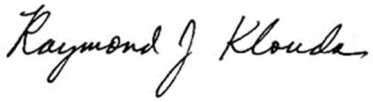
Engineering Test Report No. 2402438-07	
Report Date	April 28, 2025
Manufacturer Name	The Chamberlain Group LLC
Manufacturer Address	300 Windsor Dr Oak Brook, IL 60523
Test Item Name Model No.	Vulcan – 900-15607 Rev F Model No. – 900-15607-11
Date Received	March 7, 2025
Assessment Dates	March 10, 2025 – March 31, 2025
Specifications	FCC "Code of Federal Regulations" Title 47 Part 1, Subpart I FCC 447498 D04 Interim General RF Exposure Guidance v01 RSS-102 Issue 6 EN 62311 EN 62479 RPS S-1
Test Facility	Elite Electronic Engineering, Inc. 1516 Centre Circle, Downers Grove, IL 60515
Signature	
Tested by	Nathaniel Bouchie
Signature	
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894
PO Number	4900099030

Table of Contents

1. Report Revision History

Revision	Date	Description
–	08 MAY 2025	Initial Release of Engineering Test Report No. 2402438-07

2. Introduction

The FCC, Innovation, Science and Economic Development Canada, European Union and Australia/New Zealand publish standards regarding the evaluation of the RF Exposure hazard of radio communications devices. An evaluation has been performed on The Chamberlain Group LLC Vulcan – 900-15607 Rev F, Model No. 900-15607-11 pursuant to the relevant requirements.

3. Subject of Investigation

This document presents the demonstration of RF Exposure compliance on a Vulcan – 900-15607 Rev F, (hereinafter referred to as the Equipment under Test (EUT)). The EUT was identified as follows:

EUT Identification	
Description	Vulcan – 900-15607 Rev F
Model/Part No.	900-15607-11
S/N	Radiated Sample

The EUT is capable of operating in the following bands of the radio spectrum:

Radio Spectrum Bands of Operation	
Realtek WiFi and BLE	2400MHz to 2483.5MHz
Security 3.0 BLE	2400MHz to 2483.5MHz
Sub1GHz	902MHz to 928MHz

4. Standards and Requirements

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

- Federal Communications Commission "Code of Federal Regulations", Title 47, Chapter I, Subchapter A, Part 1, Subpart I, Section 1.1307
- Federal Communications Commission "Code of Federal Regulations", Title 47, Chapter I, Subchapter A, Part 1, Subpart I, Section 1.1310
- KDB 447498 D04 – “RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices”
- ANSI/IEEE C95.1:1992 – "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz,"
- RSS-102, Issue 6 Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
- EN 62311:2020 Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)
- EN 62479:2010 Assessment of the Compliance of Low Power Electronic and Electrical Equipment with the Basic Restrictions Related to Human Exposure to Electromagnetic Fields (10MHz-300GHz)
- 1999/519/EC Council Recommendation on the Limitation of Exposure of The General Public to Electromagnetic fields (0Hz-300GHz)
- AS/NZS 2772.2: 2016 Principles and methods of measurement and computation-3 kHz to 300 GHz

- RSP S-1 Standard for Limiting Exposure to Radiofrequency Fields – 100 kHz to 300 GHz

5. Sample Calculations

The far field power density can be calculated using the following formula:

$$S = \frac{PG}{4\pi R^2} \quad (1)$$

where P is the transmit output power (mW), G is the maximum antenna gain relative to an isotropic antenna (linear) and R is the evaluation distance (cm).

In cases where multiple antennas are utilized for a single signal, the following formula is applied to calculate the maximum antenna gain:

$$Gain\ (dBi) = G + 10\log \mathrm{N} \quad (2)$$

where N is the number of antennas, G is the gain of a single antenna.

A minimum separation distance can be calculated using the following formulas

$$Minimum\ Seperation\ Distance = \sqrt{\frac{PG}{4\pi(Power\ Density\ Limit)}} \quad (3)$$

where P is the transmit output power (mW) and G is the maximum antenna gain relative to an isotropic antenna (linear).

