

Leviton Manufacturing Co., Inc.

Application For Certification

FCC ID: QGH-OSM3D-V1W

Lighting control switch

Model: OSM3D-V1W

5.8GHz Transmitter

Report No.: 160413011SZN-001

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

Sign on file

Prepared and Checked by:

Leo Lai Kidd Yang
Senior Project Engineer Senior Pro

Senior Project Engineer Date: June 16, 2016

Approved by:

The test results reported in this test report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample
may be said to have been obtained.

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TRF No.: FCC 15C_TX_c

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MEASUREMENT/TECHNICAL REPORT

Leviton Manufacturing Co., Inc.

Model: OSM3D-V1W

FCC ID: QGH-OSM3D-V1W

This report concerns (check one:)	Original Grant <u>X</u>	Class II Change						
Equipment Type: FDS - Part 15 Field Disturbance Sensor								
Deferred grant requested per 47 CFR 0.4	. , . , . ,							
	If yes, defer unt	il: date						
Company Name agrees to notify the Com	Company Name agrees to notify the Commission by: date							
of the intended date of announcement of that date.	the product so that the	grant can be issued on						
Transition Rules Request per 15.37?	Ye	s No _X_						
If no, assumed Part 15, Subpart C for inte Edition] provision.	entional radiator – the n	ew 47 CFR [10-1-15						
Report prepared by:								
Leo Lai Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch 6F, Block D, Huahan Building, Langshan Road Nanshan District, Shenzhen, P. R. China Phone: (86 755) 8601 6288 Fax: (86 755) 8601 6751								

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List of attached file

Exhibit type	File Description	Filename
Test Report	Test Report	report.pdf
Test Setup Photo	Radiated Emission	radiated photos.pdf
Test Setup Photo	Conducted Emission	conducted photos.pdf
Test Report	20dB BW Plot	bw.pdf
External Photo	External Photo	external photos.pdf
Internal Photo	Internal Photo	internal photos.pdf
Block Diagram	Block Diagram	block.pdf
Schematics	Circuit Diagram	circuit.pdf
BOM List	BOM List	Bom.pdf
Operation Description	Technical Description	descri.pdf
ID Label/Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf
Cover Letter	Confidentiality Letter	request.pdf
Cover Letter	Letter of Agency	agency.pdf

EXHIBIT 1 GENERAL DESCRIPTION

1.0 General Description

1.1 Product Description

The equipment under test (EUT) is a Lighting control switch with 5.8G transmitter function operating in 5785MHz-5815MHz. The EUT is powered by AC 120V-277V, 50/60Hz. For more detail information please refer to the user manual.

Antenna Type: Integral antenna

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

1.2 Related Submittal(s) Grants

This is an application for certification of a transceiver for the Lighting control switch which has control function, and there is no corresponding unit for certification.

1.3 Test Methodology

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

1.4 Test Facility

The Semi-anechoic chamber and shielding room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch** and located at 6F, D Block, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China. This test facility and site measurement data have been fully placed on file with the FCC (Registration Number: 242492).

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EXHIBIT 2 SYSTEM TEST CONFIGURATION

2.0 **System Test Configuration**

2.1 Justification

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

The EUT was powered directly by 120Vac/60Hz during the test.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.

The rear of unit shall be flushed with the rear of the table.

The rear of unit was flushed with the rear of the table with 0.8m height when powered by 120V/60Hz up to 1GHz and placed in the centre of 1.5 m turntable above 1GHz.

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

2.2 EUT Exercising Software N/A

2.3 Special Accessories

No special accessories used.

2.4 Equipment Modification

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

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

2.5 Measurement Uncertainty

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

2.6 Support Equipment List and Description

Description	Manufacturer	Model No.		
Lamp	Philips	200W		
AC Cable	N/A	Unshielded, 1.0m		
Output Cable N/A		Unshielded, 0.3m		

EXHIBIT 3 EMISSION RESULTS

3.0 <u>Emission Results</u>

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

3.1 Radiated Test Results

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

3.1.1 Field Strength Calculation

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

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

Where $FS = Field Strength in dB\mu V/m$

RA = Receiver Amplitude (including preamplifier) in dBµV

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB AG = Amplifier Gain in dB

PD = Pulse Desensitization in dB

AV = Average Factor in -dB

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

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

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

 $RA = 62.0 dB\mu V$

AF = 7.4 dB

CF = 1.6 dB

AG = 29.0 dB

PD = 0 dB

AV = -10 dB

 $FS = 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32 dB\mu V/m$

Level in $\mu V/m = Common Antilogarithm [(32 dB<math>\mu V/m)/20] = 39.8 \mu V/m$

