



Engineering Test Report No. 2101086-01

Report Date	April 30, 2021	
Manufacturer Name	TouchTronics, Inc.	
Manufacturer Address	57315 Nagy Drive Elkhart, IN 46517	
Model No.	M115-A & M115-R	
Date Received	April 15, 2021	
Test Date	April 15, 2021	
Specifications	FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C Innovation, Science, and Economic Development Canada, RSS-210 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 CAB Identifier: US0107
Signature		
Tested by	Tylar Jozefczyk	
Signature		
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894	
PO Number	E0008531	

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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 and Innovation, Science, and Economic Development Canada, RSS-210 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. This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

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1. Report Revision History

Revision	Date	Description
–	05 MAY 2021	Initial Release of Engineering Test Report No. 2101086-01

2. Introduction

2.1. Scope of Tests

This document presents the results of a series of RF emissions tests that were performed on the TouchTronics, Inc. Keyless Entry System (hereinafter referred to as the Equipment Under Test (EUT)). The EUT was manufactured and submitted for testing by TouchTronics, Inc. located in Elkhart, IN.

2.2. Purpose

The test series was performed to determine if the EUT meets the RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C.

The test series was also performed to determine if the EUT meets the RF emission requirements of the Industry Canada Radio Standards Specification RSS-Gen and Industry Canada Radio Standards Specification RSS-210 for Transmitters.

Testing was performed in accordance with ANSI C63.10-2013.

2.3. Identification of the EUT

The EUT was identified as follows:

EUT Identification	
Product Description	Keyless Entry System
Model/Part No.	M115-A & M115-R
Serial No.	N/A
Software/Firmware Version	1.00
Antenna Type	RFID
Manufacturer Supplied ¹ Antenna Gain (dBi)	N/A
Product FCC ID & ISSED UPN Number	FCC ID: IVSM115 ISSED UPN: 6265A-M115

¹ Antenna gain is supplied by the manufacturer and Elite is not responsible for the accuracy of the antenna gain.

The EUT listed above was used throughout the test series.

3. Power Input

The EUT was powered by 12VDC from a twisted pair, 1 meter wiring harness.

4. Grounding

The EUT was not connected to ground.

5. Support Equipment

The EUT was submitted for testing along with the following support equipment:

Description	Model #	S/N
RFID Tag Key	N/A	N/A
Harness	N/A	N/A

6. Interconnect Leads

No interconnect cables were submitted with the test item.

7. Modifications Made to the EUT

No modifications were made to the EUT during the testing.

8. Modes of Operation

Mode	Description
Tx	The EUT is powered on and set to transmit at 135kHz.

9. Test Specifications

The tests were performed to selected portions of, and in accordance with the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C and Innovation, Science, and Economic Development Canada, RSS-210 test specifications.

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart B
- 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 9kHz to 40 GHz"
- ANSI C63.10-2013, "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices"
- RSS-Gen Issue 5, February 2021, Amendment 2, Innovation, Science, and Economic Development Canada, "General Requirements for Compliance of Radio Apparatus"
- RSS-210 Issue 10, April 2020, Amendment 1, "License-Exempt Radio Apparatus: Category I Equipment"

10. Test Plan

No test plan was provided. Instructions were provided by personnel from TouchTronics, Inc. and used in conjunction with the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Innovation, Science, and Economic Development Canada, RSS-210, and ANSI C63.10-2013 specifications.

11. Deviation, Additions to, or Exclusions from Test Specifications

There were no deviations, additions to, or exclusions from the test specifications during this test series.

12. Laboratory Conditions

Ambient Parameters	Value
Temperature	23.6°C
Relative Humidity	19%
Atmospheric Pressure	1016.4mb

13. Summary

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

Test Description	Requirements	Test Methods	Results
Spurious Radiated Emissions	FCC 15C ISED RSS-210	ANSI C63.10:2013	Conforms

14. Sample Calculations

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.

