# Report on the FCC and ISED Testing of the

# Cooper Lighting LLC
# SWPD01-SC

## In accordance with FCC 47 CFR Part 15.247 & ISED Canada's Radio Standards Specifications RSS-247

America

**Add value.**
**Inspire trust.**

Prepared for: Cooper Lighting LLC
1121 Highway 74 South
Peachtree City, GA 30269

FCC ID: 2AKCY-SWPD01SC IC: 4706A-SWPD01SC

## COMMERCIAL-IN-CONFIDENCE

Document Number: BO72141372.700 | Issue: 01

| SIGNATURE | | | |
|---|---|---|---|
| | | | |
| **NAME** | **JOB TITLE** | **RESPONSIBLE FOR** | **ISSUE DATE** |
| **Pete Walsh** | **Service Line Manager** | **Authorized Signatory** | 2019-Apr-30 |

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD America, Inc. document control rules.

FCC Accreditation
Designation Number US1063 Tampa, FL Test Laboratory

Innovation, Science, and Economic Development Canada Accreditation
Main Site Number 2087A-2 Tampa, FL Test Laboratory
Satellite Site Number: 4175C Boca Raton, FL Test Laboratory

**EXECUTIVE SUMMARY**
A sample of this product was tested and found to be compliant with FCC Part 15.247, ISED Canada's RSS-247

A2LA Cert. No. 2955.15



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# TABLE OF CONTENTS

# 1 GENERAL

## 1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations Section 15.247 and Innovation Science and Economic Development Canada's Radio Standards Specification RSS-247 for the tests documented herein.

## 1.2 Applicant Information

Cooper Lighting LLC
1121 Highway 74 South
Peachtree City, GA 30269

## 1.3 Product Description

The EUT is a Sensor to be integrated into light fixtures. The device includes a Zigbee+BLE transceiver. The model SWPD01-SC is a depopulated version of the sensor model SWPD01-DC (FCC ID: 2AKCY-SWPD01DC / IC: 4706A-SWPD01DC). The SWPD01-SC sensor does not include the additional BLE transceiver SOC. The test report documents the compliance of the BLE radio.

Technical Details

| | |
|---|---|
| Mode of Operation: | Bluetooth Low Energy |
| Frequency Range: | 2402 MHz - 2480 MHz |
| Number of Channels: | 40 |
| Channel Separation: | 2 MHz |
| Data Rate: | 1 Mbps |
| Modulations: | GFSK |
| Antenna Type/Gain: | PCB Antenna, 2.6 dBi |
| Input Power: | 12 VDC |

Model Number: SWPD01-SC

Test Sample Serial Number(s): 195 Radiated Emissions (SWPD01-DC), 191 RF Conducted Emissions (SWPD01-DC), 198 Power Line Conducted Emissions, Limited Radiated Emissions.

Test Sample Condition: The test samples were in good operating condition without any physical damages.

## 1.4 Test Methodology and Considerations

Preliminary radiated measurements were performed on the model SWPD01-SC. From the test results it was determined that the data for the model SWPD01-DC (test report BO72141372.100) is representative of the SWPD01-SC model and is therefore reported in this document.

For the radiated emissions evaluation, the EUT was set in three orthogonal orientations. The EUT flat on the table top led to the highest emissions at the band-edges. The highest radiated spurious emissions were observed for the EUT set sideways on the table top. The test results correspond to the worst case.

Test Power Setting:
Channels 0 - 39: 127

The EUT was also evaluated for unintentional emissions. The results are documented in a Supplier's Declaration of Conformity test report.

# 2 TEST FACILITIES

## 2.1 Location

The radiated and conducted emissions test sites are located at the following address:

TÜV SÜD America, Inc.
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
Phone: (561) 961-5585
Fax: (561) 961-5587
http://www.tuv-sud-america.com

Innovation, Science and Economic Development Canada Lab Code: 4175C

TÜV SÜD America, Inc.
5610 West Sligh Ave., Suite 100
Tampa, FL 33634
Phone: 813-284-2715
www.tuv-sud-america.com

FCC Designation Number US1063
FCC Test Firm Registration #: 160606
Innovation, Science, and Economic Development Canada Lab Code: 2087A-2

## 2.2 Laboratory Accreditations/Recognitions/Certifications

TÜV SÜD America, Inc. is accredited to ISO/IEC 17025 by American Association for Laboratory Accreditation (A2LA) and has been issued certificate number 2955.15 in recognition of this accreditation. Unless otherwise specified, all test methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

Main Site Information:

TÜV SÜD America, Inc.
5610 West Sligh Ave., Suite 100
Tampa, FL 33634
Phone: 813-284-2715
www.tuv-sud-america.com

FCC Designation Number US1063
FCC Test Firm Registration #: 160606
Innovation, Science, and Economic Development Canada Lab Code: 2087A-2

## 2.3 Radiated & Conducted Emissions Test Site Description

### 2.3.1 Semi-Anechoic Chamber Test Site

The EMC radiated test facility consists of an RF-shielded enclosure. The interior dimensions of the indoor semi-anechoic chamber are approximately 48 feet (14.6 m) long by 36 feet (10.8 m) wide by 24 feet (7.3 m) high and consist of rigid, 1/8 inch (0.32 cm) steel-clad, wood core modular panels with steel framing. In the shielded enclosure, the faces of the panels are galvanized, and the chamber is self-supporting. 8-foot RF absorbing cones are installed on 4 walls and the ceiling. The steel-clad ground plane is covered with vinyl flooring.

The turntable is driven by pneumatic motor, which can support a 2000 lb. load. The turntable is flush with the chamber floor which it is connected to, around its circumference, with a continuous metallic loaded spring. An EMCO Model 1060 Multi-device controller controls the turntable position.

A pneumatic motor is used to control antenna polarizations and height relative to the ground. The height information is displayed on the control unit EMCO Model 1050.

The control room is an RF shielded enclosure attached to the semi-anechoic chamber with two bulkhead panels for connecting RF, and control cables. The dimension of the room is 7.3 m x 4.9 m x 3 m high and the entrance doors of both control and conducted rooms are 3 feet (0.91 m) by 7 feet (2.13 m).

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3.1-1 below:

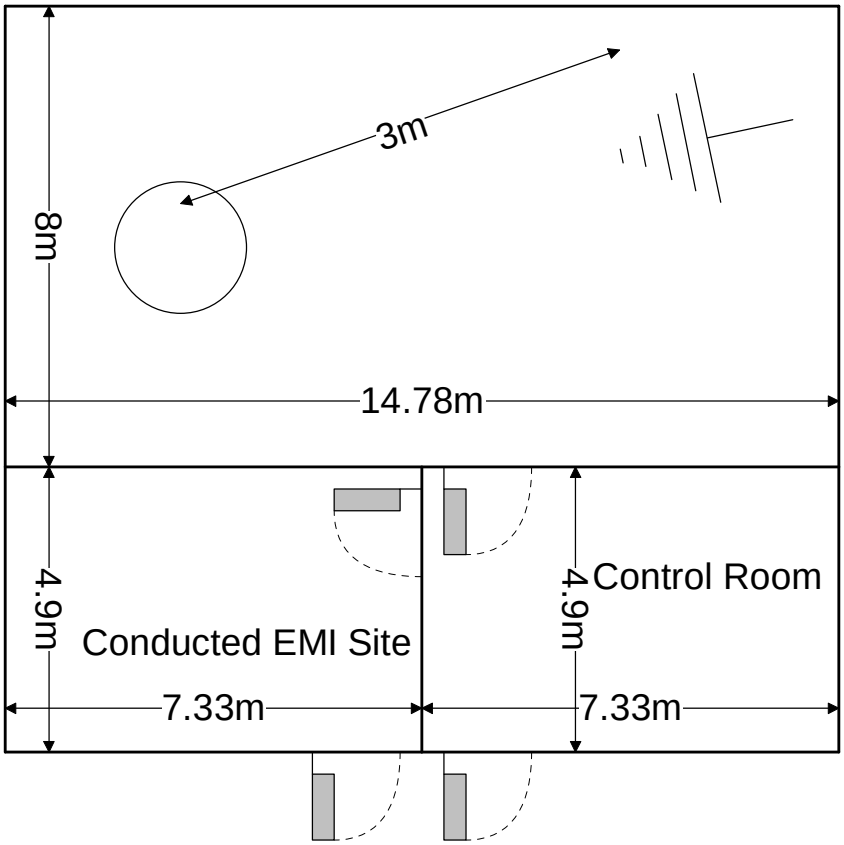



**Figure 2.3.1-1: Semi-Anechoic Chamber Test Site**

### 2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 $m^3$. The power line conducted emission site includes two LISNs: a Solar Model 8028-50 50 Ω/50 µH and an EMCO Model 3825/2R, which are installed as shown in the figure below. For evaluations requiring 230 V, 50 Hz AC input, a Polarad LISN (S/N 879341/048) is used in conjunction with a California Instruments signal generator Model 2001RP-OP1.