3.1.2 Radiated Emission Configuration Photograph

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

3.1.3 Radiated Emissions

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

Worst Case Radiated Emission at 707.545 MHz

Judgement: Passed by 14.5 dB

TEST PERSONNEL:

Sign on file

<u>Leo Lai, Engineer</u> Typed/Printed Name

April 10, 2016

Date

Date of Test: April 10, 2016

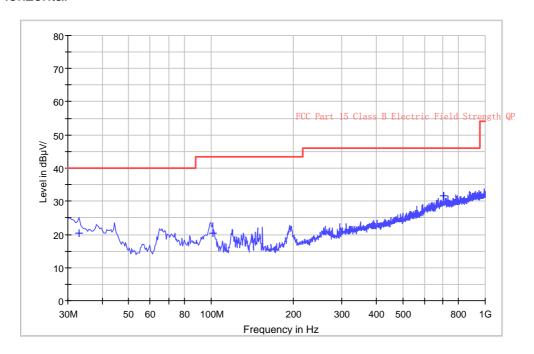
Applicant: Leviton Manufacturing Co., Inc.

Model: OSM3D-V1W

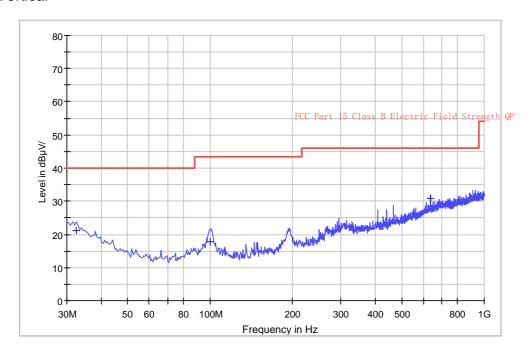
Sample: 1/1

Worst Case Operating Mode: Transmitting

Horizontal



Vertical



Applicant: Leviton Manufacturing Co., Inc.

Model: OSM3D-V1W

Sample: 1/1

Worst Case Operating Mode: Transmitting

Date of Test: April 10, 2016

Table 1

Radiated Emissions

Polarization	Frequency	Reading	Pre-	Antenna	Net	Limit	Margin
	(MHz)	(dBµV)	Amp	Factor	at 3m	at 3m	(dB)
			Gain	(dB)	(dBµV/m)	(dBµV/m)	
			(dB)				
Horizontal	32.910	26.4	20.0	13.9	20.3	40.0	-19.7
Horizontal	101.295	21.8	20.0	18.7	20.5	43.5	-23.0
Horizontal	707.545	30.4	20.0	21.1	31.5	46.0	-14.5
Vertical	32.425	33.5	20.0	7.7	21.2	40.0	-18.8
Vertical	99.840	28.2	20.0	9.6	17.8	43.5	-25.7
Vertical	638.190	37.0	20.0	13.9	30.9	46.0	-15.1

NOTES: 1. Quasi-Peak detector is used except for others stated.

- 2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
- 3. Negative value in the margin column shows emission below limit.
- 4. All emissions are below the QP limit.

3.1.4 Transmitter Spurious Emissions (Radiated)

Worst Case Radiated Emission at 11600.000 MHz

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

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

Judgement: Passed by 5.7 dB

TEST PERSONNEL:

Sign on file

<u>Leo Lai, Senior Project Engineer</u> *Typed/Printed Name*

April 10, 2016 Date

Applicant: Leviton Manufacturing Co., Inc.

Model: OSM3D-V1W

Sample: 1/1

Worst Case Operating Mode: Transmitting

Date of Test: April 10, 2016

Table 2

Radiated Emissions

(5.8GHz)

Polarization	Frequency	Reading	Pre-	Antenna	Net	Peak Limit	Margin
	(MHz)	(dBµV)	Amp	Factor	at 3m	at 3m	(dB)
			Gain	(dB)	(dBµV/m)	(dBµV/m)	
			(dB)				
Vertical	5800.000	100.3	36.7	28.5	92.1	134.0	-41.9
Vertical	11600.000	69.5	36.7	28.5	61.3	74.0	-12.7
Vertical	17400.000	64.7	36.1	33.1	61.7	84.0	-22.3

