

Test Report # 317328 D

Equipment Under Test: Leviton 0XB1803 ZigBee/Bluetooth LE PCA Transceiver Module, MGx

Test Date(s): 4/10/19

Prepared for: Dmitriy Moskovkin
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Report Issued by: Shane Dock, EMC Engineer

Signature:



Date: 11/4/2019

Report Reviewed by: Adam Alger, Quality Manager

Signature: 

Date: 3/22/2019

Report Constructed by: Shane Dock, EMC Engineer

Signature:



Date: 4/10/2019

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| | | |
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| Job: C-2856 | | Serial: Engineering Sample |

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Laird Technologies Test Services in Review

The Laird Technologies, Inc. laboratory located at W66 N220 Commerce Court Cedarburg, Wisconsin, 53012 USA is recognized through the following organizations:



A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025:2017 with Electrical (EMC) Scope

A2LA Certificate Number: 1255.01

Scope of accreditation includes all test methods listed herein unless otherwise noted



Federal Communications Commission (FCC) – USA

Accredited Test Firm Registration Number: 953492

Recognition of two 3 meter Semi-Anechoic Chambers



Innovation, Science and Economic Development Canada

Accredited U.S. Identification Number: US0218

Recognition of two 3 meter Semi-Anechoic Chambers

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1 TEST REPORT SUMMARY

During **4/10/19** the Equipment Under Test (EUT), **Leviton 0XB1803 ZigBee/Bluetooth LE PCA Transceiver Module, MGx**, as provided by **Leviton Manufacturing Co., Inc.** was tested to the following requirements:

| Requirement | Description | Specification | Method | Result |
|---------------------------------|--|---------------|-----------------------|----------|
| FCC Part 1.1307, 2.1091, 2.1093 | RF Exposure and equipment authorization requirements | Reported | FCC KDB 447498 | Reported |
| ISED Canada RSS-102 | Radiofrequency Radiation Exposure Evaluation | Reported | RSS-102 Section 2.5.2 | Reported |

Notice:

The results relate only to the item tested and described in this report. Any modifications made to the equipment under test after the specified test date(s) may invalidate the data herein.

If the resulting measurement margin is seen to be within the uncertainty value, as listed in this report, the possibility exists that this unit may not meet the required limit specification if subsequently tested.

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2 CLIENT INFORMATION

| | |
|-----------------------|---------------------------------|
| Company Name | Leviton Manufacturing Co., Inc. |
| Contact Person | Dmitriy Moskovkin |
| Address | 20497 SW Teton Avenue |

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

| | |
|----------------------|---|
| Product Name | Name: Leviton OXB1803 ZigBee/Bluetooth LE PCA Transceiver Module, MGx |
| Model Number | Model: OXB1803 Module, Bluetooth LE protocol |
| Serial Number | Engineering Sample |
| FCC/IC ID | FCC: QGH-ZBMG IC ID:2473A-ZBMG |

2.2 Product Description

Zigbee and Bluetooth low energy module using B1803 PCA and Silicon Labs EFR series MG1, MG12, or MG13

2.3 Modifications Incorporated for Compliance

None noted at time of test

2.4 Deviations and Exclusions from Test Specifications

None noted at time of test

2.5 Additional Information

AC Adapter used to power Board with 5 VDC. EUT programmed via Laptop and WSTK Board using Gecko SDK Suite V1.1.1 and Adapter firmware version 1v0p3b664. The MG12 module was tested, and the MG1 and MG13 modules feature an identical layout on the PCB.

2.6 Channels Tested

2402 MHz – Power Setting 20

2440 MHz - Power Setting 20

2478 MHz - Power Setting 20

| | | |
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2480 MHz - Power Setting 17

Minimum power tested with a setting of 10 for each channel.