For sources with frequencies <30MHz

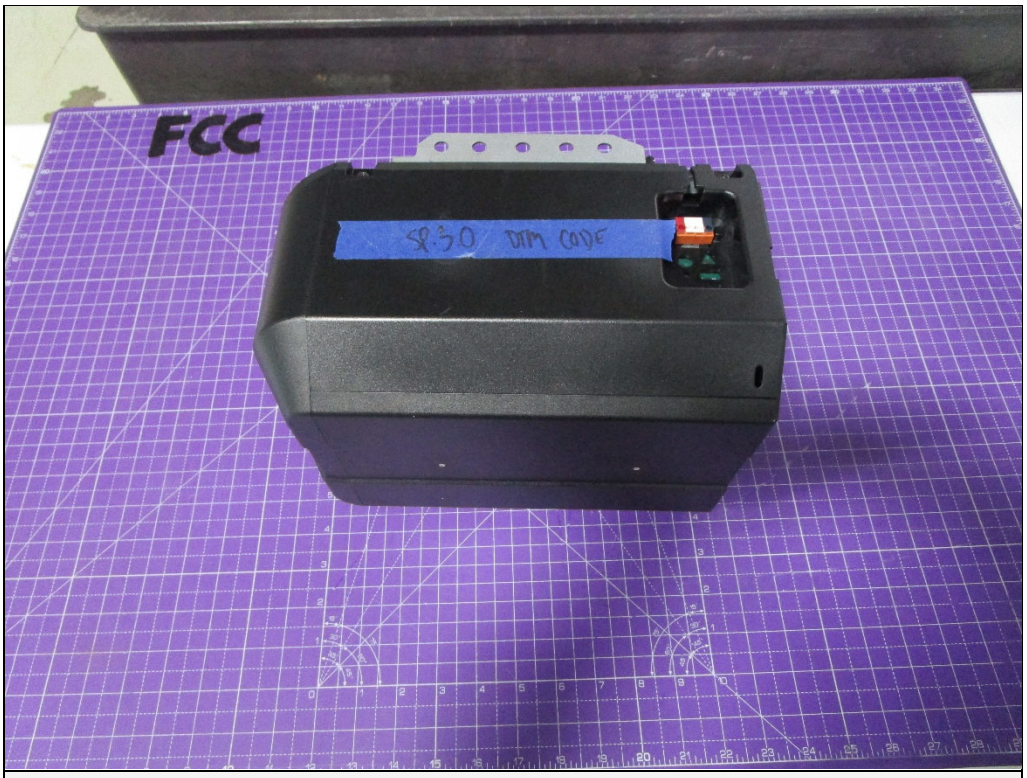
$$Seperation\ Distance = R\left(10^{\frac{(FS_{Limit}-FS_R)}{40}}\right)^{-1} \quad (4)$$