Polarization	Frequency	Reading	Pre-	Antenna	Net	Average	Margin
	(MHz)	Average	Amp	Factor	at 3m	Limit	(dB)
		(dBµV)	Gain	(dB)	(dBµV/m)	at 3m	
		`	(dB)	, ,		(dBµV/m)	
Vertical	5800.000	84.7	36.7	28.5	76.5	114.0	-37.5
Vertical	11600.000	56.5	36.7	28.5	48.3	54.0	-5.7
Vertical	17400.000	51.5	36.1	33.1	48.5	64.0	-15.5

Notes: 1. Peak detector is used, RBW=1MHz/VBW=3MHz for peak value and RBW=1MHz/VBW=10Hz for average value. RBW=10MHz used for fundamental emission.

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

- 3. Negative value in the margin column shows emission below limit.
- 4. Horn antenna is used for the emission over 1000MHz.

Test Engineer: Leo Lai

- 3.2 Conducted Emission at Mains Terminal
- 3.2.1 Conducted Emissions Configuration Photograph

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

3.2.2 Conducted Emissions

Worst Case Conducted Configuration
At

0.606 MHz

Judgement: Passed by 4.3 dB margin

TEST PERSONNEL:

Sign on file

<u>Leo Lai, Senior Project Engineer</u> *Typed/Printed Name*

April 10, 2016 Date

Date of Test: April 10, 2016

Applicant: Leviton Manufacturing Co., Inc.

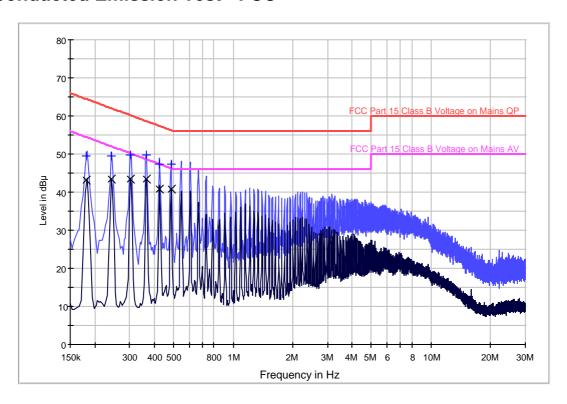
Model: OSM3D-V1W

Sample: 1/1

Worst Case Operating Mode: Transmitting

Phase: Live

Conducted Emission Test - FCC



Limit and Margin QP

Frequency	QuasiPeak	Line	Corr.	Margin	Limit
(MHz)	(dB μ V)		(dB)	(dB)	(dB µ V)
0.181500	49.5	L1	9.8	14.9	64.4
0.242000	49.5	L1	9.9	12.5	62.0
0.302000	49.7	L1	9.9	10.5	60.2
0.366000	49.8	L1	9.9	8.8	58.6
0.426000	47.4	L1	9.9	9.9	57.3
0.486000	47.3	L1	9.9	8.9	56.2

Limit and Margin AV

Frequency	Average	Line	Corr.	Margin	Limit
(MHz)	(dB µ V)		(dB)	(dB)	(dB µ V)
0.181500	43.1	L1	9.8	11.3	54.4
0.242000	43.4	L1	9.9	8.6	52.0
0.302000	43.4	L1	9.9	6.8	50.2
0.366000	43.4	L1	9.9	5.2	48.6
0.426000	40.9	L1	9.9	6.4	47.3
0.486000	40.9	L1	9.9	5.3	46.2

TRF No.: FCC 15C_TX_c FCC ID: QGH-OSM3D-V1W Report No.: 160413011SZN-001

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Date of Test: April 10, 2016

Applicant: Leviton Manufacturing Co., Inc.

