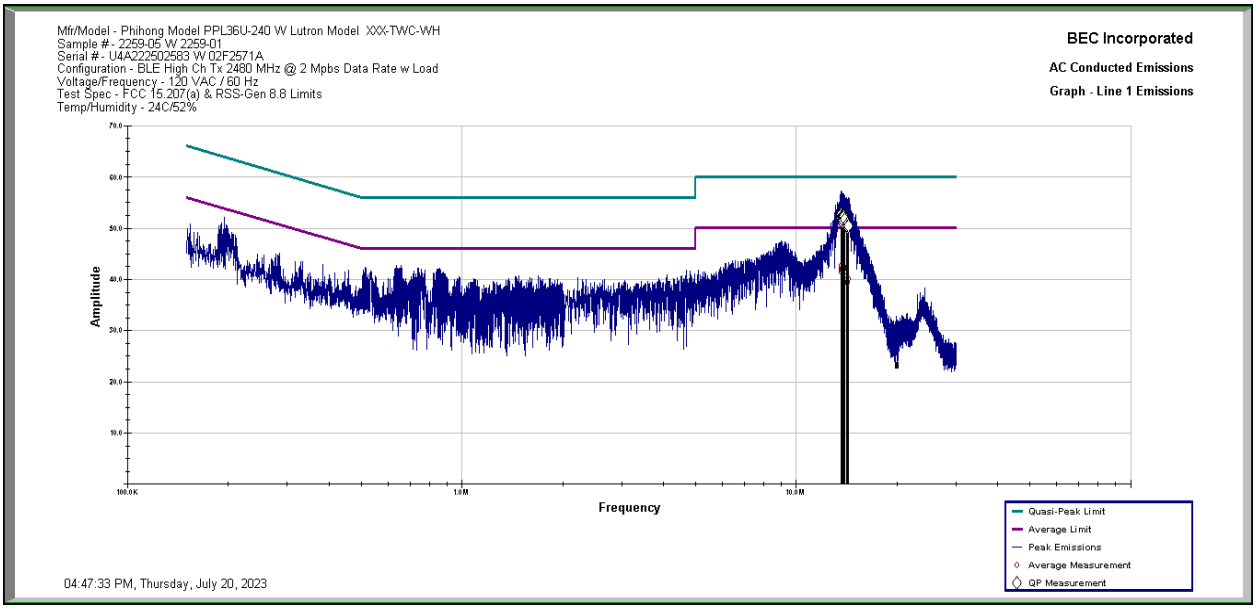
Tx @ High Channel, 2480 MHz FSK with 2 Mbps Data Rate, Phase Line

BEC Incorporated
Line 1 Conducted Emissions
04:39:22 PM, Thursday, July 20, 2023

	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
13.574 MHz	41.50	50.00	-8.50	52.35	60.00	-7.65	10.48
13.597 MHz	42.37	50.00	-7.63	51.97	60.00	-8.03	10.48
13.599 MHz	41.93	50.00	-8.07	51.97	60.00	-8.03	10.48
13.636 MHz	42.69	50.00	-7.31	52.61	60.00	-7.39	10.48
13.684 MHz	41.73	50.00	-8.27	51.57	60.00	-8.43	10.48
13.702 MHz	42.06	50.00	-7.94	52.31	60.00	-7.69	10.48
13.744 MHz	40.22	50.00	-9.78	51.07	60.00	-8.93	10.48
13.762 MHz	42.88	50.00	-7.12	52.35	60.00	-7.65	10.48
13.773 MHz	41.70	50.00	-8.30	52.27	60.00	-7.73	10.48
13.785 MHz	41.27	50.00	-8.73	51.91	60.00	-8.09	10.48
13.808 MHz	40.72	50.00	-9.28	51.53	60.00	-8.47	10.48
13.830 MHz	42.33	50.00	-7.67	52.03	60.00	-7.97	10.48
13.856 MHz	41.96	50.00	-8.04	52.40	60.00	-7.60	10.48
13.895 MHz	42.59	50.00	-7.41	52.19	60.00	-7.81	10.48
13.909 MHz	40.72	50.00	-9.28	51.71	60.00	-8.29	10.48
13.965 MHz	41.46	50.00	-8.54	51.81	60.00	-8.19	10.48
14.154 MHz	39.49	50.00	-10.51	50.49	60.00	-9.51	10.48
14.245 MHz	39.58	50.00	-10.42	50.77	60.00	-9.23	10.48
14.248 MHz	39.44	50.00	-10.56	50.29	60.00	-9.71	10.48
14.292 MHz	40.22	50.00	-9.78	50.39	60.00	-9.61	10.48
Mfr/Model - Phihong Model PPL36U-240 W Lutron Model XXX-TWC-WH							
Sample # - 2259-05 W 2259-01							
Serial # - U4A222502583 W 02F2571A							
Configuration - BLE High Ch Tx 2480 MHz @ 2 Mpbs Data Rate w Load							
Voltage/Frequency - 120 VAC / 60 Hz							

