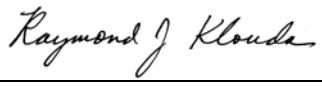
Engineering Test Report No. 2005152-01		
Report Date	January 7, 2021	
Manufacturer Name	Chamberlain Group, Inc.	
Manufacturer Address	300 Windsor Dr Oak Brook, IL 60523	
Model No.	001D7964	
Date Received	December 30, 2020	
Test Dates	December 30, 2020 to December 31, 2020	
Specifications	FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.231(b) 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	Javier Cardenas	
Signature		
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894	
PO Number	4900072916	

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.231 and Innovation, Science, and Economic Development Canada, RSS-210 and RSS-Gen test specification(s). The data presented in this test report pertains to the EUT on the test date(s) specified. Any electrical or mechanical modifications made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification. This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

Table of Contents

1. Report Revision History

Revision	Date	Description
–	11 JAN 2021	Initial Release of Engineering Test Report No. 2005152-01

2. Introduction

2.1. Scope of Tests

This document presents the results of a series of RF emissions tests that were performed on the Chamberlain Group, Inc. Single Button Transmitter (hereinafter referred to as the Equipment Under Test (EUT)). The EUT was manufactured and submitted for testing by Chamberlain Group, Inc. located in Oak Brook, IL.

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, Sections 15.231(b).

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	Single Button Transmitter
Marketing Brand Name	891MAX 950EV
Model/Part No.	001D7964
S/N	NA
Band of Operation	310MHz, 315MHz, 390MHz
20dB Bandwidth	56.9kHz
99% Bandwidth	119.9kHz
Size of EUT	8cm Length x 4.5cm Width x 1.5cm Depth

The EUT listed above was used throughout the test series.

3. Power Input

The EUT was powered by a 3V battery.

4. Grounding

The EUT was not connected to ground.

5. Support Equipment

No support equipment was submitted for testing.

6. Interconnect Leads

No interconnect leads were used during the tests.

7. Modifications Made to the EUT

No modifications were made to the EUT during the testing.

8. Modes of Operation

Mode	Description
Tx	310MHz 315MHz 390MHz

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, Section 15.231 and Innovation, Science, and Economic Development Canada, RSS-210 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 9kHz to 40 GHz”
- ANSI C63.10-2013, “American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices”
- RSS-210 Issue 10, December 2019, “License-Exempt Radio Apparatus: Category I Equipment”
- RSS-Gen Issue 5, March 2019, Amendment 1, Innovation, Science, and Economic Development Canada, “Spectrum Management and Telecommunications, Radio Standards Specification, General Requirements for Compliance of Radio Apparatus”

10. Test Plan

No test plan was provided. Instructions were provided by personnel from Chamberlain Group, Inc. and used in conjunction with the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.231 and Innovation, Science, and Economic Development Canada, RSS-210, and ANSI C63.4-2014 specification(s).

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	21°C
Relative Humidity	17%
Atmospheric Pressure	1013.1mb

13. Summary

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

Test Description	Requirements	Test Methods	S/N	Results
Periodic Operation Measurements	FCC 15C ISED RSS-210	ANSI C63.10: 2013	NA	Conforms
Duty Cycle Factor Measurements	FCC 15C ISED RSS-210	ANSI C63.10: 2013	NA	Conforms
Spurious Radiated Emissions	FCC 15C ISED RSS-210	ANSI C63.10: 2013	NA	Conforms
Occupied Bandwidth Measurements	FCC 15C ISED RSS-210	ANSI C63.10: 2013	NA	Conforms

14. Sample Calculations

For Powerline Conducted Emissions:

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

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]

15. Statement of Conformity

The Chamberlain Group, Inc. Single Button Transmitter, Model No. 001D7964, did fully conform to the selected requirements of FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.231 and Innovation, Science, and Economic Development Canada, RSS-210.

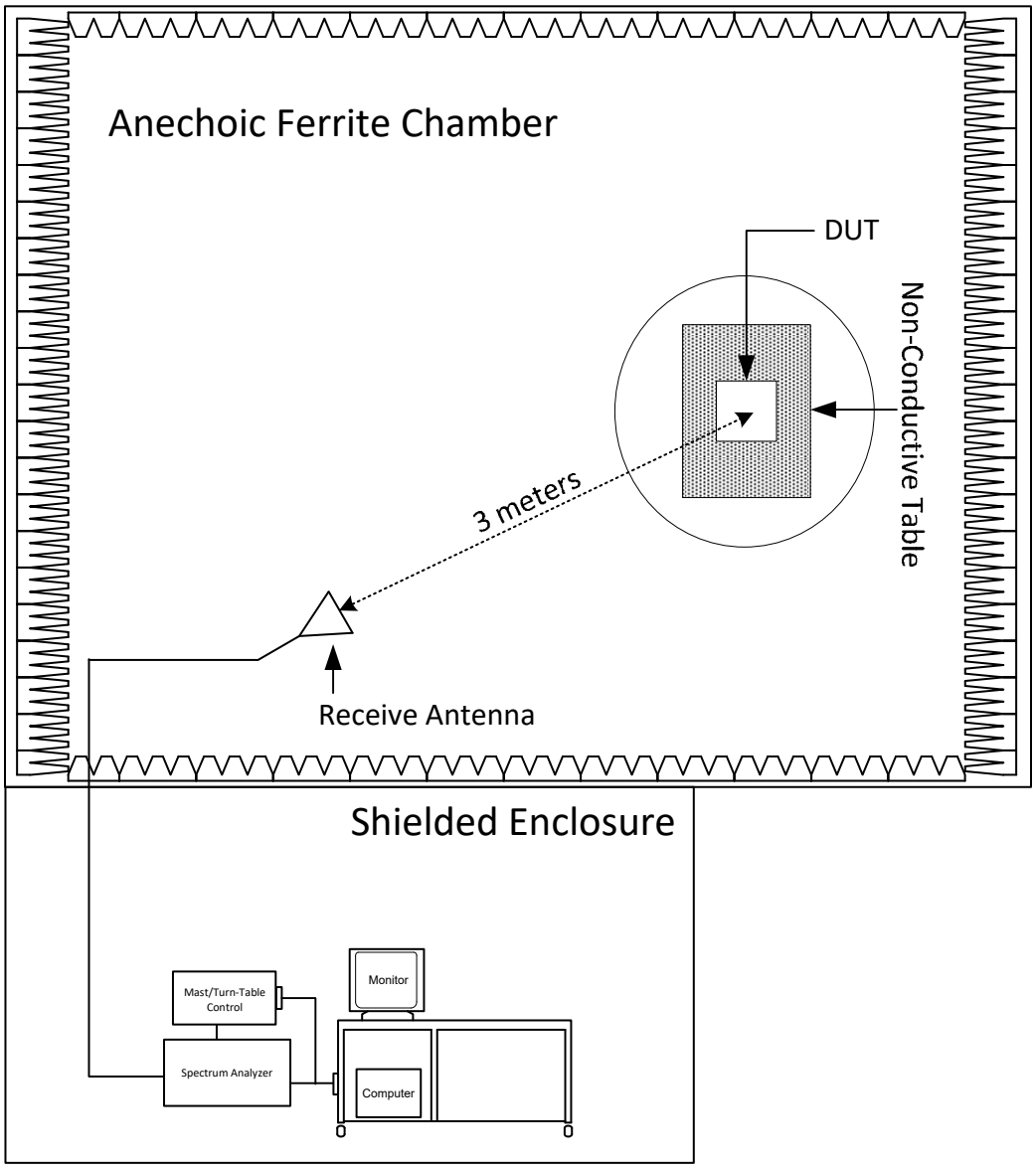
16. Certification

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, Section 15.231 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


CHAMBERLAIN

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
APW14	PREAMPLIFIER	PLANAR	PE2-35-120-5R0-10-12-SFF	PL22671	1-20GHz	9/24/2020	9/24/2021
NSDS1	UNIVERSAL SPHERICAL DIPOLE SOURCE	AET	USDS-H	AET-1116		NOTE 1	
NTA3	BILOG ANTENNA	TESEQ	6112D	32853	25-1000MHz	10/20/2020	10/20/2021
NWQ1	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS-LINDGREN	3117	66655	1GHZ-18GHZ	4/28/2020	4/28/2022
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	3/23/2020	3/23/2021
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. Periodic Operation Measurements