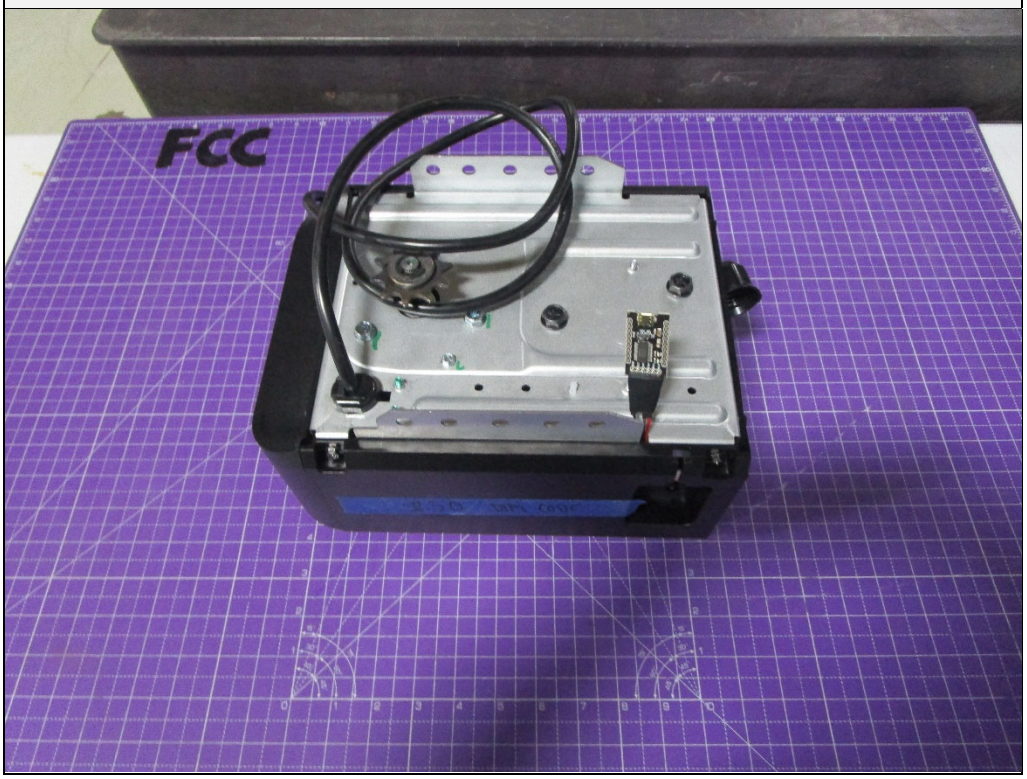
For sources with frequencies >30MHz

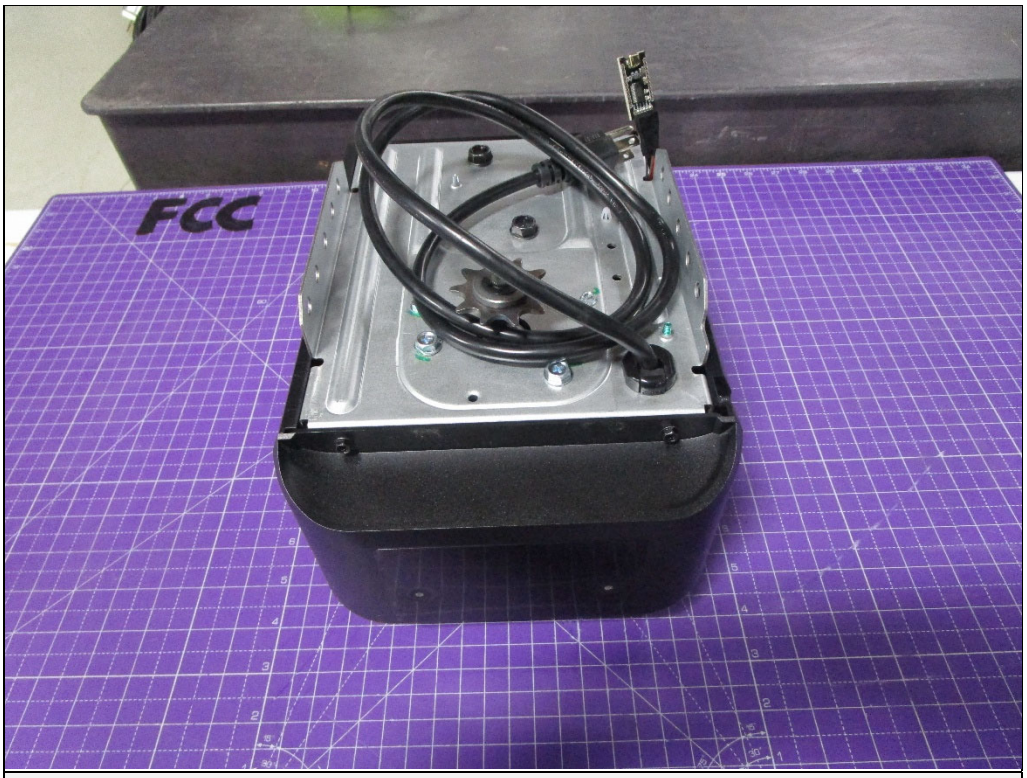
$$Seperation\ Distance = R\left(10^{\frac{(FS_{Limit}-FS_R)}{20}}\right)^{-1} \quad (5)$$

where R is the measurement distance, FS_{Limit} is the field strength limit and FS_R is the measured field strength at distance R.

6. Photographs of EUT



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VULCAN ESL1.5
2100L
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7. Limits and Requirements

7.1. Requirements mandated by the FCC

Equipment pursuing compliance to the requirements with respect to the limits of human exposure to RF provided in FCC 1.1310, need to follow the criteria in FCC 1.1307(b)(1).

Equipment exemption qualification must be demonstrated pursuant to FCC 1.1307(b)(3).

For multiple RF sources (i.e., any single portable device, mobile device or fixed RF source), the EUT is exempt if:

- FCC 1.1307(b)(3)(ii)(A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required).