Graphs Tx @ High Channel, 2480 MHz FSK with 2 Mbps Data Rate, Neutral & Phase Lines





Rx Mode Neutral Line

BEC Incorporated
Neutral Line Conducted Emissions
05:34:37 PM, Monday, June 12, 2023

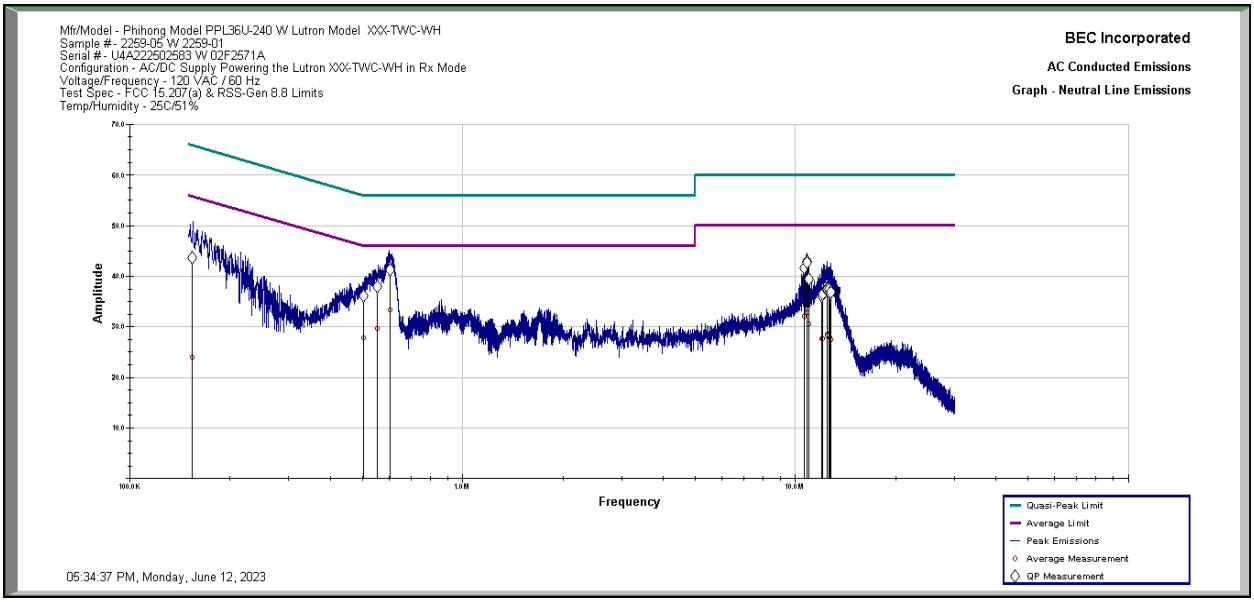
	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
153.722 KHz	23.90	55.89	-31.99	43.64	65.89	-22.25	10.12
504.550 KHz	27.83	46.00	-18.17	36.07	56.00	-19.93	10.12
552.601 KHz	29.57	46.00	-16.43	37.86	56.00	-18.14	10.13
605.315 KHz	33.37	46.00	-12.63	41.23	56.00	-14.77	10.13
10.623 MHz	32.04	50.00	-17.96	41.61	60.00	-18.39	10.49
10.822 MHz	32.70	50.00	-17.30	42.75	60.00	-17.25	10.49
10.825 MHz	32.79	50.00	-17.21	42.86	60.00	-17.14	10.49
10.826 MHz	32.75	50.00	-17.25	42.81	60.00	-17.19	10.49
10.827 MHz	32.79	50.00	-17.21	42.81	60.00	-17.19	10.49
10.951 MHz	30.63	50.00	-19.37	39.45	60.00	-20.55	10.49
11.987 MHz	27.64	50.00	-22.36	36.01	60.00	-23.99	10.49
12.085 MHz	27.56	50.00	-22.44	36.45	60.00	-23.55	10.49
12.402 MHz	28.22	50.00	-21.78	37.31	60.00	-22.69	10.49
12.429 MHz	28.30	50.00	-21.70	37.34	60.00	-22.66	10.49
12.441 MHz	28.42	50.00	-21.58	37.26	60.00	-22.74	10.49
12.457 MHz	28.58	50.00	-21.42	37.59	60.00	-22.41	10.49
12.476 MHz	28.17	50.00	-21.83	37.44	60.00	-22.56	10.49
12.573 MHz	28.46	50.00	-21.54	37.31	60.00	-22.69	10.50
12.701 MHz	27.73	50.00	-22.27	36.58	60.00	-23.42	10.50
12.729 MHz	27.35	50.00	-22.65	36.78	60.00	-23.22	10.50
Mfr/Model - Phihong Model PPL36U-240 W Lutron Model XXX-TWC-WH							
Sample # - 2259-05 W 2259-01							
Serial # - U4A222502583 W 02F2571A							
Configuration - AC/DC Supply Powering the Lutron XXX-TWC-WH in Rx Mode							
Voltage/Frequency - 120 VAC / 60 Hz							