Test Information	
Manufacturer	Chamberlain Group, Inc.
Product	Single Button Transmitter
Model	001D7964
Serial No	NA
Mode	Tx
Test Date	December 30, 2020

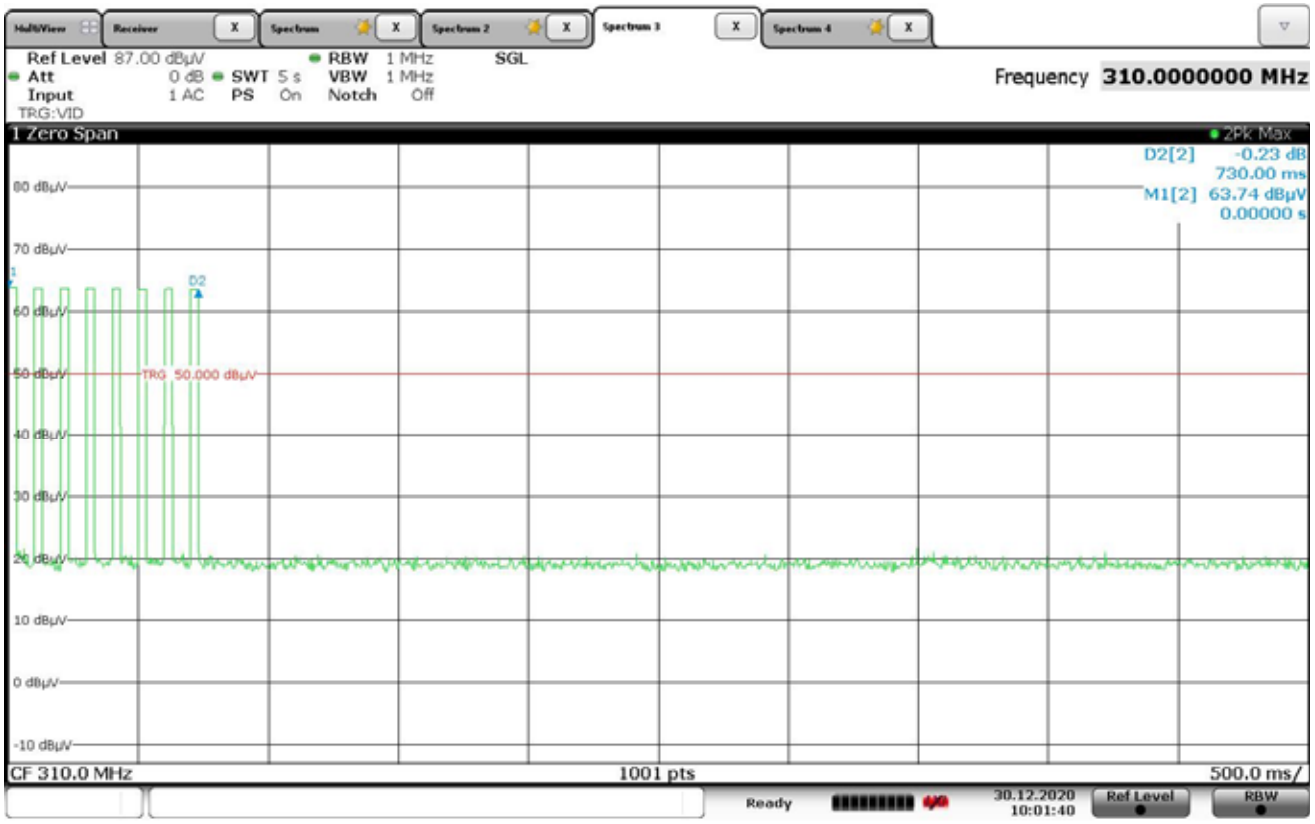
Test Setup Details	
Setup Format	Tabletop
Height of Support	NA
Type of Test Site	Shielded Enclosure
Note	None

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

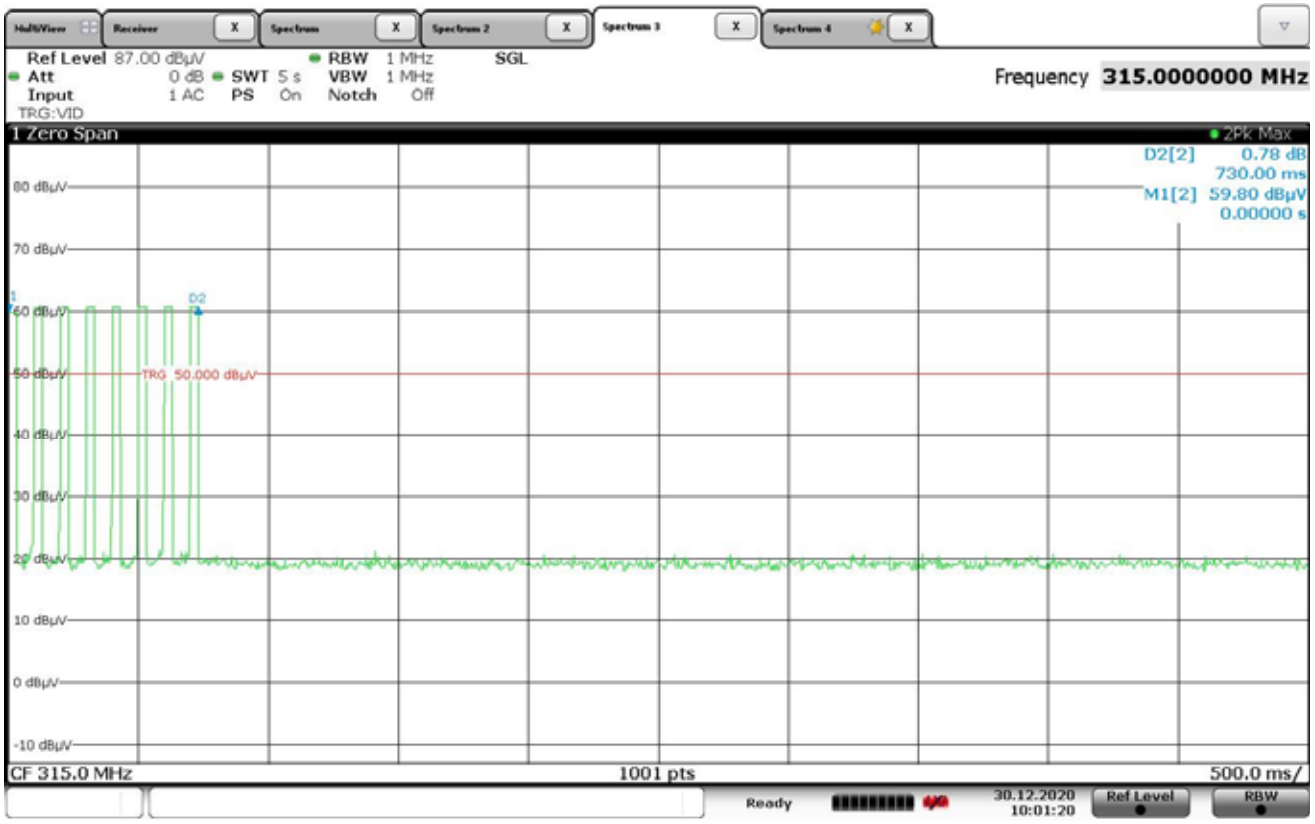
Requirements
A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released. A transmitter activated automatically shall cease transmission within 5 seconds after activation. Transmission of set-up information for security systems may exceed said transmission duration limits, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data. Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour. Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

Procedures
The spectrum analyzer was setup to display the time domain trace. The EUT was set to transmit normally. The spectrum analyzer was used to record the amount of time that the EUT remained active following activation.