- FCC 1.1307(b)(3)(ii)(B) in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1.

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

If it is determined that the equipment under investigation is not exempt from routine evaluation an assessment must be performed to determine compliance in regard to the RF exposure limits by means of measurement or calculation of the electric field, magnetic field, power density or SAR.

It may be the case that a minimum separation distance will need to be calculated or measured and maintained from the source of RF to meet radiofrequency radiation exposure restrictions.

Per 1.1310(e)(1), the power density shall not exceed the levels below:

Specific Absorption Rate (SAR) - SAR Limits for General/Uncontrolled Exposure			
Frequency Range (MHz)	Whole Body SAR Limit (W/kg)	Peak Spatial AVG SAR Limit 1g (W/kg)	Peak Spatial Extremities SAR Limit 10g (W/kg)
0.1 - 6000	0.08	1.6	4

Limits for Maximum Permissible Exposure (MPE) - Limits for General/Uncontrolled Exposure			
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)
0.3 – 1.34	614	1.63	*100
1.34 – 30	842 / f	2.19 / f	*180 / f^2
30 – 300	27.5	0.073	0.2
300 – 1,500	—	—	f / 1500
1,500 – 100,000	—	—	1.0
f – Frequency in MHz * – Plane wave Equivalent Power Density			

7.2. Requirements mandated by Innovation, Science and Economic Development Canada

Equipment exemption qualification must be demonstrated pursuant to RSS-102 Issue 6 section 6. If it is determined that the equipment under investigation is not exempt, it must be demonstrated that the equipment does not exceed the exposure limits in section 5 of RSS-102 Issue 6 or a minimum separation distance must be calculated to ensure that the exposure limits are met.

Per RSS 102 Section 5, the equipment shall not exceed the levels below:

Specific Absorption Rate (SAR) - SAR Limits for General/Uncontrolled Exposure			
Frequency Range (MHz)	Whole Body SAR Limit (W/kg)	Peak Spatial AVG SAR Limit 1g (W/kg)	Peak Spatial Extremities SAR Limit 10g (W/kg)
0.1 - 6000	0.08	1.6	4

Limits for General/Uncontrolled Exposure			
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (W/m^2)
0.003 – 10*	83	90	—
0.1 – 10*	—	0.73 / f	—
1.1 – 10*	$87 / f^{0.5}$	—	—
10 – 20	27.46	0.0728	2
20 – 48	$58.07 / f^{0.25}$	$0.1540 / f^{0.25}$	$8.944 / f^{.05}$
48 – 300	22.06	0.05852	1.291
300 – 6000	$3.142\ f^{0.3417}$	$0.008335\ f^{0.3417}$	$0.02619\ f^{0.6834}$
6000 – 15000	61.4	0.163	10
15000 – 150000	61.4	0.163	10
150000 – 300000	$0.158\ f^{0.5}$	$4.21 \times 10^{-4}\ f^{0.5}$	$6.67 \times 10^{-5}\ f$
f – Frequency in MHz *Limits only apply to Specific Absorption Rate and Nerve Stimulation requirements.			

7.3. Requirements mandated by the European Union and outlined in EN 62311

Equipment exemption qualification must be demonstrated pursuant to EN 62479. If it is determined that the equipment under investigation is not exempt, it must be demonstrated that the equipment does not exceed the basic restrictions listed in the 1999/519/EC Council Recommendation following the methods in EN 62311.

Per the 1999/519/EC Council Recommendation, the measured field strength shall not exceed the levels below:

Specific Absorption Rate (SAR) - SAR Limits for Occupational/Controlled Exposure			
Frequency Range (MHz)	Whole Body SAR Limit (W/kg)	Localized SAR (head and trunk) Limit (W/kg)	Localized SAR (limbs) Limit (W/kg)
0.1 - 6000	0.08	2	4

Reference Levels for Maximum Exposure			
Frequency Range	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (W/m^2)
0 – 1Hz	—	3.2×10^4	—
1 – 8Hz	10000	$3.2 \times 10^4 / f^2$	—
8 – 25Hz	10000	4000 / f	—
0.025 – 0.8kHz	250 / f	4 / f	—
0.8 – 3kHz	250 / f	5	—
3 – 150kHz	87	5	—
0.15 – 1MHz	87	0.73 / f	—
1 – 10MHz	$87 / f^{1/2}$	0.73 / f	—
10 – 400MHz	28	0.073	2
400 – 2000MHz	$1.375\ f^{0.5}$	$0.0037 / f^{0.5}$	f / 200
2 – 300GHz	61	0.16	10
f as indicated in the frequency range column			