A diagram of the room is shown below in figure 2.3.2-1:

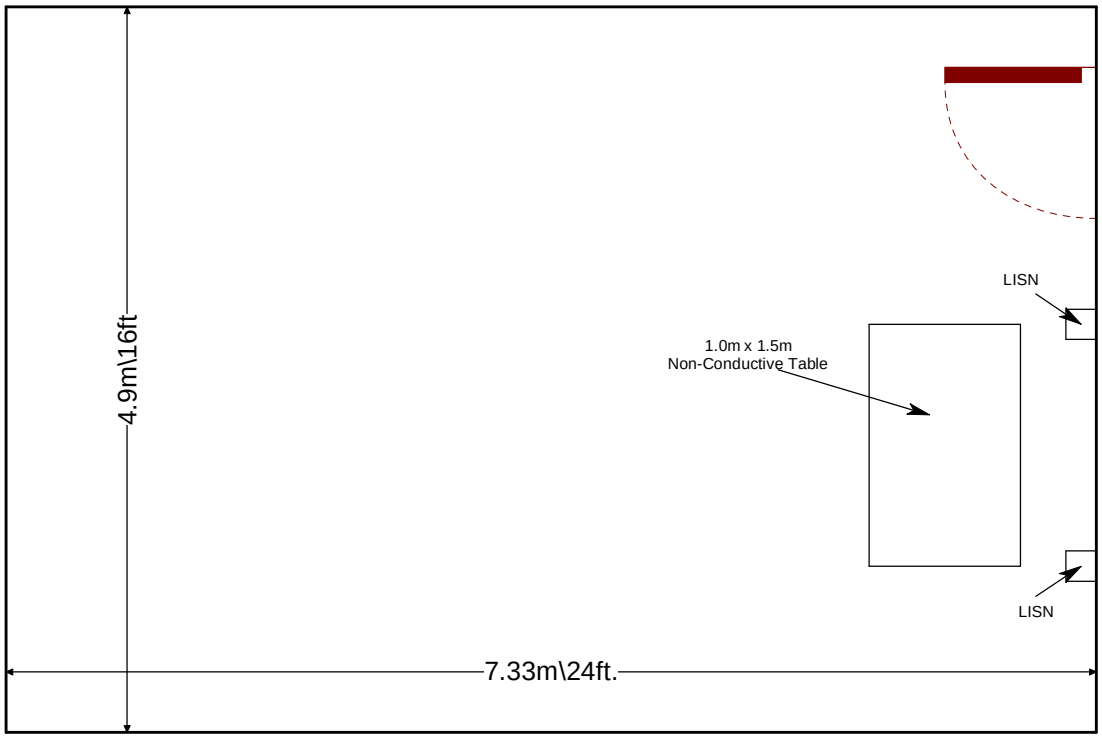



**Figure 2.3.2-1: AC Mains Conducted EMI Site**

## 3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2018.
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2018
- FCC KDB 558074 D01 DTS Meas Guidance v05 - Guidance for Performing Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating Under Section 15.257 of the FCC Rules, August 24, 2018.
- Innovation, Science and Economic Development Canada Radio Standards Specification: RSS-247 — Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices, Issue 2, February 2017.
- Innovation, Science and Economic Development Canada Radio Standards Specification: RSS-GEN – General Requirements for Compliance of Radio Apparatus, Issue 4, Amendment 1, March 2018.

## 4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

**Table 4-1: Test Equipment List**

| AssetID | Manufacturer | Model # | Equipment Type | Serial # | Calibration Performed Date | Calibration Due Date |
|---|---|---|---|---|---|---|
| 346 | Aeroflex/Weinschel | 54A-10 | Attennuator | T1362 | 7/10/2018 | 7/10/2019 |
| BEMC00078 | EMCO | 6502 | Active Loop Antenna | 9104-2608 | 5/9/2018 | 5/9/2020 |
| BEMC00282 | Microwave Circuits | H3G020G4 | 2-20GHz Band Pass Filter | 74541 | 5/17/2018 | 5/17/2019 |
| BEMC00283 | Rohde & Schwarz | FSP40 | Spectrum Analyzer | 1000033 | 11/28/2017 | 11/28/2019 |
| BEMC00523 | Agilent | E7405A | 9kHz-26.5GHz EMC analyzer/HYZ | MY45103293 | 11/27/2018 | 11/27/2020 |
| BEMC00653 | Suhner | SF-102A | Cable (40GHz) | 0944/2A | 10/9/2018 | 10/9/2019 |
| BEMC02002 | EMCO | 3108 | 30 MHz to 200 MHz Biconical Antenna | 2147 | 11/28/2017 | 11/30/2019 |
| BEMC02004 | EMCO | 3146 | 200 MHz to 1 GHz Log Periodic Antenna | 1385 | 12/27/2017 | 12/27/2019 |
| BEMC02008 | COM-power | AH-826 | Horn Antenna (18 GHz to 26.5 GHz) | 81009 | NCR | NCR |
| BEMC02011 | Hewlett-Packard | HP 8447D | 100 kHz to 1.3 GHz low-noise, high gain amplifier | 2443A03952 | 10/18/2018 | 10/18/2019 |
| BEMC02045 | ACS Boca | Conducted Cable Set | Consists of cables 2046, 2047, 2062, 2063 and 2065 | 2045 | 10/22/2018 | 10/22/2019 |
| BEMC02086 | Merrimac | FAN-6-10K | 10dB Attenuator | 23148-83-1 | 10/17/2018 | 10/17/2019 |
| BEMC02095 | ETS Lindgren | TILE4! - Version 4.2.A | Tile Automation Software | 85242 | NCR | NCR |
| BEMC02110 | Aeroflex Inmet | 40AH2W-10 | Attenuator 10dB, 2.9 mm-M/F, DC-40GHz 2 W | 2110 | 8/5/2018 | 8/5/2019 |
| BEMC02121 | Teledyne Storm Products | A81-0303 | Radiated Cable Set | 2121 | 7/26/2018 | 7/26/2019 |
| BEMC02138 | Hewlett Packard | 8449B | Pre-Amplifier | 3008A00320 | 11/26/2018 | 11/26/2019 |
| BEMC03004 | Teseq | CFL 9206A | Transient Filter Limiter 9kHz - 30MHz | 34720 | 8/10/2018 | 8/10/2019 |
| TEMC00012 | Agilent | E7405A | EMC Analyzer | MY42000055 | 3/29/2018 | 3/29/2020 |
| TEMC00044 | Rohde & Schwarz | ESHS 30 | EMI Receiver | 839667/006 | 11/16/2017 | 11/16/2019 |
| TEMC00061 | ETS Lindgren | 3117 | Double Ridge Guide Horn | 109296 | 2/13/2018 | 2/13/2020 |
| TEMC00128 | Rohde & Schwarz | ESIB 40 | EMI Test Receiver | 100255 | 11/16/2017 | 11/16/2019 |
| TEMC00153 | ode & Schwarz Vertrieb Münc | ESH3-Z5 | Voltage Network | 894785/012 | 10/19/2018 | 10/19/2019 |
| TEMC00160 | Com-Power Corporatio | PAM-118A | PAM-118A | 18040042 | 2/7/2018 | 2/7/2020 |
| TEMC00171 | MegaPhase, LLC | 1GVT4 | 4A & 4B Test Cables | NC12-K1K1-59, 394 | 5/30/2018 | 5/30/2020 |

**Notes:**

- **NCR=No Calibration Required**
- **The assets were only used during the active period of the calibration cycle.**

## 5 SUPPORT EQUIPMENT

**Table 5-1: EUT and Support Equipment Description**

| Item # | Type Device | Manufacturer | Model/Part # | Serial # |
|---|---|---|---|---|
| 1 | EUT | Eaton Cooper Lighting | SWPD01-SC | 198 |
| 2 | 50W LED Driver | Eaton | ELX-PCD-UNV-A-050-1200-AMB-SAUX-00 | XELUA5001812000127 |
| 3 | Junction Box | Eaton | N/A | N/A |

**Table 5-2: Cable Description – Radiated Emissions**

| Cable # | Cable Type | Length | Shield | Termination |
|---|---|---|---|---|
| A | Modular Cable | 300cm | No | Junction Box to EUT |
| B | Modular Cable | 300cm | No | Junction Box to LED Driver |
| C | Power Cable | 175cm | No | Led Driver to AC Mains |
| D | USB Cable | 170cm | No | Not Terminated |
| E | USB Cable | 170cm | No | Not Terminated |

