Engineering Test Report No. 1904684-01	
Report Date	December 11, 2019
Manufacturer Name	Astronics CSC
Manufacturer Address	804 S Northpoint Blvd Waukegan, IL 60087
Product Name Brand/Model No.	E71-319-01
Date Received	November 30, 2019
Test Dates	November 30, 2019 to December 11, 2019
Specifications	FCC 15.247
Test Facility	Elite Electronic Engineering, Inc. 1516 Centre Circle, Downers Grove, IL 60515
Signature	
Tested by	Javier Cardenas
Signature	
Approved by	Raymond J. Klouda Registered Professional Engineer of Illinois – 44894

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1. Report Revision History

Revision	Date	Description
–	18 Dec 2019	Initial Release of Engineering Test Report No. 1904684-01

2. Introduction

This document presents the results of a series of investigative measurements that were performed on an IFE System (hereinafter referred to as the Equipment Under Test (EUT)). The EUT is a composite system comprising of an Aruba 303 Series Campus Access Point. The intent of these measurements is to ensure continuing compliance of the composite system. The EUT was identified as follows:

Description	Part #	S/N
Portable IFE System	E71-319-01	000007

The EUT listed above was used throughout the test series. The EUT was submitted for testing along with the following support equipment:

Description	Model #	S/N
Laptop	---	---

3. Test Specification(s)

The tests were performed to selected portions of, and in accordance with the FCC 15.247 test specification(s).

Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart C
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 9 kHz to 40 GHz"
ANSI C63.10-2013, "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices"

4. Laboratory Conditions

The temperature at the time of the test was 21°C and the relative humidity was 18%.

5. Summary

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

Test Description	Results
Radiated Spurious Emissions in the Restricted Bands	Conforms
Band-Edge Compliance near the Restricted Band	Conforms

6. Test Plan

No test plan was provided. Instructions were provided by personnel from Astronics CSC and used in conjunction with the FCC 15.247 regulations.

7. Grounding

The EUT was not grounded.

8. Firmware/Software

For all tests, the EUT had Ubuntu 16.04 Xenial operating system to support functionality.

9. Modifications Made to EUT

No modifications were made to the EUT during the testing.

10. Deviations from Specification(s)

No deviations from the specification(s) were made during the testing.

11. Modes of Operation

The EMC tests were performed with the EUT operating in one or more of the test modes described below. See the specific test section for the applicable test modes.

11.1. Transmitting

This mode was achieved by energizing the EUT. The support equipment software was used to configure the EUT's on board radio into the following modes:

- 802.11b 1Mbps Ch 1, 6, 11
- 802.11n20 MCS0 Ch 11
- 802.11n40 MCS0 Ch 3, 6, 9
- 802.11n40 MCS0 BF Ch 9

12. Test Method

The tests were performed using the referenced methods described in the FCC 15.247 test specification(s). The specific test sections and specification references are listed in the individual test sections.

13. 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).

Formula 1: VL (dBuV) = MTR (dBuV) + 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.

Formula 1: FS (dBuV/m) = MTR (dBuV) + AF (dB/m) + CF (dB) + (- PA (dB)) + DC (dB)

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

Formula 2: FS (uV/m) = AntiLog [(FS (dBuV/m))/20]