7.4. Requirements mandated by Australia/New Zealand and outlined in AS/NZS 2772.2

As stated in the RPS S-1 advisory note, the evaluation of transmitting equipment for compliance with RPS S-1 is not required where the nominal mean power output averaged over 6 minutes does not exceed the levels listed in the table below. For devices exceeding the power levels below, evaluation of transmitting equipment for compliance with this standard is not required where it can be demonstrated that in normal use the mean radiated power output does not exceed the alternative low-power exclusion levels as defined in IEC 62479 (2010).

Exposure Scenario	Low Power Exclusion Level at Frequency, f		
	100 kHz ≤ f ≤ 6 GHz	6 GHz ≤ f ≤ 30 GHz	30 GHz ≤ f ≤ 300 GHz
Occupational	100 mW	40 mW	20 mW
General Public	20 mW	8 mW	4 mW

The RF exposure levels shall be assessed either by measurement or by calculating the exposure levels. If it is determined that the measured or calculated exposure levels do not meet the basic restrictions or reference levels of section 2.3 and 2.4, a minimum separation distance must be measured or calculated such that the basic restrictions are met.

Per RPS S-1, the exposure levels shall not exceed the levels below:

Specific Absorption Rate (SAR) - SAR Limits for Occupational/Controlled Exposure			
Basic Restrictions for General Exposure			
Frequency Range (MHz)	Whole Body SAR Limit (W/kg)	Localized SAR (head and trunk) Limit (W/kg)	Localized SAR (limbs) Limit (W/kg)
0.1 - 6000	0.08	2	4
6000 - 300000	0.08	NA	NA

Limits for General Exposure			
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (W/m^2)
100kHz – 150kHz	86.8	4.86	-
150KHz – 1MHz	86.8	0.729 / f	-
1MHz – 10MHz	$86.8 / f^{0.5}$	0.729 / f	-
10MHz – 400MHz	27.4	0.0729	2
400MHz – 2GHz	$1.37 \times f^{0.5}$	$0.00364 \times f^{0.5}$	f / 200
2GHz – 300GHz	61.4	0.163	10
f – Frequency in MHz			

8. Assessment Results

The following evaluations were performed at a separation distance of 8cm. The separation distance was measured based on the minimum use case separation between the radiating element of the RF source and the end user.

8.1. RF Exposure Evaluation Pertinent to the Requirements of the FCC for Multiple RF Sources

The tables below contain the highest measured, calculated or reported output powers for each RF source.

Configuration 1

Radio Access Technology	*f* Transmit Frequency (MHz)	P Conducted Output Power (dBm)	ERP (dBm)	EIRP (dBm)
Realtek WiFi	2412	17.4	22.35	24.5
Security BLE	2402	7.85	11.15	13.3
Sub1GHz	902.25	16.46	17.45	19.6

Configuration 1

Radio Access Technology	*f* Transmit Frequency (MHz)	S Power Density (mW/cm2)	Threshold Limit	Fractional Contribution	∑ Fractional Contributions	Exemption Results
Realtek WiFi	2412	0.3504	1 S_L Power Density Limit (mW/cm2)	0.3504	0.5656	Exempt
Security BLE	2402	0.0266	1 S_L Power Density Limit (mW/cm2)	0.0266		
Sub1GHz	902.25	0.1134	0.6015 S_L Power Density Limit (mW/cm2)	0.1885		

Configuration 2

Radio Access Technology	*f* Transmit Frequency (MHz)	P Conducted Output Power (dBm)	ERP (dBm)	EIRP (dBm)
Realtek BLE	2440	3.38	-0.75	1.4
Security BLE	2402	7.85	11.15	13.3
Sub1GHz	902.25	16.46	17.45	19.6

Configuration 2

Radio Access Technology	f Transmit Frequency (MHz)	ERP (W)	Threshold Limit	Fractional Contribution	$\sum$ Fractional Contributions	Exemption Results
Realtek BLE	2440	0.0008	0.1229 ERPth (W)	0.0068	0.8650	Exempt
Security BLE	2402	0.0130	0.1229 ERPth (W)	0.1061		
Sub1GHz	902.25	0.0556	0.0739 ERPth (W)	0.7521		

8.2. RF Exposure Evaluation Relevant to the Requirements of the ISED for Multiple RF Sources

The tables below contain the highest measured, calculated or reported output powers for each RF source.