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

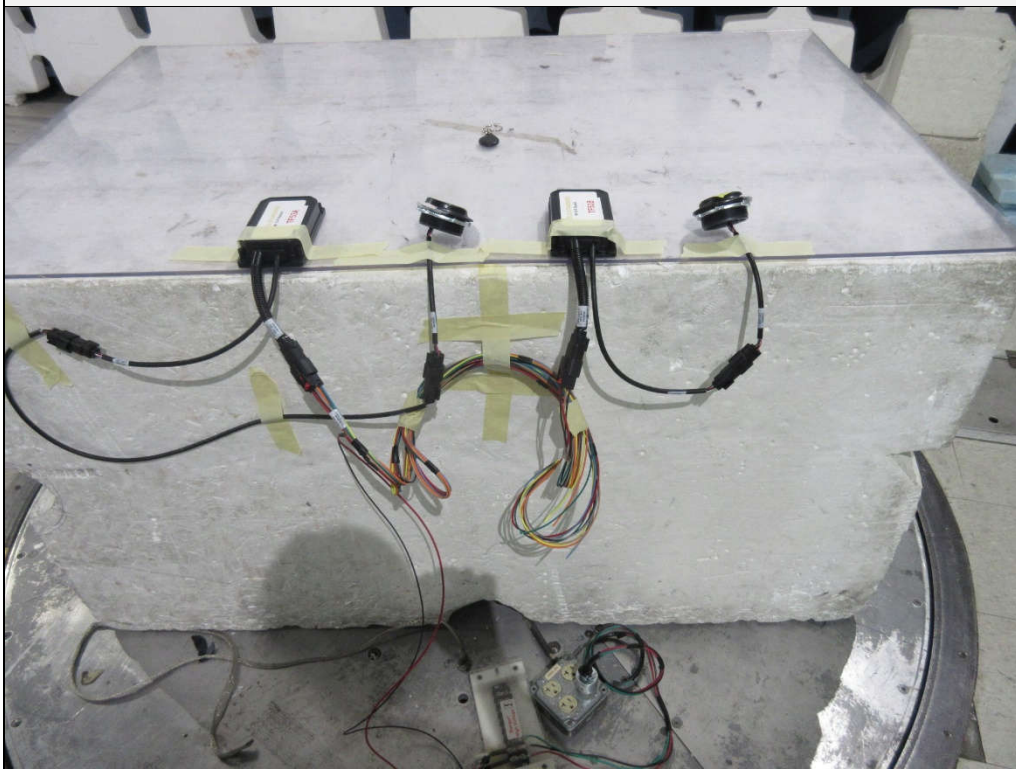
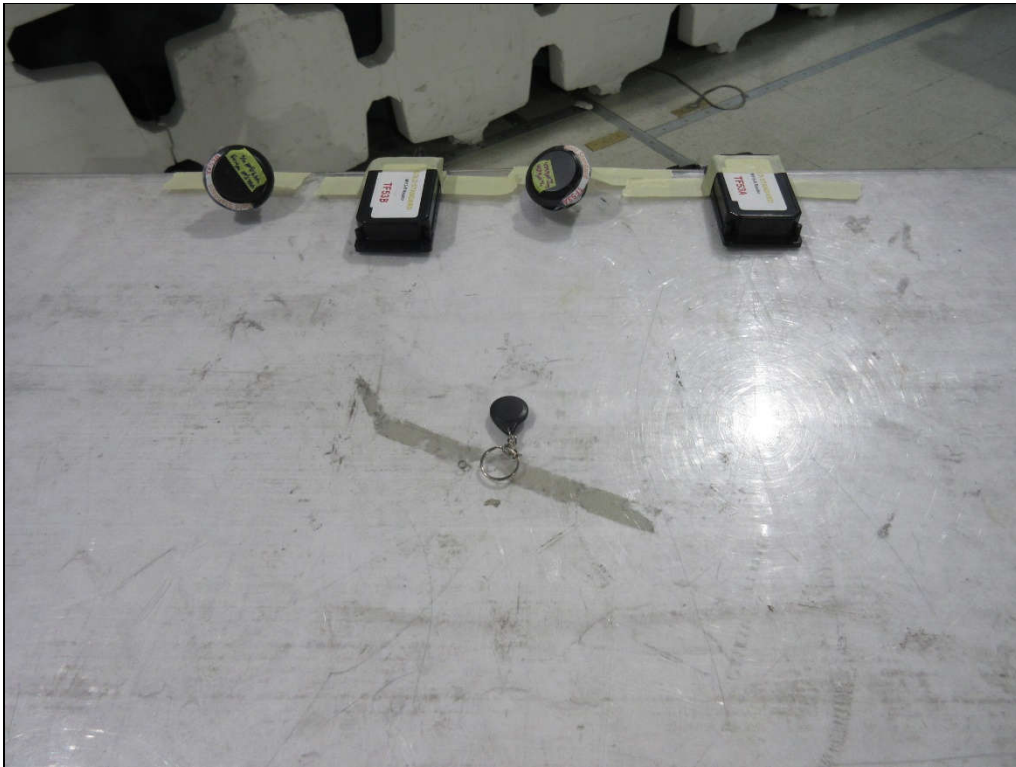
15. Statement of Conformity

