Engineering Test Report No. 2005157-01		
Report Date	June 23, 2021	
Manufacturer Name	Chamberlain Group, Inc.	
Manufacturer Address	300 Windsor Dr Oak Brook, IL 60523	
Model No.	G891LM and G893LM	
Date Received	April 12, 2021	
Test Dates	April 12, 2021 through May 18, 2021	
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	Mark E. Longinotti	
Tested by	Mark E. Longinotti	
Signature	Raymond J Klouda	
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894	
PO Number	4900073300	

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
–	23 JUN 2021	Initial Release of Engineering Test Report No. 2005157-01

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. Door and Gate Operator, Model No. G893LM, (hereinafter referred to as the Equipment Under Test (EUT)).

Additionally, this document presents the results of a limited series of RF emissions tests that were performed on the Chamberlain Group, Inc. Door and Gate Operator, Model No. G891LM.

Per Chamberlain Group, Inc. personnel, Model No. G891LM and Model No. G893LM are electrically identical aside from the following:

- Model No. G893LM circuit board is equipped with three (3) buttons and Model No. G893LM circuit board is only populated with a single button.

The EUTs, Model No. G891LM and Model No. G893LM, were 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 EUTs, Model No. G891LM, and Model No. G893LM, meet 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 EUTs, Model No. G891LM, and Model No. G893LM meet 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 EUTs were identified as follows:

EUT Identification	
Product Description	Door and Gate Operator
Model/Part No.	G891LM
S/N	None Assigned
Band of Operation	310, 315 and 390 MHz
20dB Bandwidth	38.46kHz
99% Bandwidth	67.3kHz
Size of EUT	8cm x 4.5cm x 1.5cm
Product Description	Door and Gate Operator
Model/Part No.	G893LM
S/N	None Assigned
Band of Operation	310, 315 and 390 MHz
20dB Bandwidth	38.46kHz
99% Bandwidth	67.3kHz
Size of EUT	8cm x 4.5cm x 1.5cm

The EUTs listed above were used throughout the test series.

3. Power Input

The EUTs were powered with 3.3V from an internal coin-cell battery for all tests.

4. Grounding

The EUT was not connected to ground.

5. Support Equipment

No support equipment was used during the tests.

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
Continuous Transmission	Continuously transmits at a preprogrammed frequency.
Periodic Transmission	Transmits at a normal operating duty cycle.

9. Test Specifications

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

- Federal Communications Commission “Code of Federal Regulations”, Title 47, Part 15, Subpart C
- 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 C63.10-2013 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°C
Relative Humidity	29%
Atmospheric Pressure	1002mb

13. Summary

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

Test Description	Requirements	Test Methods	Results
Periodic Operation Measurements	FCC 15C ISED RSS-210	ANSI C63.10: 2013	Conforms
Duty Cycle Factor Measurements	FCC 15C ISED RSS-210	ANSI C63.10: 2013	Conforms
Spurious Radiated Emissions	FCC 15C ISED RSS-210	ANSI C63.10: 2013	Conforms
Occupied Bandwidth Measurements	FCC 15C ISED RSS-210	ANSI C63.10: 2013	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. Door and Gate Operator, Serial No. Continuous, Model No. G891LM and Model No. G893LM, 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 EUTs on the test date specified. Any electrical or mechanical modifications made to the EUTs subsequent to the specified test date will serve to

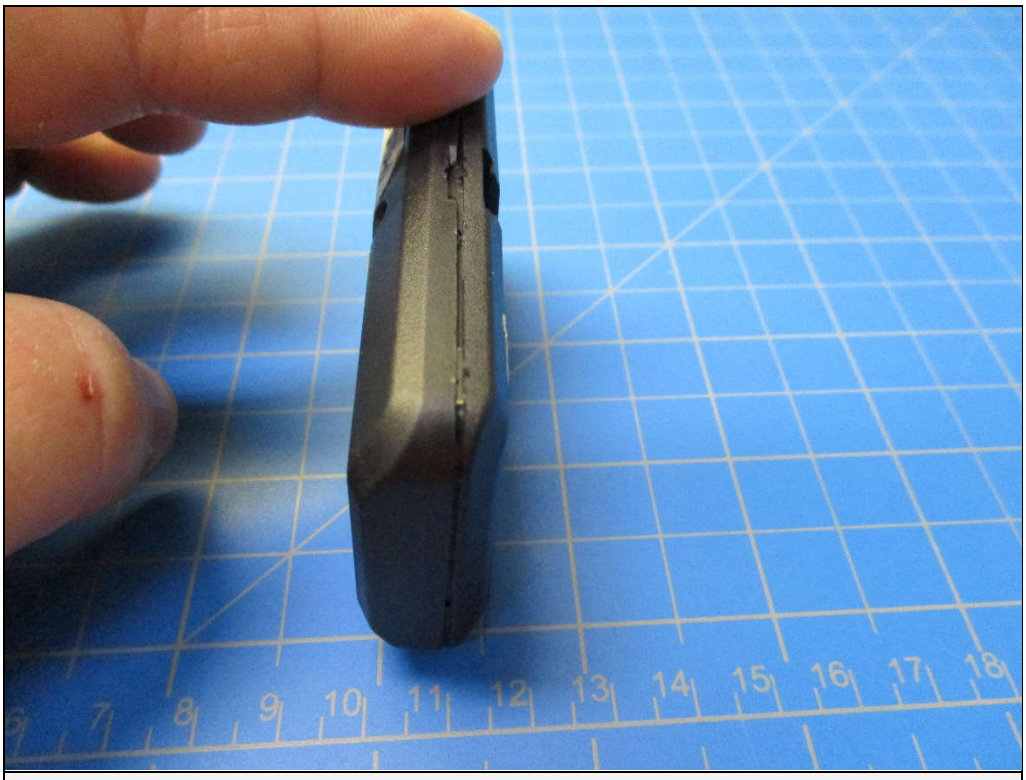
invalidate the data and void this certification.

17. Photographs of EUT

G891LM

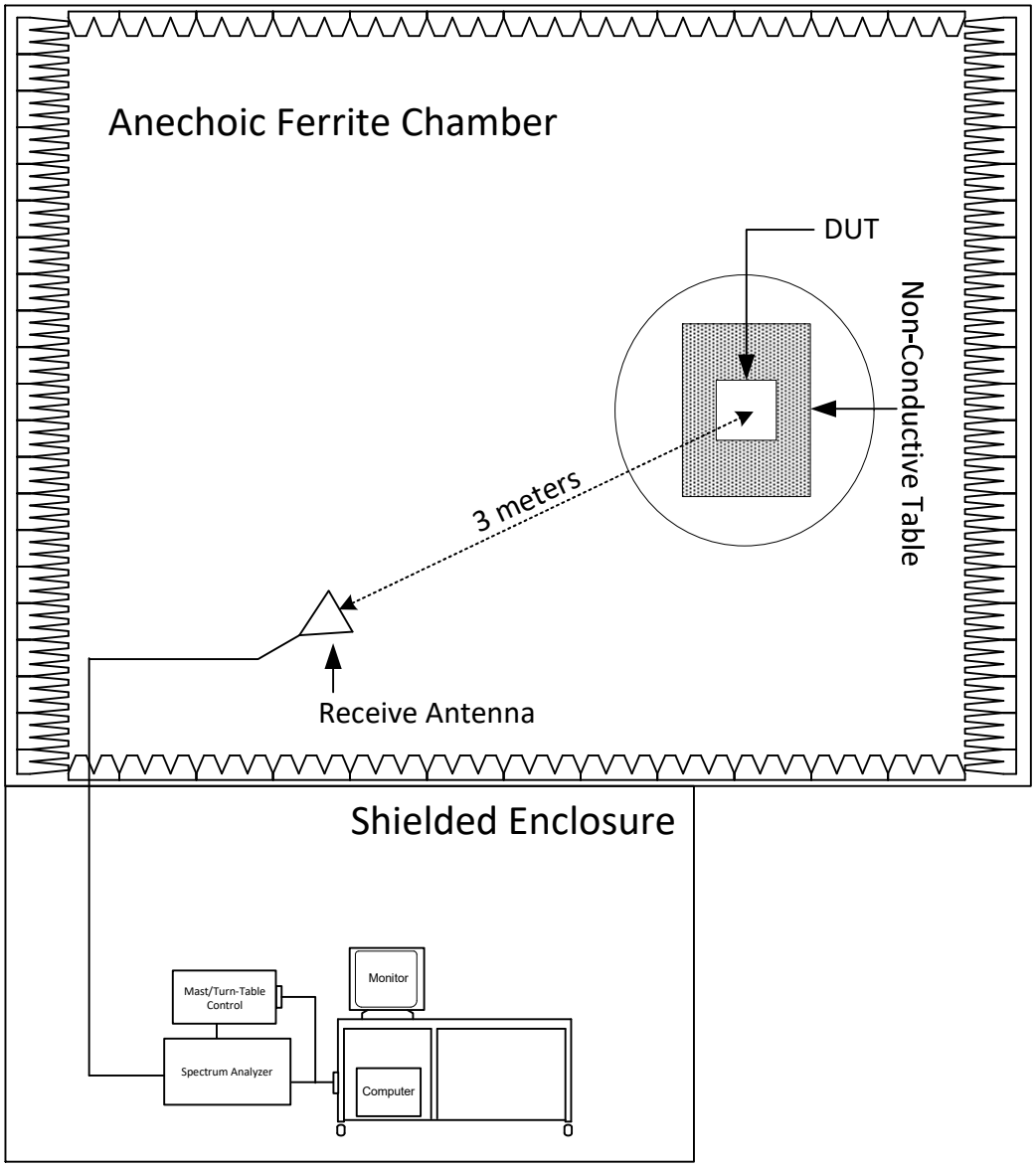
G893LM

G893LM



G893LM

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
CDZ3	LAB WORKSTATION	ELITE	LWS-10		WINDOWS 10	CNR	
MDB8	MULTIMETER (M. LONGINOTTI)	FLUKE CORPORATION	177	81240019	I,VAC,VDC,R	8/20/2020	8/20/2021
NTA4	BILOG ANTENNA	TESEQ	6112D	46660	20-2000GHZ	10/5/2020	10/5/2021
NWQ0	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66657	1GHZ-18GHZ	5/13/2020	5/13/2022
PHA0	MAGNETIC FIELD PROBE	ELECTRO-METRICS	EM-6882	134	22-230MHZ	NOTE 1	
RBD0	EMI TEST RECIEVER	ROHDE & SCHWARZ	ESU40	100010	20Hz-40GHz	8/27/2020	8/27/2021
RBG0	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101533	10HZ-44GHZ	3/2/2021	3/2/2022
SHB0	DC POWER SUPPLY	HEWLETT PACKARD	6644A	MY40000115	0-60V/0-3.5A	NOTE 1	
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	Door and Gate Operator
Model	G891LM and G893LM
Serial No	None Assigned
Mode	Periodic Transmission
Test Date	April 12, 2021

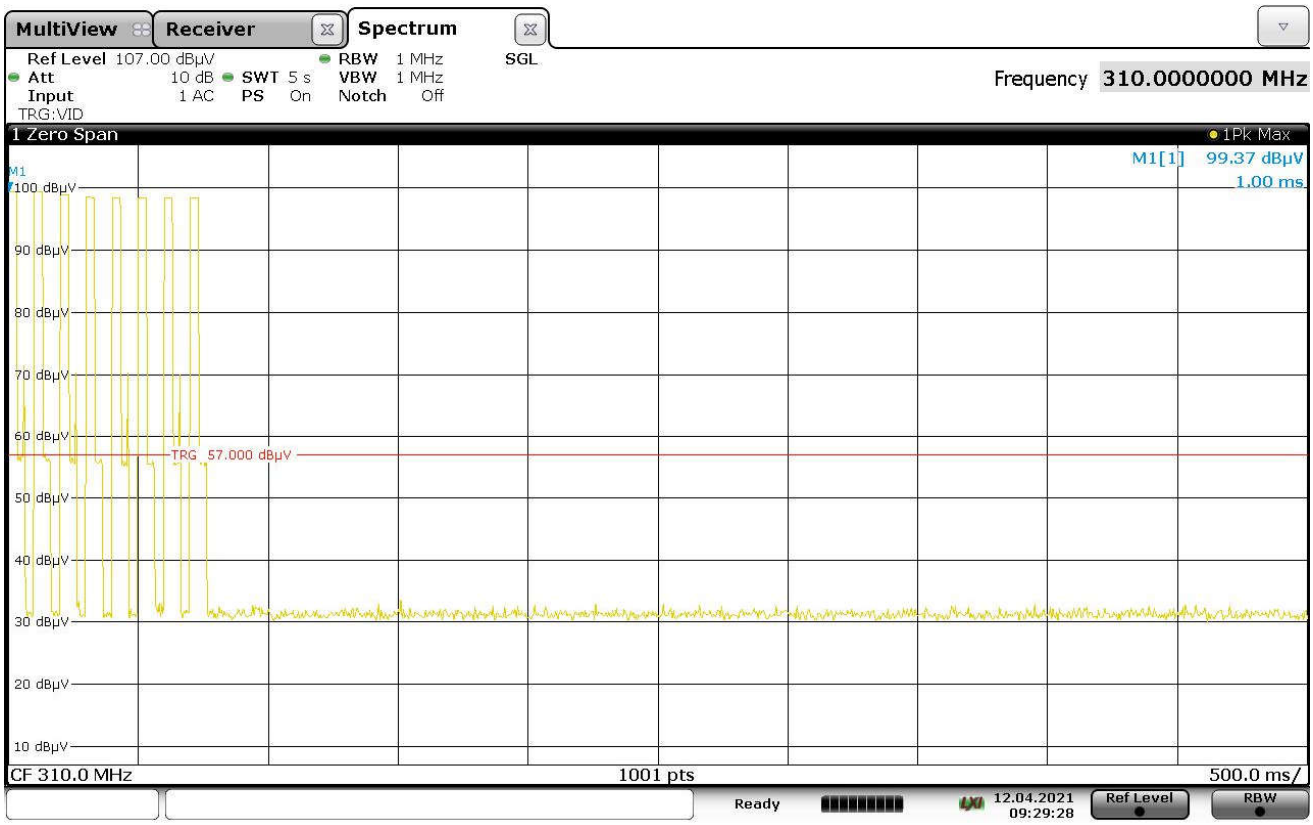
Test Setup Details	
Setup Format	Tabletop
Height of Support	NA
Type of Test Site	Shielded Enclosure
Note	None

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.