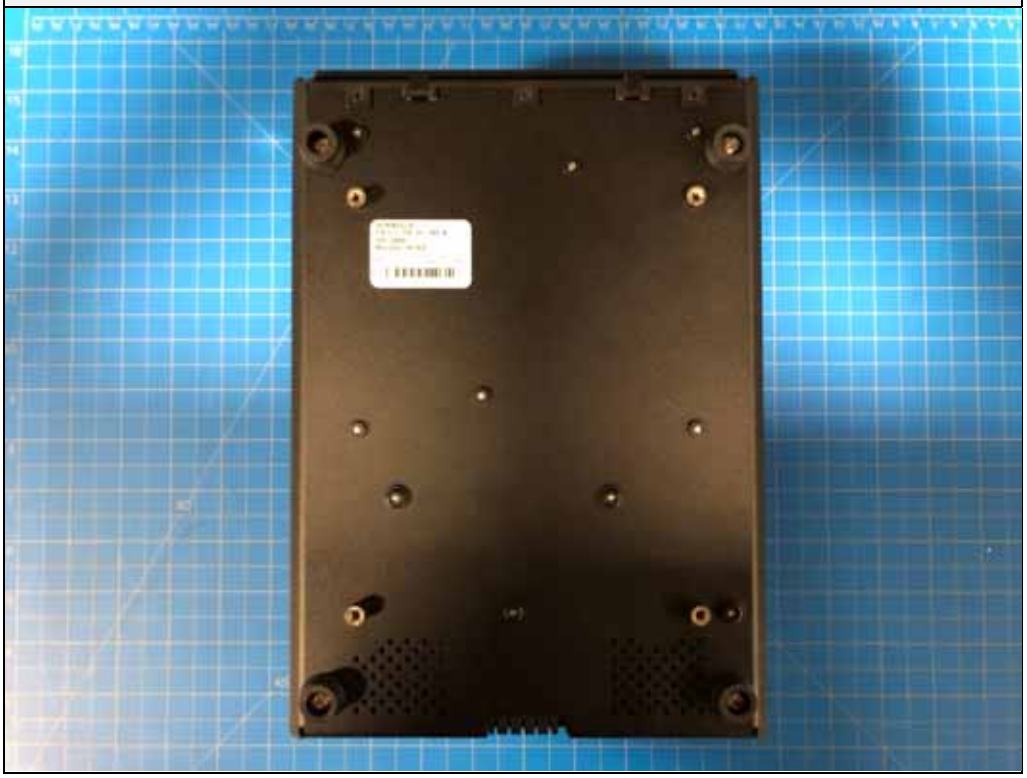
14. Statement of Conformity

The Astronics CSC IFE System, Model No. E71-319-01, Serial No. 000007 did fully conform to the selected requirements of FCC 15.247.

15. 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 15.247 test specification. 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.

16. Photographs of EUT



17. Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APW0	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-30-20G20R6G	PL2926/0646	20GHZ-26.5GHZ	10/2/2019	10/2/2020
APW11	PREAMPLIFIER	PMI	PE2-35-120-5R0-10-12-SFF	PL11685/1241	1GHZ-20GHZ	4/8/2019	4/8/2020
APW3	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-35-120-5R0-10-12	PL2924	1GHZ-20GHZ	4/8/2019	4/8/2020
NHG1	STANDARD GAIN HORN ANTENNA	NARDA	638	---	18-26.5GHZ	NOTE 1	
NWQ1	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS-LINDGREN	3117	66655	1GHZ-18GHZ	4/10/2018	4/10/2020
NWQ2	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66659	1GHZ-18GHZ	3/22/2018	3/22/2020
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	2/21/2019	2/21/2020
RBG3	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101592	2HZ-44GHZ	2/20/2019	2/20/2020
XPQ4	HIGH PASS FILTER	K&L MICROWAVE	11SH10-4800/X20000-O/O	1	4.8-20GHZ	9/6/2019	9/6/2021
XPR0	HIGH PASS FILTER	K&L MICROWAVE	11SH10-4800/X20000	001	4.8-20GHZ	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.

18. Radiated Spurious Emissions in the Restricted Bands

Manufacturer	Astronics CSC
Product	IFE System
Model	E71-319-01
Serial No	000007
Mode	Transmitting

Information	
Size of EUT	26.411cm x 18.098cm x 11.887cm (L x W x H)
Setup Format	Tabletop
Height of Support	N/A
Type of Test Site	Semi-anechoic
Number of Interconnection Wires	N/A
Type of Interconnection Wires	N/A
Note	The cables were manually maximized during the preliminary emissions sweeps. The cable arrangement which resulted in the worst-case emissions was utilized.

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

Procedures

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.