The TouchTronics, Inc. Keyless Entry System, Model No. M115-A, Serial No. S/N1, did fully conform to the selected requirements of FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C and Innovation, Science, and Economic Development Canada, RSS-210.

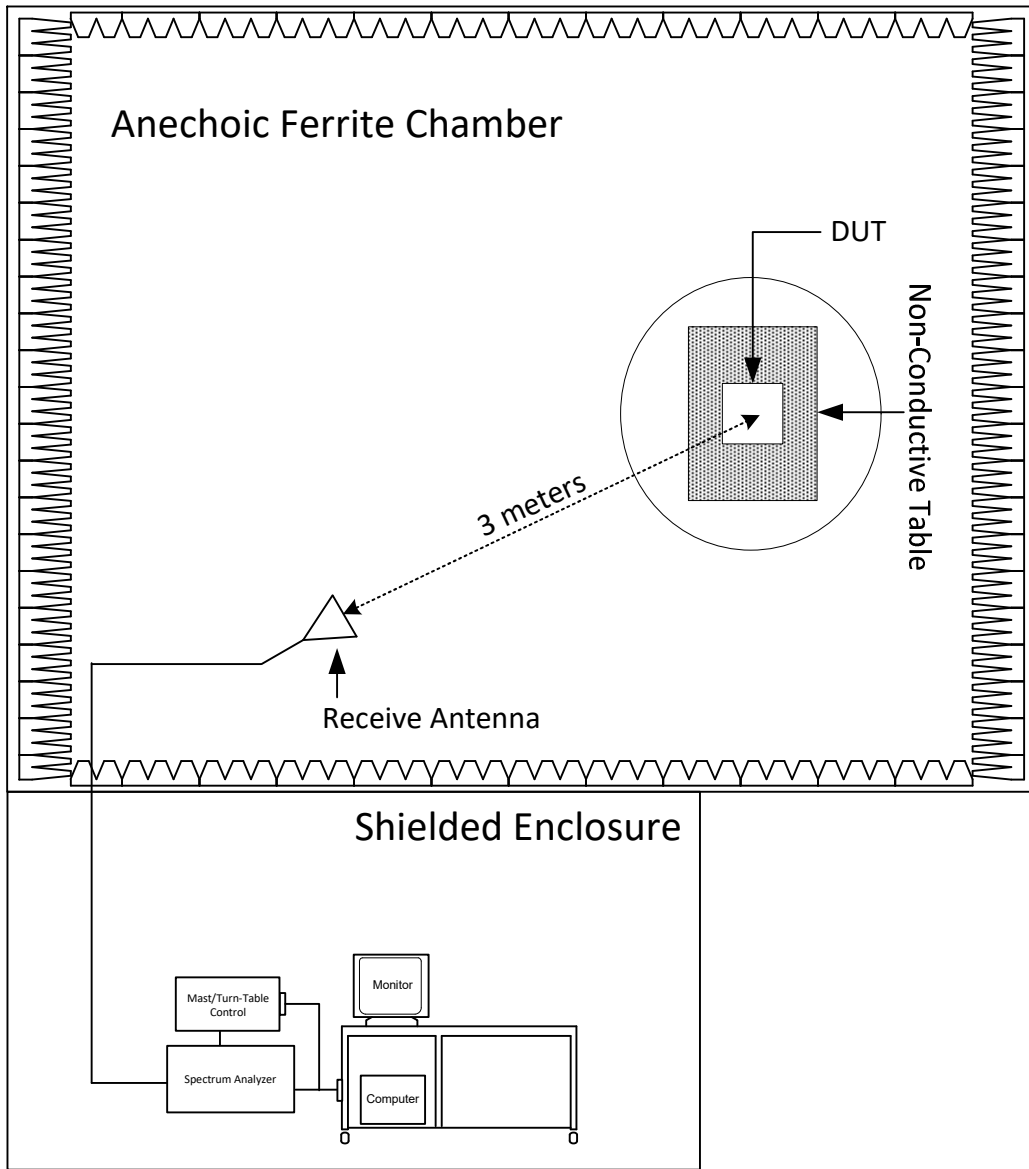
16. Certification

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 and Innovation, Science, and Economic Development Canada, RSS-210 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. Block Diagram of Test Setup



Radiated Measurements Test Setup

19. Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
CDZ4	LAB WORKSTATION	ELITE	LWS-10		WINDOWS 10	CNR	
NLS0	24" ACTIVE LOOP ANTENNA	EMCO	6502	89979	10KHZ-30MHZ	9/11/2020	9/11/2022
R21F	3M ANECHOIC CHAMBER NSA	EMC TEST SYSTEMS	3M ANECHOIC		30MHZ-18GHZ	3/14/2021	3/14/2022
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	3/11/2021	3/11/2022
WKA1	SOFTWARE, UNIVERSAL RCV EMI	ELITE	UNIV_RCV_EMI	1	---	I/O	

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.

20. Spurious Radiated Emissions

EUT Information	
Manufacturer	TouchTronics, Inc.
Product	Keyless Entry System
Model No.	M115-A
Serial No.	S/N1
Mode	Tx

Test Setup Details	
Setup Format	Tabletop
Type of Test Site	Semi-Anechoic Chamber
Test Site Used	Room 21
Type of Antennas Used	Loop Antenna (or equivalent)
Notes	N/A

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

Requirements
The EUT must comply with the requirements of FCC "Code of Federal Regulations Title 47", Part 15, Subpart C, Section 15.209 et seq., as well as the requirements of RSS-GEN Section 8.10.

Radiated Emissions Limits		
Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	3

Procedures

All tests were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4-2014 for site attenuation.

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.

A preliminary radiated emissions test was performed to determine the emission characteristics of the EUT. For the preliminary test, a broadband measuring antenna was positioned at a 3 meter distance from the EUT. The entire frequency range from 10kHz to 30MHz was investigated using a peak detector function.