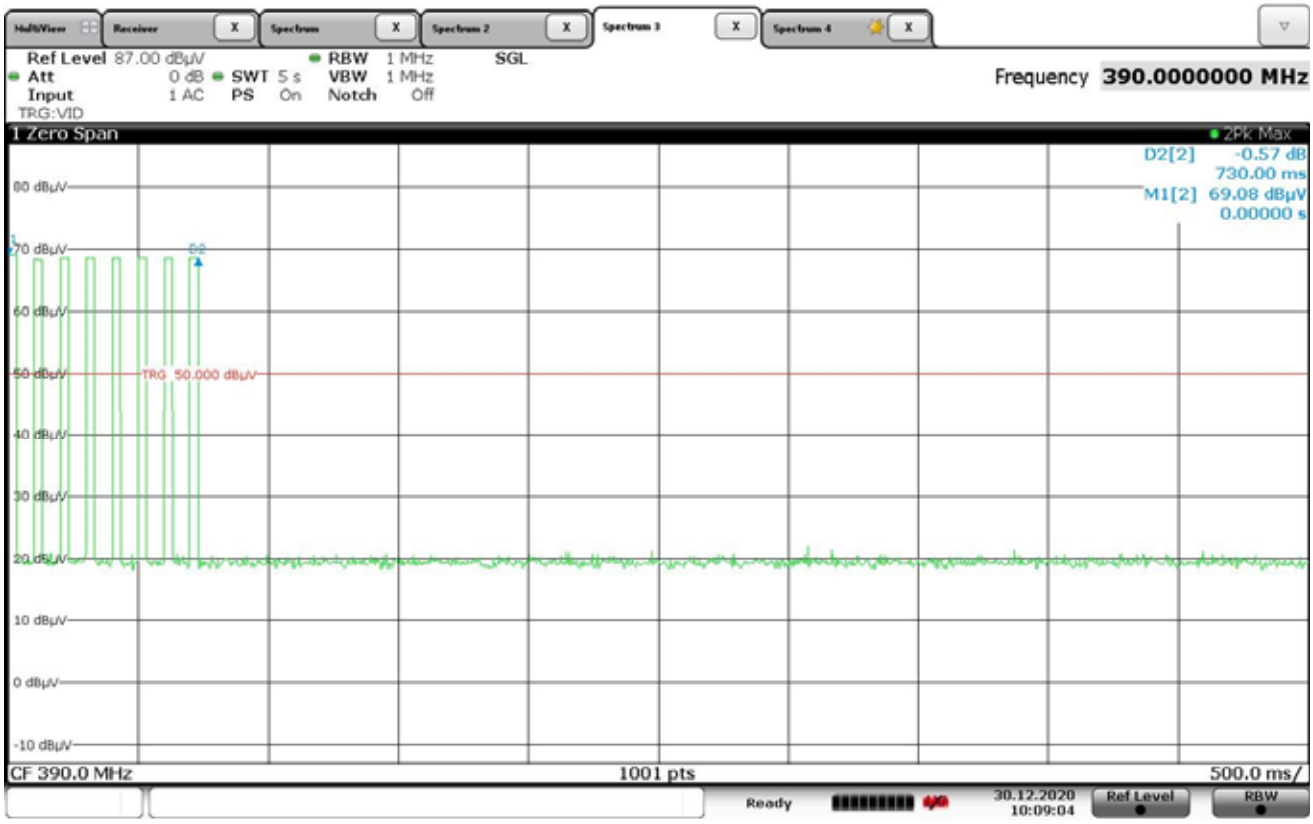
Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	001D7964
S/N	NA
Mode	Tx
Carrier Frequency	310MHz
Notes	None



Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	001D7964
S/N	NA
Mode	Tx
Carrier Frequency	315MHz
Notes	None



Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	001D7964
S/N	NA
Mode	Tx
Carrier Frequency	390MHz
Notes	None



21. Duty Cycle Factor Measurements

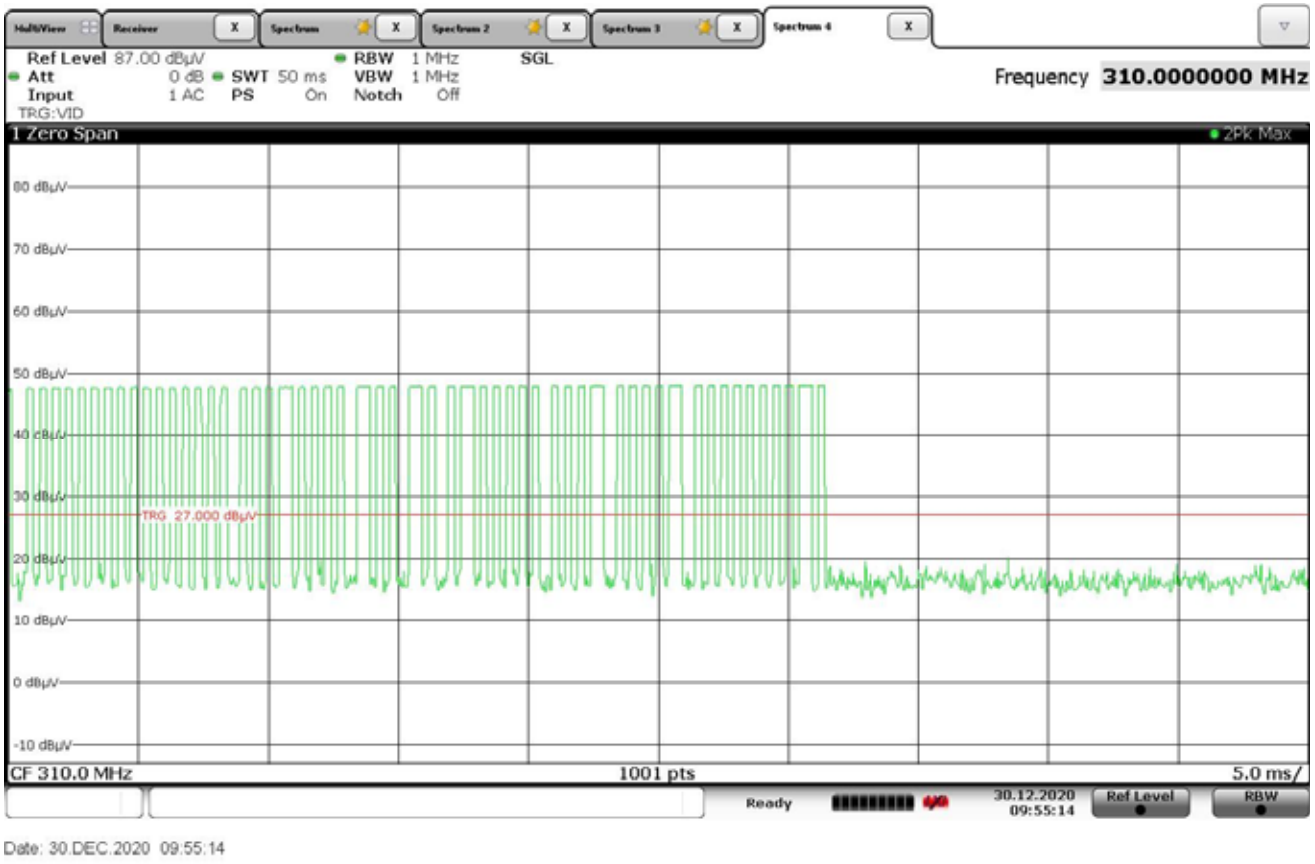
Test Information	
Manufacturer	Chamberlain Group, Inc.
Product	Single Button Transmitter
Model	001D7964
Serial No	NA
Mode	Tx
Test Date	December 30, 2020

Test Setup Details	
Setup Format	Tabletop
Height of Support	NA
Type of Test Site	Shielded Enclosure
Notes	None