3 REFERENCES

| Publication | Edition | Date |
|----------------|---------|------|
| CFR 47 Part 15 | - | 2019 |
| ANSI C63.10 | - | 2013 |
| RSS-247 | 2 | 2017 |
| RSS GEN | 5 | 2018 |

4 UNCERTAINTY SUMMARY

Using the guidance of the following publications the calculated measurement uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of $k = 2$.

| References | Version / Date |
|-----------------|------------------|
| CISPR 16-4-1 | Ed. 2 (2009-02) |
| CISPR 16-4-2 | Ed. 2 (2011-06) |
| CISPR 32 | Ed. 1 (2012-01) |
| ANSI C63.23 | 2012 |
| A2LA P103 | February 4, 2016 |
| A2LA P103c | August 10, 2015 |
| ETSI TR 100-028 | V1.3.1 (2001-03) |

| Measurement Type | Configuration | Uncertainty \pm |
|-----------------------------|-------------------------------|-------------------|
| Radiated Emissions | Biconical Antenna | 5.0 dB |
| Radiated Emissions | Log Periodic Antenna | 5.3 dB |
| Radiated Emissions | Horn Antenna | 4.7 dB |
| AC Line Conducted Emissions | Artificial Mains Network | 3.4 dB |
| Telecom Conducted Emissions | Asymmetric Artificial Network | 4.9 dB |
| Disturbance Power Emissions | Absorbing Clamp | 4.1 dB |
| Radiated Immunity | 3 Volts/meter | 2.2 dB |
| Conducted Immunity | CDN/EM/BCI | 2.4/3.5/3.4 dB |
| EFT Burst/Surge | Peak pulse voltage | 164 volts |
| ESD Immunity | 15 kV level | 1377 Volts |

| Parameter | ETSI U.C. \pm | U.C. \pm |
|--|--------------------|-----------------------|
| Radio Frequency, from F0 | 1×10^{-7} | 0.55×10^{-7} |
| Occupied Channel Bandwidth | 5 % | 2 % |
| RF conducted Power (Power Meter) | 1.5 dB | 1.2 dB |
| RF conducted emissions (Spectrum Analyzer) | 3.0 dB | 1.7 dB |
| All emissions, radiated | 6.0 dB | 5.3 dB |
| Temperature | 1° C | 0.65° C |
| Humidity | 5 % | 2.9 % |

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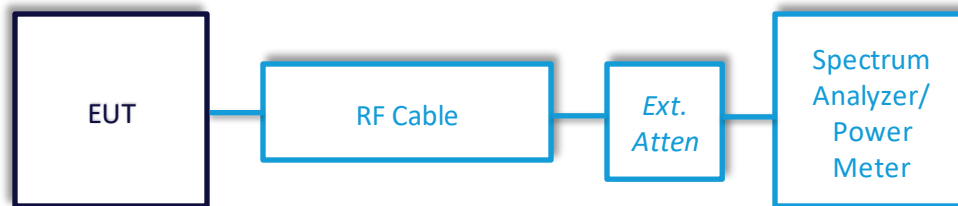
| | | |
|-----------------|-----|-----|
| Supply voltages | 3 % | 1 % |
|-----------------|-----|-----|

5 TEST DATA

5.1 Antenna Port Conducted Emissions

| | |
|-----------------------------------|---|
| Description of Measurement | <p>The direct measurement of emissions at the antenna port of the EUT is achieved by use of a RF connection to a spectrum analyzer or power meter.</p> <p>The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.</p> |
| Example Calculations | <p>Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm)</p> <p>Margin (dB) = Limit (dBm) – Corrected Reading (dBm)</p> |

Block Diagram



| | | |
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5.1.1 Antenna Port Conducted Emissions

| | |
|---------------------|---|
| Operator | Coty Hammerer |
| Test Date | 11/16/17 |
| Location | Conducted RF Area |
| Temp. / R.H. | 70 degrees F / 44% RH |
| Requirement | FCC 15.247 (a)(2), b(3), (e), (d), and Part 2.1055 (d) IC: RSS-247 5.2 (a), 5.4 (d), 5.2 (b), 5.5, and RSS-GEN 6.1 |
| Method | ANSI C63.10 Sections 6.9, 11.9.1.1, 11.10.2, 11.11, and |

Limits:

| | |
|---|---|
| Maximum Conducted Output Power (dBm) | Maximum Conducted Output Power (watts) |
| 30 | 1 |