Configuration 1

Radio Access Technology	*f* Transmit Frequency (MHz)	P Conducted Output Power (dBm)	EIRP (dBm)
Realtek WiFi	2412	17.4	24.5
Security BLE	2402	7.85	13.3
Sub1GHz	902.25	16.46	19.6

The following are the results of an evaluation with respect to the applicable exposure limits listed in RSS-102, Issue 6, Section 5.

Configuration 1

Radio Access Technology	*f* Transmit Frequency (MHz)	P Conducted Output Power (mW)	SAR Exemption Limit (mW)	Maximum Fractional Contribution	∑ Fractional Contributions
Realtek WiFi	2412	54.95	245	0.2243	0.2492
Security BLE	2402	6.095	245	0.0249	
Sub1GHz	902.25	44.26	323	0.1370	

Configuration 2

Radio Access Technology	*f* Transmit Frequency (MHz)	P Conducted Output Power (dBm)	EIRP (dBm)
Realtek BLE	2440	3.38	1.4
Security BLE	2402	7.85	13.3
Sub1GHz	902.25	16.46	19.6

The following are the results of an evaluation with respect to the applicable exposure limits listed in RSS-102, Issue 6, Section 5.

Configuration 2

Radio Access Technology	*f* Transmit Frequency (MHz)	P Conducted Output Power (mW)	SAR Exemption Limit (mW)	Maximum Fractional Contribution	∑ Fractional Contributions
Realtek BLE	2412	2.178	245	0.0089	0.0338
Security BLE	2402	6.095	245	0.0249	
Sub1GHz	902.25	44.26	323	0.1370	

For all transmitter combinations the sum of fractional contributions in relation to the SAR exemption was less than one (1). A declaration of conformity with the requirements of RSS-102 can be justifiably made.

8.3. RF Exposure Evaluation Relevant to the Requirements of the EU

The tables below contain the highest measured, calculated or reported output powers for each RF source.

The Duty Cycle was calculated using an assumed 5-second button push during a period of 6 minutes, per the intended end-user interaction with the EUT.

Configuration 1

Radio Access Technology	*f* Transmit Frequency (MHz)	P Conducted Output Power (dBm)	EIRP (dBm)
Realtek WiFi	2412	17.4	24.5
Security BLE	2402	7.85	13.3
Sub1GHz	902.25	16.46	19.6

Configuration 1

Radio Access Technology	*f* Transmit Frequency (MHz)	P Conducted Output Power (mW)	Duty Cycle	Time Averaged Power (mW)	IEEE Std C95.1-1999 SAR Exemption Limit (mW)	SAR Exemption Limit IEEE Std C95.1-2005 SAR Exemption Limit (mW)	Maximum Fractional Contribution	∑ Fractional Contributions
Realtek WiFi	2412	54.95	0.0139	0.7633	40	40	0.0191	0.0212
Security BLE	2402	6.095	0.0139	0.0847	40	40	0.0021	
Sub1GHz	902.25	44.26	0.0139	0.6147	40	40	0.0154	

Configuration 2

Radio Access Technology	*f* Transmit Frequency (MHz)	P Conducted Output Power (dBm)	EIRP (dBm)
Realtek BLE	2440	3.38	1.4
Security BLE	2402	7.85	13.3
Sub1GHz	902.25	16.46	19.6

Configuration 2

Radio Access Technology	*f* Transmit Frequency (MHz)	P Conducted Output Power (mW)	Duty Cycle	Time Averaged Power (mW)	IEEE Std C95.1-1999 SAR Exemption Limit (mW)	SAR Exemption Limit IEEE Std C95.1-2005 SAR Exemption Limit (mW)	Maximum Fractional Contribution	∑ Fractional Contributions
Realtek BLE	2440	2.178	0.0139	0.0302	40	40	0.0008	0.0029
Security BLE	2402	6.095	0.0139	0.0847	40	40	0.0021	
Sub1GHz	902.25	44.26	0.0139	0.6147	40	40	0.0154	

For all transmitter combinations the sum of fractional contributions in relation to the SAR exemption was less than one (1). A declaration of conformity with the requirements of EN 62479 can be justifiably made.

