



Engineering Test Report No. 2002451-01	
Report Date	June 5, 2020
Manufacturer Name	Ideal Industries
Manufacturer FCC FRN Number & IC Company Number	0002862225 11250A
Manufacturer Address	1375 Park Avenue Sycamore, IL 60178
Product Name Brand/Model No.	Luminaire Controller Model No. LCE20A1000
Product FCC ID & IC UPN Number	FCC ID: 2AAMXLCE20A1000 IC UPN:11250A-LCE20A1000
Date Received	May 26, 2020
Test Dates	May 27, 2020
Specifications	FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 for Digital Modulation Intentional Radiators Operating within the band 902-928MHz Innovation, Science, and Economic Development Canada, RSS-247 Innovation, Science, and Economic Development Canada, RSS-GEN
Test Facility	Elite Electronic Engineering, Inc. 1516 Centre Circle, Downers Grove, IL 60515 FCC Reg. Number: 269750 IC Reg. Number: 2987A
Signature	<i>MARK E. LONGINOTTI</i>
Tested by	Mark E. Longinotti
Signature	<i>Raymond J Klouda</i>
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894
PO Number	AWS1076

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.

This report shall not be reproduced, except in full, without the written approval of Elite Electronic Engineering Inc.

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 and Innovation, Science, and Economic Development Canada, RSS-247 test specifications. The data presented in this test report pertains to the EUT on the test date(s) specified. Any electrical or mechanical modifications made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification. This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

**This report shall not be reproduced, except in full,
without the written approval of Elite Electronic Engineering Inc.**

Table of Contents

1.	Report Revision History	4
2.	Introduction	5
3.	Purpose	5
4.	Test Specifications	5
5.	Laboratory Conditions	6
6.	Summary	6
7.	Test Plan	6
8.	Grounding	6
9.	Power Input	6
10.	Firmware/Software	6
11.	Modifications Made to EUT	6
12.	Deviations from Specifications	6
13.	Modes of Operation.....	6
14.	Sample Calculations	6
15.	Statement of Conformity	7
16.	Certification	7
17.	Photographs of EUT.....	8
18.	Equipment List	10
19.	Average Effective Isotropic Radiated Power (EIRP).....	11
20.	Case Spurious Radiated Emissions.....	16
21.	Scope of Accreditation	25

**This report shall not be reproduced, except in full,
without the written approval of Elite Electronic Engineering Inc.**

1. Report Revision History

Revision	Date	Description
-	08 JUN 2020	Initial Release of Engineering Test Report No. 2002451-01

2. Introduction

This document presents the results of a series of electromagnetic compatibility (EMC) tests that were performed on one (1) Luminaire Controller, Model No. LCE20A1000 (hereinafter referred to as the Equipment Under Test (EUT)). The EUT was identified as follows:

EUT Identification	
Description	Luminaire Controller
Device Type	Digitally Modulated
Band of Operation	902-928MHz
Model/Part No.	LCE20A1000
S/N	None Assigned
Size of EUT	9.5cm x 6.5cm x 4.5cm

The EUT listed above was used throughout the test series. The EUT was submitted for testing with no support equipment.

3. Purpose

The original EUT was issued a grant of equipment authorization under the following IDs:

FCC ID: 2AAMXLCE20A1000
IC: 11250A-LCE20A1000

The test series was performed to determine if the EUT, with the AC power supply removed from the PCB, meets the Class II Permissive Change requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.247 for Intentional Radiators. Testing was performed in accordance with ANSI C63.10-2013.

The test series was also performed to determine if the EUT, with the AC power supply removed from the PCB, meets the Class II Permissive Change requirements of the Innovation, Science, and Economic Development Canada Radio Standards Specification, RSS-247, for transmitters. Testing was performed in accordance with ANSI C63.10-2013.

4. Test Specifications

The tests were performed to selected portions of, and in accordance with the following test specifications:

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart C, Section 247
- ANSI C63.4-2014, "American National Standard for Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"
- ANSI C63.10-2013, "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices"
- Federal Communications Commission Office of Engineering and Technology Laboratory Division, Guidance For Compliance Measurements On Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating Under Section 15.247 Of the FCC Rules, April 2, 2019, KDB 558074
- RSS-247 Issue 2, February 2017, "Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices"

- RSS-Gen Issue 5, March 2019, Amendment 1, Innovation, Science, and Economic Development Canada, "Spectrum Management and Telecommunications, Radio Standards Specification, General Requirements for Compliance of Radio Apparatus"

5. Laboratory Conditions

The temperature at the time of the test was 25°C and the relative humidity was 33%.

6. Summary

The following EMC tests were performed and the results are shown below:

Test Description	Test Methods	Results
Average Effective Isotropic Radiated Power (EIRP)	FCC 15.247 ISED RSS-247	Conforms
Case Spurious Radiated Emissions	FCC 15.247 ISED RSS-247	Conforms

7. Test Plan

No test plan was provided. Instructions were provided by personnel from Ideal Industries and used in conjunction with the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 and Innovation, Science, and Economic Development Canada, RSS-247, and ANSI C63.4-2014 specifications.

8. Grounding

The EUT was not grounded.

9. Power Input

The EUT was powered with 12VDC via a 2 wire power harness.

10. Firmware/Software

For all tests, the EUT had Firmware Version audacy-certification-line-na loaded onto the device to provide the correct load characteristics.

11. Modifications Made to EUT

No modifications were made to the EUT during the testing.

12. Deviations from Specifications

No deviations from the specifications were made during the testing.