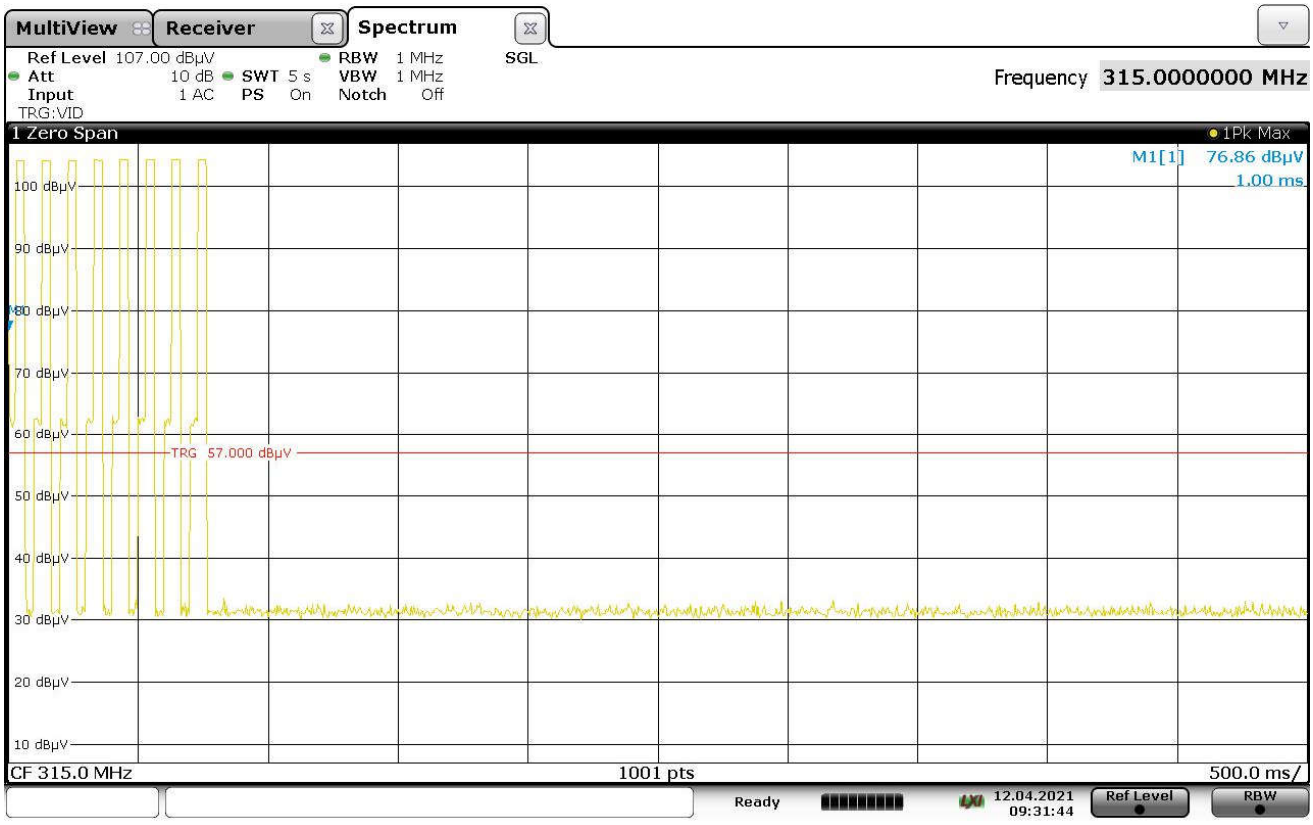
Procedures
The spectrum analyzer was setup to display the time domain trace. The EUT was set to transmit normally. The spectrum analyzer was used to record the amount of time that the EUT remained active following activation.

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G891LM
S/N	Normal
Mode	Periodic Transmission
Carrier Frequency	310MHz
Parameters	Transmitter deactivates within not more than 5 seconds of being released
Notes	None



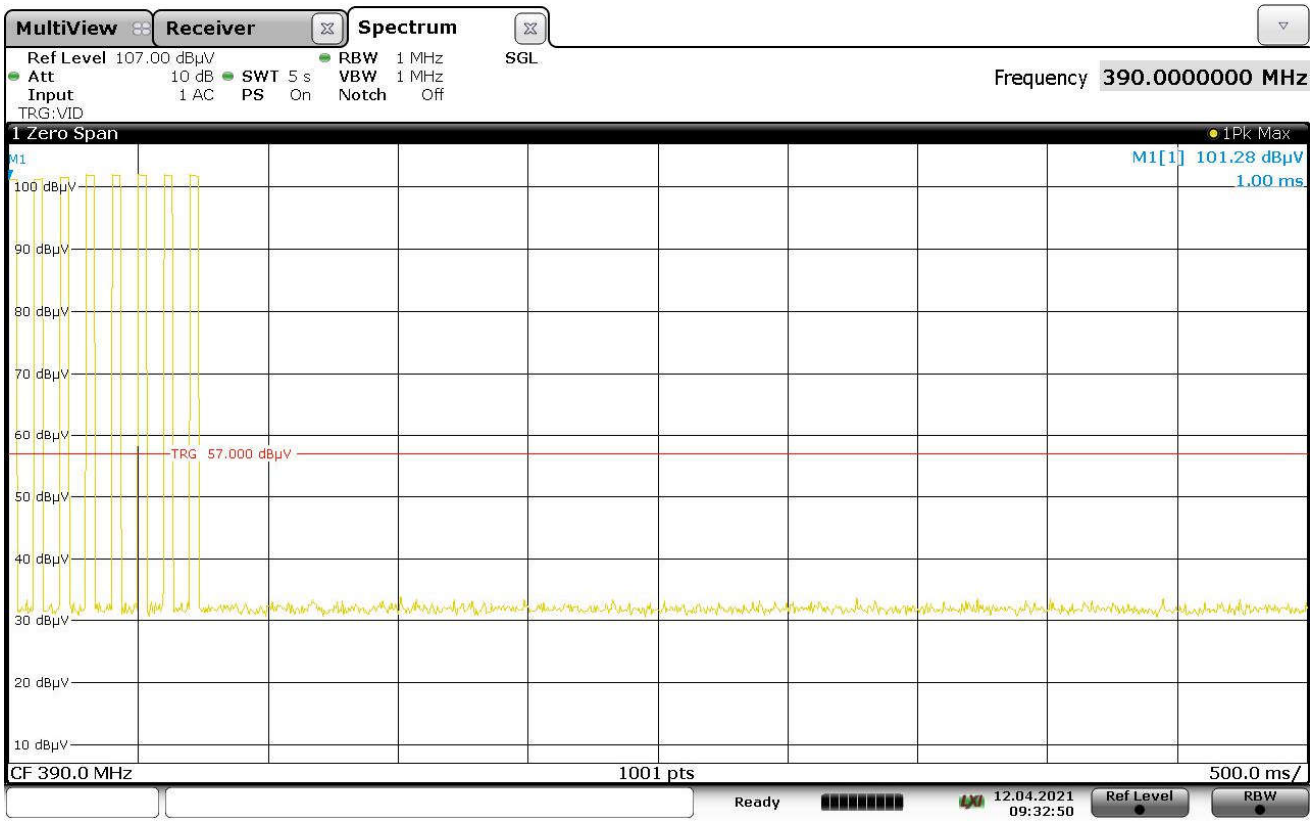
09:29:29 12.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G891LM
S/N	Normal
Mode	Periodic Transmission
Carrier Frequency	315MHz
Parameters	Transmitter deactivates within not more than 5 seconds of being released
Notes	None



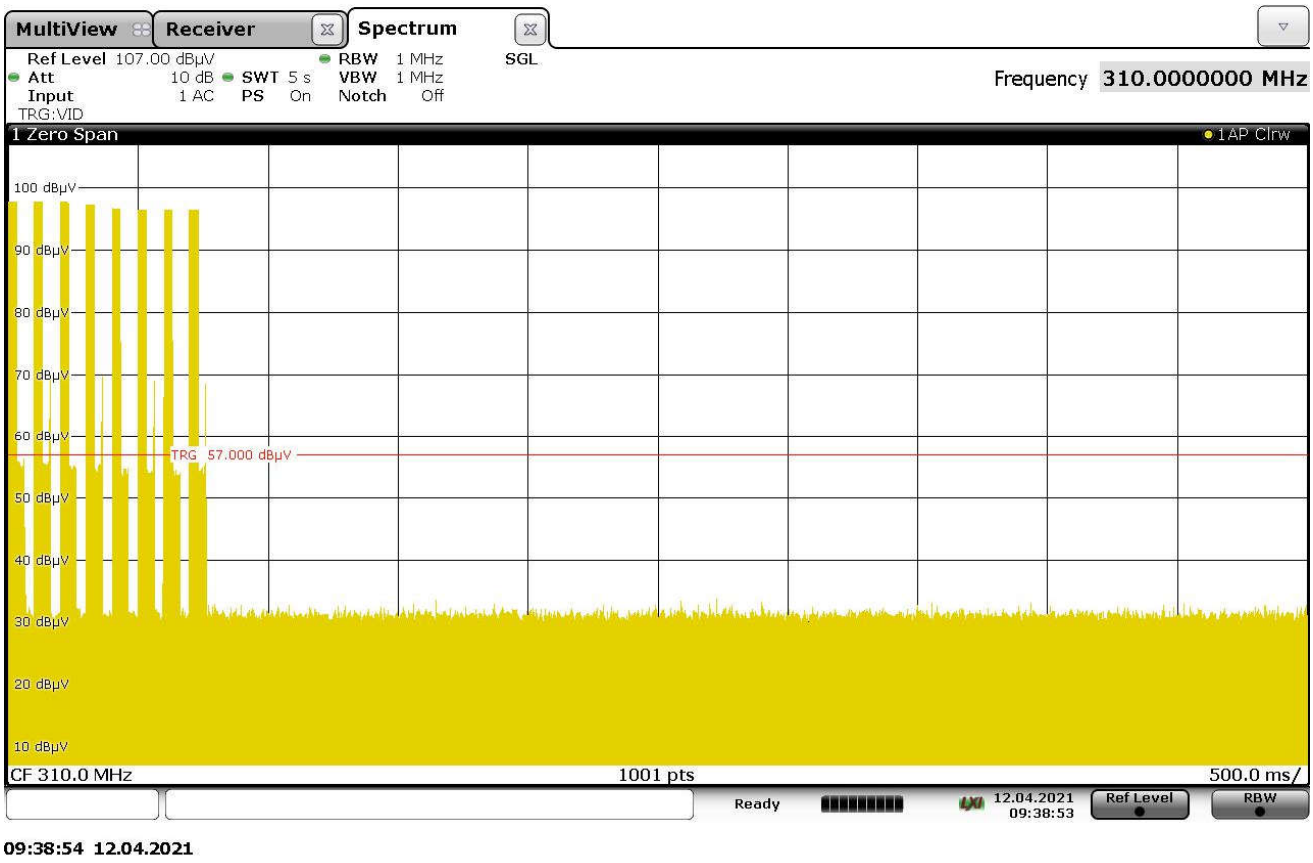
09:31:45 12.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G891LM
S/N	Normal
Mode	Periodic Transmission
Carrier Frequency	390MHz
Parameters	Transmitter deactivates within not more than 5 seconds of being released
Notes	None