8.4. RF Exposure Evaluation Relevant to the Requirements of Australia/New Zealand

The tables below contain the highest measured, calculated or reported output powers for each RF source.

The Duty Cycle was calculated using an assumed 5-second button push during a period of 6 minutes, per the intended end-user interaction with the EUT.

Configuration 1

Radio Access Technology	*f* Transmit Frequency (MHz)	P Conducted Output Power (dBm)	EIRP (dBm)
Realtek WiFi	2412	17.4	24.5
Security BLE	2402	7.85	13.3
Sub1GHz	902.25	16.46	19.6

Configuration 1

Radio Access Technology	*f* Transmit Frequency (MHz)	P Conducted Output Power (mW)	Duty Cycle	Time Averaged Power (mW)	Low Power Exclusion Level (mW)	Maximum Fractional Contribution	∑ Fractional Contributions
Realtek WiFi	2412	54.95	0.0139	0.7633	20	0.03816	0.0424
Security BLE	2402	6.095	0.0139	0.0847	20	0.00423	
Sub1GHz	902.25	44.26	0.0139	0.6147	20	0.03074	

Configuration 2

Radio Access Technology	*f* Transmit Frequency (MHz)	P Conducted Output Power (dBm)	EIRP (dBm)
Realtek BLE	2440	3.38	1.4
Security BLE	2402	7.85	13.3
Sub1GHz	902.25	16.46	19.6

Configuration 2

Radio Access Technology	*f* Transmit Frequency (MHz)	P Conducted Output Power (mW)	Duty Cycle	Time Averaged Power (mW)	Low Power Exclusion Level (mW)	Maximum Fractional Contribution	∑ Fractional Contributions
Realtek BLE	2440	2.178	0.0139	0.0302	20	0.0015	0.0057
Security BLE	2402	6.095	0.0139	0.0847	20	0.0042	
Sub1GHz	902.25	44.26	0.0139	0.6147	20	0.0307	

For all transmitter combinations the sum of fractional contributions in relation to the low power exclusion levels was less than one (1). A declaration of conformity with the requirements of RPS S-1 can be justifiably made.

9. Statement of Compliance

The Chamberlain Group LLC Vulcan – 900-15607 Rev F, Model 900-15607-11 is in compliance with the FCC, Innovation, Science and Economic Development Canada, European Union and Australia/New Zealand requirements for RF Exposure at a minimum separation distance of 8cm.

10. Scope of Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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ELECTRICAL

Valid To: June 30, 2025 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 *(Max Voltage 60V/Max current 100A)*	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) *(Up to +/-25kV)*	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, CE 430, CE440)

Test Technology:	Test Method(s)[1]:
Radiated Emissions Anechoic *(Up to 6GHz)*	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, RE320);
Vehicle Radiated Emissions	CISPR 12; CISPR 36; ICES-002; ECE Regulation 10.06 Annex 5
Bulk Current Injection (BCI) *(1 to 400MHz 500mA)*	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); ECE Regulation 10.06 Annex 9
Radiated Immunity Anechoic *(Up to 6GHz and 200V/m)* *(Including Radar Pulse 600V/m)*	ISO 11452-2; 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; ECE Regulation 10.06 Annex 9
Radiated Immunity Magnetic Field	ISO 11452-8; FMC 1278 (RI140)
Radiated Immunity Reverb *(360MHz to 6GHz and 100V/m)*	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)* *(Up to 6GHz and 20W)*	ISO 11452-9; EMC-CS-2009.1 (RI115); FMC1278 (RI115); GMW 3097, Sec 3.4.4
Vehicle Radiated Immunity (ALSE)	ISO 11451-2; ECE Regulation 10.06 Annex 6
Vehicle Product Specific EMC Standards	EN 14982; EN ISO 13309; ISO 13766; EN 50498; EC Regulation No. 2015/208; EN 55012
Electrical Loads	ISO 16750-2
Stripline	ISO 11452-5
Transverse Electromagnetic (TEM) Cell	ISO 11452-3