13. Modes of Operation

The EMC tests were performed with the EUT operating separately in each of the following test modes:

- Transmit at 902.73MHz
- Transmit at 915MHz
- Transmit at 927.26MHz

14. Sample Calculations

For Powerline Conducted Emissions:

The resultant voltage level (VL) is a summation in decibels (dB) of the receiver meter reading (MTR) and the cable loss factor (CF).

$$\text{Formula 1: } VL \text{ (dB}\mu\text{V)} = \text{MTR (dB}\mu\text{V)} + \text{CF (dB).}$$

For Radiated Emissions:

The resultant field strength (FS) is a summation in decibels (dB) of the receiver meter reading (MTR), the antenna correction factor (AF), and the cable loss factor (CF). If an external preamplifier is used, the total is reduced by its gain (-PA). If a distance correction (DC) is required, it is added to the total.

$$\text{Formula 1: FS (dB}\mu\text{V/m)} = \text{MTR (dB}\mu\text{V)} + \text{AF (dB/m)} + \text{CF (dB)} + (-\text{PA (dB)}) + \text{DC (dB)}$$

To convert the Field Strength dB μ V/m term to μ V/m, the dB μ V/m is first divided by 20. The Base 10 AntiLog is taken of this quotient. The result is the Field Strength value in μ V/m terms.

$$\text{Formula 2: FS (}\mu\text{V/m)} = \text{AntiLog} [(\text{FS (dB}\mu\text{V/m)})/20]$$

15. Statement of Conformity

The Ideal Industries Luminaire Controller, Model No. LCE20A1000, Serial No. None Assigned, with the AC power supply removed from the PCB, did fully meet the Class II Permissive Change requirements of the FCC "Code of Federal Regulations", Title 47, Part 15, Subpart C, Section 15.247 for Intentional Radiators. Testing was performed in accordance with ANSI C63.10-201.

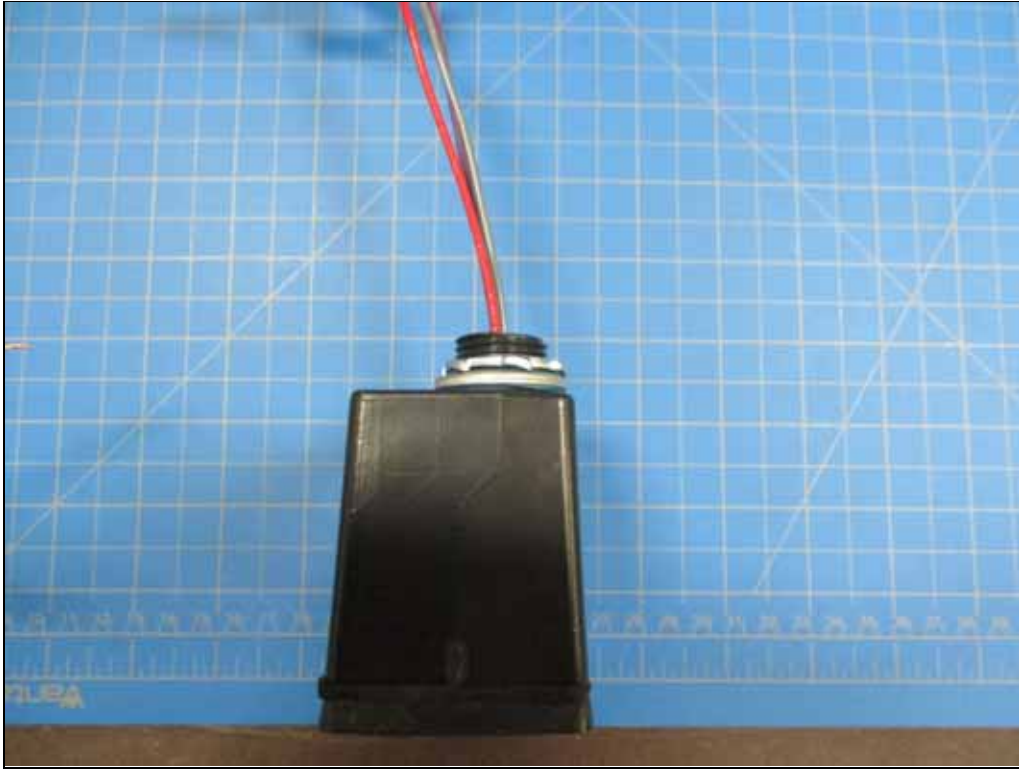
It was also determined that Ideal Industries Luminaire Controller, Model No. LCE20A1000, Serial No. None Assigned, with the AC power supply removed from the PCB, did fully meet the Class II Permissive Change requirements of the Innovation, Science, and Economic Development Canada Radio Standards Specification, RSS-247 for transmitters. Testing was performed in accordance with ANSI C63.10-2013.

16. Certification

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 and Innovation, Science, and Economic Development Canada, RSS-247 test specifications. The data presented in this test report pertains to the EUT on the test date specified. Any electrical or mechanical modifications made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification.