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

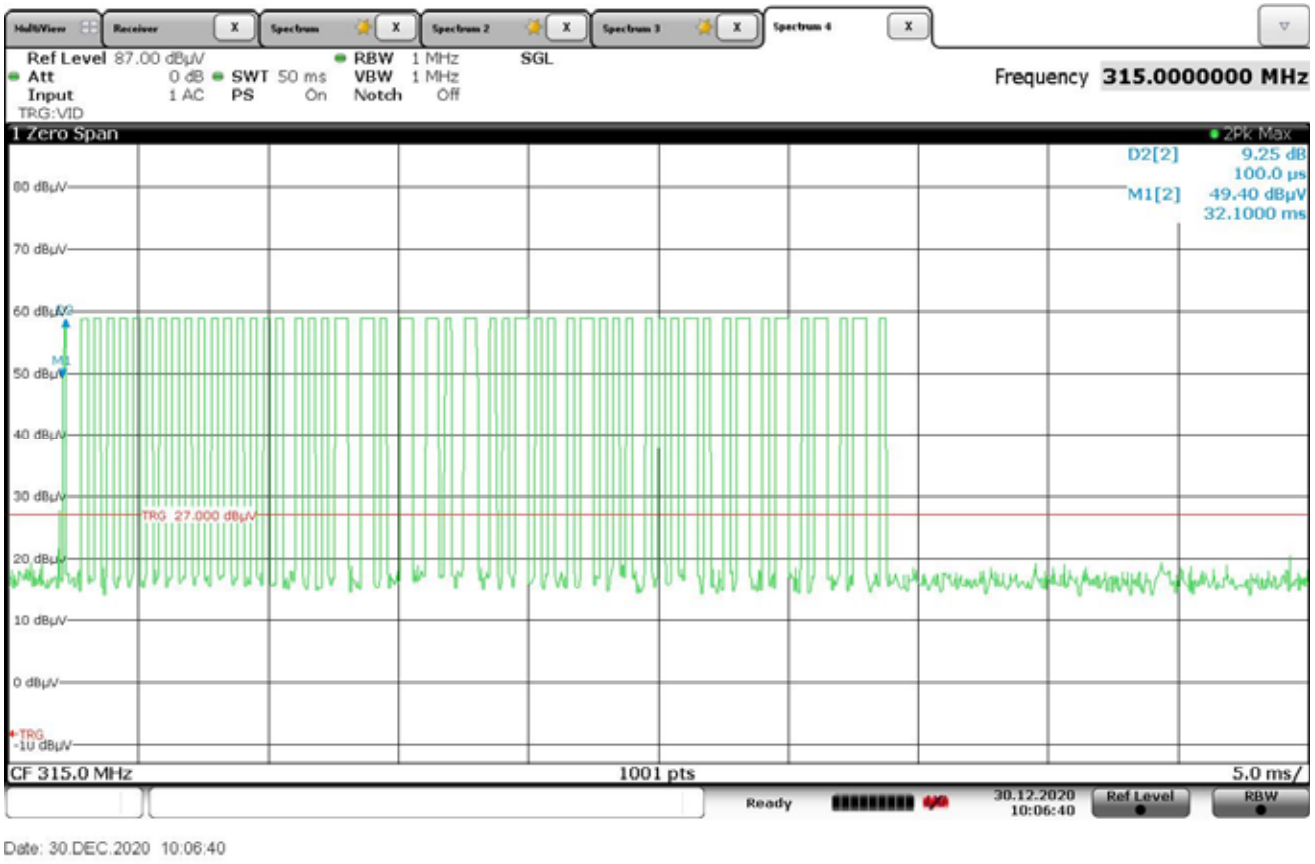
Procedures
The duty cycle factor is used to convert peak detected readings to average readings. This factor is computed from the time domain trace of the pulse modulation signal. The following procedure was used to measure a representative sample: Since this EUT utilizes a rolling code modulation, the duty is calculated based on the worst case. The following procedure was used to measure a representative sample: 1) With the transmitter set up to transmit for maximum pulse density, the time domain trace is displayed on the spectrum analyzer. 2) The pulse width is measured and a plot of this measurement is recorded. 3) Next the number of pulses in the word period is measured and a plot is recorded. 4) Finally the length of the word period is measured and a third plot is recorded. If the word period exceeds 100msec, the word period is limited to 100msec. 5) The pulse width and number of pulses for the word period are used to compute the on-time. The duty cycle is then computed as the (on-time/ word period). 6) The duty cycle factor is computed from the duty cycle.

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	001D7964
S/N	NA
Mode	Tx
Carrier Frequency	310MHz
Parameters	Operation Time = 15.12msec
Notes	First Pulse = 100µsec, Short Pulse = 240µsec, Long Pulse = 500µsec



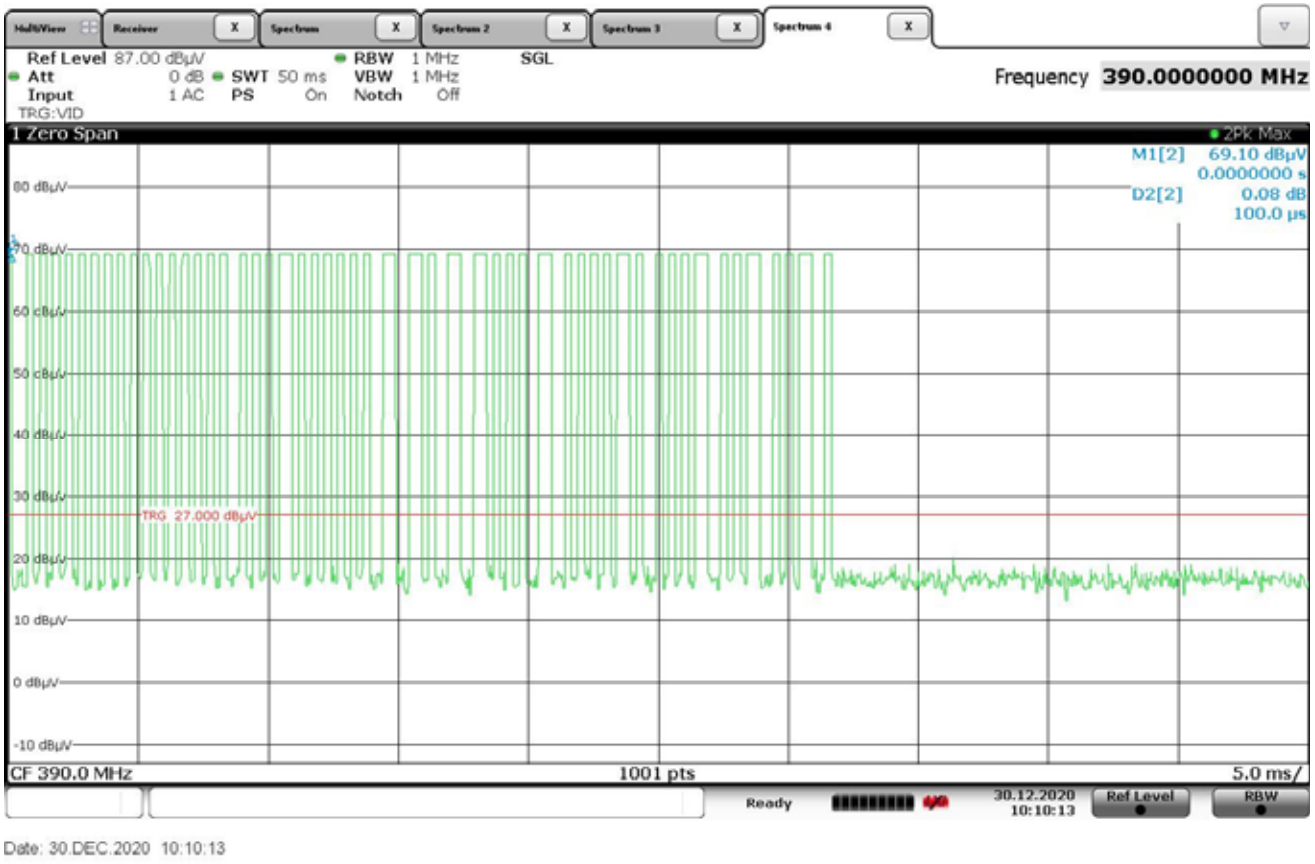
$$\text{Duty Cycle Factor} = 20\log\left(\frac{15.12\text{msec}}{100\text{msec}}\right) = -16.4\text{dB}$$

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	001D7964
S/N	NA
Mode	Tx
Carrier Frequency	315MHz
Parameters	Operation Time = 15.6msec
Notes	First Pulse = 100µsec, Short Pulse = 250µsec, Long Pulse = 500µsec



$$\text{Duty Cycle Factor} = 20\log\left(\frac{15.6\text{msec}}{100\text{msec}}\right) = -16.1\text{dB}$$

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	001D7964
S/N	NA
Mode	Tx
Carrier Frequency	390MHz
Parameters	Operation Time = 15.85msec
Notes	First Pulse = 100µsec, Short Pulse = 250µsec, Long Pulse = 500µsec



$$\text{Duty Cycle Factor} = 20\log\left(\frac{15.85\text{msec}}{100\text{msec}}\right) = -16.0\text{dB}$$

22. Spurious Radiated Emissions

Test Information	
Manufacturer	Chamberlain Group, Inc.
Product	Single Button Transmitter
Model	001D7964
Serial No	NA
Mode	Tx
Test Date	December 30, 2020

Test Setup Details	
Setup Format	Tabletop
Height of Support	NA
Type of Test Site	Semi-Anechoic Chamber
Notes	None

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

Requirements		
The EUT must comply with the requirements of FCC "Code of Federal Regulations Title 47", Part 15, Subpart C, Section 15.205 et seq. as well as the requirements of the RSS-GEN specification Section 8.10.		
Carrier Frequency (MHz)	Field Strength of Carrier (µV/m)	Field Strength of Spurious Emissions (µV/m)
70-130 130-174 174-260 260-470 Above 470	2250 1250 1250 to 3750* 3750 3750 to 12500* 12500	225 125 125 to 375* 375 375 to 1250* 1250

*Linear interpolations

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 30MHz to 4GHz was investigated using a peak detector function. The data was then processed by the computer to calculate equivalent field intensity. The final emission tests were then manually performed over the frequency range of 30MHz to 4GHz. Between 30MHz and 1000MHz, a bi-log antenna was used as the pick-up device. The EUT was placed on an 80cm high non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer. Above 1GHz, a broadband double ridged waveguide antenna was used as the pick-up device. The EUT was placed on an 150cm high non-conductive stand. A peak detector with a resolution bandwidth of 1 MHz was used on the spectrum analyzer. The peak detected levels were converted to average levels using a duty cycle factor which was computed from the pulse train. 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. In instances where it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer and the antenna cannot be raised to 4 meters. The measuring antenna is raised or lowered as much as the cable will allow and the EUT is rotated through all axis to ensure the maximum readings are recorded.