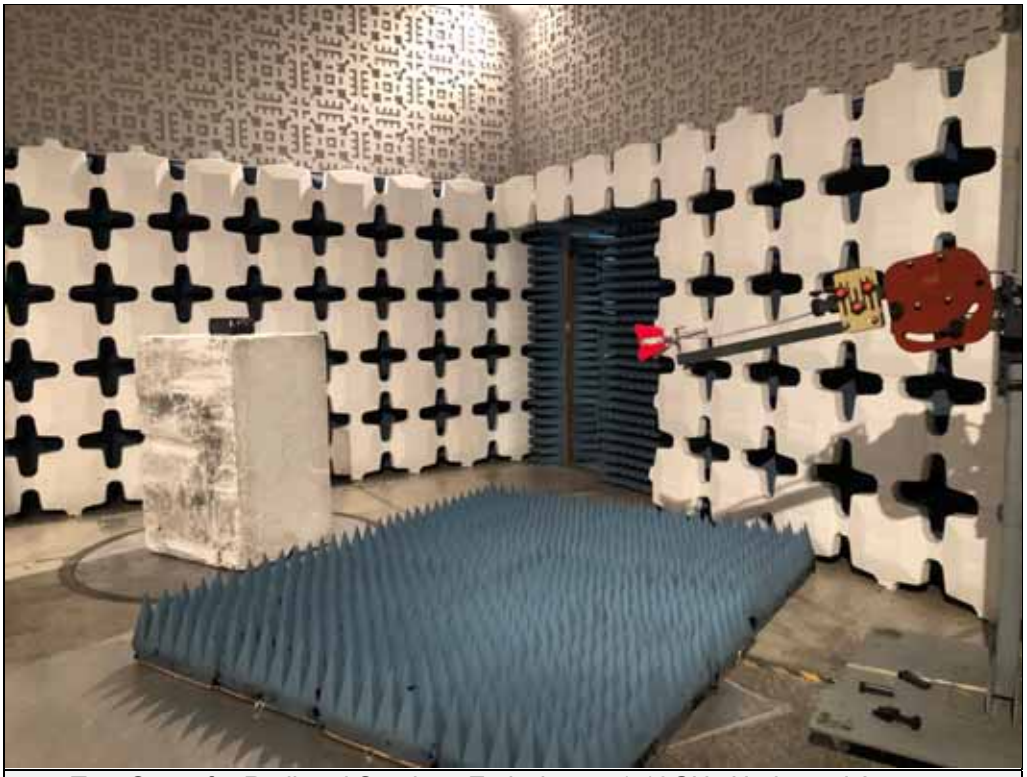
1) For all emissions in the restricted bands, the following procedure was used:
   a) The field strengths of all emissions above 1 GHz were measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3 meter distance from the EUT. The EUT was placed on a 1.5 meter high non-conductive stand. A peak detector with a resolution bandwidth of 1 MHz was used on the spectrum analyzer.
   b) 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.

iv) In instances where it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer. The measuring antenna was not raised or lowered to ensure maximized readings, instead the EUT was rotated through all axis to ensure the maximum readings were recorded for the EUT.

c) For all radiated emissions measurements above 1 GHz, 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 20 dB above the maximum permitted average emission limit applicable to the equipment under test. Therefore, all peak readings above 1 GHz must be no greater than 20 dB above the limits specified in 15.209(a).

d) Next, for all radiated emissions measurements above 1GHz, an average reading was taken.



Test Setup for Radiated Spurious Emissions – 1-18GHz Horizontal Antenna Polarization

Test Setup for Radiated Spurious Emissions – 1-18GHz Vertical Antenna Polarization

Test Setup for Radiated Spurious Emissions – 18-26.5GHz Horizontal Antenna Polarization

Test Setup for Radiated Spurious Emissions – 18-26.5GHz Vertical Antenna Polarization

Test	Spurious Emissions – Peak Measurements
Mode	802.11b 1Mbps Ch 1 – 18dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
4824.00	H	49.3	*	4.8	34.2	-39.7	48.6	269.4	5000.0	-25.4
4824.00	V	49.3	*	4.8	34.2	-39.7	48.7	270.9	5000.0	-25.3
12060.00	H	50.6	*	8.0	38.7	-39.0	58.3	827.0	5000.0	-15.6
12060.00	V	50.2	*	8.0	38.7	-39.0	57.9	781.6	5000.0	-16.1
14472.00	H	50.3	*	8.7	39.6	-38.6	60.1	1006.1	5000.0	-13.9
14472.00	V	50.2	*	8.7	39.6	-38.6	60.0	999.1	5000.0	-14.0
19296.00	H	36.5	*	2.2	40.4	-28.5	50.5	336.8	5000.0	-23.4
19296.00	V	36.8	*	2.2	40.4	-28.5	50.9	350.6	5000.0	-23.1