17. Photographs of EUT





18. Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APW3	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-35-120-5R0-10-12	PL2924	1GHZ-20GHZ	3/23/2020	3/23/2021
GRE1	SIGNAL GENERATOR	AGILENT	E4438C	MY42081749	250KHZ-6GHZ	2/25/2020	2/25/2021
NDQ1	TUNED DIPOLE ANTENNA	EMCO	3121C-DB4	313	400-1000MHZ	6/28/2018	6/28/2020
NTA3	BILOG ANTENNA	TESEQ	6112D	32853	25-1000MHz	10/10/2019	10/10/2020
NWQ1	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS-LINDGREN	3117	66655	1GHZ-18GHZ	4/28/2020	4/28/2022
RBG3	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101592	2HZ-44GHZ	4/24/2020	4/24/2021
XPQ3	HIGH PASS FILTER	K&L MICROWAVE	4IH30-1804/T10000-0	4	1.8GHZ-10GHZ	9/6/2019	9/6/2021

N/A: Not Applicable

I/O: Initial Only

CNR: Calibration Not Required

NOTE 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

19. Average Effective Isotropic Radiated Power (EIRP)

EUT Information	
Manufacturer	Ideal Industries
Product	Luminaire Controller
Model	LCE20A1000
Serial No	None Assigned
Mode	Transmit at 902.73MHz, Transmit at 915MHz, and Transmit at 927.26MHz

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Procedure
<p>The EUT was placed on an 80cm high non-conductive stand and set to transmit. A bilog antenna was placed at a test distance of 3 meters from the EUT. The EUT was maximized for worst case emissions (or maximum output power) at the measuring antenna. Method “AVGSA-1” of ANSI C63.10-2013 was used to measure the average EIRP. The average power output was measured for the low, middle and high channels.</p> <p>The equivalent power was determined from the field intensity levels measured at 3 meters using the substitution method. To determine the emission power, a dipole antenna was then set in place of the EUT and connected to a calibrated signal generator. The output of the signal generator was adjusted to match the received level at the spectrum analyzer. The signal level was recorded. The reading was then corrected to compensate for cable loss. The average EIRP was calculated for low, middle, and high frequencies.</p>



Test Setup for Effective Isotropic Radiated Power – Horizontal Polarization



Test Setup for Effective Isotropic Radiated Power – Vertical Polarization

Test Details	
Manufacturer	Ideal Industries
Model	LCE20A1000
S/N	None Assigned
Test Performed	Average EIRP
Mode	Transmit at 902.73MHz
Date Tested	May 27, 2020
Requirements	4W (36dBm)
Parameters	Average EIRP = 0.112W (20.5dBm)
Notes	

Freq. (MHz)	Ant Pol	Meter Reading (dBm)	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
902.73	H	-19.2	18.2	2.2	1.6	18.7	36.0	-17.3
902.73	V	-20.5	20.0	2.2	1.6	20.5	36.0	-15.5

$EIRP \text{ (dBm)} = \text{Matched Sig. Gen. Reading (dBm)} + \text{Antenna Gain (dB)} - \text{Cable Loss (dB)}$

Test Details	
Manufacturer	Ideal Industries
Model	LCE20A1000
S/N	None Assigned
Test Performed	Average EIRP
Mode	Transmit at 915MHz
Date Tested	May 27, 2020
Requirements	4W (36dBm)
Parameters	Average EIRP = 0.071W (18.5dBm)
Notes	

Freq. (MHz)	Ant Pol	Meter Reading (dBm)	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
915.00	H	-22.7	14.6	2.2	1.6	15.1	36.0	-20.9
915.00	V	-22.5	18.0	2.2	1.6	18.5	36.0	-17.5

$EIRP \text{ (dBm)} = \text{Matched Sig. Gen. Reading (dBm)} + \text{Antenna Gain (dB)} - \text{Cable Loss (dB)}$

Test Details	
Manufacturer	Ideal Industries
Model	LCE20A1000
S/N	None Assigned
Test Performed	Average EIRP
Mode	Transmit at 927.26MHz
Date Tested	May 27, 2020
Requirements	4W (36dBm)
Parameters	Average EIRP = 0.052W (17.2dBm)
Notes	

Freq. (MHz)	Ant Pol	Meter Reading (dBm)	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
927.26	H	-24.6	12.8	2.2	1.7	13.3	36.0	-22.7
927.26	V	-24.2	16.7	2.2	1.7	17.2	36.0	-18.8

$EIRP (dBm) = Matched\ Sig.\ Gen.\ Reading (dBm) + Antenna\ Gain (dB) - Cable\ Loss (dB)$

20. Case Spurious Radiated Emissions

EUT Information	
Manufacturer	Ideal Industries
Product	Luminaire Controller
Model	LCE20A1000
Serial No	None Assigned
Mode	Transmit at 902.73MHz, Transmit at 915MHz, Transmit at 927.26MHz

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

Procedure

Radiated measurements were performed in a 32ft. x 20ft. x 14ft. high shielded enclosure. The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

Final emission tests were then manually performed over the frequency range of 30MHz to 10.0GHz.

- 1) For emissions in the restricted bands, the following procedure was used:
 - a) The field strengths of all emissions below 1GHz were measured using a bi-log antenna. The bi-log antenna was positioned at a 3 meter distance from the EUT. The EUT was placed on an 80cm high non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.
 - b) The field strengths of all emissions above 1GHz were measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3 meter distance from the EUT. The EUT was placed on a 1.5 meter high non-conductive stand. A peak detector with a resolution bandwidth of 1MHz was used on the spectrum analyzer.
 - c) To ensure that maximum (or worst case) emission levels were measured, the following steps were taken when taking all measurements:
 - i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.
 - ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
 - iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.
 - d) For all radiated emissions measurements below 1GHz, if the peak reading is below the limits listed in §15.209(a), no further measurements are required. If however, the peak readings exceed the limits listed in 15.209(a), then the emissions are remeasured using a quasi-peak detector.
 - e) For all radiated emissions measurements above 1GHz, the peak readings must comply with the §15.35(b) limits. §15.35(b) states that when average radiated emissions measurements are specified, there also is a limit on the peak level of the radiated emissions. The limit on the peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. Therefore, all peak readings above 1GHz must be no greater than 20dB above the limits specified in §15.209(a).
 - f) Next, for all radiated emissions measurements above 1GHz, the resolution bandwidth was set to 1MHz. The analyzer was set to linear mode with a 10Hz video bandwidth in order to simulate an average detector and an average reading was taken.