Test Setup for Spurious Radiated Emissions, 30-1000MHz – Antenna Polarization Horizontal

Test Setup for Spurious Radiated Emissions, 30-1000MHz – Antenna Polarization Vertical

Test Setup for Spurious Radiated Emissions, Above 1GHz – Antenna Polarization Horizontal

Test Setup for Spurious Radiated Emissions, Above 1GHz – Antenna Polarization Vertical

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	001D7964
S/N	NA
Mode	Tx
Carrier Frequency	310MHz
Requirements	Field Strength of Carrier Limit = 5833.3µV/m
Notes	None

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Total (dBuV/m)	Total (uV/m)	Limit (uV/m)	Margin (dB)
310.000	H	58.8		1.2	19.2	0.0	-16.4	62.8	1379.8	5833.3	-12.5
310.000	V	63.9		1.2	19.2	0.0	-16.4	67.9	2485.0	5833.3	-7.4
620.000	H	25.9		1.7	24.5	0.0	-16.4	35.7	60.7	583.3	-19.7
620.000	V	23.3		1.7	24.5	0.0	-16.4	33.0	44.7	583.3	-22.3
930.000	H	13.7		2.1	26.7	0.0	-16.4	26.1	20.1	583.3	-29.2
930.000	V	15.3		2.1	26.7	0.0	-16.4	27.7	24.2	583.3	-27.6
1240.000	H	55.3		2.4	28.9	-40.7	-16.4	29.5	29.9	500.0	-24.5
1240.000	V	51.2		2.4	28.9	-40.7	-16.4	25.4	18.7	500.0	-28.5
1550.000	H	52.5		2.7	28.0	-40.2	-16.4	26.7	21.5	500.0	-27.3
1550.000	V	51.0		2.7	28.0	-40.2	-16.4	25.1	18.0	500.0	-28.9
1860.000	H	50.3		3.0	31.1	-40.1	-16.4	27.9	24.8	583.3	-27.4
1860.000	V	56.2		3.0	31.1	-40.1	-16.4	33.7	48.5	583.3	-21.6
2170.000	H	52.1		3.2	31.8	-39.9	-16.4	30.9	35.0	583.3	-24.4
2170.000	V	50.5		3.2	31.8	-39.9	-16.4	29.3	29.0	583.3	-26.1
2480.000	H	50.5		3.5	32.5	-40.2	-16.4	29.9	31.3	583.3	-25.4
2480.000	V	51.0		3.5	32.5	-40.2	-16.4	30.4	33.3	583.3	-24.9
2790.000	H	20.4		3.7	32.5	-40.1	-16.4	0.1	1.0	500.0	-53.9
2790.000	V	51.5		3.7	32.5	-40.1	-16.4	31.2	36.2	500.0	-22.8
3100.000	H	49.6		4.0	33.3	-39.8	-16.4	30.6	33.8	583.3	-24.7
3100.000	V	49.1		4.0	33.3	-39.8	-16.4	30.2	32.3	583.3	-25.1

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	001D7964
S/N	NA
Mode	Tx
Carrier Frequency	315MHz
Requirements	Field Strength of Carrier Limit = 6041.7µV/m
Notes	None

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Total (dBuV/m)	Total (uV/m)	Limit (uV/m)	Margin (dB)
315.000	H	56.3		1.2	19.3	0.0	-16.1	60.7	1081.8	6041.7	-14.9
315.000	V	61.4		1.2	19.3	0.0	-16.1	65.8	1946.0	6041.7	-9.8
630.000	H	18.3		1.7	25.0	0.0	-16.1	29.0	28.2	604.2	-26.6
630.000	V	17.7		1.7	25.0	0.0	-16.1	28.3	26.1	604.2	-27.3
945.000	H	18.3		2.1	27.0	0.0	-16.1	31.3	36.6	604.2	-24.4
945.000	V	18.3		2.1	27.0	0.0	-16.1	31.2	36.5	604.2	-24.4
1260.000	H	61.7		2.5	29.0	-40.7	-16.1	36.4	65.8	604.2	-19.3
1260.000	V	53.6		2.5	29.0	-40.7	-16.1	28.2	25.8	604.2	-27.4
1575.000	H	68.7		2.7	28.3	-40.2	-16.1	43.4	147.2	500.0	-10.6
1575.000	V	65.7		2.7	28.3	-40.2	-16.1	40.4	104.5	500.0	-13.6
1890.000	H	55.0		3.0	31.4	-40.1	-16.1	33.3	46.2	604.2	-22.3
1890.000	V	60.9		3.0	31.4	-40.1	-16.1	39.2	90.8	604.2	-16.5
2205.000	H	53.0		3.3	31.8	-39.9	-16.1	32.1	40.4	500.0	-21.9
2205.000	V	55.9		3.3	31.8	-39.9	-16.1	35.0	55.9	500.0	-19.0
2520.000	H	55.1		3.5	32.6	-40.2	-16.1	34.9	55.9	604.2	-20.7
2520.000	V	51.2		3.5	32.6	-40.2	-16.1	31.0	35.4	604.2	-24.6
2835.000	H	50.4		3.8	32.5	-40.1	-16.1	30.5	33.4	500.0	-23.5
2835.000	V	49.9		3.8	32.5	-40.1	-16.1	30.0	31.8	500.0	-23.9
3150.000	H	53.2		4.0	33.2	-39.8	-16.1	34.5	53.2	604.2	-21.1
3150.000	V	53.5		4.0	33.2	-39.8	-16.1	34.8	55.3	604.2	-20.8

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	001D7964
S/N	NA
Mode	Tx
Carrier Frequency	390MHz
Requirements	Field Strength of Carrier Limit = 9166.7µV/m
Notes	None

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Total (dBuV/m)	Total (uV/m)	Limit (uV/m)	Margin (dB)
390.000	H	59.5		1.3	21.5	0.0	-16.0	66.4	2079.2	9166.7	-12.9
390.000	V	66.8		1.3	21.5	0.0	-16.0	73.7	4857.3	9166.7	-5.5
780.000	H	33.1		1.9	25.9	0.0	-16.0	44.9	175.2	916.7	-14.4
780.000	V	27.6		1.9	25.9	0.0	-16.0	39.3	92.4	916.7	-19.9
1170.000	H	65.9		2.4	28.4	-40.9	-16.0	39.8	97.2	500.0	-14.2
1170.000	V	66.5		2.4	28.4	-40.9	-16.0	40.4	104.5	500.0	-13.6
1560.000	H	66.2		2.7	28.1	-40.2	-16.0	40.9	110.4	500.0	-13.1
1560.000	V	56.3		2.7	28.1	-40.2	-16.0	30.9	35.3	500.0	-23.0
1950.000	H	50.8		3.0	31.4	-40.0	-16.0	29.3	29.0	916.7	-30.0
1950.000	V	51.2		3.0	31.4	-40.0	-16.0	29.7	30.4	916.7	-29.6
2340.000	H	52.3		3.4	32.2	-40.1	-16.0	31.7	38.5	500.0	-22.3
2340.000	V	51.3		3.4	32.2	-40.1	-16.0	30.7	34.4	500.0	-23.3
2730.000	H	51.6		3.7	32.6	-40.2	-16.0	31.7	38.3	500.0	-22.3
2730.000	V	50.9		3.7	32.6	-40.2	-16.0	31.0	35.3	500.0	-23.0
3120.000	H	50.2		4.0	33.3	-39.8	-16.0	31.6	38.1	916.7	-27.6
3120.000	V	51.5		4.0	33.3	-39.8	-16.0	32.9	44.1	916.7	-26.4
3510.000	H	49.0		4.2	33.2	-39.5	-16.0	30.9	34.9	916.7	-28.4
3510.000	V	48.7		4.2	33.2	-39.5	-16.0	30.6	33.8	916.7	-28.7
3900.000	H	49.3		4.4	33.5	-39.5	-16.0	31.7	38.4	500.0	-22.3
3900.000	V	49.4		4.4	33.5	-39.5	-16.0	31.8	39.0	500.0	-22.2