Test	Spurious Emissions – Average Measurements
Mode	802.11b 1Mbps Ch 1 – 18dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
4824.00	H	33.9	*	4.8	34.2	-39.7	0.0	33.3	46.0	500.0	-20.7
4824.00	V	34.0	*	4.8	34.2	-39.7	0.0	33.3	46.4	500.0	-20.7
12060.00	H	35.0	*	8.0	38.7	-39.0	0.0	42.7	136.8	500.0	-11.3
12060.00	V	34.8	*	8.0	38.7	-39.0	0.0	42.5	133.2	500.0	-11.5
14472.00	H	34.7	*	8.7	39.6	-38.6	0.0	44.4	166.8	500.0	-9.5
14472.00	V	34.5	*	8.7	39.6	-38.6	0.0	44.3	164.1	500.0	-9.7
19296.00	H	22.2	*	2.2	40.4	-28.5	0.0	36.2	64.8	500.0	-17.8
19296.00	V	22.0	*	2.2	40.4	-28.5	0.0	36.1	63.7	500.0	-17.9

Test	Spurious Emissions – Peak Measurements
Mode	802.11b 1Mbps Ch 6 – 18dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
4874.00	H	48.5	*	4.9	34.1	-39.6	47.9	247.2	5000.0	-26.1
4874.00	V	48.6	*	4.9	34.1	-39.6	48.0	251.8	5000.0	-26.0
7311.00	H	47.3	*	6.2	35.9	-39.6	49.7	305.9	5000.0	-24.3
7311.00	V	47.6	*	6.2	35.9	-39.6	50.1	318.8	5000.0	-23.9
12185.00	H	49.1	*	8.0	38.7	-38.9	56.9	697.6	5000.0	-17.1
12185.00	V	49.3	*	8.0	38.7	-38.9	57.0	711.4	5000.0	-16.9
19496.00	H	36.0	*	2.2	40.4	-28.8	49.8	310.2	5000.0	-24.1
19496.00	V	36.3	*	2.2	40.4	-28.8	50.1	321.4	5000.0	-23.8

Test	Spurious Emissions – Average Measurements
Mode	802.11b 1Mbps Ch 6 – 18dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
4874.00	H	33.2	*	4.9	34.1	-39.6	0.0	32.6	42.6	500.0	-21.4
4874.00	V	33.4	*	4.9	34.1	-39.6	0.0	32.8	43.6	500.0	-21.2
7311.00	H	32.00	*	6.2	35.9	-39.6	0.0	34.4	52.7	500.0	-19.5
7311.00	V	32.0	*	6.2	35.9	-39.6	0.0	34.5	52.9	500.0	-19.5
12185.00	H	34.0	*	8.0	38.7	-38.9	0.0	41.8	122.5	500.0	-12.2
12185.00	V	34.0	*	8.0	38.7	-38.9	0.0	41.7	122.2	500.0	-12.2
19496.00	H	22.2	*	2.2	40.4	-28.8	0.0	36.0	63.2	500.0	-18.0
19496.00	V	22.3	*	2.2	40.4	-28.8	0.0	36.1	63.5	500.0	-17.9

Test	Spurious Emissions – Peak Measurements
Mode	802.11b 1Mbps Ch 11 – 18dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
4924.00	H	48.9	*	4.9	34.1	-39.6	48.3	259.5	5000.0	-25.7
4924.00	V	48.9	*	4.9	34.1	-39.6	48.2	258.0	5000.0	-25.7
7386.00	H	47.8	*	6.2	35.8	-39.6	50.2	323.5	5000.0	-23.8
7386.00	V	47.5	*	6.2	35.8	-39.6	49.9	314.3	5000.0	-24.0
12310.00	H	49.3	*	8.0	38.7	-38.8	57.1	719.5	5000.0	-16.8
12310.00	V	48.8	*	8.0	38.7	-38.8	56.6	677.7	5000.0	-17.4
19696.00	H	36.0	*	2.2	40.4	-28.5	50.1	320.4	5000.0	-23.9
19696.00	V	36.4	*	2.2	40.4	-28.5	50.5	335.5	5000.0	-23.5
22158.00	H	38.7	*	2.2	40.6	-29.3	52.2	406.0	5000.0	-21.8
22158.00	V	39.2	*	2.2	40.6	-29.3	52.7	430.0	5000.0	-21.3