## 6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

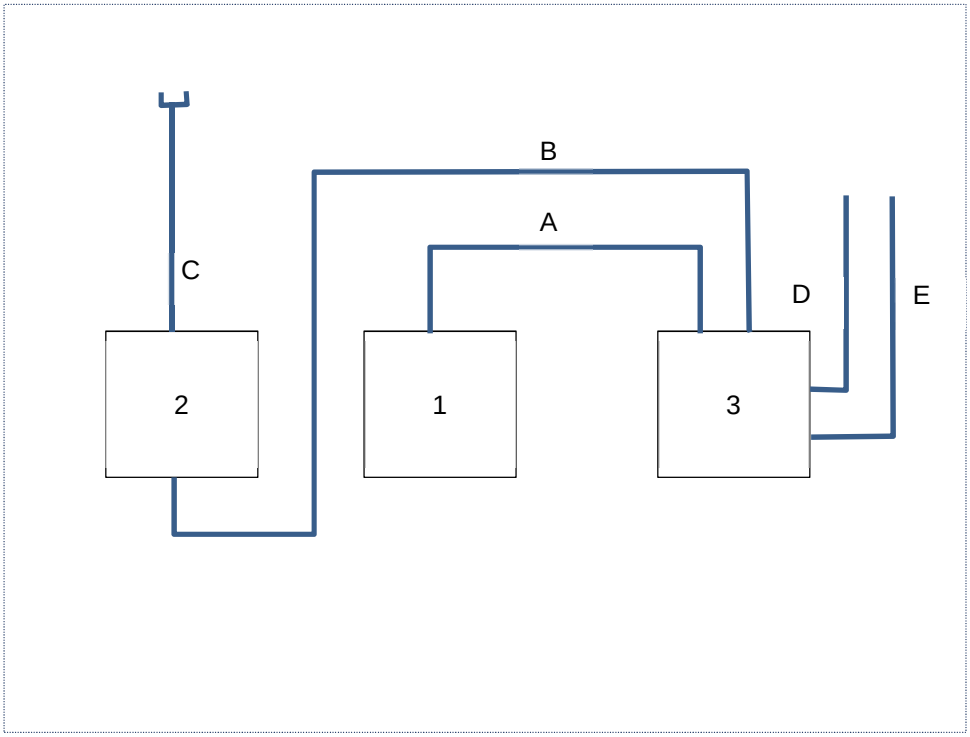



**Figure 6-1: EUT and Support Equipment Block Diagram**

# 7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

Test Begin Date: August 2, 2018
Test End Date: April 26, 2019

**Table 7-1: Summary of Tests**

| Requirements | FCC Rule Part | ISED Canada | Test Results |
|---|---|---|---|
| Antenna Requirement | FCC: Section 15.203 | | Pass |
| 6 dB Bandwidth | FCC: Section 15.247(a)(2) | ISED Canada: RSS-247 5.2(a) | Pass |
| 99% Bandwidth | | ISED Canada: RSS-GEN 6.6 | Pass |
| Peak Output Power | FCC: Section 15.247(b)(3) | ISED Canada: RSS-247 5.4(d) | Pass |
| Band-Edge Compliance of RF Conducted Emissions | FCC: Section 15.247(d) | ISED Canada: RSS-247 5.5 | Pass |
| RF Conducted Spurious Emissions | FCC: Section 15.247(d) | ISED Canada: RSS-247 5.5 | Pass |
| Radiated Spurious Emissions into Restricted Frequency Bands | FCC: Sections 15.205, 15.209 | ISED Canada: RSS-Gen 8.9, 8.10 | Pass |
| Power Spectral Density | FCC: Section 15.247(e) | ISED Canada: RSS-247 5.2(b) | Pass |
| Power Line Conducted Emissions | FCC: Section 15.207 | ISED Canada: RSS-Gen 8.8 | Pass |

## 7.1 Antenna Requirement – FCC: Section 15.203

The EUT uses a 2.6 dBi PCB antenna that is integral to the PCB. The antenna permanently attached and is not readily removable. Therefore meets the requirements of FCC Section 15.203.

## 7.2 6 dB Bandwidth - FCC: Section 15.247(a)(2); ISED Canada: RSS-247 5.2(a); 99% Bandwidth ISED Canada: RSS-GEN 6.6

### 7.2.1 Measurement Procedure

The 6dB bandwidth was measured in accordance with Subclause 11.8 of ANSI C63.10. The RBW of the spectrum analyzer was set to 100 kHz and VBW 300 kHz. Span was set large enough to capture the emissions and >> RBW. A peak detector was used for the measurements.

The 99% occupied bandwidth was measured with the spectrum analyzer span set to fully display the emission. The RBW was set to 1% to 5% of the approximated bandwidth. The occupied 99% bandwidth was measured by using 99% bandwidth equipment function of the spectrum analyzer using a peak detector.

### 7.2.2 Measurement Results

Performed by: Thierry Jean-Charles

**Table 7.2.2-1: 6dB / 99% Bandwidth**

| Frequency (MHz) | 6dB Bandwidth (kHz) | 99% Bandwidth (kHz) |
|---|---|---|
| 2402 | 712.75 | 1040.667 |
| 2440 | 713.50 | 1040.000 |
| 2480 | 710.00 | 1040.000 |

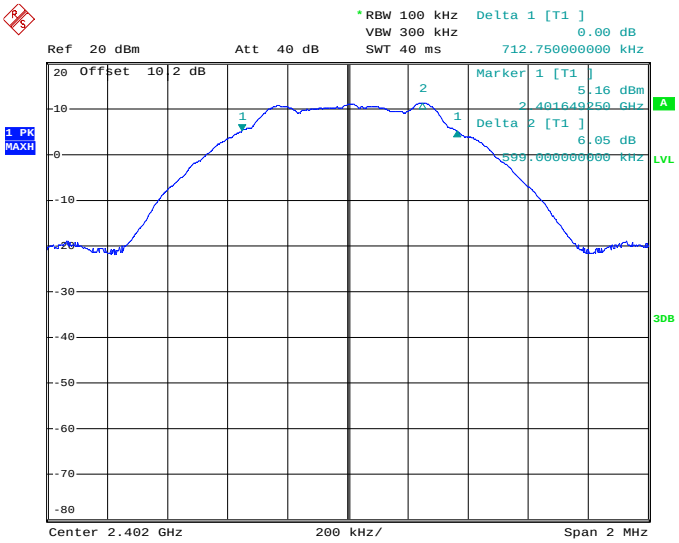



**Figure 7.2.2-1: 6dB BW - Low Channel**

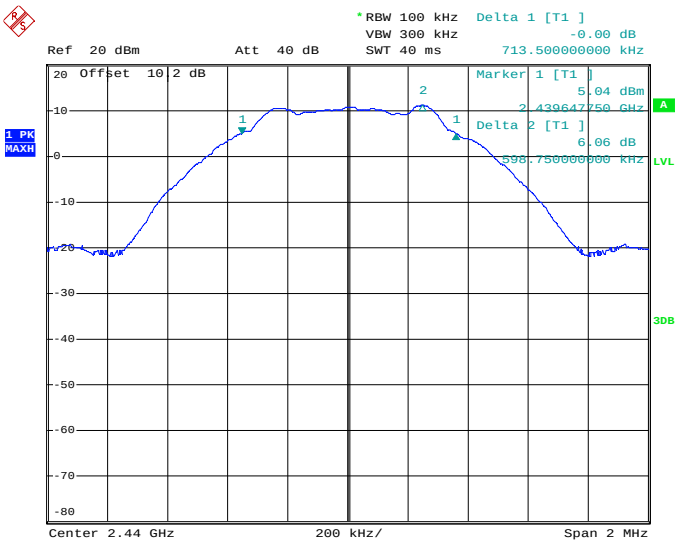
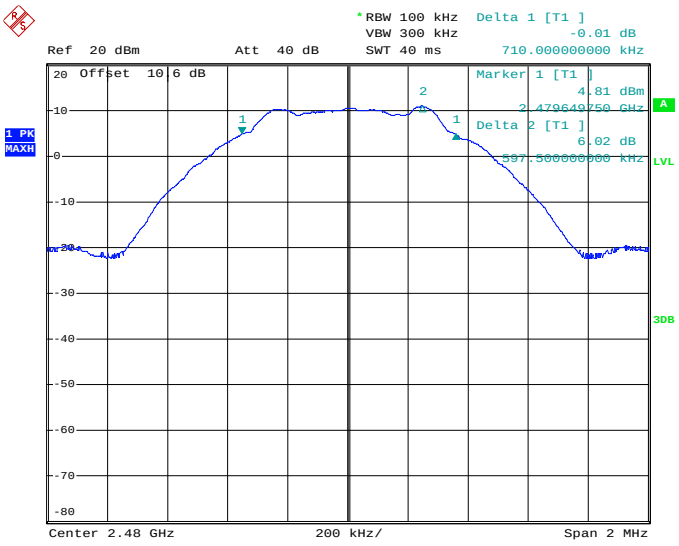
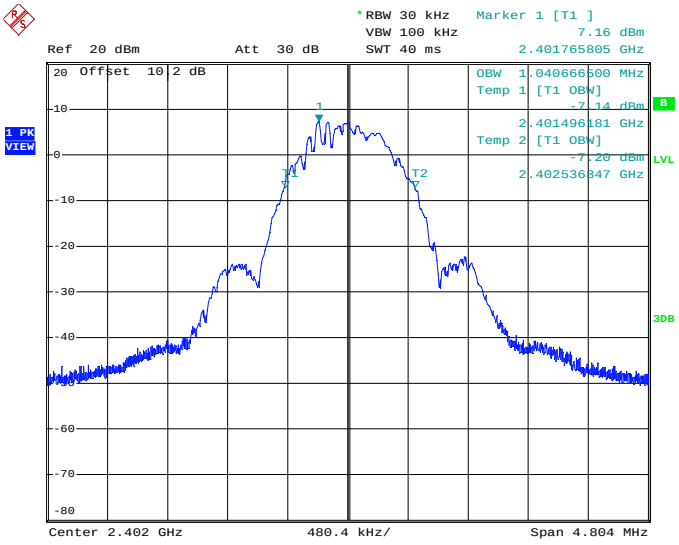