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; KS C 9811; CNS 13803 (1997, 2003); CISPR 14-1; EN 55014-1; AS/NZS CISPR 14.1; CISPR 16-2-1 (2008); CISPR 16-2-1; KS C 9814-1; 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; KS C 9832; KN 32; ECE Regulation 10.06 Annex 7 (Broadband); ECE Regulation 10.06 Annex 8 (Narrowband); ECE Regulation 10.06 Annex 14 (Conducted)
Cellular Radiated Spurious Emissions	ETSI TS 151 010-1 GSM; 3GPP TS 51.010-1, Sec 12; ETSI TS 134 124 UMTS; 3GPP TS 34.124; ETSI TS 136 124 LTE; E-UTRA; 3GPP TS 36.124
Current Harmonics	IEC 61000-3-2; IEC 61000-3-12; EN 61000-3-2; KN 61000-3-2; KS C 9610-3-2; ECE Regulation 10.06 Annex 11
Flicker and Fluctuations	IEC 61000-3-3; IEC 61000-3-11; EN 61000-3-3; KN 61000-3-3; KS C 9610-3-3; 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; KS C 9610-4-2; 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; KS C 9610-4-3; IEEE C37.90.2 2004

Test Technology:	Test Method(s)[1]:
Immunity (cont'd)	
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; KS C 9610-4-4; ECE Regulation 10.06 Annex 15
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; KS C 9610-4-5; 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; KS C 9610-4-6
Power Frequency Magnetic Field Immunity (*Down to 3 A/m*)	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; KS C 9610-4-8
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; KS C 9610-4-11
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

Test Technology:	Test Method(s)[1]:
Generic and Product Specific EMC Standards	IEC/EN 61000-6-1; AS/NZS 61000-6-1; KN 61000-6-1; KS C 9610-6-1; IEC/EN 61000-6-2; AS/NZS 61000-6-2; KN 61000-6-2; KS C 9610-6-2; IEC/EN 61000-6-3; AS/NZS 61000-6-3; KN 61000-6-3; KS C 9610-6-3; IEC/EN 61000-6-4; AS/NZS 61000-6-4; KN 61000-6-4; KS C 9610-6-4; EN 50130-4; EN 61326-1; EN 50121-3-2; EN 12895; EN 50270; EN 50491-1; EN 50491-2; EN 50491-3; EN 55015; EN 60730-1; EN 60945; IEC 60533; EN 61326-2-6; EN 61800-3; IEC/CISPR 14-2; EN 55014-2; AS/NZS CISPR 14.2; KN 14-2; KS C 9814-2; IEC/CISPR 24; AS/NZS CISPR 24; EN 55024; KN 24; IEC/CISPR 35; AS/NZS CISPR 35; EN 55035; KN 35; KS C 9835; 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 301 489-20
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 300 220-3-1; ETSI EN 300 220-3-2; 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 303 413; ETSI EN 302 502; EN 303 340; EN 303 345-2; EN 303 345-3; EN 303 345-4
Canadian Radio Tests	RSS-102 measurement (RF Exposure Evaluation); RSS-102 measurement (Nerve Stimulation); SPR-002; 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-248; 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 (July 15, 2020)

Test Technology:	Test Method(s)[1]:
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; KS X 3124; KS X 3125; KS X 3130; KS X 3126; KS X 3129
Vietnam Radio Test Standards	QCVN 47:2015/BTTTT; QCVN 54:2020/BTTTT; QCVN 55:2011/BTTTT; QCVN 65:2013/BTTTT; QCVN 73:2013/BTTTT; QCVN 74:2020/BTTTT; QCVN 112:2017/BTTTT; QCVN 117:2020//BTTTT
Vietnam EMC Test Standards	QCVN 18:2014/BTTTT; QCVN 86:2019/BTTTT; QCVN 96:2015/BTTTT; QCVN 118:2018/BTTTT
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 (using 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/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; FAA AC 150/5345-47C;
DC Voltage / Current (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, edition, version, etc. is not identified in the scope of accreditation, laboratories may use the version that immediately precedes the current version for a period of one year from the date of publication of the standard measurement method, 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.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

Testing Activities Performed in Support of FCC 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)
Unlicensed Personal Communication Systems Devices Part 15D	ANSI C63.17:2013	40000
U-NII without DFS Intentional Radiators Part 15E	ANSI C63.10:2013	40000
U-NII 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
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

Testing Activities Performed in Support of FCC 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)
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 15th day of August 2023.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1786.01
Valid to June 30, 2025

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