23. Occupied Bandwidth Measurements

Test Information	
Manufacturer	Chamberlain Group, Inc.
Product	Single Button Transmitter
Model	001D7964
Serial No	NA
Mode	Tx
Test Date	December 30, 2020

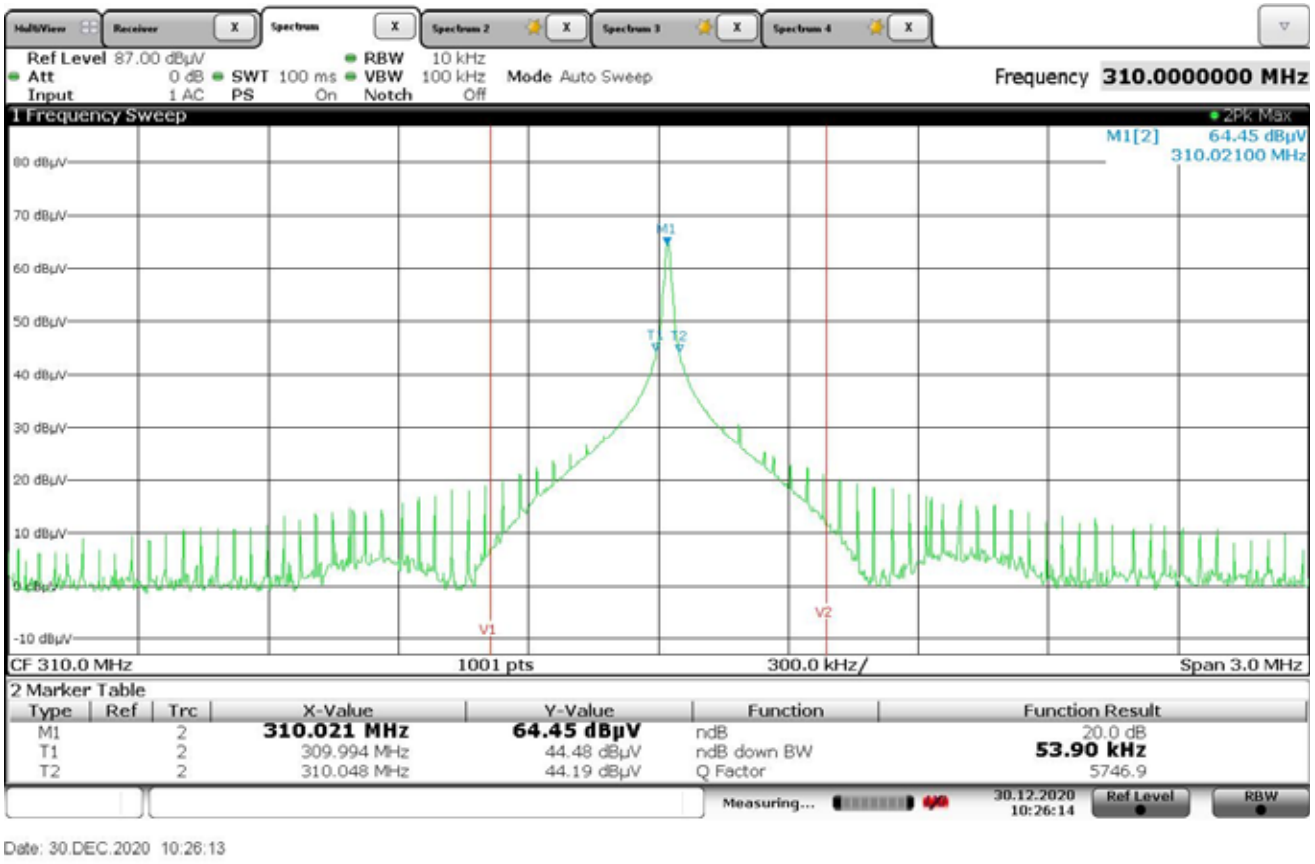
Test Setup Details	
Setup Format	Tabletop
Height of Support	NA
Type of Test Site	Shielded Enclosure
Notes	None

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

Requirements
FCC 15.231(c): The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier. RSS-210, Annex A, Section A.1.3: The occupied bandwidth (99% Bandwidth) of momentarily operated devices shall be less than or equal to 0.25% of the center frequency for devices operating between 70 MHz and 900 MHz. For devices operating above 900 MHz, the occupied bandwidth shall be less than or equal to 0.5% of the center frequency.

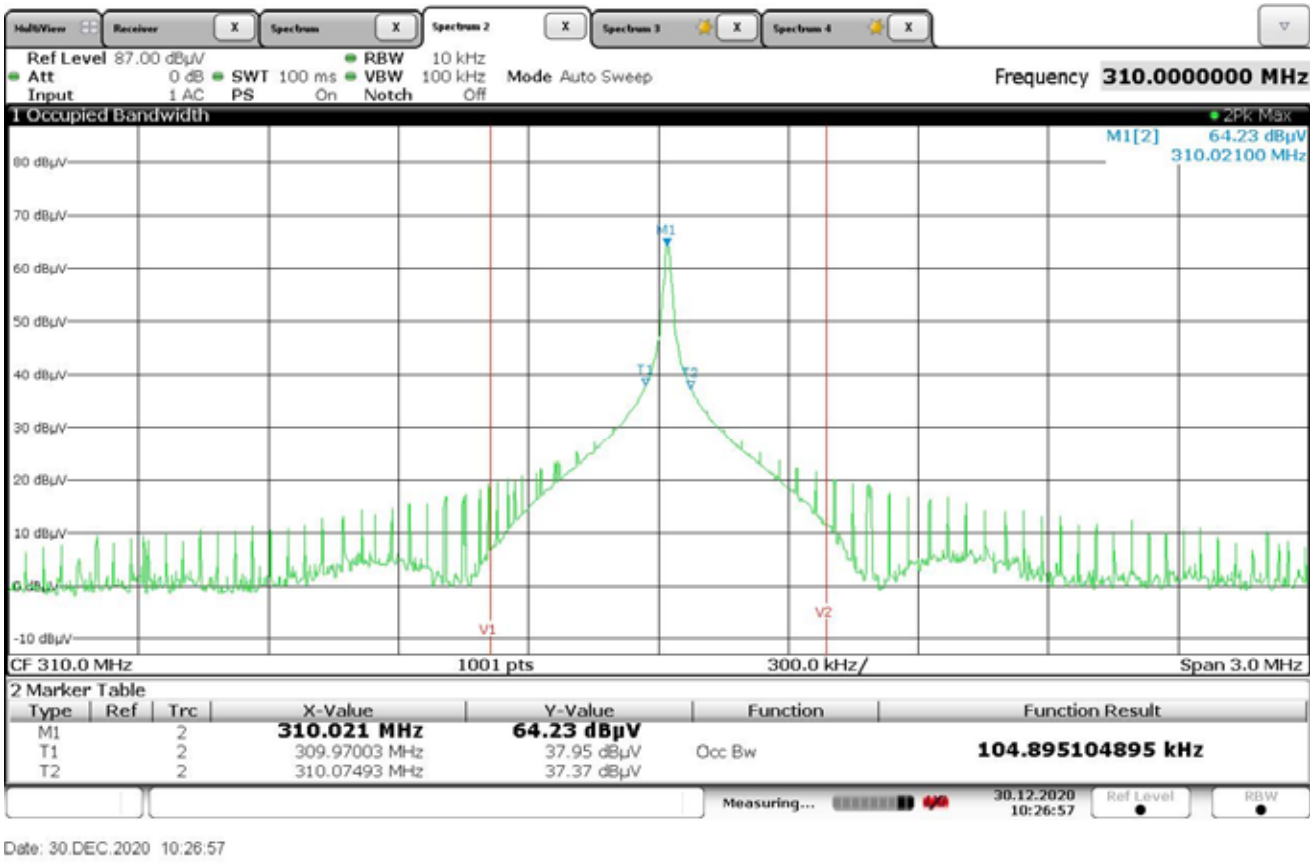
Procedures
The EUT was placed on an 80cm high non-conductive stand. The unit was set to transmit continuously. With an antenna positioned nearby, occupied bandwidth emissions were displayed on the spectrum analyzer. The resolution bandwidth was set to 10kHz and span was set to 3MHz. A screen capture was taken of the frequency spectrum near the carrier using a screen dump function on the spectrum analyzer.