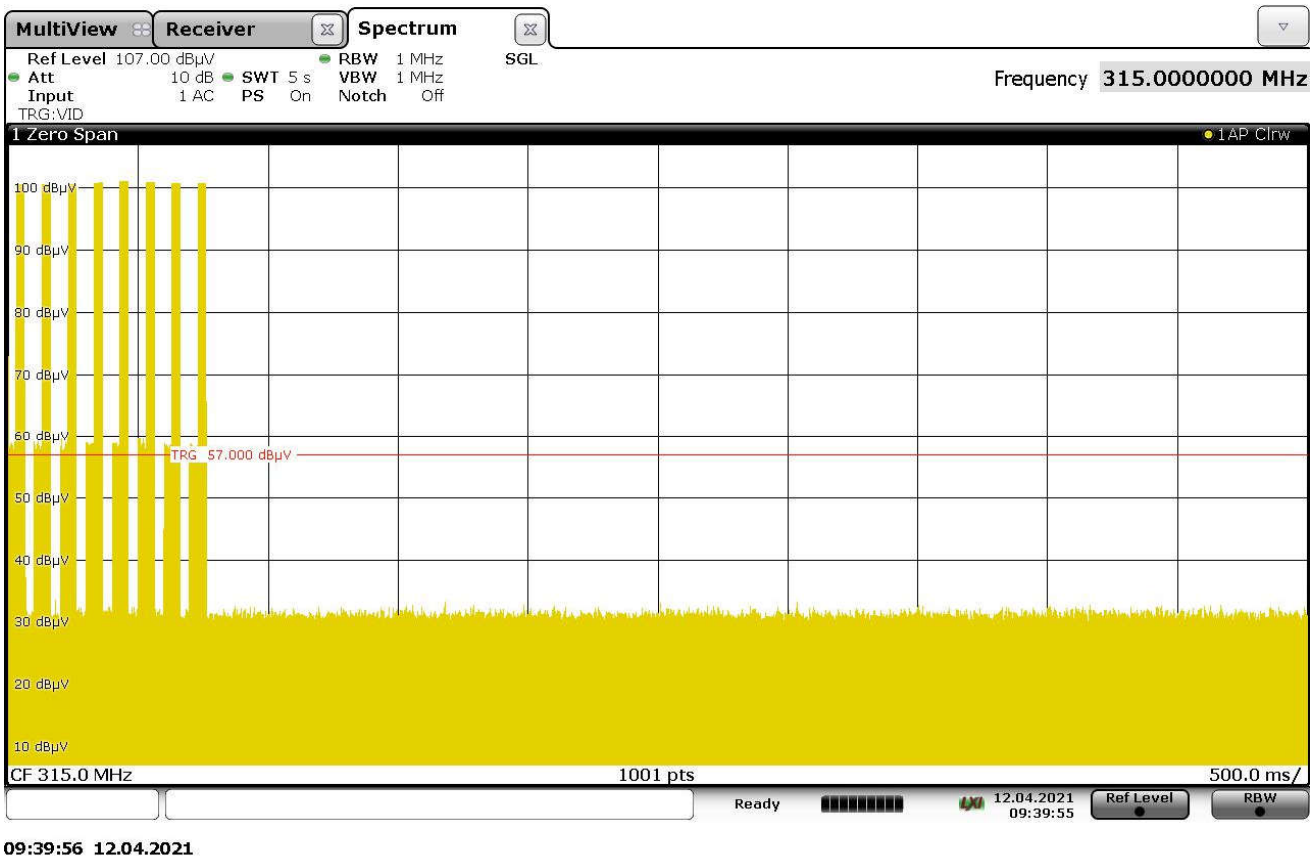


09:32:51 12.04.2021

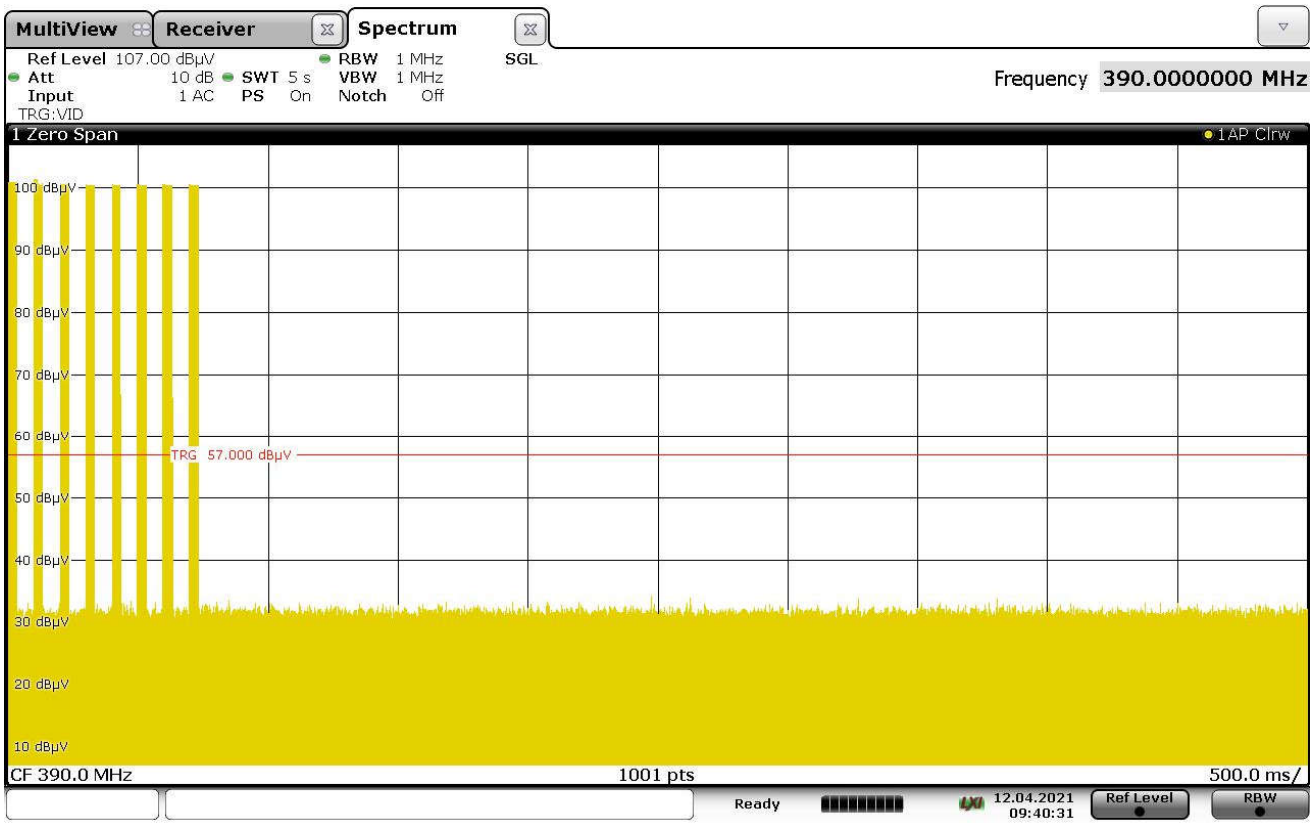
Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G893LM
S/N	Normal
Mode	Periodic Transmission
Carrier Frequency	310MHz
Parameters	Transmitter deactivates within not more than 5 seconds of being released
Notes	None



Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G893LM
S/N	Normal
Mode	Periodic Transmission
Carrier Frequency	315MHz
Parameters	Transmitter deactivates within not more than 5 seconds of being released
Notes	None



Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G893LM
S/N	Normal
Mode	Periodic Transmission
Carrier Frequency	390MHz
Parameters	Transmitter deactivates within not more than 5 seconds of being released
Notes	None



09:40:31 12.04.2021

21. Duty Cycle Factor Measurements

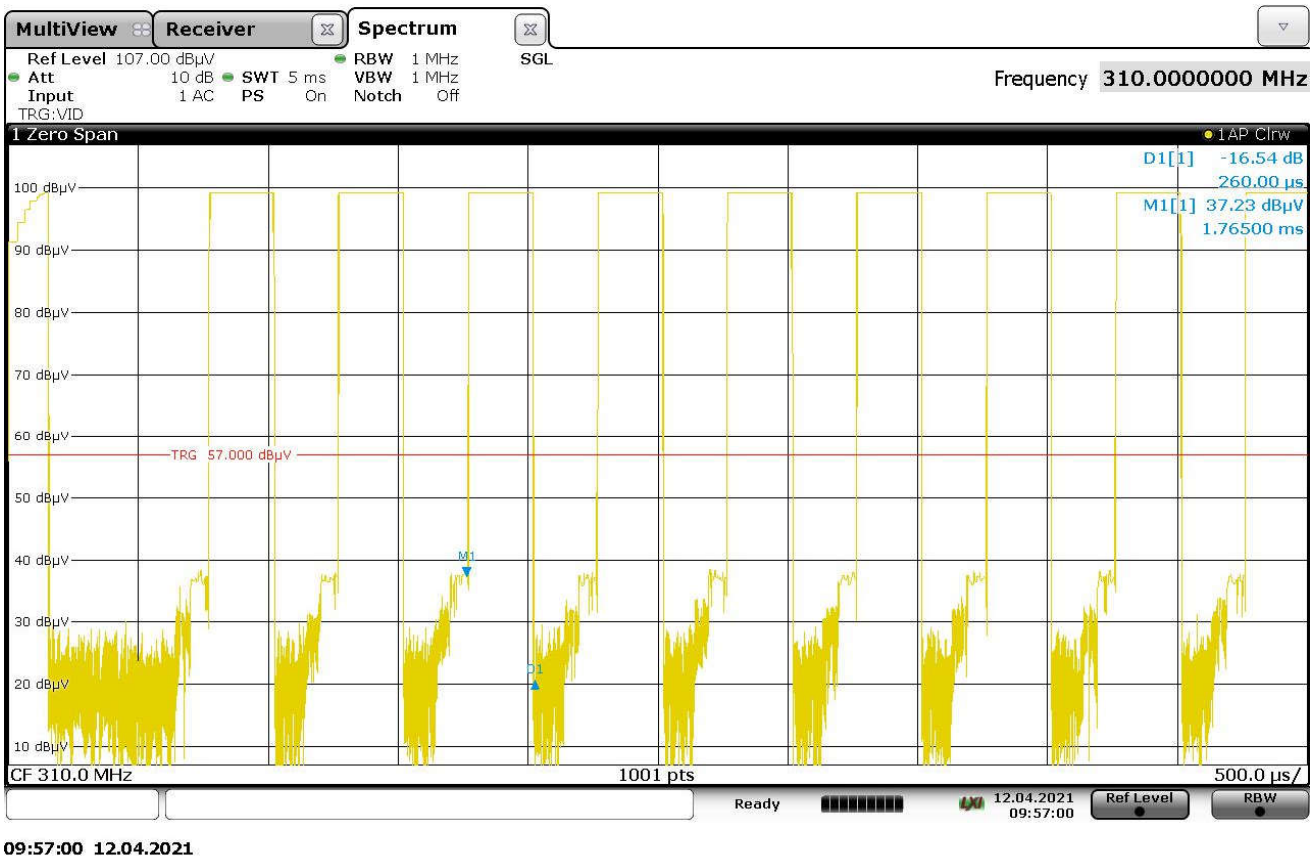
Test Information	
Manufacturer	Chamberlain Group, Inc.
Product	Door and Gate Operator
Model	G891LM and G893LM
Serial No	Normal Operation
Mode	Periodic Transmission
Test Date	April 12, 2021