Test Parameters

| | |
|-----------------------------------|---|
| Frequency | 2402, 2440, 2478, and 2480 MHz |
| Settings | VBW and RBW set per requirements of each procedure (see plots). Peak detector used. |
| Settings | Peak measurement methods used for conducted output power and PSD measurements. |
| Note | Frequency Stability testing performed at +/- 10% of nominal voltage. |
| Conducted Tx Spurious Note | All emissions were found to be more than 20 dB below the limit. |

Instrumentation



Date : 30-Oct-2017 Test : Conducted RF Measurements Job : C-2856
 PE : Shane Dock Customer : Leviton LES Quote : 317328

| No. | Asset | Description | Manufacturer | Model | Serial | Cal Date | Cal Due Date | Equipment Status |
|-----|-----------|-----------------------------|--------------|--------------------|------------|------------|--------------|---------------------|
| 1 | EE 960087 | 44GHz EXA Spectrum Analyzer | Agilent | N9010A | MY53400296 | 12/22/2016 | 12/22/2017 | Active Calibration |
| 2 | AA 960160 | UTIFLEX Cable | Micro-Coax | UFC142A-0-0720-20C | 218652-001 | 11/15/2017 | 11/12/2018 | Active Verification |

| | | |
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Date : 30-Oct-2017 Test : Conducted - 2019 Job : C-2856
 PE : Shane Dock Customer : Leviton LES Quote : 317328

| No. | Asset | Description | Manufacturer | Model | Serial | Cal Date | Cal Due Date | Equipment Status |
|-----|------------------|---------------------|-------------------|-----------|------------|-----------|--------------|---------------------|
| 1 | EE 960087 | Analyzer - Spectrum | Agilent | N9010A | MY53400296 | 4/24/2019 | 4/24/2020 | Active Calibration |
| 2 | AA 960172 | Cable | A.H. Systems, Inc | SAC-26G-1 | 387 | 6/4/2018 | 6/4/2020 | Active Verification |

Table

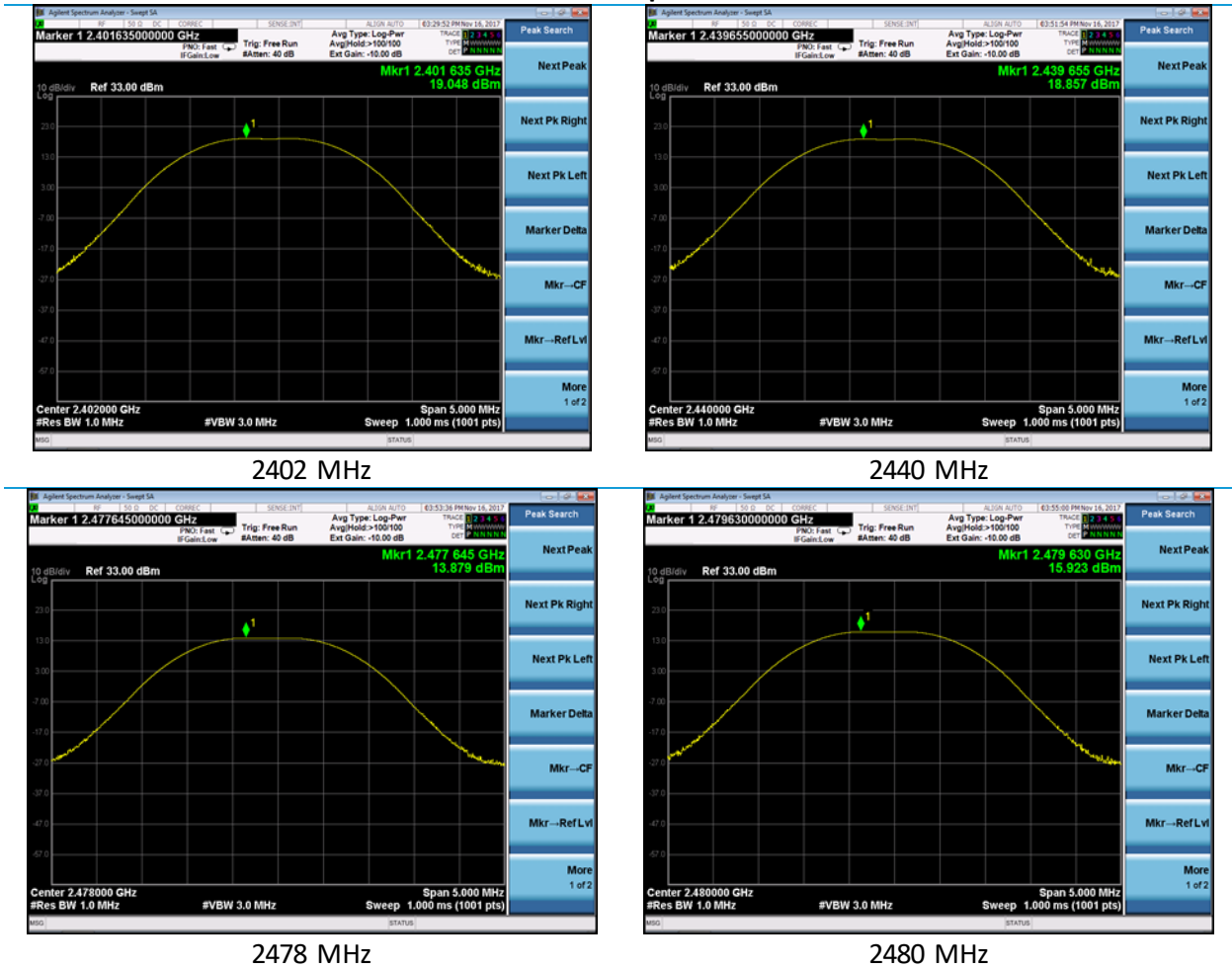
| Channel | 2402 MHz | 2440 MHz | 2478 MHz | 2480 MHz |
|------------------------------|----------|----------|----------|----------|
| Conducted Output Power (dBm) | 19.0 | 18.9 | 13.9 | 15.9 |