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	001D7964
S/N	NA
Mode	Tx
Carrier Frequency	310MHz
Parameters	20dB BW = 53.9kHz
Notes	None



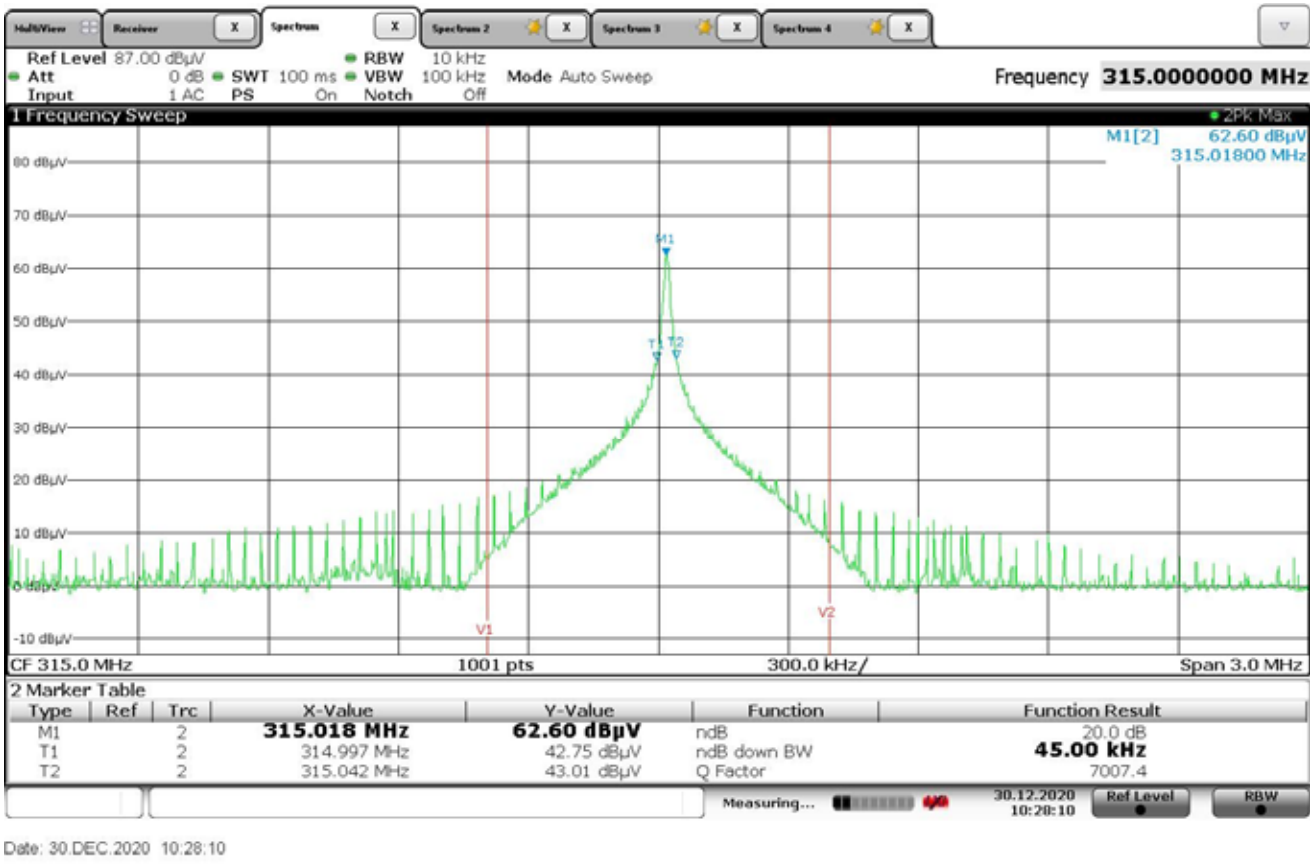
Date: 30.DEC.2020 10:26:13

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	001D7964
S/N	NA
Mode	Tx
Carrier Frequency	310MHz
Parameters	99% BW = 104.9kHz
Notes	None



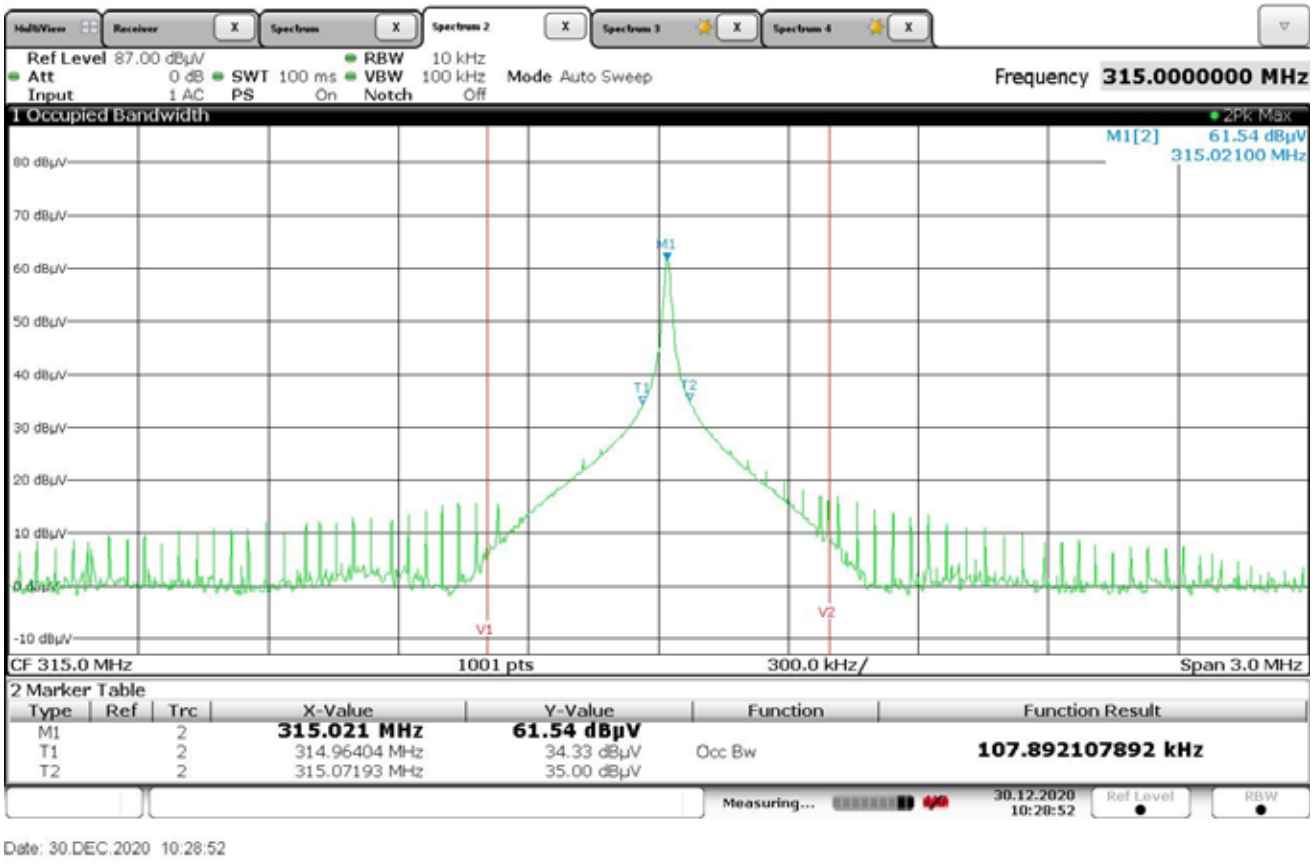
Date: 30.DEC.2020 10:26:57

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	001D7964
S/N	NA
Mode	Tx
Carrier Frequency	315MHz
Parameters	20dB BW = 45.0kHz
Notes	None