**Figure 7.2.2-2: 6dB BW - Middle Channel**



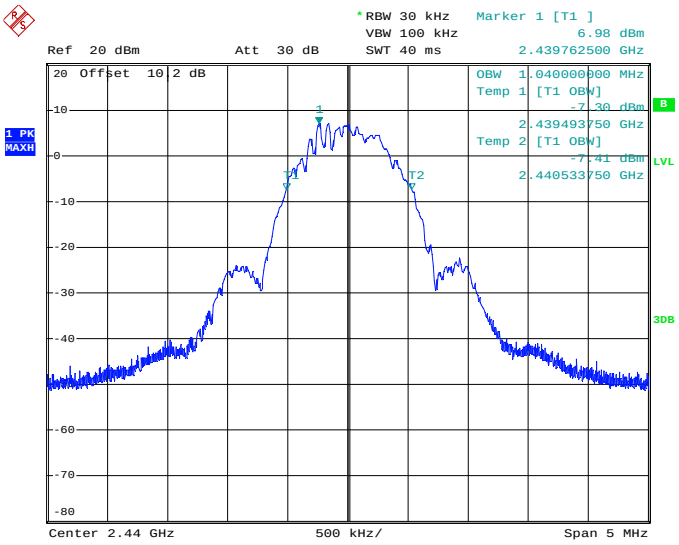

Date: 26.APR.2019 15:23:06

**Figure 7.2.2-3: 6dB BW - High Channel**



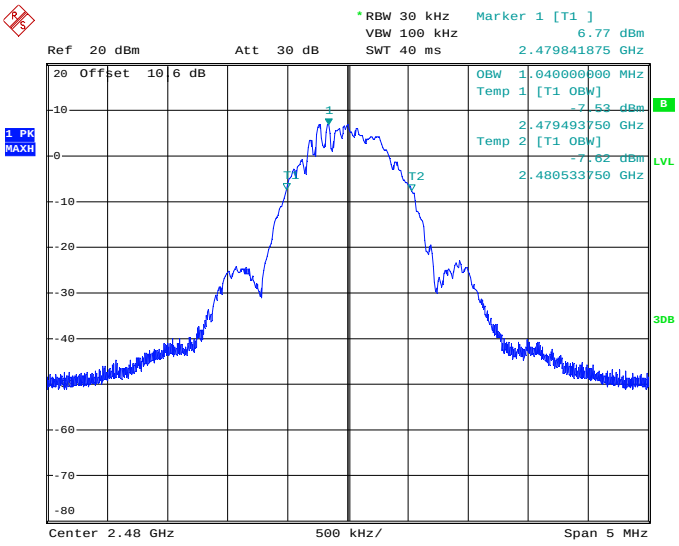

Date: 3.AUG.2018 14:23:30

**Figure 7.2.2-4: 99% OBW - Low Channel**




Date: 3.AUG.2018 14:51:05

**Figure 7.2.2-5: 99% OBW - Middle Channel**




Date: 26.APR.2019 15:18:45

**Figure 7.2.2-6 99% OBW - High Channel**

## 7.3 Peak Output Power – FCC: Section 15.247(b)(3); ISED Canada: RSS-247 5.4(d)

### 7.3.1 Measurement Procedure (Conducted Method)

The fundamental emission output power was measured in accordance with Subclause 11.9.1.1 of ANSI C63.10. The RF output of the equipment under test was directly connected to the input of the spectrum analyzer through suitable attenuation.

The Maximum Output Power allowed is 1 Watt (30 dBm)

### 7.3.2 Measurement Results

Performed by: Thierry Jean-Charles

**Table 7.3.2-1: RF Output Power**

| Frequency (MHz) | Power (dBm) |
|---|---|
| 2402 | 12.34 |
| 2440 | 12.19 |
| 2480 | 11.83 |

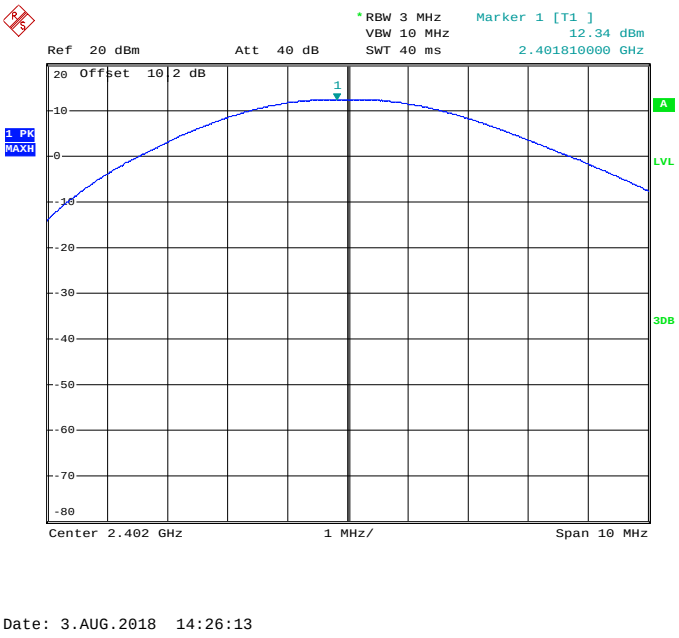



**Figure 7.3.2-1: RF Output Power - Low Channel**

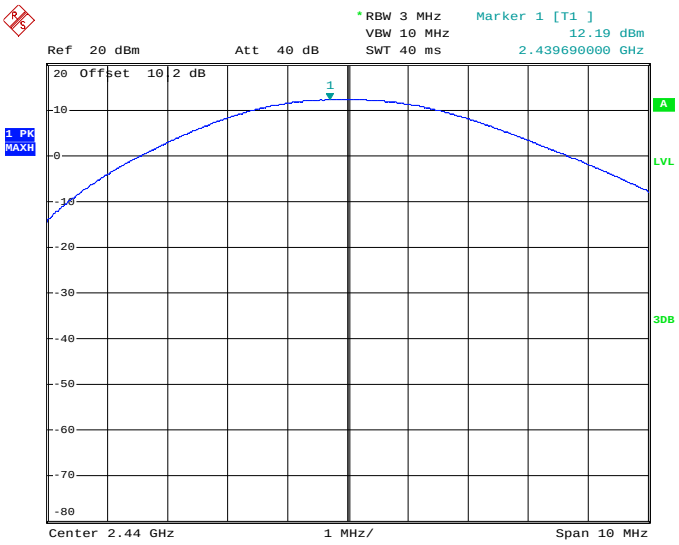



**Figure 7.3.2-2: RF Output Power - Middle Channel**

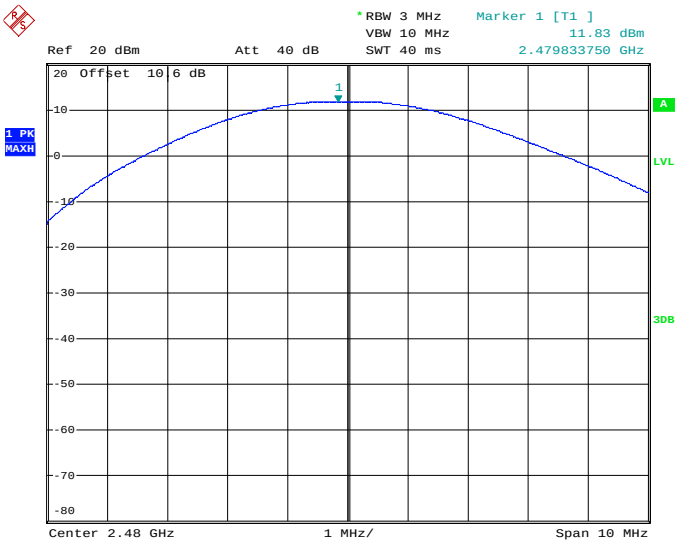



**Figure 7.3.2-3: RF Output Power - High Channel**

## 7.4 Band-Edge Compliance and Spurious Emissions

### 7.4.1 Band-Edge Compliance of RF Conducted Emissions – FCC: Section 15.247(d); ISED Canada: RSS-247 5.5

#### 7.4.1.1 Measurement Procedure

The RF Conducted Emissions at the Band-Edges were measured in accordance with Subclause 11.11 of ANSI C63.10. The RF output port of the EUT was connected to the input of the spectrum analyzer through suitable attenuation. The EUT was investigated at the lowest and highest channel available to determine band-edge compliance. For each measurement the spectrum analyzer's RBW was set to 100 kHz, and the VBW was set to >= 300 kHz.