Test Setup for Spurious Radiated Emissions above 1GHz – Horizontal Polarization



Test Setup for Spurious Radiated Emissions above 1GHz – Vertical Polarization

Test Details	
Manufacturer	Ideal Industries
Model	LCE20A1000
S/N	None Assigned
Mode	Transmit at 902.73MHz
Test Date	May 27, 2020
Parameters	Peak Measurements in the Restricted Bands
Notes	3 meter test distance

Freq. (MHz)	Ant Pol	Meter Reading (dB μ V)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dB μ V/m at 3m	Peak Total μ V/m at 3 m	Peak Limit μ V/m at 3 m	Margin (dB)
2708.19	H	48.4	Ambient	3.7	32.5	-40.4	44.2	161.4	5000.0	-29.8
2708.19	V	47.5	Ambient	3.7	32.5	-40.4	43.3	145.5	5000.0	-30.7
3610.92	H	52.7	Ambient	4.3	33.0	-40.3	49.6	302.8	5000.0	-24.4
3610.92	V	52.3	Ambient	4.3	33.0	-40.3	49.2	289.2	5000.0	-24.8
4513.65	H	52.2	Ambient	4.7	34.0	-40.1	50.9	348.9	5000.0	-23.1
4513.65	V	51.8	Ambient	4.7	34.0	-40.1	50.5	333.2	5000.0	-23.5
5416.38	H	50.7	Ambient	5.1	34.7	-40.2	50.3	326.8	5000.0	-23.7
5416.38	V	50.8	Ambient	5.1	34.7	-40.2	50.4	330.6	5000.0	-23.6

Test Details	
Manufacturer	Ideal Industries
Model	LCE20A1000
S/N	None Assigned
Mode	Transmit at 902.73MHz
Test Date	May 27, 2020
Parameters	Average Measurements in the Restricted Bands
Notes	3 meter test distance

Freq. (MHz)	Ant Pol	Meter Reading (dB μ V)	Ambient	CBL Fac. (dB)	Ant Fac. (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dB μ V/m at 3m	Average Total μ V/m at 3 m	Average Limit μ V/m at 3 m	Margin (dB)
2708.19	H	32.50	Ambient	3.7	32.5	-40.4	0.0	28.3	25.9	500.0	-25.7
2708.19	V	32.6	Ambient	3.7	32.5	-40.4	0.0	28.4	26.2	500.0	-25.6
3610.92	H	37.1	Ambient	4.3	33.0	-40.3	0.0	34.0	50.2	500.0	-20.0
3610.92	V	37.1	Ambient	4.3	33.0	-40.3	0.0	34.0	50.2	500.0	-20.0
4513.65	H	36.3	Ambient	4.7	34.0	-40.1	0.0	35.0	55.9	500.0	-19.0
4513.65	V	36.4	Ambient	4.7	34.0	-40.1	0.0	35.1	56.6	500.0	-18.9
5416.38	H	35.0	Ambient	5.1	34.7	-40.2	0.0	34.6	53.6	500.0	-19.4
5416.38	V	35.1	Ambient	5.1	34.7	-40.2	0.0	34.7	54.2	500.0	-19.3

Test Details	
Manufacturer	Ideal Industries
Model	LCE20A1000
S/N	None Assigned
Mode	Transmit at 915MHz
Test Date	May 27, 2020
Parameters	Peak Measurements in the Restricted Bands
Notes	3 meter test distance

Freq. (MHz)	Ant Pol	Meter Reading (dBμV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBμV/m at 3m	Peak Total μV/m at 3 m	Peak Limit μV/m at 3 m	Margin (dB)
2745.00	H	49.4	Ambient	3.7	32.6	-40.4	45.3	183.3	5000.0	-28.7
2745.00	V	51.8	Ambient	3.7	32.6	-40.4	47.7	241.7	5000.0	-26.3
3660.00	H	52.2	Ambient	4.3	33.0	-40.3	49.2	288.2	5000.0	-24.8
3660.00	V	52.1	Ambient	4.3	33.0	-40.3	49.1	284.9	5000.0	-24.9
4575.00	H	51.6	Ambient	4.7	34.2	-40.1	50.4	331.4	5000.0	-23.6
4575.00	V	51.2	Ambient	4.7	34.2	-40.1	50.0	316.5	5000.0	-24.0
2745.00	H	49.4	Ambient	3.7	32.6	-40.4	45.3	183.3	5000.0	-28.7
2745.00	V	51.8	Ambient	3.7	32.6	-40.4	47.7	241.7	5000.0	-26.3

Test Details	
Manufacturer	Ideal Industries
Model	LCE20A1000
S/N	None Assigned
Mode	Transmit at 915MHz
Test Date	May 27, 2020
Parameters	Average Measurements in the Restricted Bands
Notes	3 meter test distance