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

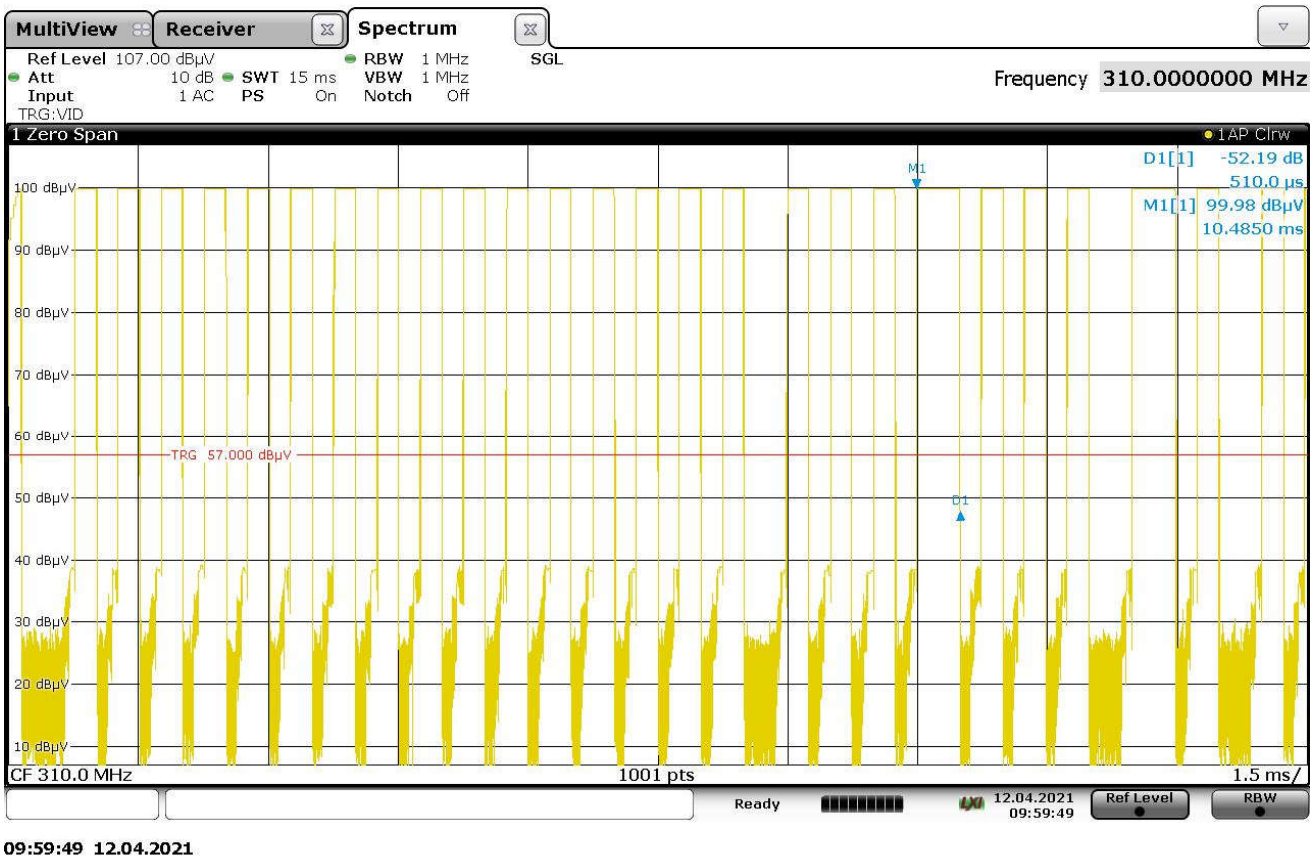
Procedures
The duty cycle factor is used to convert peak detected readings to average readings. This factor is computed from the time domain trace of the pulse modulation signal. The following procedure was used to measure a representative sample: 1) With the transmitter set up to transmit for maximum 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	G891LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	310MHz
Parameters	Short Pulse = 260usec
Notes	None



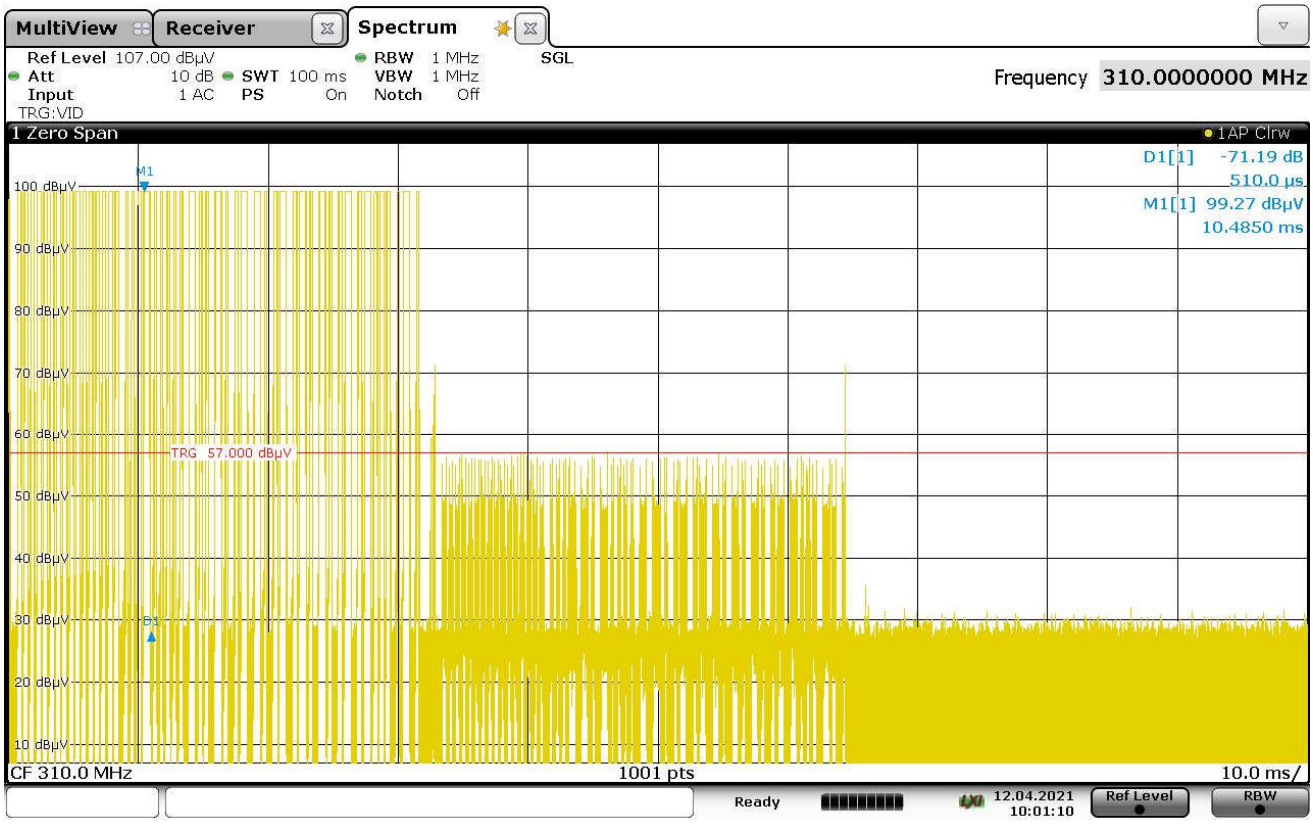
09:57:00 12.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G891LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	310MHz
Parameters	Long Pulse = 510usec
Notes	None



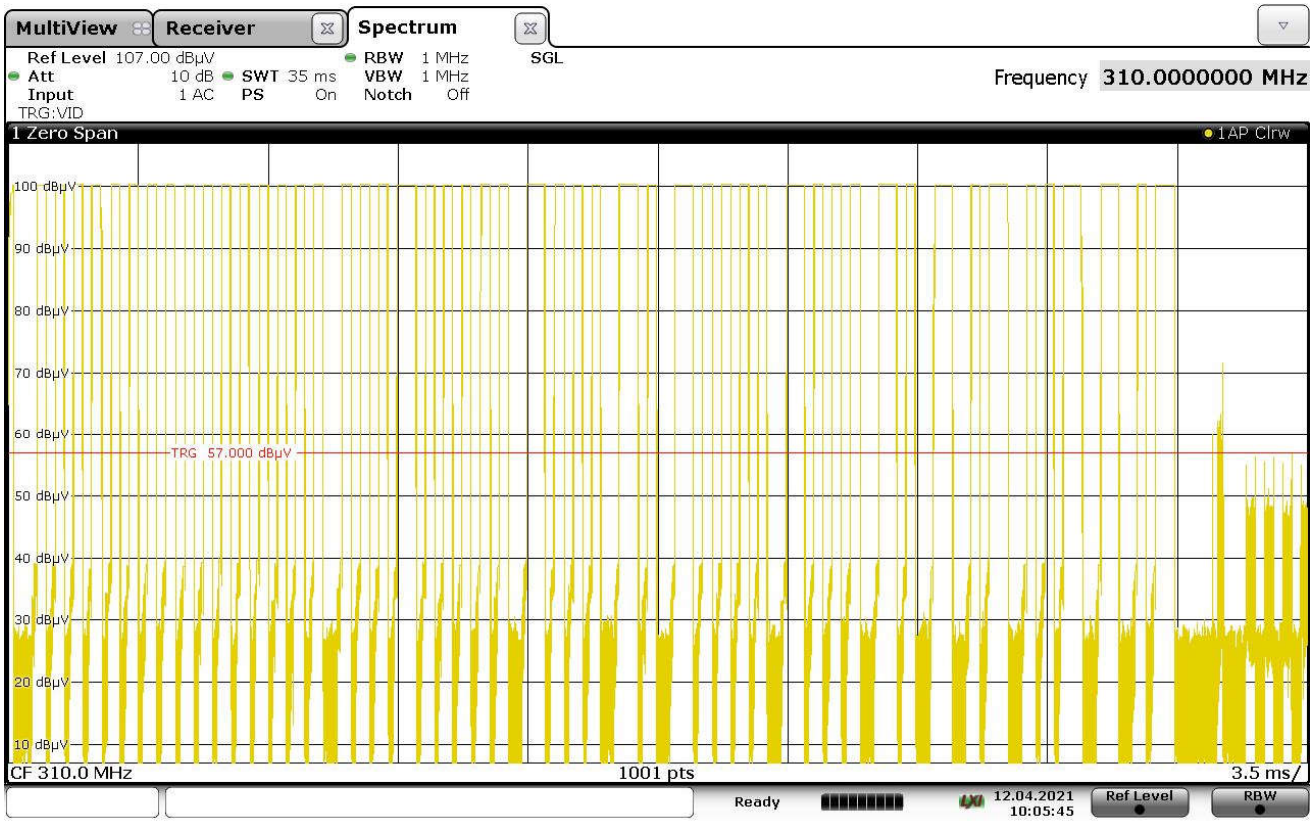
09:59:49 12.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G891LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	310MHz
Parameters	100msec
Notes	None



10:01:11 12.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G891LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	310MHz
Parameters	Duty Cycle
Notes	None

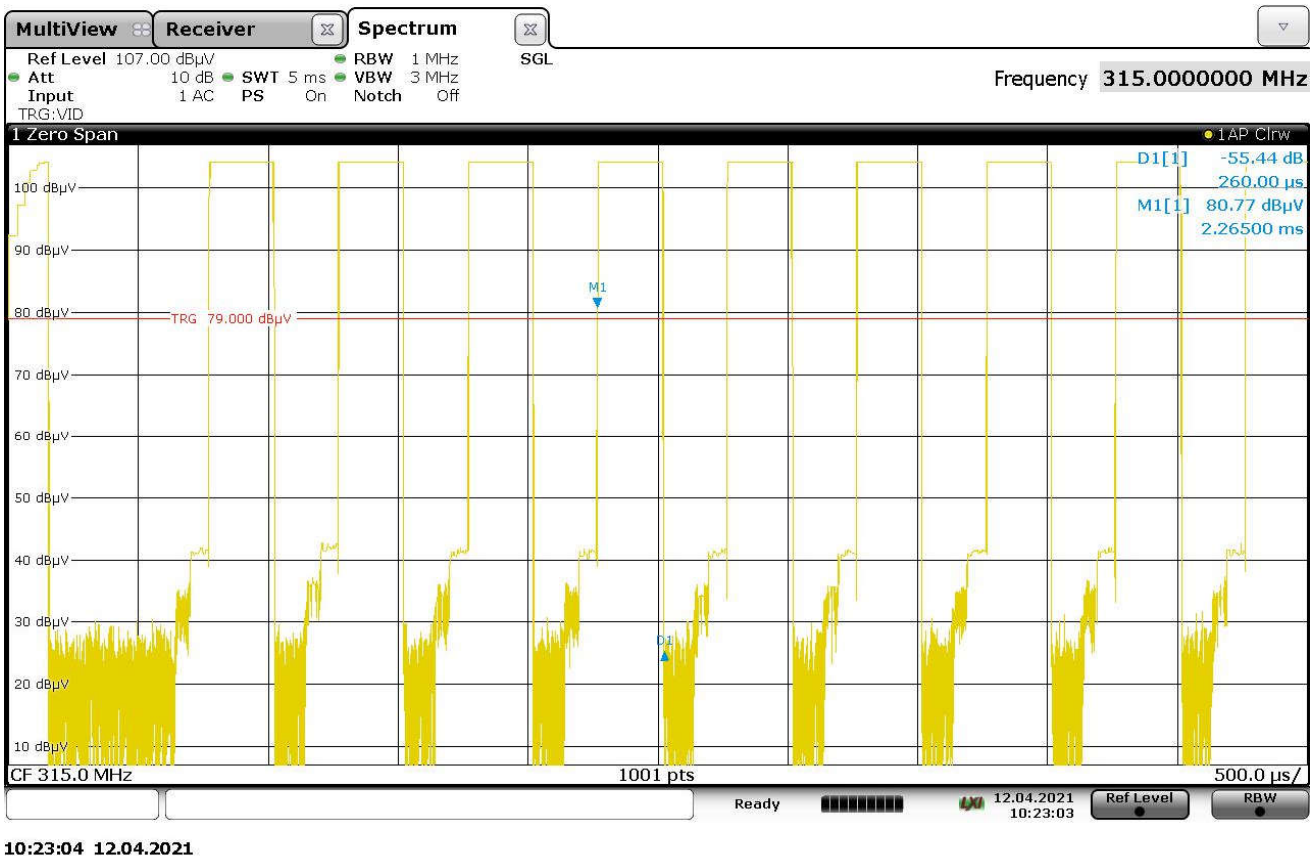


10:05:45 12.04.2021

On time = (40 short pulses x 260usec/short pulse) + (11 long pulses x 510usec/long pulse) = 16.01msec

$$\text{Duty Cycle Factor} = 20\log\left(\frac{16.01msec}{(100\text{msec})}\right) = -15.91\text{dB}$$