#### 7.4.1.2 Measurement Results

Performed by: Thierry Jean-Charles

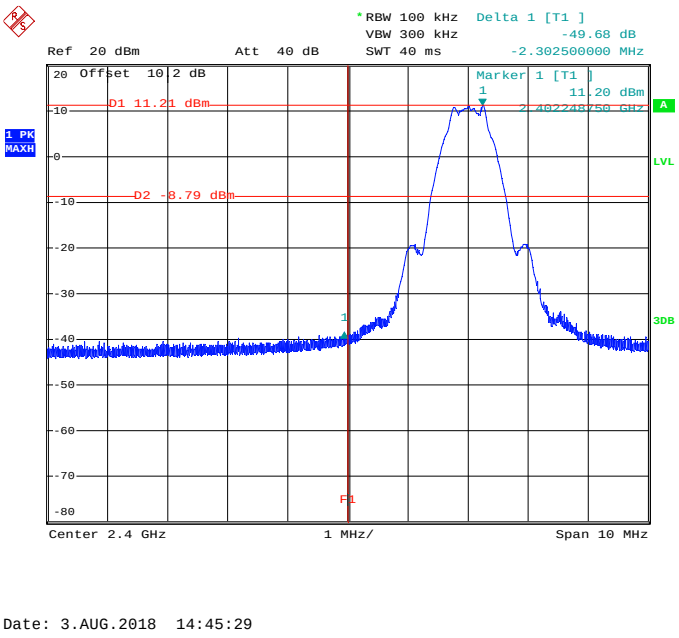



**Figure 7.4.1.2-1: Lower Band-Edge**

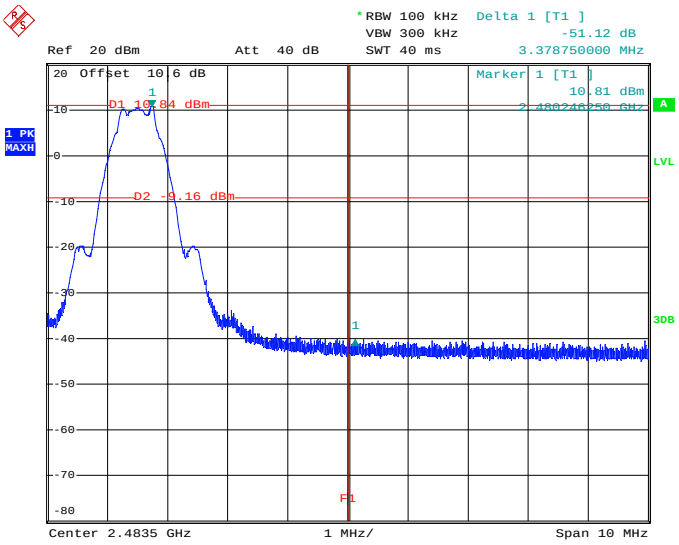



**Figure 7.4.1.2-2: Upper Band-Edge**

### 7.4.2 RF Conducted Spurious Emissions – FCC: Section 15.247(d); ISED Canada: RSS-247 5.5

#### 7.4.2.1 Measurement Procedure

The RF Conducted Spurious Emissions were measured in accordance with Subclause 11.11 of ANSI C63.10. The RF output port of the equipment under test was directly connected to the input of the spectrum analyzer. The EUT was investigated for conducted spurious emissions from 30 MHz to 26 GHz, 10 times the highest fundamental frequency. Measurements were made at the low, center and high channels of the EUT. For each measurement, the spectrum analyzer's RBW was set to 100 kHz and the VBW was set to 300 kHz. The peak Max Hold function of the analyzer was utilized.