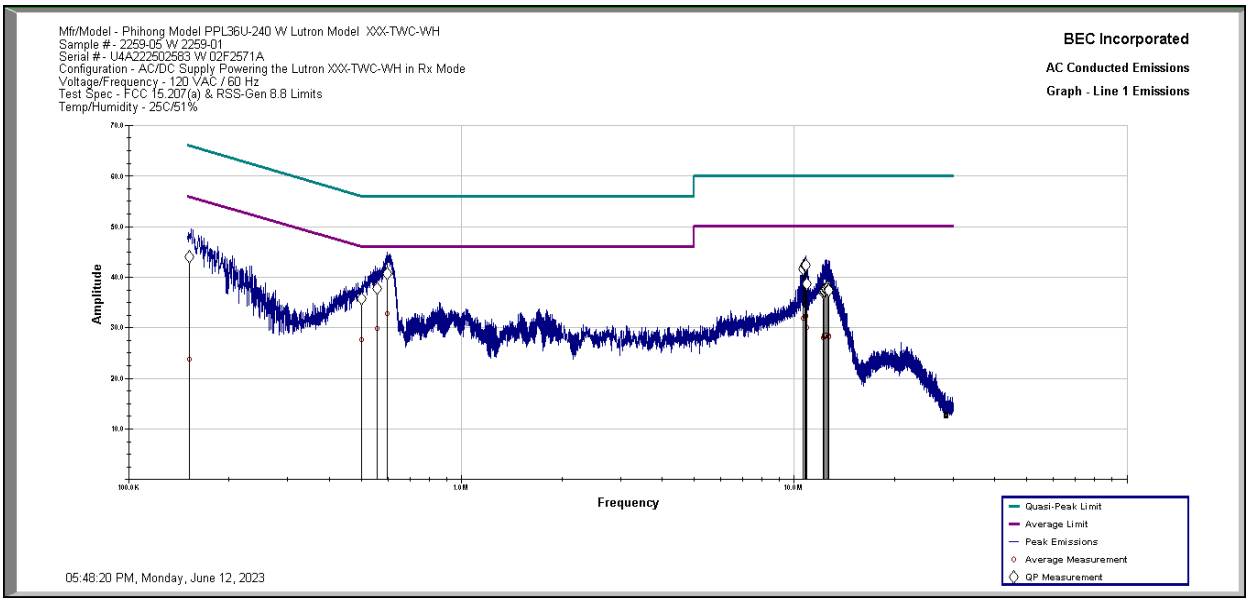
Rx Mode Phase Line

BEC Incorporated
Line 1 Conducted Emissions
05:48:20 PM, Monday, June 12, 2023

	1	2	3	4	5	6	7
Frequency	AVG	AVG	AVG	QP	QP	QP	Corr
MHz	dBuV	Limit	Margin	dBuV	Limit	Margin	Factor
151.743 KHz	23.80	55.95	-32.15	43.99	65.95	-21.96	10.14
501.439 KHz	27.61	46.00	-18.39	35.70	56.00	-20.30	10.13
555.711 KHz	29.77	46.00	-16.23	37.77	56.00	-18.23	10.15
597.507 KHz	32.73	46.00	-13.27	40.75	56.00	-15.25	10.15
10.622 MHz	31.87	50.00	-18.13	41.55	60.00	-18.45	10.49
10.745 MHz	32.32	50.00	-17.68	42.27	60.00	-17.73	10.48
10.827 MHz	32.37	50.00	-17.63	42.32	60.00	-17.68	10.48
10.827 MHz	32.32	50.00	-17.68	42.29	60.00	-17.71	10.48
10.906 MHz	30.00	50.00	-20.00	38.66	60.00	-21.34	10.48
12.229 MHz	28.05	50.00	-21.95	36.93	60.00	-23.07	10.48
12.288 MHz	28.10	50.00	-21.90	37.45	60.00	-22.55	10.48
12.313 MHz	28.50	50.00	-21.50	37.13	60.00	-22.87	10.48
12.316 MHz	28.53	50.00	-21.47	37.35	60.00	-22.65	10.48
12.419 MHz	28.46	50.00	-21.54	37.64	60.00	-22.36	10.48