Test	Spurious Emissions – Average Measurements
Mode	802.11b 1Mbps Ch 11 – 18dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
4924.00	H	33.2	*	4.9	34.1	-39.6	0.0	32.6	42.7	500.0	-21.4
4924.00	V	33.2	*	4.9	34.1	-39.6	0.0	32.6	42.6	500.0	-21.4
7386.00	H	31.90	*	6.2	35.8	-39.6	0.0	34.3	52.2	500.0	-19.6
7386.00	V	31.9	*	6.2	35.8	-39.6	0.0	34.3	52.1	500.0	-19.6
12310.00	H	34.3	*	8.0	38.7	-38.8	0.0	42.1	127.2	500.0	-11.9
12310.00	V	34.2	*	8.0	38.7	-38.8	0.0	42.1	126.9	500.0	-11.9
19696.00	H	21.7	*	2.2	40.4	-28.5	0.0	35.8	61.7	500.0	-18.2
19696.00	V	22.2	*	2.2	40.4	-28.5	0.0	36.4	65.8	500.0	-17.6
22158.00	H	24.4	*	2.2	40.6	-29.3	0.0	37.8	78.1	500.0	-16.1
22158.00	V	24.5	*	2.2	40.6	-29.3	0.0	38.0	79.2	500.0	-16.0

Test	Spurious Emissions – Peak Measurements
Mode	802.11n40 MCS0 Ch 3 – 18dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
4844.00	H	48.5	*	4.9	34.1	-39.6	47.9	248.0	5000.0	-26.1
4844.00	V	48.2	*	4.9	34.1	-39.6	47.5	238.4	5000.0	-26.4
7266.00	H	47.0	*	6.1	35.9	-39.7	49.4	295.2	5000.0	-24.6
7266.00	V	47.1	*	6.1	35.9	-39.7	49.5	297.6	5000.0	-24.5
12110.00	H	48.9	*	8.0	38.7	-38.9	56.7	680.0	5000.0	-17.3
12110.00	V	49.0	*	8.0	38.7	-38.9	56.8	691.1	5000.0	-17.2
19376.00	H	36.6	*	2.2	40.4	0.0	79.2	9110.2	5000.0	5.2
19376.00	V	36.8	*	2.2	40.4	0.0	79.4	9354.7	5000.0	5.4

Test	Spurious Emissions – Average Measurements
Mode	802. 11n40 MCS0 Ch 3 – 18dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
4844.00	H	33.4	*	4.9	34.1	-39.6	0.0	32.8	43.8	500.0	-21.2
4844.00	V	33.4	*	4.9	34.1	-39.6	0.0	32.8	43.5	500.0	-21.2
7266.00	H	31.98	*	6.1	35.9	-39.7	0.0	34.4	52.4	500.0	-19.6
7266.00	V	32.0	*	6.1	35.9	-39.7	0.0	34.4	52.2	500.0	-19.6
12110.00	H	34.5	*	8.0	38.7	-38.9	0.0	42.3	129.9	500.0	-11.7
12110.00	V	34.5	*	8.0	38.7	-38.9	0.0	42.3	129.7	500.0	-11.7
19376.00	H	22.1	*	2.2	40.4	0.0	0.0	64.7	1718.0	500.0	10.7
19376.00	V	22.6	*	2.2	40.4	0.0	0.0	65.2	1815.6	500.0	11.2

Test	Spurious Emissions – Peak Measurements
Mode	802. 11n40 MCS0 Ch 6 – 18dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
4874.00	H	48.0	*	4.9	34.1	-39.6	47.4	233.1	5000.0	-26.6
4874.00	V	47.9	*	4.9	34.1	-39.6	47.3	232.3	5000.0	-26.7
7311.00	H	46.9	*	6.2	35.9	-39.6	49.4	293.4	5000.0	-24.6
7311.00	V	46.7	*	6.2	35.9	-39.6	49.1	286.1	5000.0	-24.8
12185.00	H	49.5	*	8.0	38.7	-38.9	57.3	731.3	5000.0	-16.7
12185.00	V	48.2	*	8.0	38.7	-38.9	56.0	631.8	5000.0	-18.0
19496.00	H	35.9	*	2.2	40.4	-28.8	49.7	306.3	5000.0	-24.3
19496.00	V	36.6	*	2.2	40.4	-28.8	50.4	332.3	5000.0	-23.5

Test	Spurious Emissions – Average Measurements
Mode	802. 11n40 MCS0 Ch 6 – 18dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
4874.00	H	33.3	*	4.9	34.1	-39.6	0.0	32.7	43.1	500.0	-21.3
4874.00	V	33.3	*	4.9	34.1	-39.6	0.0	32.7	43.2	500.0	-21.3
7311.00	H	32.25	*	6.2	35.9	-39.6	0.0	34.7	54.2	500.0	-19.3
7311.00	V	32.3	*	6.2	35.9	-39.6	0.0	34.7	54.5	500.0	-19.2
12185.00	H	34.2	*	8.0	38.7	-38.9	0.0	41.9	125.1	500.0	-12.0
12185.00	V	34.1	*	8.0	38.7	-38.9	0.0	41.9	124.8	500.0	-12.1
19496.00	H	21.9	*	2.2	40.4	-28.8	0.0	35.7	61.2	500.0	-18.2
19496.00	V	22.0	*	2.2	40.4	-28.8	0.0	35.8	61.6	500.0	-18.2