#### 7.4.2.2 Measurement Results

Performed by: Thierry Jean-Charles

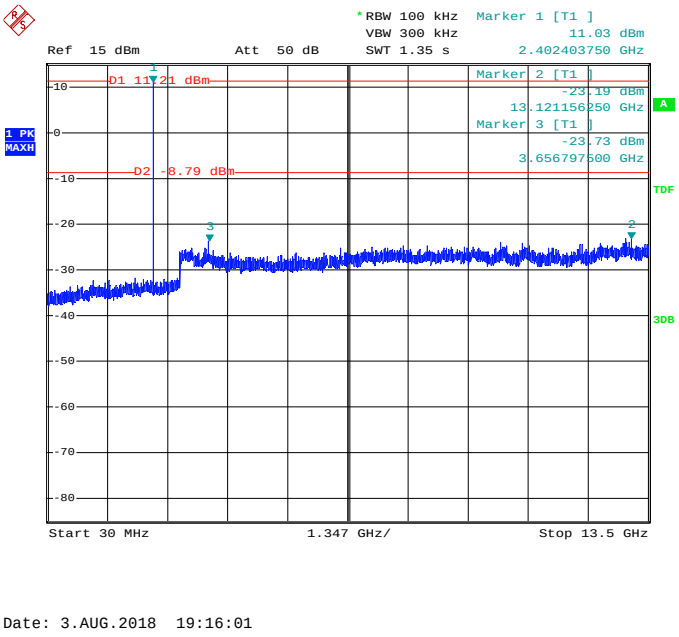



**Figure 7.4.2.2-1: 30 MHz – 13.5 GHz – Low Channel**

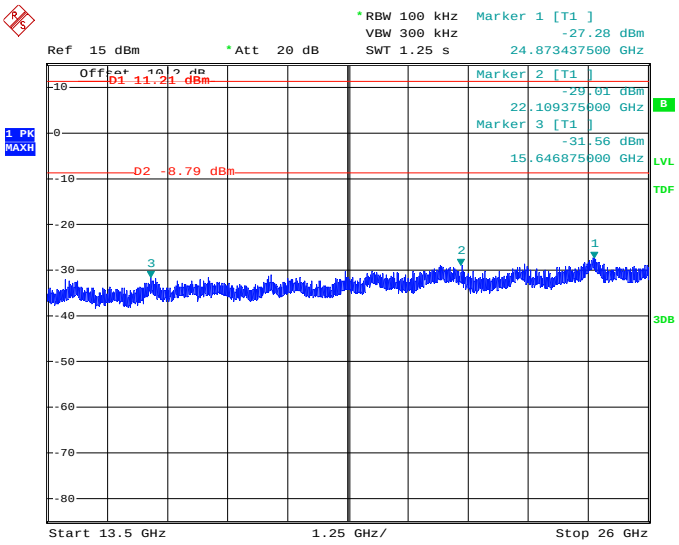



**Figure 7.4.2.2-2: 13.5 GHz – 26 GHz – Low Channel**

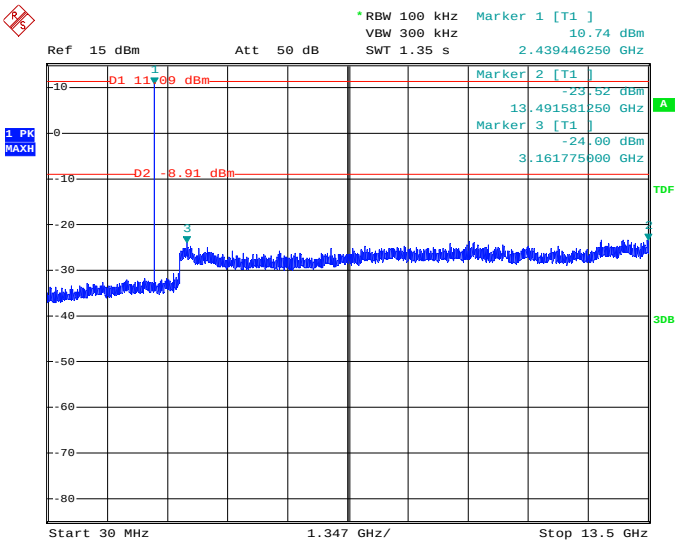



**Figure 7.4.2.2-3: 30 MHz – 13.5 GHz – Middle Channel**

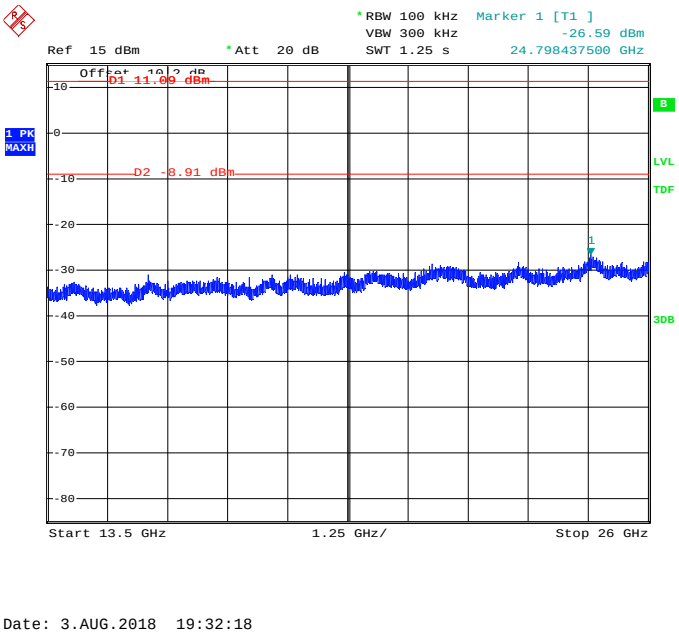



**Figure 7.4.2.2-4: 13.5 GHz – 26 GHz – Middle Channel**

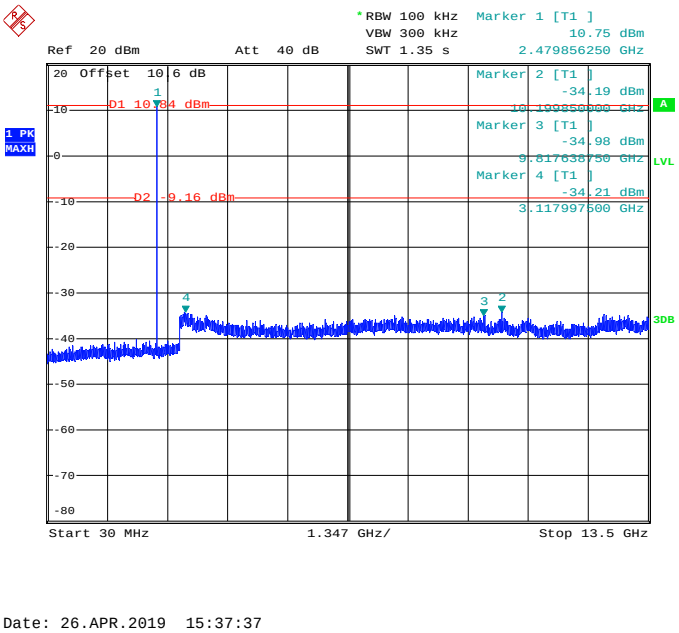



**Figure 7.4.2.2-5: 30 MHz – 13.5 GHz – High Channel**

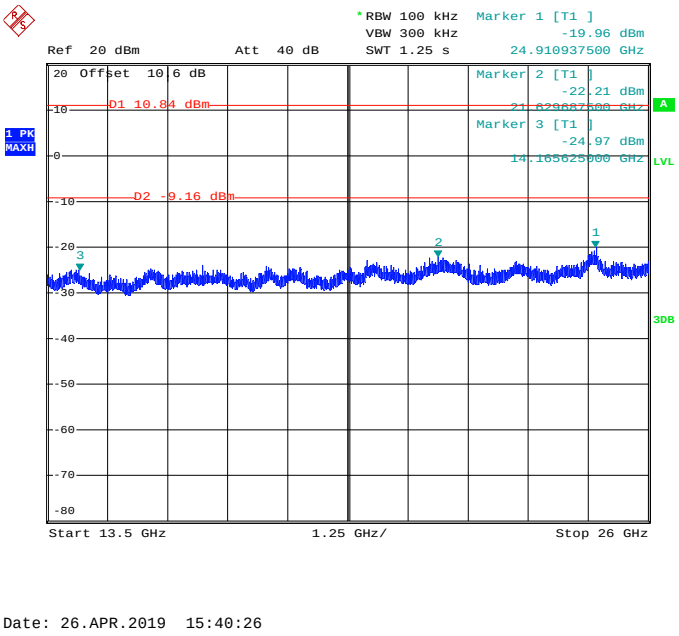



**Figure 7.4.2.2-6: 13.5 GHz – 26 GHz – High Channel**

### 7.4.3 Radiated Spurious Emissions into Restricted Frequency Bands – FCC: Sections 15.205, 15.209; ISED Canada: RSS-Gen 8.9, 8.10

#### 7.4.3.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 9 kHz to 26 GHz, 10 times the highest fundamental frequency. Each emission found to be in a restricted band as defined by section 15.205, including any emission at the operational band-edge, was compared to the radiated emission limits as defined in Section 15.209.

For measurements below 30 MHz, the receive antenna height was set to 1 m and the EUT was rotated through 360 degrees. The resolution bandwidth was set to 200 Hz below 150 kHz and to 9 kHz above 150 kHz.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000 MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000 MHz, peak measurements are made with RBW of 1 MHz and VBW of 3 MHz. Average measurements are performed in the linear scale using VBW of 30 Hz.

#### 7.4.3.2 Duty Cycle Correction

The EUT was configured to transmit at 100% duty cycle during the evaluation. A Duty Cycle Correction of 34.22% corresponding to 20*log(34.22/100) = -9.31 dB was applied to the average measurements for the corrected average results.

Per the equipment manufacturer the maximum duty cycle of the EUT is inherent to the IEEE 802.15.1 protocol and is not accessible to the end user.

The duty cycle correction factor is calculated as such:

Worst Cast Transmission time: 1.232 ms
Transmission Period: 3.6 ms

Duty Cycle = 1.232 / 3.6 = 34.22%

#### 7.4.3.3 Measurement Results

Performed by: Jean Rene, Thierry Jean-Charles

Radiated band-edge and spurious emissions found in the restricted frequency bands of 9 kHz to 26 GHz are reported in the tables below.

**Table 7.4.3.3-1: Radiated Spurious Emissions Tabulated Data**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **Low Channel** | | | | | | | | | | |
| **2390** | 50.89 | 37.52 | H | 0.69 | 51.58 | 28.89 | 74.0 | 54.0 | 22.4 | 25.1 |
| **4804** | 39.52 | 28.01 | H | 8.03 | 47.55 | 26.73 | 74.0 | 54.0 | 26.4 | 27.3 |
| **4804** | 38.76 | 26.26 | V | 8.03 | 46.79 | 24.98 | 74.0 | 54.0 | 27.2 | 29.0 |
| **Middle Channel** | | | | | | | | | | |
| **4880** | 40.77 | 30.28 | H | 8.35 | 49.12 | 29.32 | 74.0 | 54.0 | 24.9 | 24.7 |
| **4880** | 39.17 | 26.31 | V | 8.35 | 47.52 | 25.35 | 74.0 | 54.0 | 26.5 | 28.7 |
| **High Channel** | | | | | | | | | | |
| **2483.5** | 65.80 | 51.57 | H | -2.29 | 63.51 | 39.97 | 74.0 | 54.0 | 10.5 | 14.0 |
| **2483.5** | 61.23 | 47.22 | V | -2.29 | 58.94 | 35.62 | 74.0 | 54.0 | 15.1 | 18.4 |
| **4960** | 48.19 | 36.86 | H | 4.33 | 52.52 | 31.87 | 74.0 | 54.0 | 21.5 | 22.1 |
| **4960** | 47.13 | 33.99 | V | 4.33 | 51.46 | 29.00 | 74.0 | 54.0 | 22.5 | 25.0 |

**Notes:**

**All emissions above 4.96 GHz were attenuated below the limits and the noise floor of the measurement equipment.**

**A duty cycle correction factor corresponding to 20 log(34.22/100) was used for the average measurements.**

### 7.4.4 Sample Calculation:

$R_C = R_U + CF_T$

Where:

| | | |
|---|---|---|
| $CF_T$ | = | Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only) |
| $R_U$ | = | Uncorrected Reading |
| $R_C$ | = | Corrected Level |
| AF | = | Antenna Factor |
| CA | = | Cable Attenuation |
| AG | = | Amplifier Gain |
| DC | = | Duty Cycle Correction Factor |

**Example Calculation: Peak**
Corrected Level: 50.89 + 0.69 = 51.58 dBµV/m
Margin: 74 dBµV/m – 51.58 dBµV/m = 22.42 dB

**Example Calculation: Average**
Corrected Level: 37.52 + 0.69 -9.31 = 28.90 dBµV/m
Margin: 54 dBµV/m – 28.90 dBµV/m = 25.10 dB

## 7.5 Power Spectral Density – FCC: Section 15.247(e); ISED Canada: RSS-247 5.2(b)

### 7.5.1 PSD Measurement Procedure (Conducted Method)

The power spectral density was measured in accordance with ANSI C63.10:2013 Section 11.10.2 Method PKPSD (peak PSD). The RF output port of the EUT was directly connected to the input of the spectrum analyzer. Offset values were input for cable and external attenuation. The spectrum analyzer RBW was set to 3 kHz and VBW to 10 kHz. The Span was adjusted to 1.5 times the DTS bandwidth and the sweep time was set to auto. The measurements were performed using a peak detector.