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G891LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	315MHz
Parameters	Short Pulse = 260usec
Notes	None



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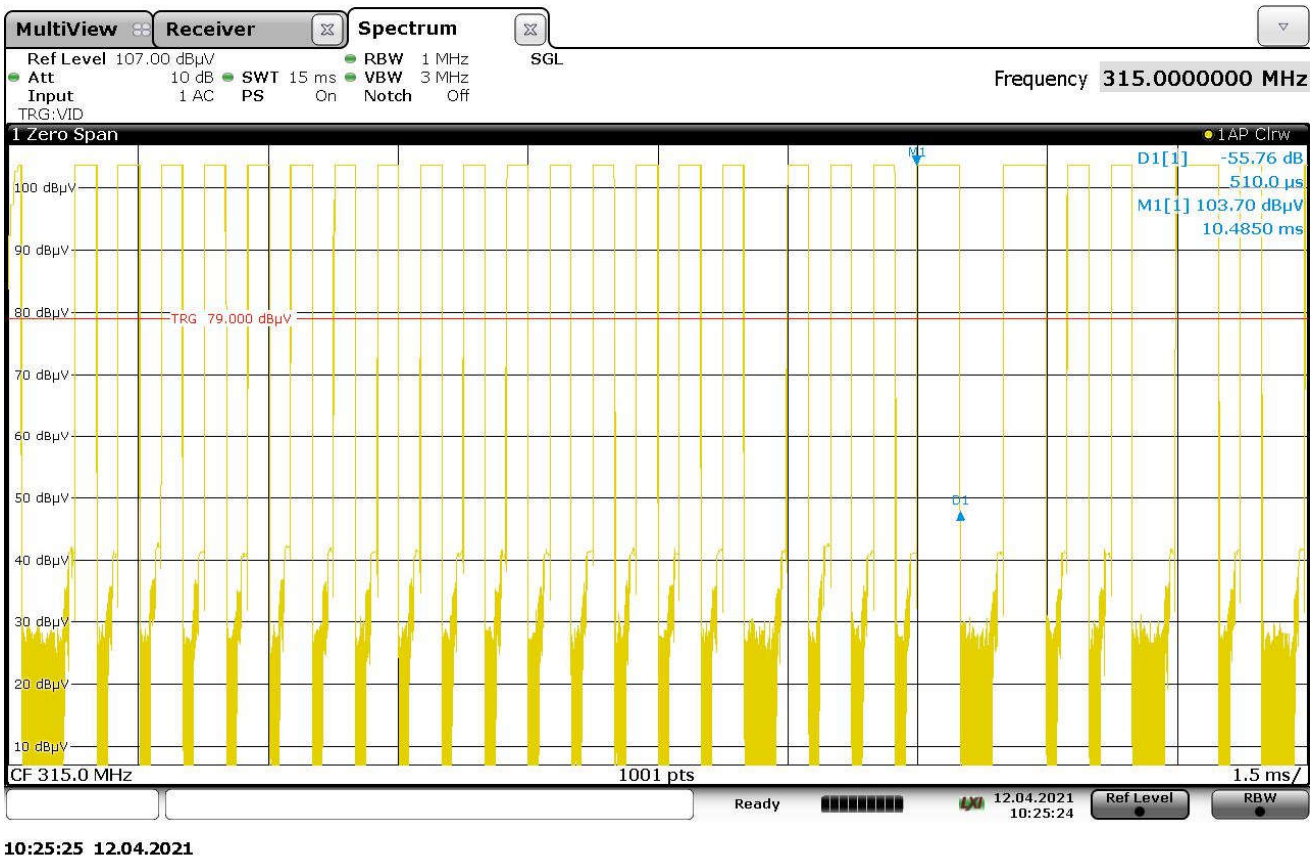
Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G891LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	315MHz
Parameters	Long Pulse = 510usec
Notes	None



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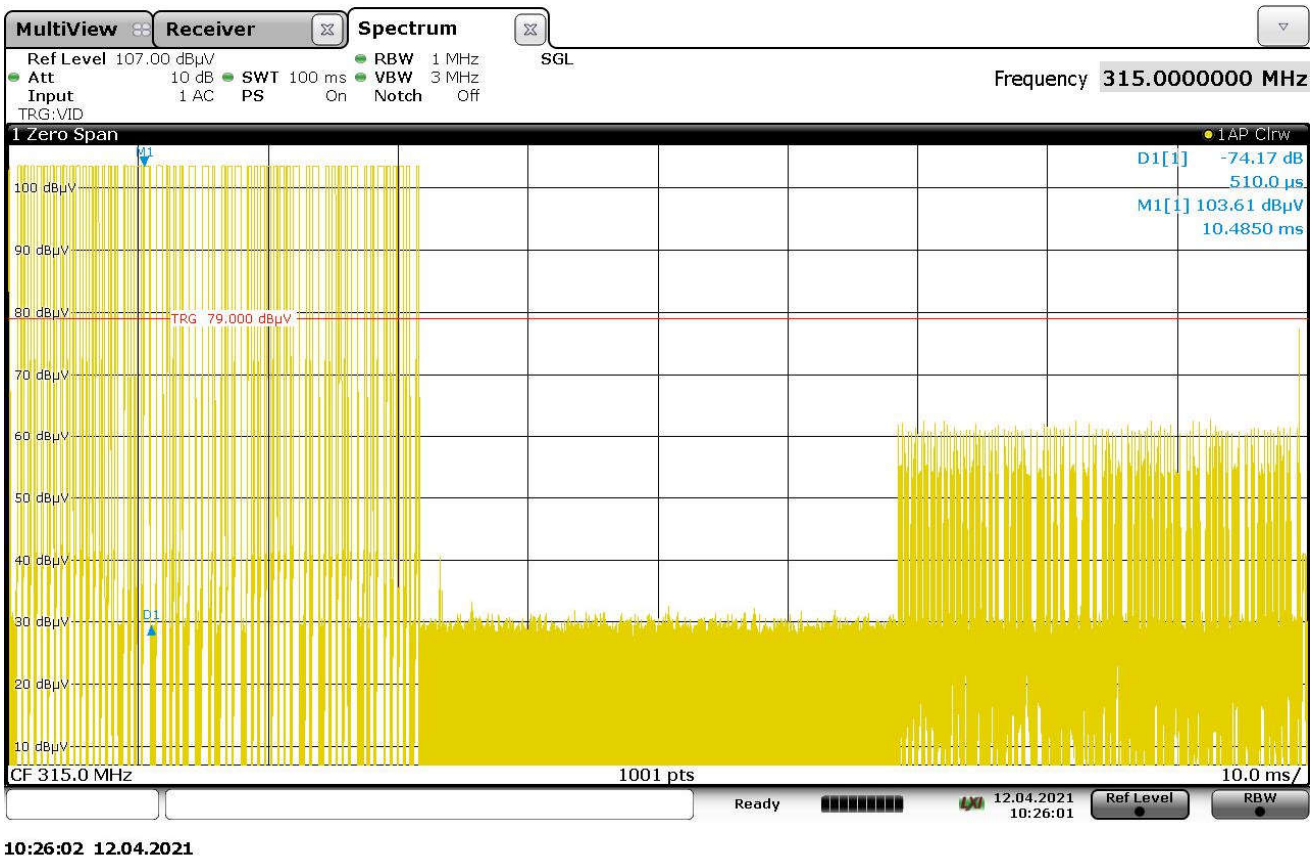
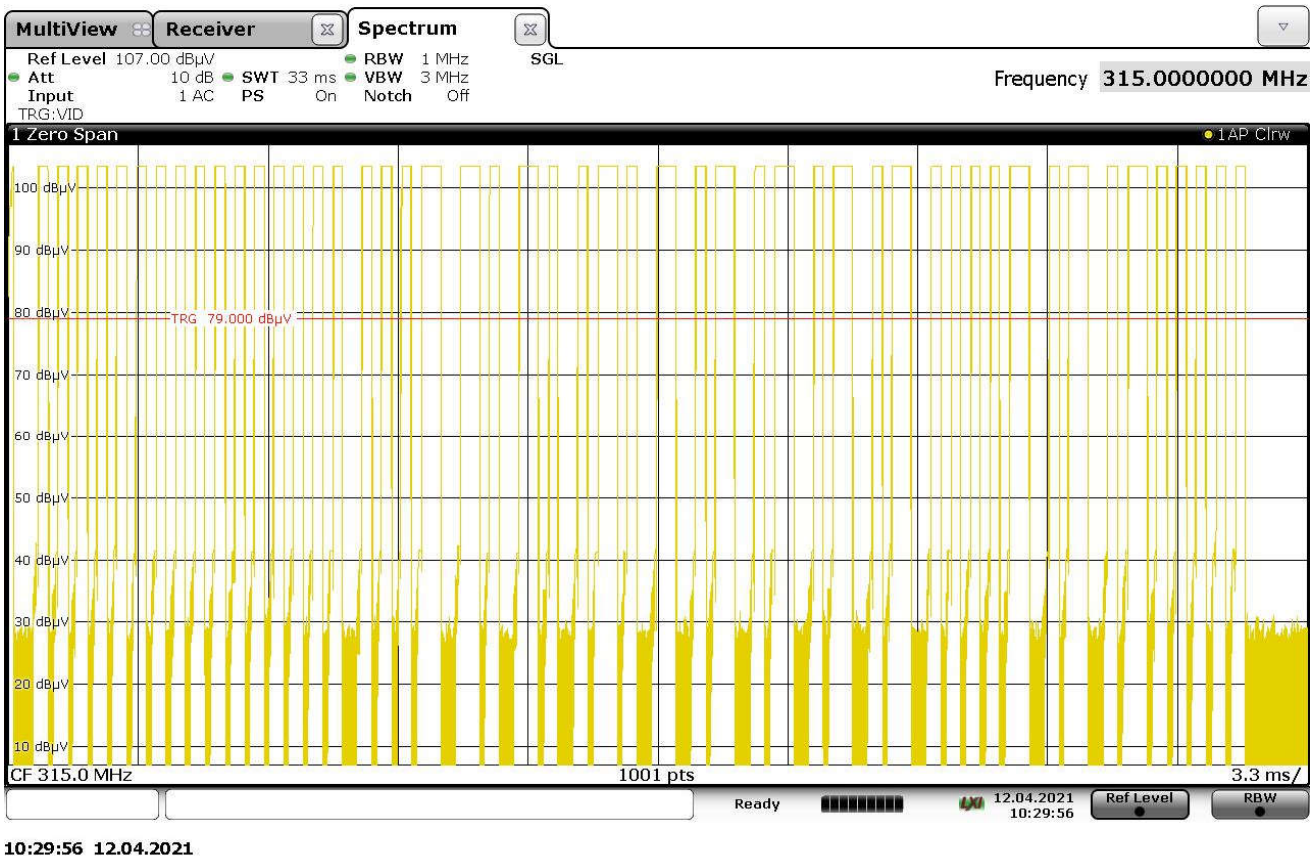
Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G891LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	315MHz
Parameters	Duty Cycle
Notes	None



10:26:02 12.04.2021

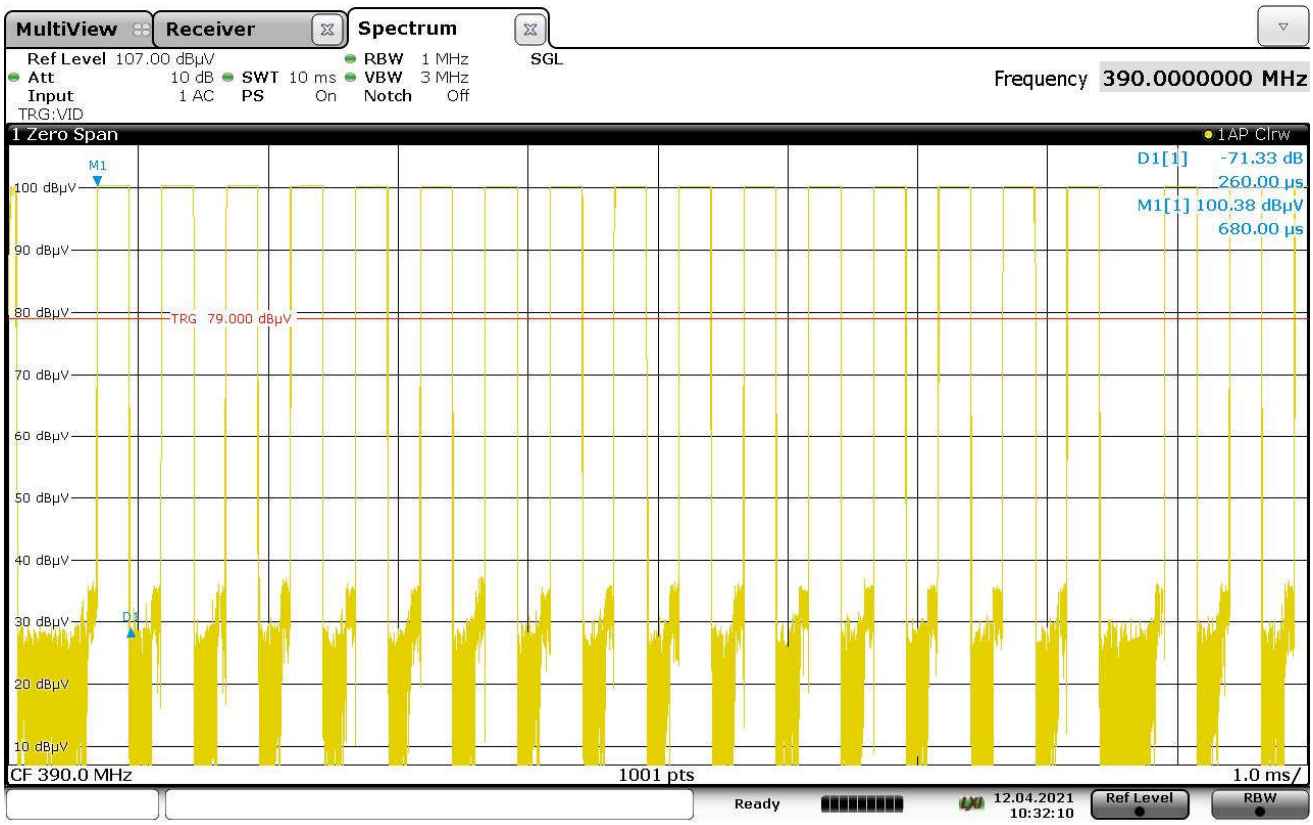
Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G891LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	315MHz
Parameters	Duty Cycle
Notes	None