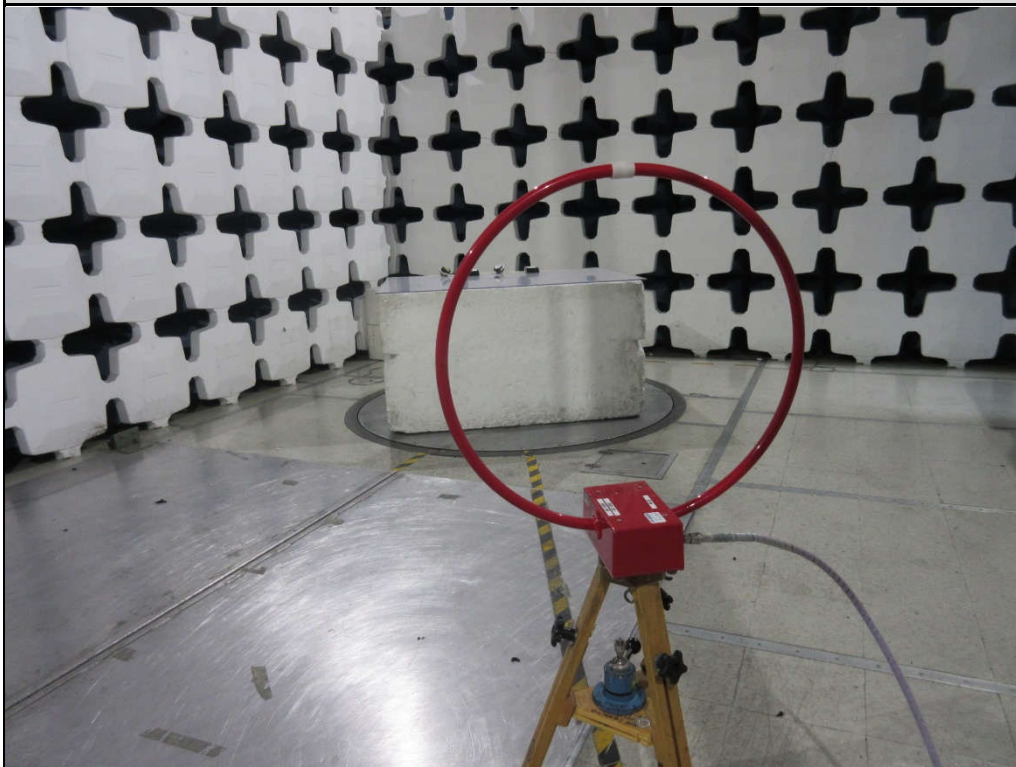
The final emission tests were then manually performed over the frequency range of 135kHz to 1.35MHz. Between 135kHz to 1.35MHz, a loop antenna was used as the pick-up device. The EUT was placed on an 80cm high non-conductive stand.

To ensure that maximum or worst case, emission levels were measured, the following steps were taken:

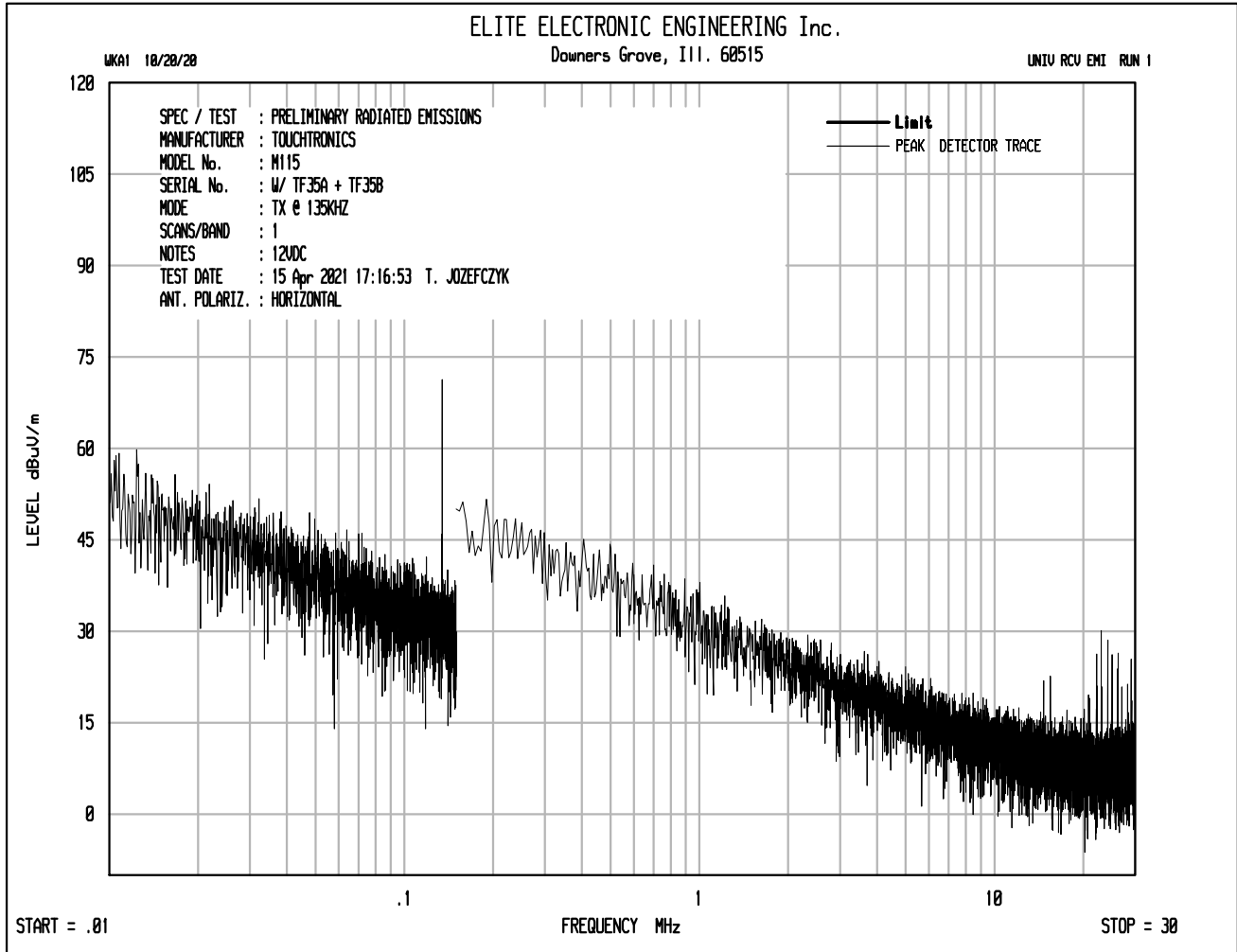
- 1) The EUT was rotated so that all of its sides were exposed to the receiving antenna.
- 2) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
- 3) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.
- 4) For hand-held or body-worn devices, the EUT was rotated through three orthogonal axes to determine which orientation produces the highest emission relative to the limit.