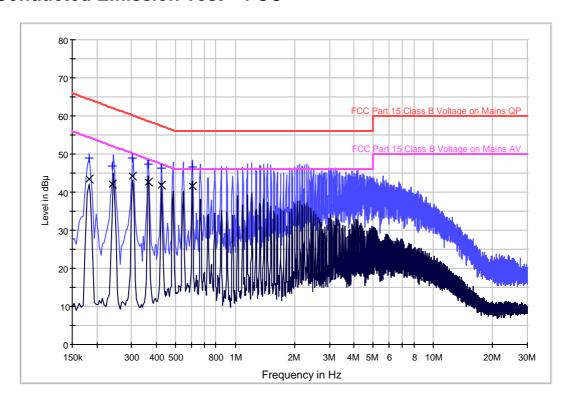
Model: OSM3D-V1W

Sample: 1/1

Worst Case Operating Mode: Transmitting

Phase: Neutral

Conducted Emission Test - FCC



Limit and Margin QP

Frequency	QuasiPeak	Line	Corr.	Margin	Limit
(MHz)	(dB μ V)		(dB)	(dB)	(dB µ V)
0.182000	48.8	N	10.1	15.6	64.4
0.240000	47.0	N	10.2	15.1	62.1
0.302000	49.0	N	10.2	11.2	60.2
0.366000	47.3	N	10.2	11.3	58.6
0.426000	46.4	N	10.2	10.9	57.3
0.606000	46.6	N	10.3	9.4	56.0

Limit and Margin AV

Frequency	Average	Line	Corr.	Margin	Limit
(MHz)	(dB µ V)		(dB)	(dB)	(dB μ V)
0.182000	43.5	N	10.1	10.9	54.4
0.240000	42.1	N	10.2	10.0	52.1
0.302000	44.2	N	10.2	6.0	50.2
0.366000	42.6	N	10.2	6.0	48.6
0.426000	41.8	N	10.2	5.5	47.3
0.606000	41.7	N	10.3	4.3	46.0

TRF No.: FCC 15C_TX_c FCC ID: QGH-OSM3D-V1W Report No.: 160413011SZN-001

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EXHIBIT 4 EQUIPMENT PHOTOGRAPHS

4.0 **Equipment Photographs**

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

EXHIBIT 5 PRODUCT LABELLING

5.0 **Product Labelling**

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

EXHIBIT 6 TECHNICAL SPECIFICATIONS

6.0 <u>Technical Specifications</u>

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

EXHIBIT 7 INSTRUCTION MANUAL

7.0 <u>Instruction Manual</u>

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

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

EXHIBIT 8

MISCELLANEOUS INFORMATION

8.0 <u>Miscellaneous Information</u>

This miscellaneous information includes details of the measured bandwidth, the test procedure such as pulse desensitization.

8.1 Measured bandwidth

The plot saved in bw.pdf which shows the fundamental emission is confined in the specified band.

Pursuant to FCC part 15 Section 15.215(c), the 20dB bandwidth of the emission was contained within the frequency band designated (5785MHz-5815MHz) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

8.2 Emissions Test Procedures

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

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

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

Detector function for radiated emissions is in peak mode.

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

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

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8.2 Emissions Test Procedures (cont'd)

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

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

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

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

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

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EXHIBIT 9 TEST EQUIPMENT LIST

9.0 <u>Test Equipment List</u>

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-12	BiConiLog Antenna	ETS	3142E	00166158	15-Sep-2015	15-Sep-2016
SZ185-01	EMI Receiver	R&S	ESCI	100547	17-Oct-2015	17-Oct-2016
SZ061-08	Horn Antenna	ETS	3115	00092346	29-Apr-2015	29-Apr-2016
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	08-Jun-2015	08-Jun-2016
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	8-Jun-2015	8-Jun-2016
SZ056-06	Spectrum Analyzer	R&S	FSV 40	101101	8-Jul-2015	8-Jul-2016
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	23-Jan-2016	23-Jan-2017
SZ188-01	Anechoic Chamber	ETS	RFD-F/A- 100	4102	19-Apr-2014	19-Apr-2016
SZ062-24	RF Cable	HUBER+SUH NER	SF104PE	MY4263/4PE	3-Nov-2015	3-Nov-2016
SZ062-26	RF Cable	HUBER+SUH NER	SF104PE	MY4556/4PE	13-Jan-2016	13-Jan-2017
SZ062-28	RF Cable	HUBER+SUH NER	SF104	MY28844/4	18-Dec-2015	18-Dec-2016
SZ067-04	Notch Filter	Micro-Tronics	BRM5070 2-02		20-May-2015	20-May-2016
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	3-Nov-2015	3-Nov-2016
SZ187-01	Two-Line V- Network	R&S	ENV216	100072	3-Nov-2015	3-Nov-2016
SZ187-02	Two-Line V- Network	R&S	ENV216	100073	24-Jun-2015	24-Jun-2016
SZ188-03	Shielding Room	ETS	RFD-100	4100	23-Aug-2014	23-Aug-2016

---End Report---