On time = (38 short pulses x 260usec/short pulse) + (11 long pulses x 510usec/long pulse) = 15.49msec

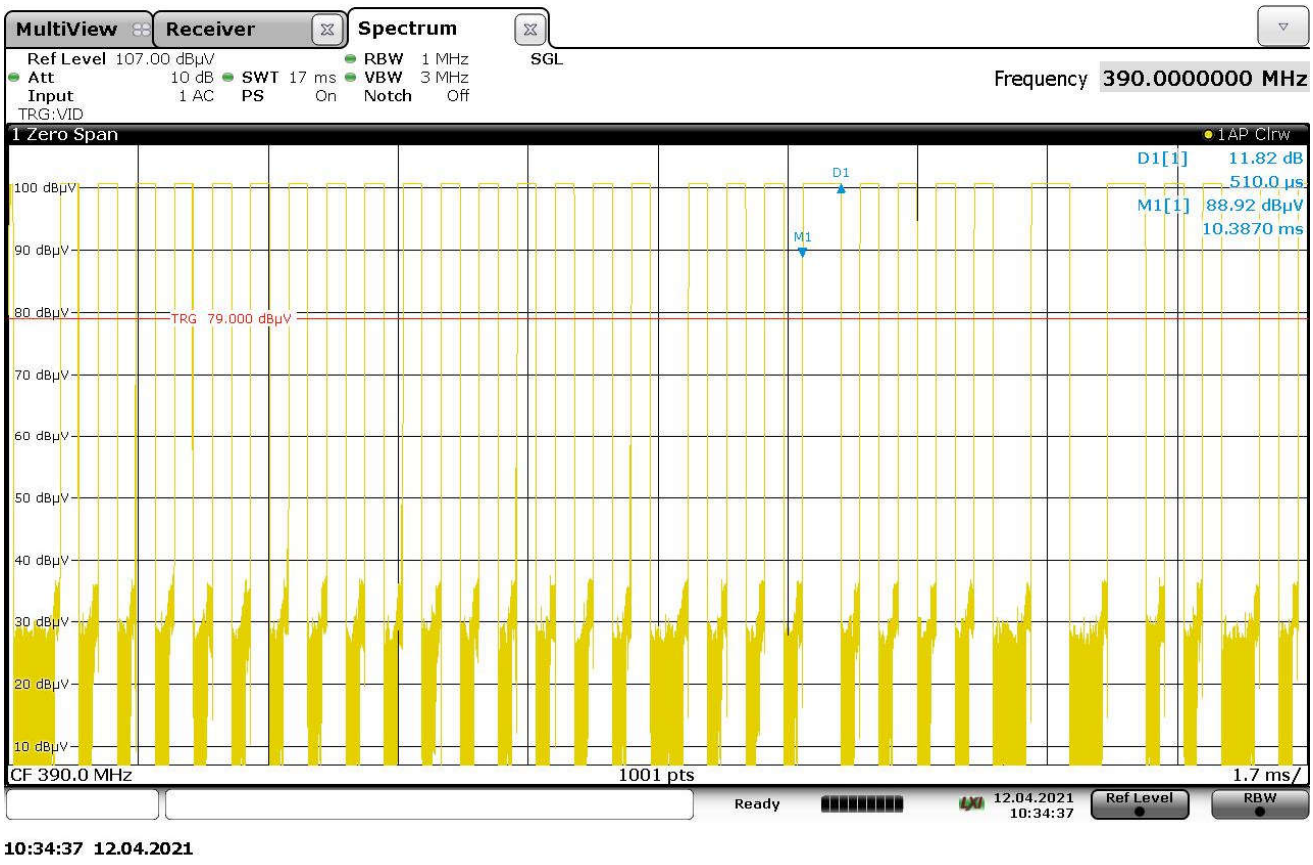
$$\text{Duty Cycle Factor} = 20\log\left(\frac{15.49msec}{(100\text{msec})}\right) = -16.2\text{dB}$$

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G891LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	390MHz
Parameters	Short Pulse = 260usec
Notes	None



10:32:11 12.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G891LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	390MHz
Parameters	Long Pulse = 510usec
Notes	None



Test Details	
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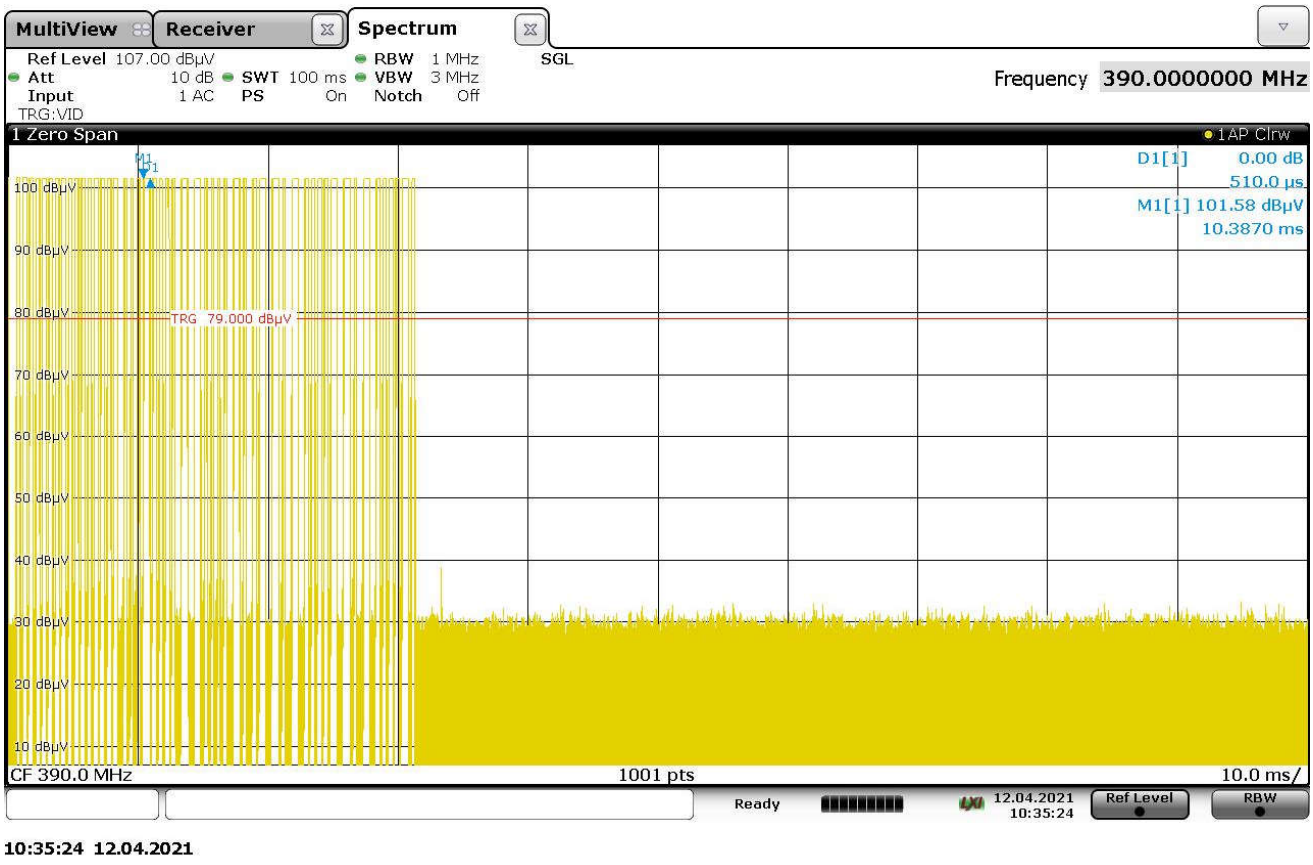
Model	G891LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	390MHz
Parameters	100msec
Notes	None



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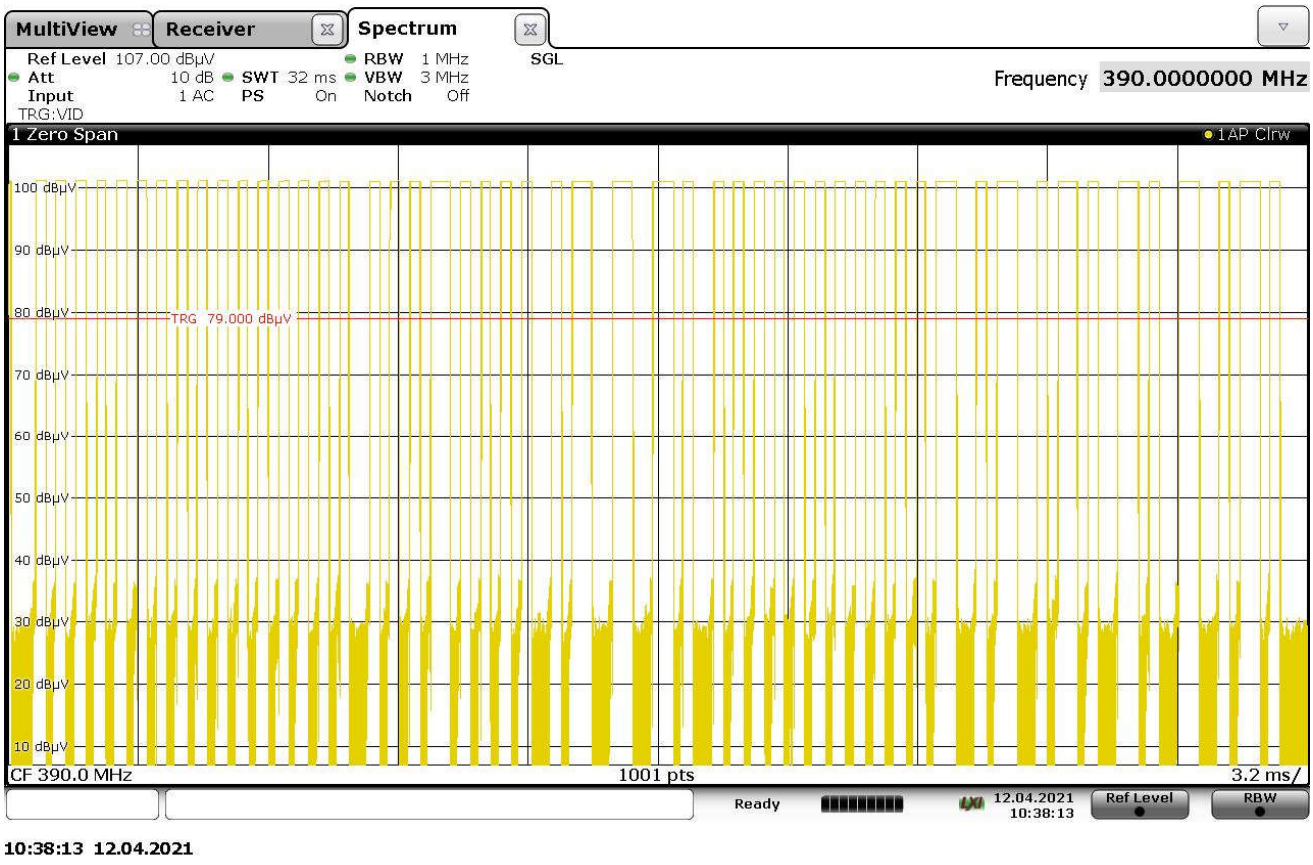
Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G891LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	390MHz
Parameters	Duty Cycle
Notes	None