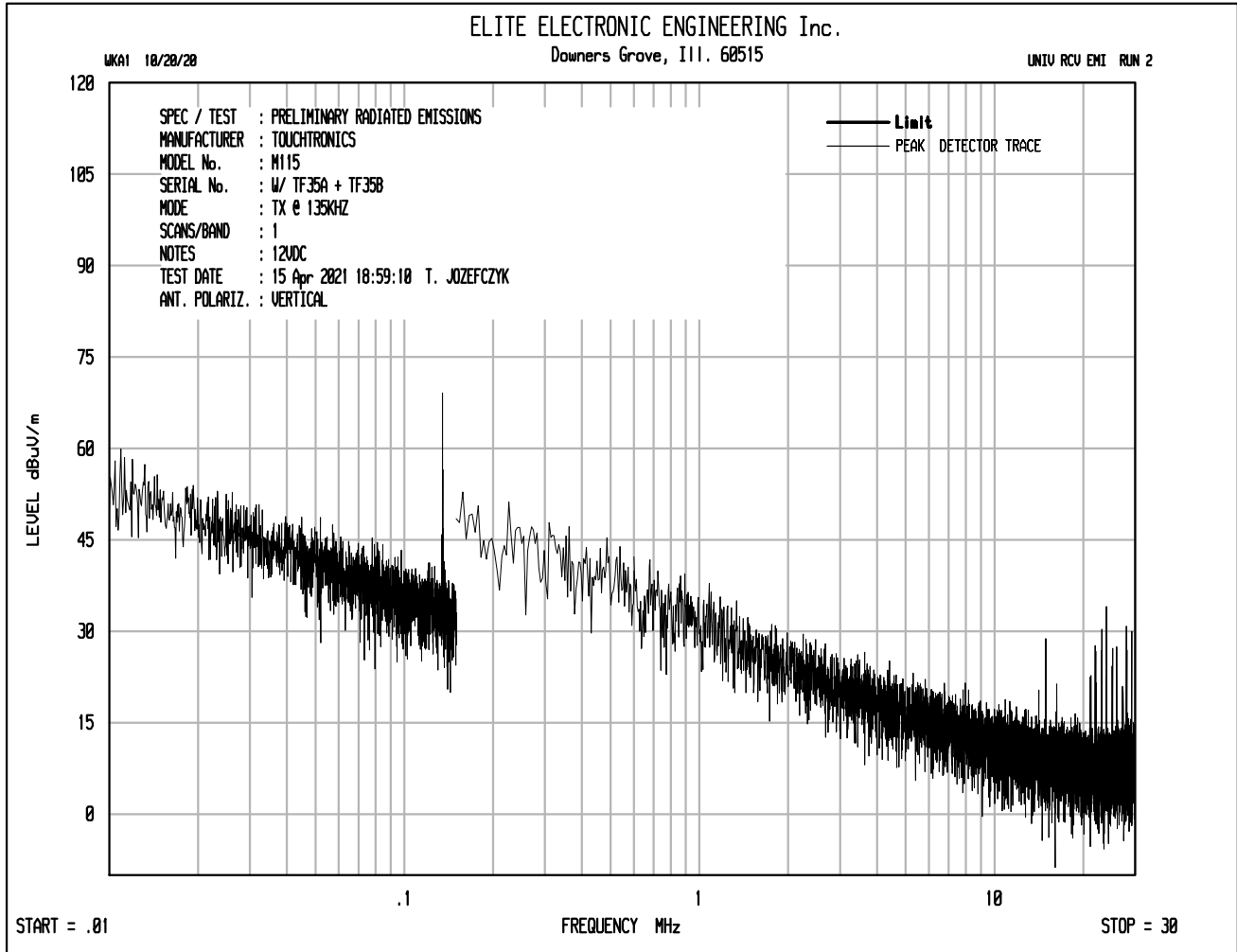


Test Setup for Spurious Radiated Emissions, 10kHz – 30MHz – Antenna Polarization Horizontal



Test Setup for Spurious Radiated Emissions, 10kHz – 30MHz – Antenna Polarization Vertical





Test Details	
Manufacturer	TouchTronics, Inc.
EUT	Keyless Entry System
Model No.	M115-A
Serial No.	S/N1
Mode	Tx
Frequency Tested	135kHz
Notes	Test Distance = 3 meters Distance Correction Factor: Per CFR 15.31(f)(2), at frequencies below 30MHz measurements may be performed at a distance closer than that specified in the regulations. The results may be extrapolated to the specified distance by using the square of an inverse linear distance extrapolation factor (40dB/decade). - Distance correction factor (300 meters to 3 meters) = -80dB (2 decades @ 40dB per decade) - Distance correction factor (30 meters to 3 meters) = -40dB (1 decade @ 40dB per decade)

Freq. (kHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Dist. Corr. (dB)	Total (dBuV/m)	Total (uV/m)	Limit (uV/m)	Specified Test Distance (meters)	Margin (dB)
135	H	75.74		0.26	10.66	0.00	-80.00	6.65	2.15	17.78	300.00	-18.34
135	V	71.86		0.26	10.66	0.00	-80.00	2.77	1.38	17.78	300.00	-22.22
270	H	46.34	Ambient	0.26	10.64	0.00	-80.00	-22.76	0.07	8.89	300.00	-41.73