12.451 MHz	28.62	50.00	-21.38	37.81	60.00	-22.19	10.48
12.468 MHz	28.52	50.00	-21.48	37.67	60.00	-22.33	10.48
12.468 MHz	28.60	50.00	-21.40	37.66	60.00	-22.34	10.48
12.592 MHz	28.49	50.00	-21.51	37.85	60.00	-22.15	10.48
12.648 MHz	28.28	50.00	-21.72	37.53	60.00	-22.47	10.48
12.679 MHz	28.14	50.00	-21.86	37.45	60.00	-22.55	10.48
Mfr/Model - Phihong Model PPL36U-240 W Lutron Model XXX-TWC-WH							
Sample # - 2259-05 W 2259-01							
Serial # - U4A222502583 W 02F2571A							
Configuration - AC/DC Supply Powering the Lutron XXX-TWC-WH in Rx Mode							
Voltage/Frequency - 120 VAC / 60 Hz							

Graphs Rx Mode Neutral and Phase Lines





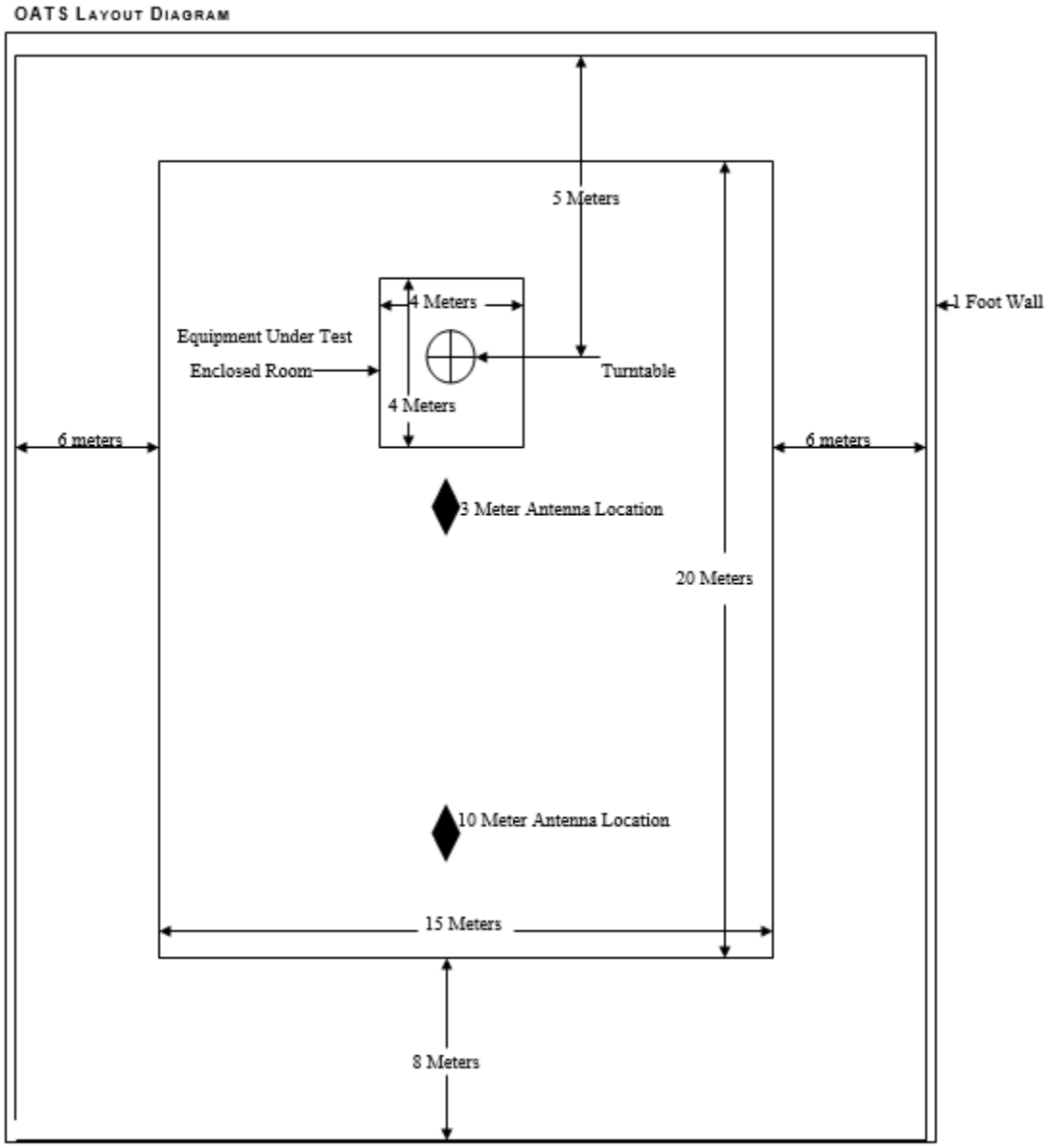
Results: The Lutron Model JPZ0148 Sample 2259-01 powered by the Lutron Electronics Model T120-24DC-15 Sample 2259-05 complies with the requirements of FCC Part 15.207. The margin is -7.00 dB @ 13.753 MHz Line 1 Average with Sample 2259-01 transmitting Middle Channel, 2440 MHz at the 2 Mbps data rate.