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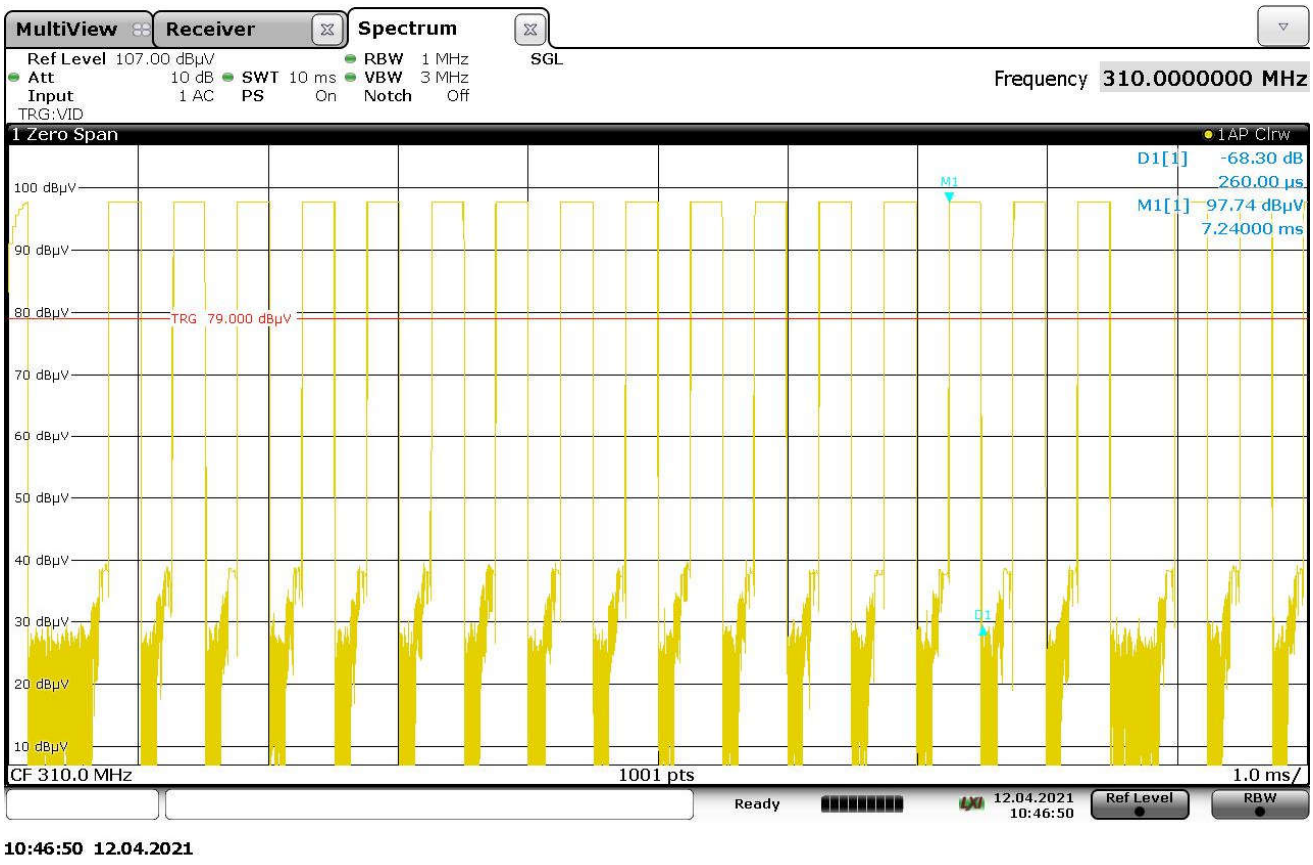
On time = (42 short pulses x 260usec/short pulse) + (10 long pulses x 510usec/long pulse) = 16.02msec

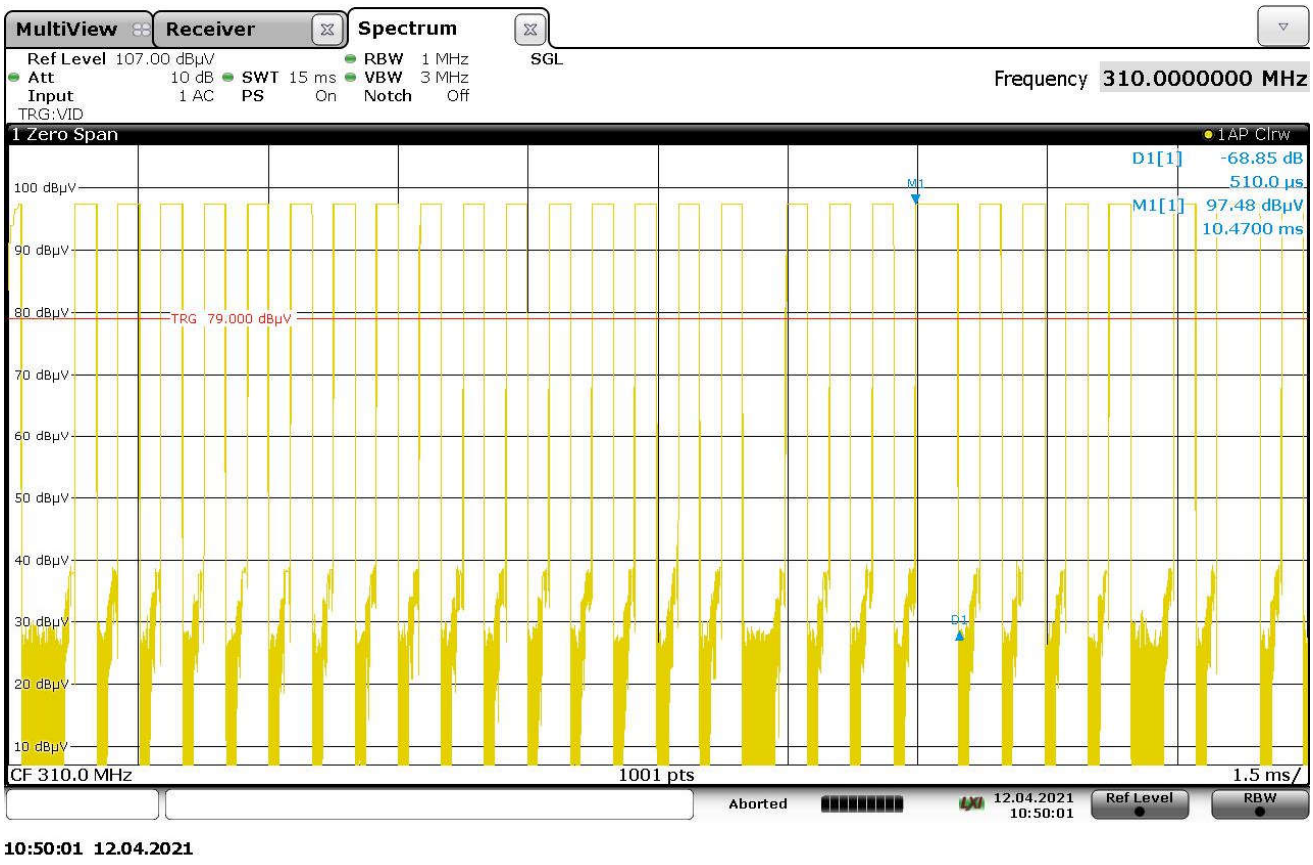
$$\text{Duty Cycle Factor} = 20\log\left(\frac{21.56msec}{(100\text{msec})}\right) = -15.91\text{dB}$$

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G893LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	310MHz
Parameters	Short Pulse = 260usec
Notes	None



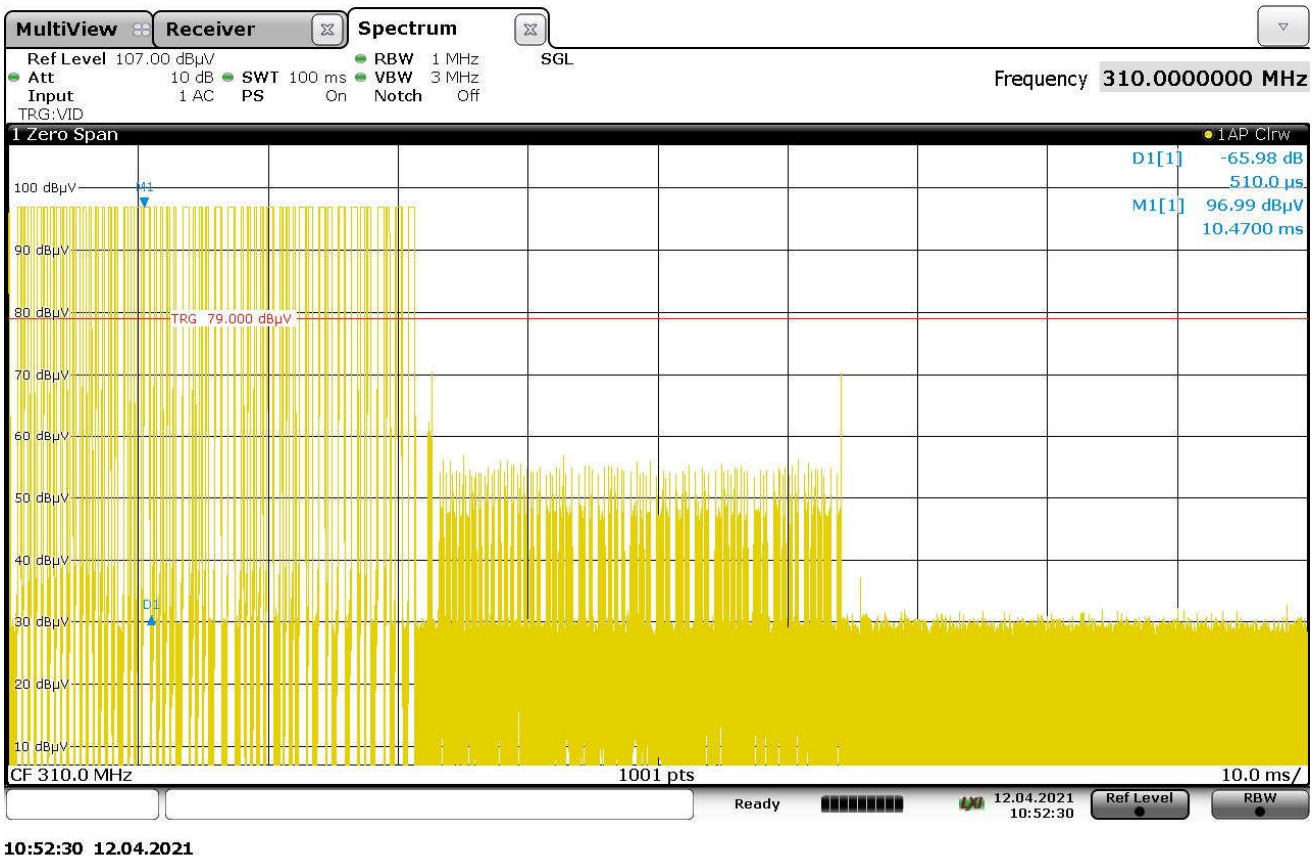
10:46:50 12.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G893LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	310MHz
Parameters	Long Pulse = 510usec
Notes	None



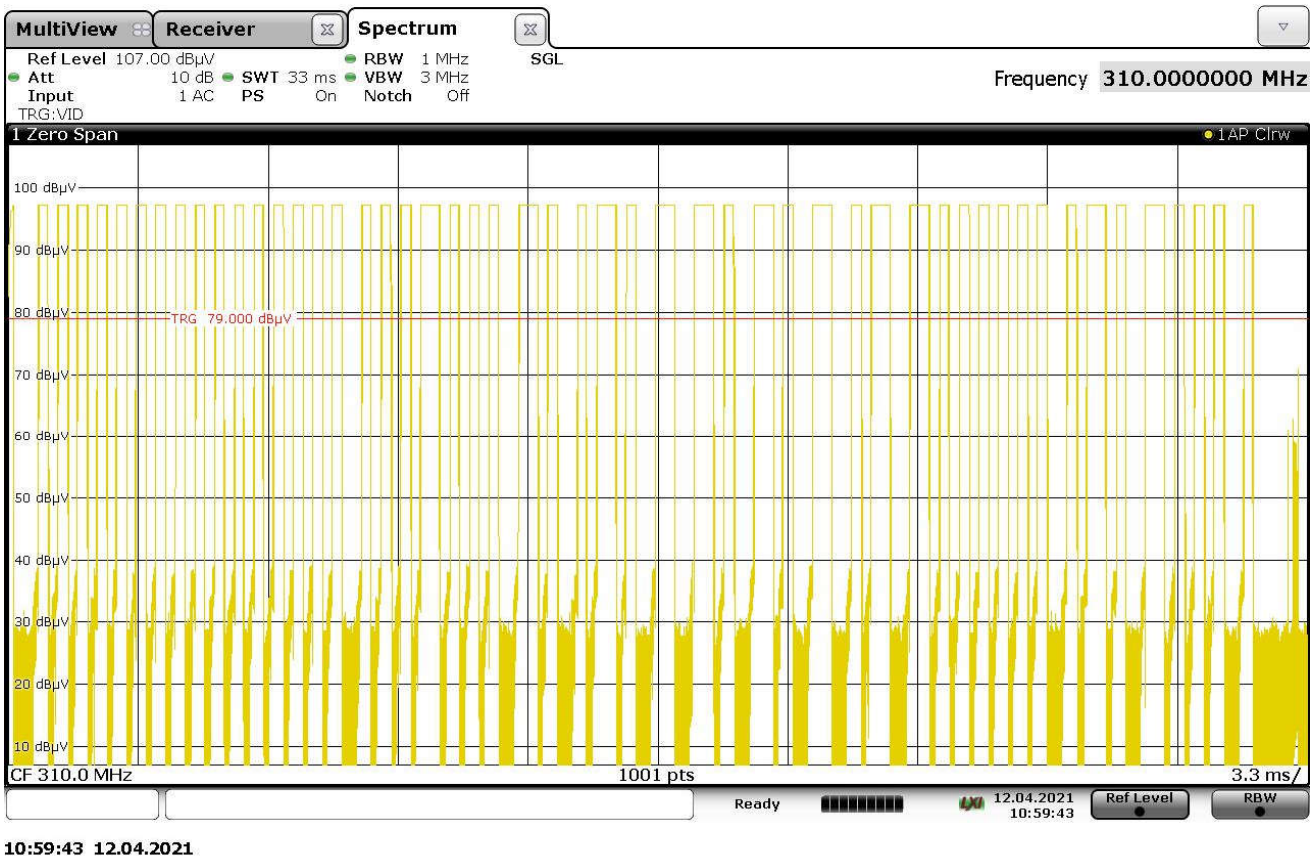
10:50:01 12.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G893LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	310MHz
Parameters	100msec
Notes	None