270	V	45.49	Ambient	0.26	10.64	0.00	-80.00	-23.61	0.07	8.89	300.00	-42.58
405	H	41.72	Ambient	0.26	10.70	0.00	-80.00	-27.32	0.04	5.93	300.00	-42.78
405	V	42.35	Ambient	0.26	10.70	0.00	-80.00	-26.69	0.05	5.93	300.00	-42.15
540	H	38.07	Ambient	0.26	10.73	0.00	-40.00	9.06	2.84	44.44	30.00	-23.90
540	V	38.93	Ambient	0.26	10.73	0.00	-40.00	9.92	3.13	44.44	30.00	-23.04
675	H	36.70	Ambient	0.26	10.72	0.00	-40.00	7.68	2.42	35.56	30.00	-23.34
675	V	37.20	Ambient	0.26	10.72	0.00	-40.00	8.18	2.56	35.56	30.00	-22.84
810	H	34.89	Ambient	0.26	10.72	0.00	-40.00	5.87	1.97	29.63	30.00	-23.56
810	V	34.48	Ambient	0.26	10.72	0.00	-40.00	5.46	1.88	29.63	30.00	-23.97
945	H	33.66	Ambient	0.26	10.74	0.00	-40.00	4.66	1.71	25.40	30.00	-23.43
945	V	33.52	Ambient	0.26	10.74	0.00	-40.00	4.52	1.68	25.40	30.00	-23.57
1080	H	31.72	Ambient	0.26	10.76	0.00	-40.00	2.74	1.37	22.22	30.00	-24.19
1080	V	31.59	Ambient	0.26	10.76	0.00	-40.00	2.61	1.35	22.22	30.00	-24.32
1215	H	30.90	Ambient	0.26	10.78	0.00	-40.00	1.94	1.25	19.75	30.00	-23.97
1215	V	31.15	Ambient	0.26	10.78	0.00	-40.00	2.19	1.29	19.75	30.00	-23.72
1350	H	29.39	Ambient	0.26	10.80	0.00	-40.00	0.45	1.05	17.78	30.00	-24.55
1350	V	29.55	Ambient	0.26	10.80	0.00	-40.00	0.61	1.07	17.78	30.00	-24.39