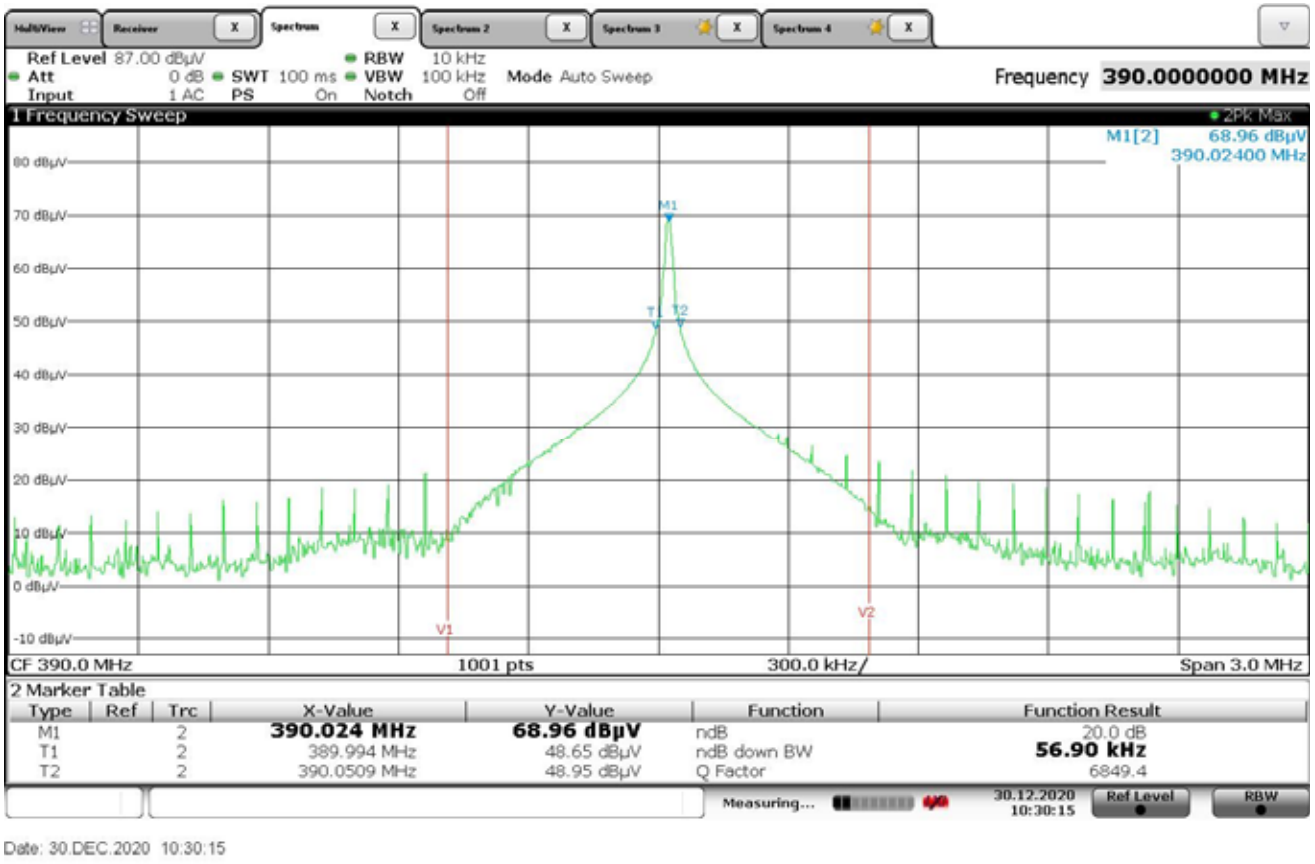


Date: 30.DEC.2020 10:28:10

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	001D7964
S/N	NA
Mode	Tx
Carrier Frequency	315MHz
Parameters	99% BW = 107.9kHz
Notes	None

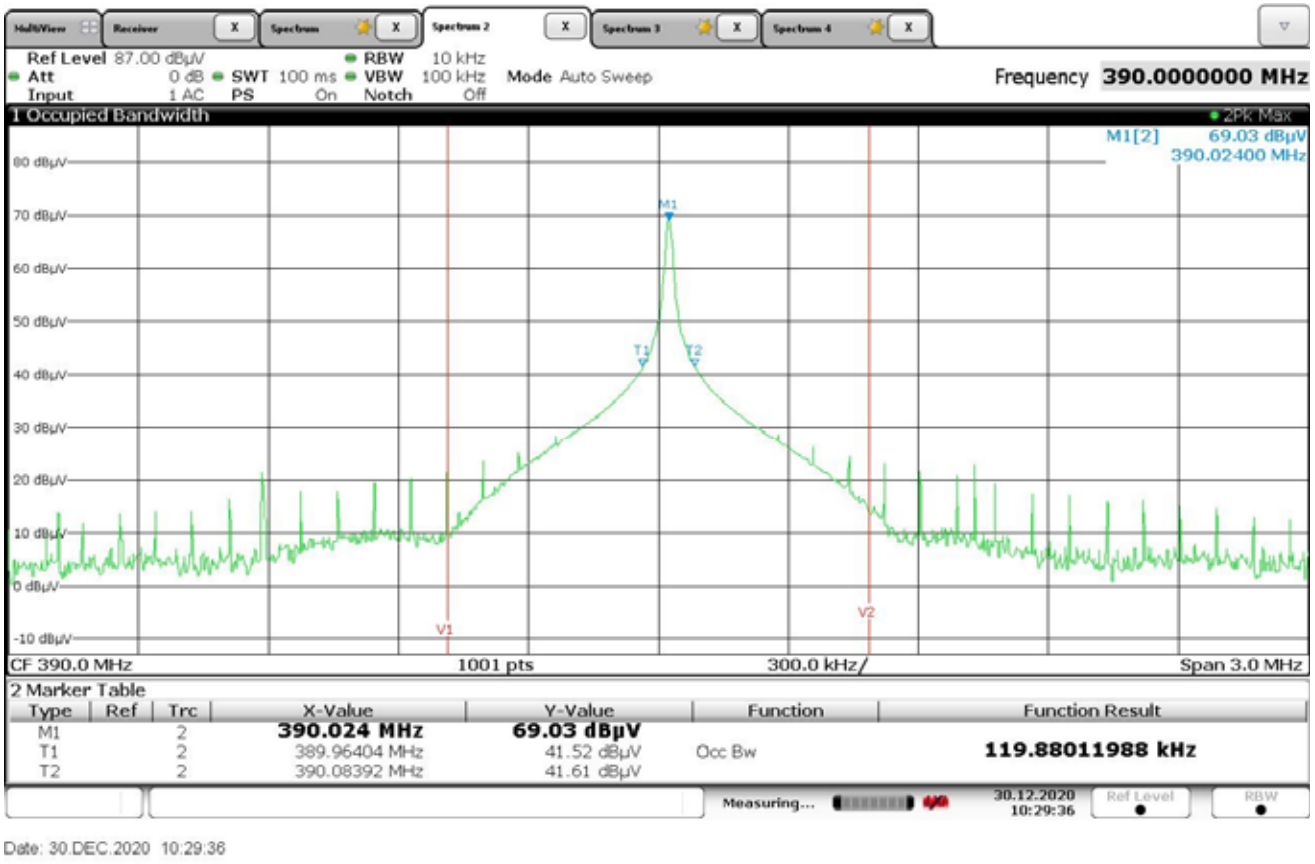


Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	001D7964
S/N	NA
Mode	Tx
Carrier Frequency	390MHz
Parameters	20dB BW = 56.9kHz
Notes	None



Date: 30.DEC.2020 10:30:15

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	001D7964
S/N	NA
Mode	Tx
Carrier Frequency	390MHz
Parameters	99% BW = 119.9kHz
Notes	None



Date: 30.DEC.2020 10:29:36

24. 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; 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)

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

Test Technology:	Test Method(s) [1]:
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); ECE Regulation 10.06 Annex 7 (Broadband) ECE Regulation 10.06 Annex 8 (Narrowband)
Vehicle Radiated Emissions	CISPR 12; ICES-002; ECE Regulation 10.06 Annex 5
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); ECE Regulation 10.06 Annex 9
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; ECE Regulation 10.06 Annex 9
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; ECE Regulation 10.06 Annex 6
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-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 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	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 15kV) / (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 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

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)
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
Broadcast Radio Services 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.1[2]

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
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.