Appendix A – Test Equipment

Equipment	Manufacturer	Model #	Serial #	BEC #	Calibration Date	Calibration Cycle	Calibration Due Date
EMI Receiver (20 Hz – 26.5 GHz)	Rohde & Schwarz	ESIB 26	836119/006	1010	12/09/22	3 Years	12/09/25
Antenna (30 MHz - 6 GHz)	Sunol Sciences	JB6	A022108	712	06/21/21	3 Years	06/21/24
9kHz-3GHz EMC Analyzer	Agilent	E7402A	US39440162	883	06/21/21	3 Years	06/21/24
Antenna (30 MHz - 6 GHz)	Sunol Sciences	JB6	A020714	882	05/24/21	3 Years	05/24/24
Amplifier (.09 – 1300 MHz)	Hewlett Packard	8447F	3313A06658	807	01/13/21	3 Years	01/13/24
EMC Analyzer (9 kHz - 26.5 GHz)	Hewlett Packard	8593EM	3710A00214	1026	03/23/20	5 Years	03/23/25
Amplifier System (0.5 – 50 GHz)	Hewlett Packard	83015A 83017A	3123A00360 & 3332A00219	1027	06/16/21	3 Years	06/16/24
Double Ridged Horn Antenna (1 - 18 GHz)	EMCO	3115	9705-5225	1028	11/24/21	3 Years	11/21/24
Antenna (18 - 26.5 GHz)	Hewlett Packard	84125-80008	N/A	1056	01/18/22	3 Years	01/18/25
OATS Site (30 MHz – 1 GHz)	BEC	N/A	N/A	705	10/07/22	1 Year	10/07/23
Temp/Humidity Meter	Control Company	4096	151872672	780	07/21/22	3 Years	07/21/25

3.5GHz High Pass Filter	Hewlett Packard	84300-80038	005	779	08/04/22	3 Years	08/04/25
EMI Receiver (9 kHz - 6.5 GHz)	Hewlett Packard	8546A	3325A00158	761	03/15/23	3 Years	03/15/26
Four Line V-LISN	TESEQ	NNB 52	253551	950	12/08/22	3 Years	12/08/25
Conducted Emissions Cable	Pasternack	CE-01	N/A	802	10/15/20	3 Years	10/15/23
Software (Tile Instrument Control System)	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
Screen Room	ETS Lindgren	26W-2/2-0	6065	880	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.