Total (dBµV/m) = Meter Reading + CBL Fac. + Ant. Fac. + Pre Amp

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
Brandon Lugo (Automotive Team Leader) Phone: 630 495 9770 ext. 163
Email: blugo@elitetest.com
Richard King (FCC/Commercial Team Leader) Phone: 630 495 9770 ext. 123
Email: reking@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;
ECE Regulation 10.06 Annex 10

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)

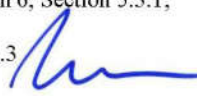
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<u>Test Technology:</u>	<u>Test Method(s) ¹:</u>
<i>Radiated Emissions Anechoic</i>	CISPR 25 (2002, 2008), Section 6.4; CISPR 25 (2016), Section 6.5; CS-11979, Section 5.3; CS.00054, Section 5.6.3; GMW 3097, Section 3.3.1; EMC-CS-2009.1 (RE 310); FMC1278 (RE310); ECE Regulation 10.06 Annex 7 (Broadband) ECE Regulation 10.06 Annex 8 (Narrowband)
<i>Vehicle Radiated Emissions</i>	CISPR 12; ICES-002; ECE Regulation 10.06 Annex 5
<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 (RII12); FMC1278 (RII12); ECE Regulation 10.06 Annex 9
<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 (RII14); FMC1278 (RII14); SAE J1113-21; ECE Regulation 10.06 Annex 9
<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 (RII14); FMC1278 (RII14); ISO 11452-11
<i>Radiated Immunity (Portable Transmitters)</i>	ISO 11452-9; EMC-CS-2009.1 (RII15); FMC1278 (RII15)
<i>Vehicle Radiated Immunity (ALSE)</i>	ISO 11451-2; ECE Regulation 10.06 Annex 6
<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-364-23C; USCAR21-3 Section 4.5.3



Test Technology:

Test Method(s) ¹:

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

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; ECE Regulation 10.06 Annex 14

Current Harmonics

IEC 61000-3-2; EN 61000-3-2; KN 61000-3-2;
ECE Regulation 10.06 Annex 11

Flicker and Fluctuations

IEC 61000-3-3; EN 61000-3-3; KN 61000-3-3;
ECE Regulation 10.06 Annex 12

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;
ECE Regulation 10.06 Annex 15



Test Technology:

Test Method(s) ¹:

Immunity (cont'd)

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; IEEE STD C62.41.2 2002;
 ECE Regulation 10.06 Annex 16

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;
 IEEE STD C62.41.2 2002

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; EN 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

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;



Test Technology:

Test Method(s) ¹:

*European Radio Test Standards
(cont'd)*

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 303 413; ETSI EN 302 502

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-247; RSS-251; RSS-252; RSS-287;
RSS-288; RSS-310; RSS-GEN

Mexico Radio Tests

IFT-008-2015; NOM-208-SCFI-2016

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 MI
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/a

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 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 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 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.

A blue ink signature, appearing to be a stylized name.



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.