Test	Spurious Emissions – Peak Measurements
Mode	802. 11n40 MCS0 Ch 9 – 16dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
4904.00	H	48.2	*	4.9	34.1	-39.6	47.5	237.9	5000.0	-26.4
4904.00	V	48.2	*	4.9	34.1	-39.6	47.6	239.0	5000.0	-26.4
7356.00	H	47.1	*	6.2	35.9	-39.6	49.6	300.9	5000.0	-24.4
7356.00	V	47.1	*	6.2	35.9	-39.6	49.5	298.1	5000.0	-24.5
12260.00	H	48.6	*	8.0	38.7	-38.8	56.4	660.1	5000.0	-17.6
12260.00	V	48.3	*	8.0	38.7	-38.8	56.2	642.1	5000.0	-17.8
19616.00	H	36.1	*	2.2	40.4	-28.5	50.3	326.0	5000.0	-23.7
19616.00	V	36.4	*	2.2	40.4	-28.5	50.5	336.7	5000.0	-23.4
22068.00	H	38.3	*	2.2	40.6	-29.4	51.7	385.7	5000.0	-22.3
22068.00	V	38.9	*	2.2	40.6	-29.4	52.3	414.3	5000.0	-21.6

Test	Spurious Emissions – Average Measurements
Mode	802. 11n40 MCS0 Ch 9 – 16dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
4904.00	H	33.5	*	4.9	34.1	-39.6	0.0	32.8	43.9	500.0	-21.1
4904.00	V	33.4	*	4.9	34.1	-39.6	0.0	32.8	43.7	500.0	-21.2
7356.00	H	31.84	*	6.2	35.9	-39.6	0.0	34.3	51.8	500.0	-19.7
7356.00	V	31.8	*	6.2	35.9	-39.6	0.0	34.2	51.2	500.0	-19.8
12260.00	H	33.8	*	8.0	38.7	-38.8	0.0	41.7	121.0	500.0	-12.3
12260.00	V	33.7	*	8.0	38.7	-38.8	0.0	41.6	119.7	500.0	-12.4
19616.00	H	22.1	*	2.2	40.4	-28.5	0.0	36.2	64.9	500.0	-17.7
19616.00	V	22.1	*	2.2	40.4	-28.5	0.0	36.3	65.1	500.0	-17.7
22068.00	H	24.1	*	2.2	40.6	-29.4	0.0	37.6	75.5	500.0	-16.4
22068.00	V	24.4	*	2.2	40.6	-29.4	0.0	37.9	78.1	500.0	-16.1

Test	Spurious Emissions – Peak Measurements
Mode	802. 11n40 MCS0 BF Ch 9 – 18dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
4904.00	H	48.4	*	4.9	34.1	-39.6	47.7	243.5	5000.0	-26.2
4904.00	V	48.2	*	4.9	34.1	-39.6	47.6	240.4	5000.0	-26.4
7356.00	H	47.9	*	6.2	35.9	-39.6	50.3	329.2	5000.0	-23.6
7356.00	V	47.9	*	6.2	35.9	-39.6	50.3	327.3	5000.0	-23.7
12260.00	H	48.7	*	8.0	38.7	-38.8	56.6	673.2	5000.0	-17.4
12260.00	V	48.7	*	8.0	38.7	-38.8	56.5	667.0	5000.0	-17.5
19616.00	H	36.1	*	2.2	40.4	-28.5	50.3	327.5	5000.0	-23.7
19616.00	V	36.2	*	2.2	40.4	-28.5	50.4	331.3	5000.0	-23.6
22068.00	H	38.6	*	2.2	40.6	-29.4	52.0	399.7	5000.0	-21.9
22068.00	V	38.8	*	2.2	40.6	-29.4	52.2	408.6	5000.0	-21.8