Freq. (MHz)	Ant Pol	Meter Reading (dBμV)	Ambient	CBL Fac. (dB)	Ant Fac. (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBμV/m at 3m	Average Total μV/m at 3 m	Average Limit μV/m at 3 m	Margin (dB)
2745.00	H	36.20	Ambient	3.7	32.6	-40.4	0.0	32.1	40.1	500.0	-21.9
2745.00	V	36.2	Ambient	3.7	32.6	-40.4	0.0	32.1	40.1	500.0	-21.9
3660.00	H	36.7	Ambient	4.3	33.0	-40.3	0.0	33.7	48.4	500.0	-20.3
3660.00	V	36.7	Ambient	4.3	33.0	-40.3	0.0	33.7	48.4	500.0	-20.3
4575.00	H	35.9	Ambient	4.7	34.2	-40.1	0.0	34.7	54.4	500.0	-19.3
4575.00	V	35.8	Ambient	4.7	34.2	-40.1	0.0	34.6	53.7	500.0	-19.4
2745.00	H	36.20	Ambient	3.7	32.6	-40.4	0.0	32.1	40.1	500.0	-21.9
2745.00	V	36.2	Ambient	3.7	32.6	-40.4	0.0	32.1	40.1	500.0	-21.9

Test Details	
Manufacturer	Ideal Industries
Model	LCE20A1000
S/N	None Assigned
Mode	Transmit at 927.26MHz
Test Date	May 27, 2020
Parameters	Peak Measurements in the Restricted Bands
Notes	3 meter test distance

Freq. (MHz)	Ant Pol	Meter Reading (dBμV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBμV/m at 3m	Peak Total μV/m at 3 m	Peak Limit μV/m at 3 m	Margin (dB)
2781.78	H	50.1	Ambient	3.7	32.4	-40.4	45.9	197.1	5000.0	-28.1
2781.78	V	49.9	Ambient	3.7	32.4	-40.4	45.7	192.6	5000.0	-28.3
3709.04	H	52.8	Ambient	4.3	33.0	-40.2	49.9	310.8	5000.0	-24.1
3709.04	V	52.1	Ambient	4.3	33.0	-40.2	49.2	286.8	5000.0	-24.8
4636.30	H	50.6	Ambient	4.8	34.3	-40.2	49.6	300.4	5000.0	-24.4
4636.30	V	50.3	Ambient	4.8	34.3	-40.2	49.3	290.2	5000.0	-24.7
2781.78	H	50.1	Ambient	3.7	32.4	-40.4	45.9	197.1	5000.0	-28.1
2781.78	V	49.9	Ambient	3.7	32.4	-40.4	45.7	192.6	5000.0	-28.3

Test Details	
Manufacturer	Ideal Industries
Model	LCE20A1000
S/N	None Assigned
Mode	Transmit at 927.26MHz
Test Date	May 27, 2020
Parameters	Average Measurements in the Restricted Bands
Notes	3 meter test distance

Freq. (MHz)	Ant Pol	Meter Reading (dBμV)	Ambient	CBL Fac. (dB)	Ant Fac. (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBμV/m at 3m	Average Total μV/m at 3 m	Average Limit μV/m at 3 m	Margin (dB)
2781.78	H	34.70	Ambient	3.7	32.4	-40.4	0.0	30.5	33.5	500.0	-23.5
2781.78	V	34.9	Ambient	3.7	32.4	-40.4	0.0	30.7	34.3	500.0	-23.3
3709.04	H	36.6	Ambient	4.3	33.0	-40.2	0.0	33.7	48.1	500.0	-20.3
3709.04	V	36.6	Ambient	4.3	33.0	-40.2	0.0	33.7	48.1	500.0	-20.3
4636.30	H	34.9	Ambient	4.8	34.3	-40.2	0.0	33.9	49.3	500.0	-20.1
4636.30	V	34.9	Ambient	4.8	34.3	-40.2	0.0	33.9	49.3	500.0	-20.1
2781.78	H	34.70	Ambient	3.7	32.4	-40.4	0.0	30.5	33.5	500.0	-23.5
2781.78	V	34.9	Ambient	3.7	32.4	-40.4	0.0	30.7	34.3	500.0	-23.3

21. Scope of Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

ELITE ELECTRONIC ENGINEERING, INC.
1516 Centre Circle
Downers Grove, IL 60515
Robert Bugielski (QA Manager) Phone: 630 495 9770 ext. 168
Email: rbugielski@elitetest.com
Craig Fanning (EMC Lab Manager) Phone: 630 495 9770 ext. 112
Email: cfanning@elitetest.com
Stanley Dolecki (Automotive Team Leader) Phone: 630 495 9770 ext. 103
Email: sdolecki@elitetest.com
Website: www.elitetest.com

ELECTRICAL

Valid to: June 30, 2021

Certificate Number: 1786.01

In recognition of the successful completion of the A2LA Accreditation Program evaluation process, accreditation is granted to this laboratory to perform the following automotive electromagnetic compatibility and other electrical tests:

Test Technology:**Test Method(s) ¹:*****Transient Immunity***

ISO 7637-2 (including emissions); ISO 7637-3;
ISO 16750-2:2012, Sections 4.6.3 and 4.6.4;
CS-11979, Section 6.4; CS.00054, Section 5.9;
EMC-CS-2009.1 (CI220); FMC1278 (CI220, CI221, CI222);
GMW 3097, Section 3.5;
SAE J1113-11; SAE J1113-12

Electrostatic Discharge (ESD)