### 7.5.2 Measurement Results

Performed by: Thierry Jean-Charles

Results are shown below.

**Table 7.5.2-1: Power Spectral Density**

| Frequency (MHz) | PSD (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|
| 2402 | -3.90 | 8.0 | 11.9 |
| 2440 | -4.03 | 8.0 | 12.03 |
| 2480 | -4.23 | 8.0 | 12.23 |

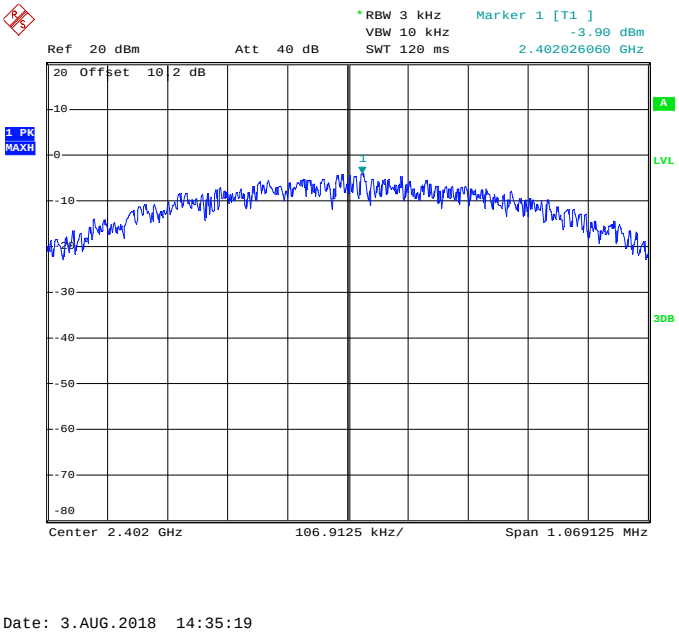



**Figure 7.5.2-1: Power Spectral Density - Low Channel**

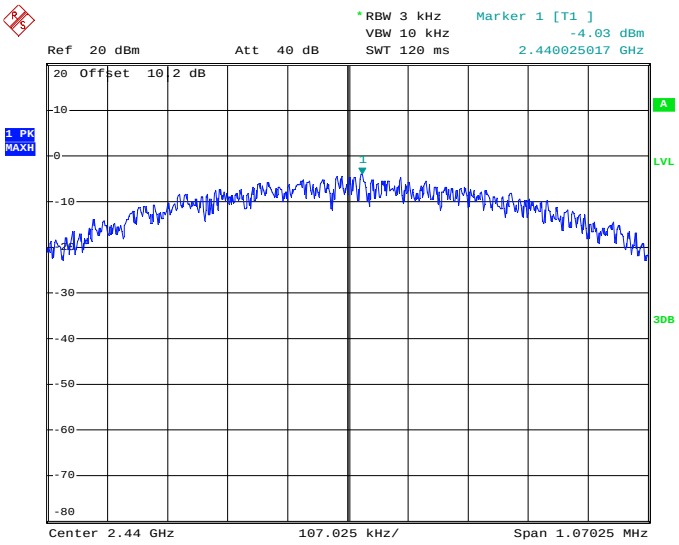



**Figure 7.5.2-2: Power Spectral Density - Middle Channel**

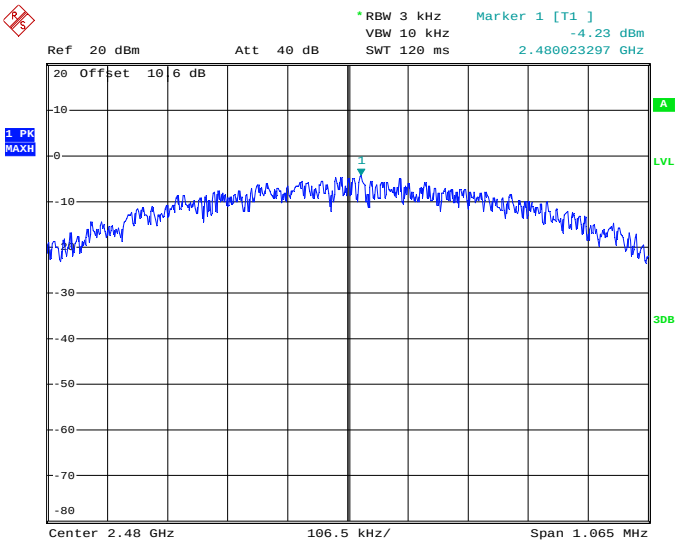



**Figure 7.5.2-3: Power Spectral Density – High Channel**

## 7.6 Power Line Conducted Emissions – FCC: Section 15.207; ISED Canada: RSS-Gen 8.8

### 7.6.1 Measurement Procedure

ANSI C63.10 section 6.2 was the guiding document for this evaluation. Conducted emissions were performed from 150 kHz to 30 MHz with the spectrum analyzer's resolution bandwidth set to 9 kHz and the video bandwidth set to 30 kHz. The calculation for the conducted emissions is as follows:

**Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss**
**Margin = Applicable Limit - Corrected Reading**

### 7.6.2 Measurement Results

Performed by: Thierry Jean-Charles

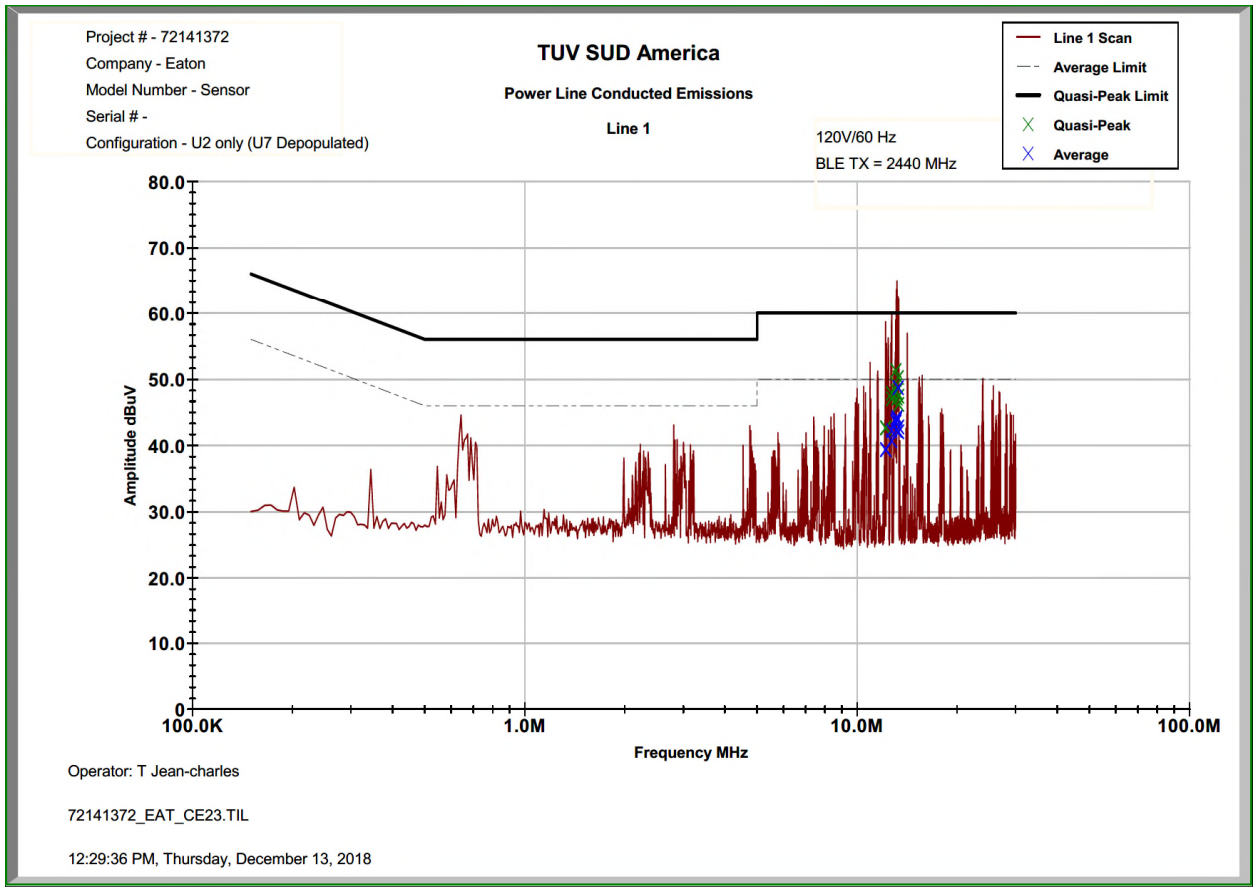



**Figure 7.6.2-1: Conducted Emissions Results – Line 1**

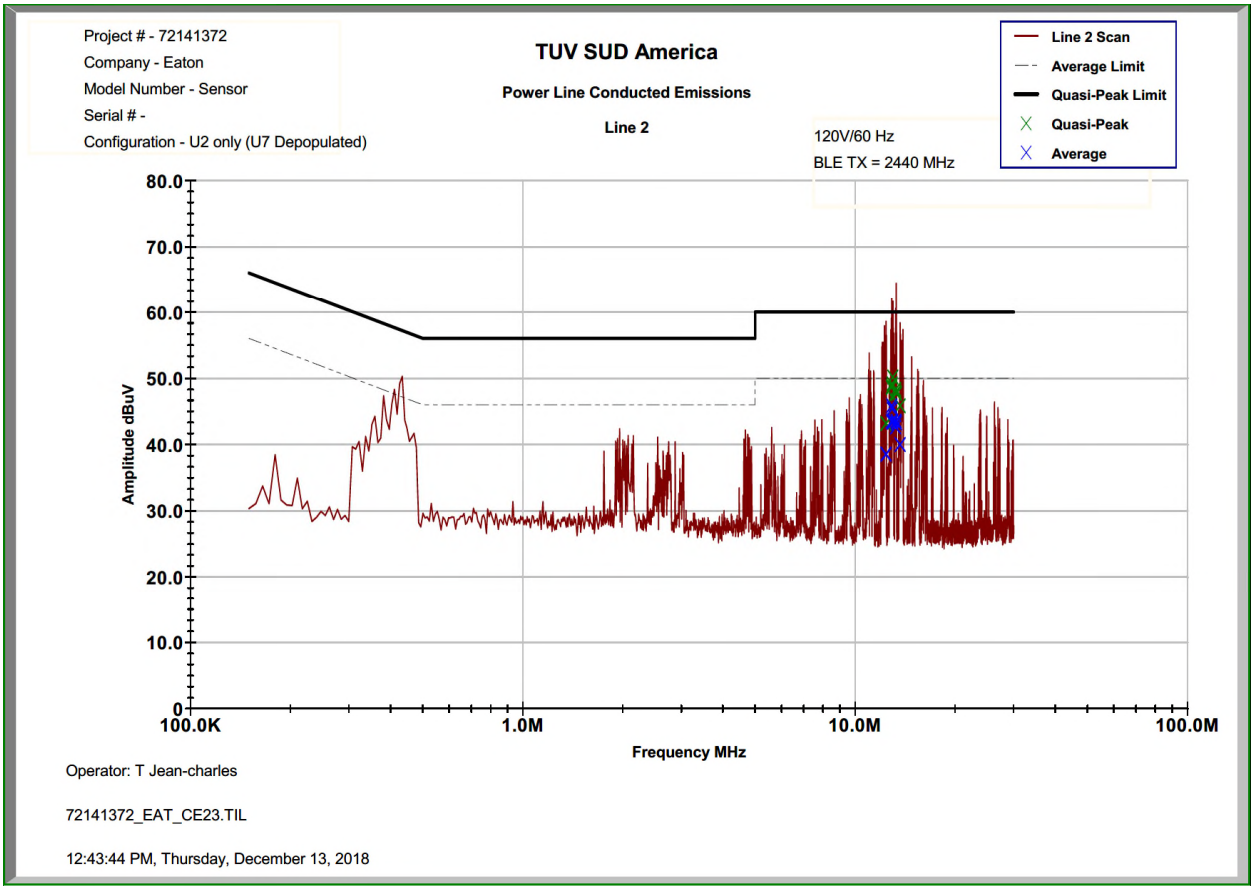



**Figure 7.6.2-2: Conducted Emissions Results – Line 2**

## Table 7.6.2-1: Conducted EMI Results

☒ Line 1 ☒ Line 2 ☐ Line 3 ☐ Line 4
☒ To Ground ☐ Floating
☐ Telecom Port _____
☒ dBµV ☐ dBµA

Plot Number: 72141372_EAT_CE23
Power Supply Description: 12 VDC LED Driver

| Frequency (MHz) | Uncorrected Reading | | Total Correction Factor (dB) | Corrected Level | | Limit | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|
| | Quasi-Peak | Average | | Quasi-Peak | Average | Quasi-Peak | Average | Quasi-Peak | Average |
| **Line 1** | | | | | | | | | |
| 12.1791 | 31.65 | 28.353 | 10.99 | 42.64 | 39.34 | 60.00 | 50.00 | 17.4 | 10.7 |
| 12.6858 | 36.811 | 29.628 | 11.03 | 47.84 | 40.66 | 60.00 | 50.00 | 12.2 | 9.3 |
| 12.693 | 35.991 | 31.153 | 11.03 | 47.02 | 42.18 | 60.00 | 50.00 | 13.0 | 7.8 |
| 13.0776 | 40.223 | 32.468 | 11.06 | 51.28 | 43.53 | 60.00 | 50.00 | 8.7 | 6.5 |
| 13.1199 | 37.036 | 31.147 | 11.06 | 48.10 | 42.21 | 60.00 | 50.00 | 11.9 | 7.8 |
| 13.1264 | 37.997 | 32.827 | 11.06 | 49.06 | 43.89 | 60.00 | 50.00 | 10.9 | 6.1 |
| 13.1776 | 36.005 | 33.149 | 11.07 | 47.07 | 44.22 | 60.00 | 50.00 | 12.9 | 5.8 |
| 13.281 | 39.155 | 37.601 | 11.07 | 50.23 | 48.68 | 60.00 | 50.00 | 9.8 | 1.3 |
| 13.3147 | 36.3 | 31.689 | 11.08 | 47.38 | 42.77 | 60.00 | 50.00 | 12.6 | 7.2 |
| 13.319 | 35.055 | 30.915 | 11.08 | 46.13 | 41.99 | 60.00 | 50.00 | 13.9 | 8.0 |
| **Line 2** | | | | | | | | | |
| 12.3766 | 32.471 | 27.813 | 10.67 | 43.14 | 38.48 | 60.00 | 50.00 | 16.9 | 11.5 |
| 12.8429 | 37.883 | 32.734 | 10.68 | 48.56 | 43.41 | 60.00 | 50.00 | 11.4 | 6.6 |
| 12.8822 | 38.016 | 35.105 | 10.68 | 48.69 | 45.78 | 60.00 | 50.00 | 11.3 | 4.2 |
| 12.9132 | 38.433 | 34.65 | 10.68 | 49.11 | 45.33 | 60.00 | 50.00 | 10.9 | 4.7 |
| 12.9414 | 36.46 | 32.578 | 10.68 | 47.14 | 43.26 | 60.00 | 50.00 | 12.9 | 6.7 |
| 12.9853 | 39.426 | 32.849 | 10.68 | 50.11 | 43.53 | 60.00 | 50.00 | 9.9 | 6.5 |
| 13.2316 | 37.601 | 31.869 | 10.68 | 48.28 | 42.55 | 60.00 | 50.00 | 11.7 | 7.4 |
| 13.259 | 37.211 | 32.826 | 10.68 | 47.90 | 43.51 | 60.00 | 50.00 | 12.1 | 6.5 |
| 13.2999 | 36.938 | 32.503 | 10.68 | 47.62 | 43.19 | 60.00 | 50.00 | 12.4 | 6.8 |
| 13.6574 | 35.08 | 29.206 | 10.69 | 45.77 | 39.90 | 60.00 | 50.00 | 14.2 | 10.1 |

## 8 MEASUREMENT UNCERTAINTIES

The expanded laboratory measurement uncertainty figures ($U_{Lab}$) provided below correspond to an expansion factor (coverage factor) k = 1.96 which provide confidence levels of 95%.

**Table 8-1: Measurement Uncertainties**

| Parameter | $U_{lab}$ |
|---|---|
| Occupied Channel Bandwidth | ± 0.009 % |
| RF Conducted Output Power | ± 1.15 dB |
| Power Spectral Density | ± 1.15 dB |
| Antenna Port Conducted Emissions | ± 1.15 dB |
| Radiated Emissions ≤ 1GHz | ± 5.86 dB |
| Radiated Emissions > 1GHz | ± 4.65 dB |
| Temperature | ± 0.860 °C |
| Radio Frequency | $\pm 2.832 \times 10^{-8}$ |
| AC Power Line Conducted Emissions | ±3.72 dB |

## 9 CONCLUSION

In the opinion of TÜV SÜD America, Inc. the models SWPD01-SC, manufactured by Cooper Lighting LLC, meets the requirements of FCC Part 15.247 and Industry Canada's Radio Standards Specification RSS-247 for the tests documented herein.

# END REPORT