Test	Spurious Emissions – Average Measurements
Mode	802. 11n40 MCS0 BF Ch 9 – 18dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
4904.00	H	33.6		4.9	34.1	-39.6	0.0	33.0	44.6	500.0	-21.0
4904.00	V	33.6		4.9	34.1	-39.6	0.0	32.9	44.3	500.0	-21.0
7356.00	H	31.92		6.2	35.9	-39.6	0.0	34.4	52.2	500.0	-19.6
7356.00	V	31.9		6.2	35.9	-39.6	0.0	34.3	52.1	500.0	-19.7
12260.00	H	34.0		8.0	38.7	-38.8	0.0	41.8	123.5	500.0	-12.1
12260.00	V	33.9		8.0	38.7	-38.8	0.0	41.8	122.4	500.0	-12.2
19616.00	H	22.1	*	2.2	40.4	-28.5	0.0	36.3	65.3	500.0	-17.7
19616.00	V	22.2	*	2.2	40.4	-28.5	0.0	36.3	65.5	500.0	-17.7
22068.00	H	24.2	*	2.2	40.6	-29.4	0.0	37.7	76.5	500.0	-16.3
22068.00	V	24.3	*	2.2	40.6	-29.4	0.0	37.8	77.4	500.0	-16.2

19. Band-Edge Compliance near the Restricted Band

Manufacturer	Astronics CSC
Product	IFE System
Model	E71-319-01
Serial No	000007
Mode	Transmitting

Information	
Size of EUT	26.411cm x 18.098cm x 11.887cm (L x W x H)
Setup Format	Tabletop
Height of Support	N/A
Type of Test Site	Semi-anechoic chamber
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)
Number of Interconnection Wires	1
Type of Interconnection Wires	Ethernet
Notes	

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

Procedures

1) The EUT was set to transmit continuously at the channel closest to the band-edge near a restricted band.
2) A double ridged waveguide was placed 3 meters away from the EUT. The antenna was connected to the input of a spectrum analyzer.
3) The center frequency of the analyzer was set to the high band edge
4) The resolution bandwidth was set to 1MHz.
5) To ensure that the maximum or worst case emission level was measured, the following steps were taken:

    a. The EUT was rotated so that all of its sides were exposed to the receiving antenna.
    b. Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
    c. The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.

6) The highest measured peak reading was recorded.
7) The highest measured average reading was recorded.

Test	Band-Edge Compliance near the Restricted Band – Peak Measurements
Mode	802.11b 1Mbps Ch 11

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2483.50	H	27.0	*	3.5	32.3	0.0	62.8	1377.9	5000.0	-11.2
2483.50	V	27.4	*	3.5	32.3	0.0	63.2	1446.1	5000.0	-10.8

Test	Band-Edge Compliance near the Restricted Band – Average Measurements
Mode	802.11b 1Mbps Ch 11

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2483.50	H	8.7	*	3.5	32.3	0.0	0.0	44.5	168.0	500.0	-9.5
2483.50	V	9.0	*	3.5	32.3	0.0	0.0	44.8	173.5	500.0	-9.2

Test	Band-Edge Compliance near the Restricted Band – Peak Measurements
Mode	802.11n20 Ch 11 – 15dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2483.50	H	24.9		3.5	32.3	0.0	60.7	1082.0	5000.0	-13.3
2483.50	V	31.0		3.5	32.3	0.0	66.8	2191.4	5000.0	-7.2

Test	Band-Edge Compliance near the Restricted Band – Average Measurements
Mode	802.11n20 Ch 11 – 15dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2483.50	H	9.1		3.5	32.3	0.0	0.0	44.9	176.1	500.0	-9.1
2483.50	V	15.6		3.5	32.3	0.0	0.0	51.4	372.1	500.0	-2.6

Test	Band-Edge Compliance near the Restricted Band – Peak Measurements
Mode	802.11n40 Ch 9 – 16dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2483.50	H	27.6	*	3.5	32.3	0.0	63.4	1479.8	5000.0	-10.6
2483.50	V	32.7	*	3.5	32.3	0.0	68.6	2683.6	5000.0	-5.4

Test	Band-Edge Compliance near the Restricted Band – Average Measurements
Mode	802.11n40 Ch 9 – 16dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2483.50	H	9.8	*	3.5	32.3	0.0	0.0	45.6	190.6	500.0	-8.4
2483.50	V	17.4	*	3.5	32.3	0.0	0.0	53.2	458.4	500.0	-0.8