ISO 10605 (2001, 2008);
CS-11979 Section 7.0; CS.00054, Section 5.10;
EMC-CS-2009.1 (CI 280); FMC1278 (CI280); SAE J1113-13;
GMW 3097 Section 3.6

Conducted Emissions

CISPR 25 (2002, 2008), Sections 6.2 and 6.3;
CISPR 25 (2016), Sections 6.3 and 6.4;
CS-11979, Section 5.1; CS.00054, Sections 5.6.1 and 5.6.2;
GMW 3097, Section 3.3.2;
EMC-CS-2009.1 (CE 420); FMC1278 (CE420, CE421)

Radiated Emissions Anechoic

CISPR 25 (2002, 2008), Section 6.4;
CISPR 25 (2016), Section 6.5;
CS-11979, Section 5.3; CS.00054, Section 5.6.3;
GMW 3097, Section 3.3.1;
EMC-CS-2009.1 (RE 310); FMC1278 (RE310)

Vehicle Radiated Emissions

CISPR 12; ICES-002

(A2LA Cert. No. 1786.01) Revised 01/10/2020



Page 1 of 8

5202 Presidents Court, Suite 220 | Frederick, MD 21703-8515 | Phone: 301 644 3248 | Fax: 240 454 9449 | www.A2LA.org

<u>Test Technology:</u>	<u>Test Method(s) ¹:</u>
<i>Bulk Current Injection (BCI)</i>	ISO 11452-4; CS-11979, Section 6.1; CS.00054, Section 5.8.1; GMW 3097, Section 3.4.1; SAE J1113-4; EMC-CS-2009.1 (RI112); FMC1278 (RI112)
<i>Bulk Current Injections (BCI) (Closed Loop Method)</i>	ISO 11452-4; SAE J1113-4
<i>Radiated Immunity Anechoic (Including Radar Pulse)</i>	ISO 11452-2; ISO 11452-5; CS-11979, Section 6.2; CS.00054, Section 5.8.2; GMW 3097, Section 3.4.2; EMC-CS-2009.1 (RI114); FMC1278 (RI114); SAE J1113-21
<i>Radiated Immunity Magnetic Field</i>	ISO 11452-8
<i>Radiated Immunity Reverb</i>	ISO/IEC 61000-4-21; GMW 3097, Section 3.4.3; EMC-CS-2009.1 (RI114); FMC1278 (RI114); ISO 11452-11
<i>Radiated Immunity (Portable Transmitters)</i>	ISO 11452-9; EMC-CS-2009.1 (RI115); FMC1278 (RI115)
<i>Vehicle Radiated Immunity (ALSE)</i>	ISO 11451-2
<i>Electrical Loads</i>	ISO 16750-2, Sections 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.11, and 4.12
<i>Dielectric Withstand Voltage</i>	MIL-STD-202, Method 301; EIA-364-20D
<i>Insulation Resistance</i>	MIL-STD-202, Method 302; SAE/USCAR-2, Revision 6, Section 5.5.1; EIA-364-21D
<i>Contact Resistance</i>	MIL-STD-202, Method 307; SAE/USCAR-2, Revision 6, Section 5.3.1; EIA/ECA-364-23C; USCAR21-3 Section 4.5.3
<i>DC Resistance</i>	MIL-STD-202, Method 303
<i>Contact Chatter</i>	MIL-STD-202, Method 310; SAE/USCAR-2, Revision 6, Section 5.1.9
<i>Voltage Drop</i>	SAE/USCAR-2, Revision 6, Section 5.3.2; USCAR21-3 Section 4.5.6

Test Technology:

Test Method(s) ¹:

Emissions

Radiated and Conducted
(3m Semi-anechoic chamber,
up to 40 GHz)

47 CFR, FCC Part 15 B (using ANSI C63.4:2014);
47 CFR, FCC Part 18 (using FCC MP-5:1986);
ICES-001; ICES-003; ICES-005;
IEC/CISPR 11, Ed. 4.1 (2004-06); AS/NZS CISPR 11 (2004);
IEC/CISPR 11 Ed 5 (2009-05) + A1 (2010);
KN 11 (2008-5) with RRL Notice No. 2008-3 (May 20, 2008);
CISPR 11; EN 55011; KN 11; CNS 13803 (1997, 2003);
CISPR 14-1; EN 55014-1; AS/NZS CISPR 14.1; KN 14-1;
IEC/CISPR 22 (1997); EN 55022 (1998) + A1(2000);
EN 55022 (1998) + A1(2000) + A2(2003); EN 55022 (2006);
IEC/CISPR 22 (2008-09); AS/NZS CISPR 22 (2004);
AS/NZS CISPR 22, 3rd Edition (2006); KN 22 (up to 6 GHz);
CNS 13438 (up to 6 GHz); VCCI V-3 (up to 6 GHz);
CISPR 32; EN 55032; KN 32

Current Harmonics

IEC 61000-3-2; EN 61000-3-2; KN 61000-3-2

Flicker and Fluctuations

IEC 61000-3-3; EN 61000-3-3; KN 61000-3-3

Immunity

Electrostatic Discharge

IEC 61000-4-2, Ed. 1.2 (2001);
IEC 61000-4-2 (1995) + A1(1998) + A2(2000);
EN 61000-4-2 (1995); EN 61000-4-2 (2009-05);
KN 61000-4-2 (2008-5); RRL Notice No. 2008-4 (May 20, 2008);
IEC 61000-4-2; EN 61000-4-2; KN 61000-4-2;
IEEE C37.90.3 2001