Tables – Minimum Test Power

| Channel | 2402 MHz | 2440 MHz | 2480 MHz |
|------------------------------|----------|----------|----------|
| Conducted Output Power (dBm) | 7.695 | 7.346 | 6.748 |

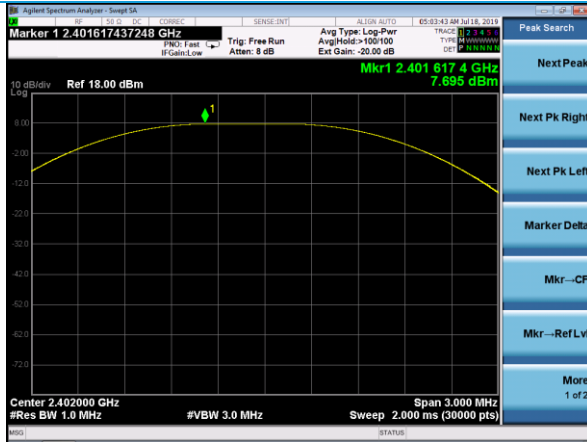
Plots

Conducted Output Power

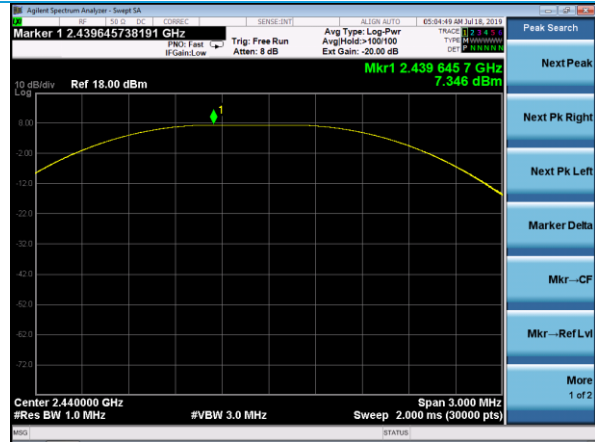


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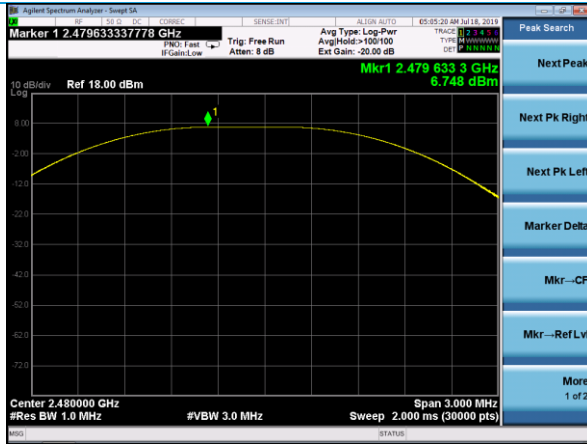
Minimum Conducted Output Power