Test	Band-Edge Compliance near the Restricted Band – Peak Measurements
Mode	802.11n40 BF Ch 9 – 18dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
2483.50	H	28.1		3.5	32.3	0.0	63.9	1563.9	5000.0	-10.1
2483.50	V	34.4		3.5	32.3	0.0	70.3	3256.2	5000.0	-3.7

Test	Band-Edge Compliance near the Restricted Band – Average Measurements
Mode	802.11n40 BF Ch 9 – 18dBm

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2483.50	H	10.3		3.5	32.3	0.0	0.0	46.1	202.9	500.0	-7.8
2483.50	V	16.1		3.5	32.3	0.0	0.0	51.9	394.7	500.0	-2.1

20. Scope of Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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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

Test Technology:	Test Method(s) [1]:
Bulk Current Injection (BCI)	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)
Bulk Current Injections (BCI) *(Closed Loop Method)*	ISO 11452-4; SAE J1113-4
Radiated Immunity Anechoic *(Including Radar Pulse)*	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
Radiated Immunity Magnetic Field	ISO 11452-8
Radiated Immunity Reverb	ISO/IEC 61000-4-21; GMW 3097, Section 3.4.3; EMC-CS-2009.1 (RI114); FMC1278 (RI114); ISO 11452-11
Radiated Immunity *(Portable Transmitters)*	ISO 11452-9; EMC-CS-2009.1 (RI115); FMC1278 (RI115)
Vehicle Radiated Immunity (ALSE)	ISO 11451-2
Electrical Loads	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
Dielectric Withstand Voltage	MIL-STD-202, Method 301; EIA-364-20D
Insulation Resistance	MIL-STD-202, Method 302; SAE/USCAR-2, Revision 6, Section 5.5.1; EIA-364-21D
Contact Resistance	MIL-STD-202, Method 307; SAE/USCAR-2, Revision 6, Section 5.3.1; EIA/ECA-364-23C; USCAR21-3 Section 4.5.3
DC Resistance	MIL-STD-202, Method 303
Contact Chatter	MIL-STD-202, Method 310; SAE/USCAR-2, Revision 6, Section 5.1.9
Voltage Drop	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

Test Technology:	Test Method(s) [1]:
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
TxRx EMC Requirements	EN 301 489-1; EN 301 489-3; EN 301 489-9; EN 301 489-17; EN 301 489-19; EN 301 489-52;
European Radio Test Standards	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;
Electrical Measurements and Simulation	
AC Voltage / Current	FAA AC 150/5345-10H
(1mV to 5kV) 60 Hz	FAA AC 150/5345-43J
(0.1V to 250V) up to 500 MHz	FAA AC 150/5345-44K
(1µA to 150A) 60 Hz	FAA AC 150/5345-46E
DC Voltage / Current	FAA AC 150/5345-47C
(1mV to 15-kV) / (1µA to 10A)	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.1[2]

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
Unintentional Radiators Part 15B	ANSI C63.4:2014	40000
Industrial, Scientific, and Medical Equipment Part 18	FCC MP-5 (February 1986)	40000
Intentional Radiators Part 15C	ANSI C63.10:2013	40000
Unlicensed Personal Communication Systems Devices Part 15D	ANSI C63.17:2013	40000
U-NIII without DFS Intentional Radiators Part 15E	ANSI C63.10:2013	40000
U-NIII with DFS Intentional Radiators Part 15E	FCC KDB 905462 D02 (v02)	40000
UWB Intentional Radiators Part 15F	ANSI C63.10:2013	40000
BPL Intentional Radiators Part 15G	ANSI C63.10:2013	40000
White Space Device Intentional Radiators Part 15H	ANSI C63.10:2013	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.1[2]

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
Commercial Mobile Services (FCC Licensed Radio Service Equipment)		
Parts 22 (cellular), 24, 25 (below 3 GHz), and 27	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
General Mobile Radio Services (FCC Licensed Radio Service Equipment)		
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
Citizens Broadband Radio Services (FCC Licensed Radio Service Equipment)		
Part 96	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
Maritime and Aviation Radio Services		
Parts 80 and 87	ANSI/TIA-603-E; ANSI C63.26:2015	40000
Microwave and Millimeter Bands Radio Services		
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
Broadcast Radio Services		
Parts 73 and 74 (below 3 GHz)	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
Signal Boosters		
Part 20 (Wideband Consumer Signal Boosters, Provider-specific signal boosters, and Industrial Signal Boosters) Section 90.219	ANSI C63.26:2015	40000

[2]Accreditation 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.