Radiated Immunity

IEC 61000-4-3 (1995) + A1(1998) + A2(2000);
IEC 61000-4-3, Ed. 3.0 (2006-02);
IEC 61000-4-3, Ed. 3.2 (2010);
KN 61000-4-3 (2008-5); RRL Notice No. 2008-4 (May 20, 2008);
IEC 61000-4-3; EN 61000-4-3; KN 61000-4-3;
IEEE C37.90.2 2004

Electrical Fast Transient/Burst

IEC 61000-4-4, Ed. 2.0 (2004-07); IEC 61000-4-4, Ed. 2.1 (2011);
IEC 61000-4-4 (1995) + A1(2000) + A2(2001);
KN 61000-4-4 (2008-5); RRL Notice No. 2008-5 (May 20, 2008);
IEC 61000-4-4; EN 61000-4-4; KN 61000-4-4

Surge

IEC 61000-4-5 (1995) + A1(2000);
IEC 61000-4-5, Ed 1.1 (2005-11);
EN 61000-4-5 (1995) + A1(2001);
KN 61000-4-5 (2008-5); RRL Notice No. 2008-4 (May 20, 2008);
IEC 61000-4-5; EN 61000-4-5; KN 61000-4-5;
IEEE C37.90.1 2012

<u>Test Technology:</u>	<u>Test Method(s) ¹:</u>
Immunity (cont'd) Conducted Immunity	IEC 61000-4-6 (1996) + A1(2000); IEC 61000-4-6, Ed 2.0 (2006-05); IEC 61000-4-6 Ed. 3.0 (2008); KN 61000-4-6 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); EN 61000-4-6 (1996) + A1(2001); IEC 61000-4-6; EN 61000-4-6; KN 61000-4-6
Power Frequency Magnetic Field Immunity	IEC 61000-4-8 (1993) + A1(2000); IEC 61000-4-8 (2009); EN 61000-4-8 (1994) + A1(2000); KN 61000-4-8 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-8; EN 61000-4-8; KN 61000-4-8
Voltage Dips, Short Interrupts, and Line Voltage Variations	IEC 61000-4-11, Ed. 2 (2004-03); KN 61000-4-11 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-11; EN 61000-4-11; KN 61000-4-11
Ring Wave	IEC 61000-4-12, Ed. 2 (2006-09); EN 61000-4-12:2006; IEC 61000-4-12; EN 61000-4-12; KN 61000-4-12
Generic and Product Specific EMC Standards	IEC/EN 61000-6-1; AS/NZS 61000-6-1; KN 61000-6-1; IEC/EN 61000-6-2; AS/NZS 61000-6-2; KN 61000-6-2; IEC/EN 61000-6-3; AS/NZS 61000-6-3; KN 61000-6-3; IEC/EN 61000-6-4; AS/NZS 61000-6-4; KN 61000-6-4; EN 50130-4; IEC 61326-1; IEC/CISPR 14-2; EN 55014-2; AS/NZS CISPR 14.2; KN 14-2; IEC/CISPR 24; AS/NZS CISPR 24; EN 55024; KN 24; IEC 60601-1-2; JIS T0601-1-2
<i>TxRx EMC Requirements</i>	EN 301 489-1; EN 301 489-3; EN 301 489-9; EN 301 489-17; EN 301 489-19; EN 301 489-52;
<i>European Radio Test Standards</i>	ETSI EN 300 086-1; ETSI EN 300 086-2; ETSI EN 300 113-1; ETSI EN 300 113-2; ETSI EN 300 220-1; ETSI EN 300 220-2; ETSI EN 300 330-1; ETSI EN 300 330-2; ETSI EN 300 440-1; ETSI EN 300 440-2; ETSI EN 300 422-1; ETSI EN 300 422-2; ETSI EN 300 328; ETSI EN 301 893; ETSI EN 301 511; ETSI EN 301 908-1; ETSI EN 908-2; ETSI EN 908-13; ETSI EN 301 413; ETSI EN 302 502

Test Technology:

Test Method(s) ¹:

Canadian Radio Tests

RSS-102 (RF Exposure Evaluation only); RSS-111; RSS-112; RSS-117; RSS-119; RSS-123; RSS-125; RSS-127; RSS-130; RSS-131; RSS-132; RSS-133; RSS-134; RSS-135; RSS-137; RSS-139; RSS-140; RSS-141; RSS-142; RSS-170; RSS-181; RSS-182; RSS-191; RSS-192; RSS-194; RSS-195; RSS-196; RSS-197; RSS-199; RSS-210; RSS-211; RSS-213; RSS-215; RSS-216; RSS-220; RSS-222; RSS-236; RSS-238; RSS-243; RSS-244; RSS-246; RSS-247; RSS-251; RSS-252; RSS-287; RSS-288; RSS-310; RSS-GEN

Mexico Radio Tests

IFT-008; NOM-208-SCFI

Japan Radio Tests

Radio Law No. 131, Ordinance of MPT No. 37, 1981, MIC Notification No. 88:2004, Table No. 22-11; ARIB STD-T66, Regulation 18

Taiwan Radio Tests

LP-0002

Australia/New Zealand Radio Tests

AS/NZS 4268; Radiocommunications (Short Range Devices) Standard (2014)