10:52:30 12.04.2021

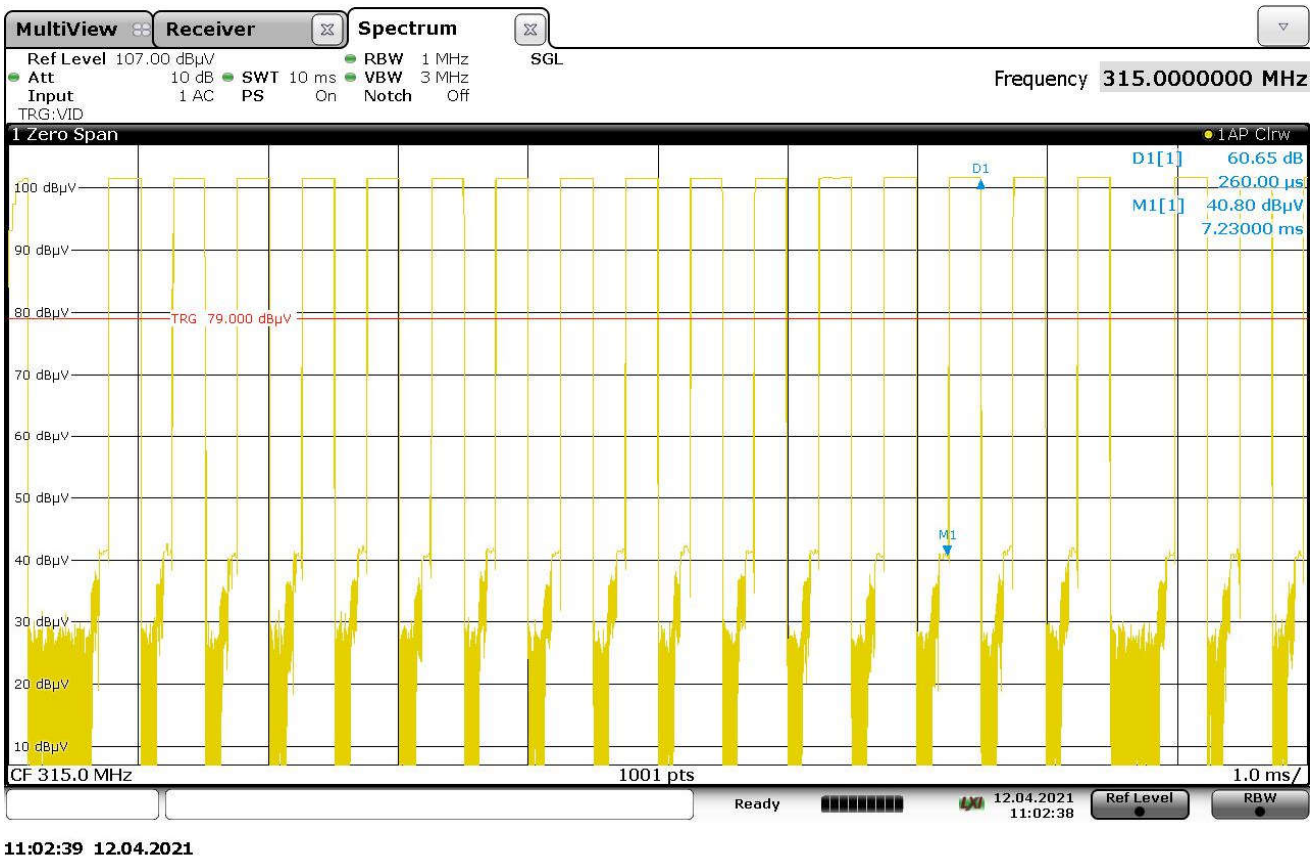
Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G893LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	310MHz
Parameters	Duty Cycle
Notes	None



On time = (40 short pulses x 260usec/short pulse) + (11 long pulses x 510usec/long pulse) = 16.01msec

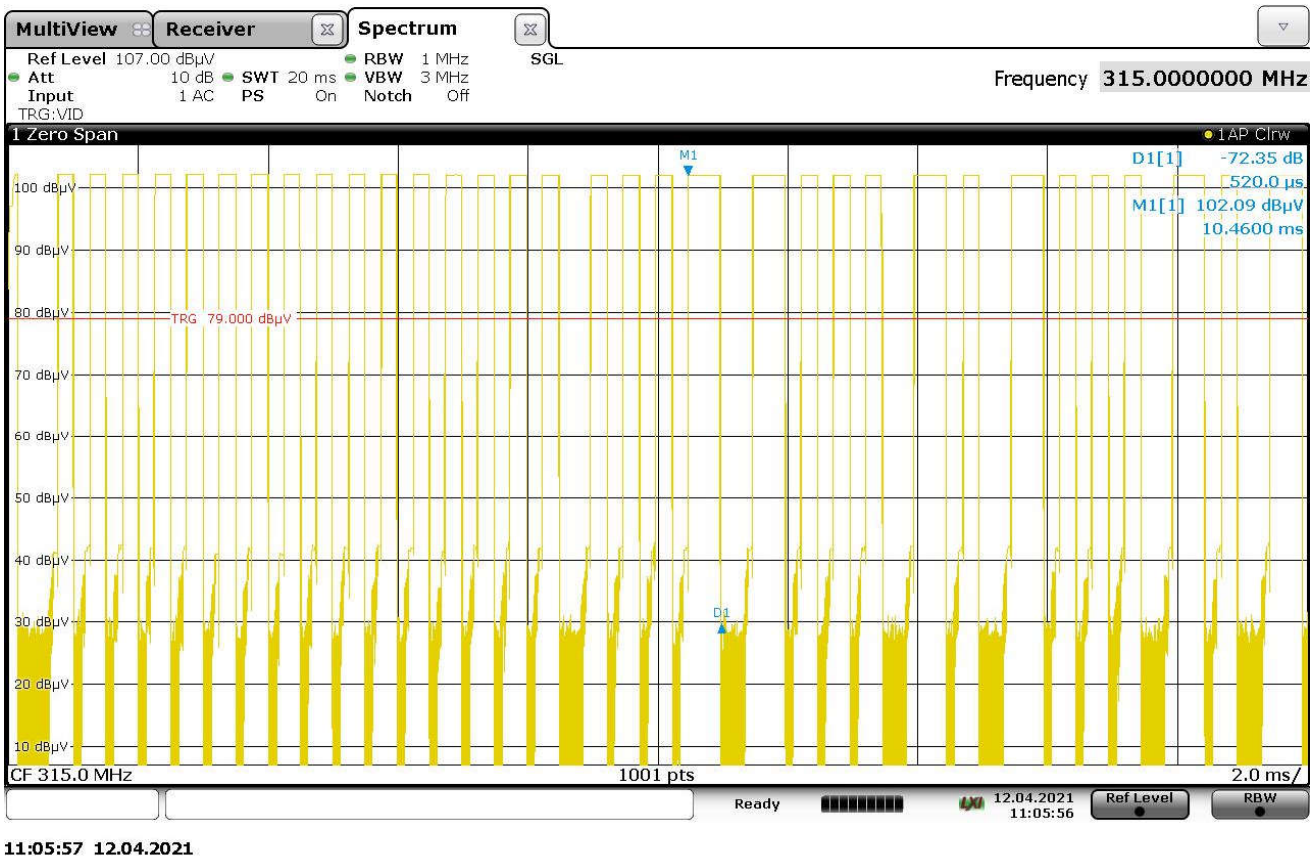
$$\text{Duty Cycle Factor} = 20\log\left(\frac{16.01msec}{(100\text{msec})}\right) = -15.91\text{dB}$$

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G893LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	315MHz
Parameters	Short Pulse = 260usec
Notes	None



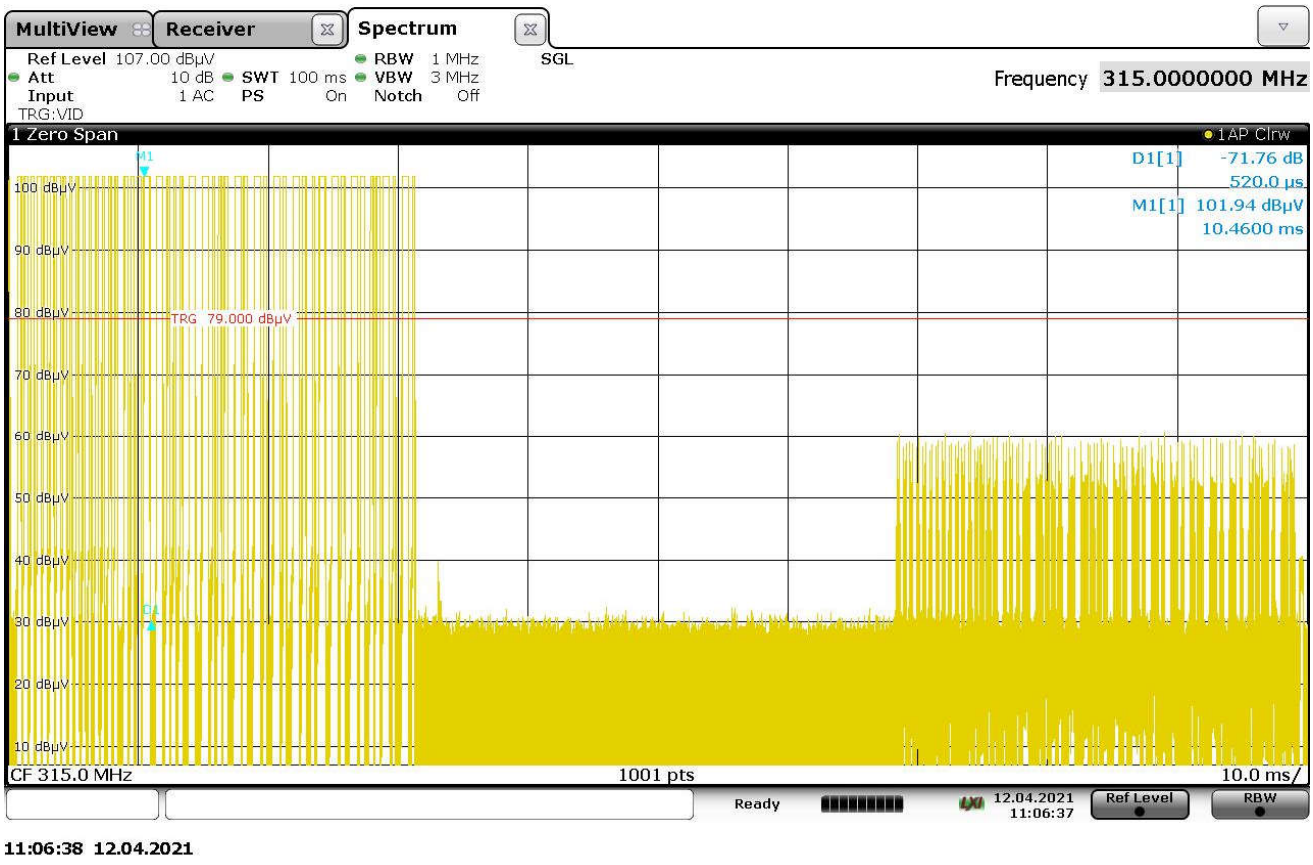
11:02:39 12.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G893LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	315MHz
Parameters	Long Pulse = 520usec
Notes	None



11:05:57 12.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	G893LM
S/N	Continuous
Mode	Periodic Transmission
Carrier Frequency	315MHz
Parameters	Duty Cycle
Notes	None



11:06:38 12.04.2021