2402 MHz



2440 MHz



2480 MHz

| | | |
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6 EXCLUSION CALCULATION

6.1 FCC

Worst Case Scenario: 19.0 dBm at 2402 MHz

Tune-Up Tolerance: 0.4 dB

Total Power: 19.4 dBm = 87.1 mW

Peak Antenna Gain: 1.5 dBi

Minimum test separation distance: To be calculated (EUT is a module).

From OET KDB 447498 Section 4.3.1.a:

For 100 MHz to 6 GHz and *test separation distances* ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{(\text{GHz})}}] \leq 3.0$ for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR,³⁰ where

- $f_{(\text{GHz})}$ is the RF channel transmit frequency in GHz

$$(87.1 \text{ mW} / X \text{ mm}) * \text{sqrt}(2.402 \text{ GHz}) \leq 3.0$$

Minimum test separation distance = 45 mm

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6.2 ISED Canada

Per Section 2.5.1:

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance^{4,5}

| Frequency (MHz) | Exemption Limits (mW) | | | | |
|-----------------|---------------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| | At separation distance of ≤ 5 mm | At separation distance of 10 mm | At separation distance of 15 mm | At separation distance of 20 mm | At separation distance of 25 mm |
| ≤ 300 | 71 mW | 101 mW | 132 mW | 162 mW | 193 mW |
| 450 | 52 mW | 70 mW | 88 mW | 106 mW | 123 mW |
| 835 | 17 mW | 30 mW | 42 mW | 55 mW | 67 mW |
| 1900 | 7 mW | 10 mW | 18 mW | 34 mW | 60 mW |
| 2450 | 4 mW | 7 mW | 15 mW | 30 mW | 52 mW |
| 3500 | 2 mW | 6 mW | 16 mW | 32 mW | 55 mW |
| 5800 | 1 mW | 6 mW | 15 mW | 27 mW | 41 mW |

| Frequency (MHz) | Exemption Limits (mW) | | | | |
|-----------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|--|
| | At separation distance of 30 mm | At separation distance of 35 mm | At separation distance of 40 mm | At separation distance of 45 mm | At separation distance of ≥ 50 mm |
| ≤ 300 | 223 mW | 254 mW | 284 mW | 315 mW | 345 mW |
| 450 | 141 mW | 159 mW | 177 mW | 195 mW | 213 mW |
| 835 | 80 mW | 92 mW | 105 mW | 117 mW | 130 mW |
| 1900 | 99 mW | 153 mW | 225 mW | 316 mW | 431 mW |
| 2450 | 83 mW | 123 mW | 173 mW | 235 mW | 309 mW |
| 3500 | 86 mW | 124 mW | 170 mW | 225 mW | 290 mW |
| 5800 | 56 mW | 71 mW | 85 mW | 97 mW | 106 mW |

Exemption limit at 30 mm for 2402 MHz (interpolated): 84.4 mW

Exemption limit at 35 mm for 2402 MHz (interpolated): 125.6 mW

Since 87.1 mW is above the 30 mm limit but not the 35 mm limit, the EUT is exempt from routine for all test separation distances at 35 mm or greater.

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7 REVISION HISTORY

| Version | Date | Notes | Person |
|---------|---------|---------------------------|------------|
| V0 | 3/19/19 | First Draft | Shane Dock |
| V1 | 4/10/19 | Updated Draft | Shane Dock |
| V2 | 5/2/19 | Final Draft | Shane Dock |
| V3 | 8/7/19 | Low Power Data Added | Shane Dock |
| V4 | 11/4/19 | Updated For TCB Responses | Shane Dock |

END OF REPORT

| | | |
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