Hong Kong Radio Tests

HKCA 1039 Issue 6; HKCA 1042; HKCA 1033 Issue 7; HKCA 1061; HKCA 1008; HKCA 1043; HKCA 1057; HKCA 1073

Korean Radio Test Standards

KN 301 489-1; KN 301 489-3; KN 301 489-9; KN 301 489-17; KN 301 489-52

*Unlicensed Radio Frequency Devices
(3 Meter Semi-Anechoic Room)*

47 CFR FCC Part 15C, 15D, 15E, 15F, 15G, 15H (using ANSI C63.10:2013, ANSI C63.17:2013 and FCC KDB 905462 D02 (v02))

Licensed Radio Service Equipment

47 CFR FCC Parts 20, 22, 24, 25, 27, 30, 73, 74, 80, 87, 90, 95, 96, 97, 101; ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015;

OTA (Over the Air) Performance
GSM, GPRS, EGPRS
UMTS (W-CDMA)
LTE including CAT M1
A-GPS for UMTS/GSM
LTS A-GPS, A-GLONASS,
SIB8/SIB16
Large Device/Laptop/Tablet Testing
Integrated Device Testing
WiFi 802.11 a/b/g/n/ac

CTIA Test Plan for Wireless Device Over-the-Air Performance (Method for Measurement for Radiated Power and Receiver Performance) V3.8.2;
CTIA Test Plan for RF Performance Evaluation of WiFi Mobile Converged Devices V2.1.0

Test Technology:

Test Method(s) ¹:

Electrical Measurements and Simulation

AC Voltage / Current

(1mV to 5kV) 60 Hz
(0.1V to 250V) up to 500 MHz
(1µA to 150A) 60 Hz

FAA AC 150/5345-10H
FAA AC 150/5345-43J
FAA AC 150/5345-44K
FAA AC 150/5345-46E

DC Voltage / Current

(1mV to 15-kV) / (1µA to 10A)

FAA AC 150/5345-47C
FAA EB 67D

Power Factor / Efficiency / Crest Factor

(Power to 30kW)

Resistance

(1mΩ to 4000MΩ)

Surge

(Up to 10 kV / 5 kA) (Combination Wave and Ring Wave)

On the following products and materials:

Telecommunications Terminal Equipment (TTE), Radio Equipment, Network Equipment, Information Technology Equipment (ITE), Automotive Electronic Equipment, Automotive Hybrid Electronic Devices, Maritime Navigation and Radio Communication Equipment and Systems, Vehicles, Boats and Internal Combustion Engine Driven Devices, Automotive, Aviation, and General Lighting Products, Medical Electrical Equipment, Motors, Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment, Household Appliances, Electric Tools, Low-voltage Switchgear and Control gear, Programmable Controllers, Electrical Equipment for Measurement, Control and Laboratory Use, Base Materials, Power and Data Transmission Cables and Connectors

¹ When the date, revision or edition of a test method standard is not identified on the scope of accreditation, the laboratory is expected to be using the current version within one year of the date of publication, per part C., Section 1 of A2LA R101 - *General Requirements - Accreditation of ISO-IEC 17025 Laboratories.*

Testing Activities Performed in Support of FCC Declaration of Conformity and Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1²

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
<u>Unintentional Radiators</u> Part 15B	ANSI C63.4:2014	40000
<u>Industrial, Scientific, and Medical Equipment</u> Part 18	FCC MP-5 (February 1986)	40000
<u>Intentional Radiators</u> Part 15C	ANSI C63.10:2013	40000
<u>Unlicensed Personal Communication Systems Devices</u> Part 15D	ANSI C63.17:2013	40000



Testing Activities Performed in Support of FCC Declaration of Conformity and Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1²

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
<u>U-NII without DFS Intentional Radiators</u> Part 15E	ANSI C63.10:2013	40000
<u>U-NII with DFS Intentional Radiators</u> Part 15E	FCC KDB 905462 D02 (v02)	40000
<u>UWB Intentional Radiators</u> Part 15F	ANSI C63.10:2013	40000
<u>BPL Intentional Radiators</u> Part 15G	ANSI C63.10:2013	40000
<u>White Space Device Intentional Radiators</u> Part 15H	ANSI C63.10:2013	40000
<u>Commercial Mobile Services (FCC Licensed Radio Service Equipment)</u> Parts 22 (cellular), 24, 25 (below 3 GHz), and 27	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
<u>General Mobile Radio Services (FCC Licensed Radio Service Equipment)</u> Parts 22 (non-cellular), 90 (below 3 GHz), 95, 97, and 101 (below 3 GHz)	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
<u>Citizens Broadband Radio Services (FCC Licensed Radio Service Equipment)</u> Part 96	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
<u>Maritime and Aviation Radio Services</u> Parts 80 and 87	ANSI/TIA-603-E; ANSI C63.26:2015	40000
<u>Microwave and Millimeter Bands Radio Services</u> Parts 25, 30, 74, 90 (above 3 GHz), 97 (above 3 GHz), and 101	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
<u>Broadcast Radio Services</u> Parts 73 and 74 (below 3 GHz)	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000



Testing Activities Performed in Support of FCC Declaration of Conformity and Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1²

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
<u>Signal Boosters</u> Part 20 (Wideband Consumer Signal Boosters, Provider-specific signal boosters, and Industrial Signal Boosters) Section 90.219	ANSI C63.26:2015	40000

²Accreditation does not imply acceptance to the FCC equipment authorization program. Please see the FCC website (<https://apps.fcc.gov/oetcf/eas/>) for a listing of FCC approved laboratories.



Accredited Laboratory

A2LA has accredited

ELITE ELECTRONIC ENGINEERING INC.

Downers Grove, IL

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 8th day of August 2019.



Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1786.01
Valid to June 30, 2021

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.