Engineering Test Report No. 2100274-01		
Report Date	May 19, 2021	
Manufacturer Name	Chamberlain Group, Inc.	
Manufacturer Address	300 Windsor Dr Oak Brook, IL 60523	
Model No.	811LMX and 813LMX	
Date Received	March 23, 2021	
Test Dates	March 23, 2021 through May 6, 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	Javier Cardenas	MARK E. LONGINOTTI
Tested by	Javier Cardenas	Mark Longinotti
Signature	Raymond J Klouda	
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894	
PO Number	4900074378	

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
–	19 MAY 2021	Initial Release of Engineering Test Report No. 2100274-01

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. 813LMX, (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. 811LMX.

Per Chamberlain Group, Inc. personnel, Model No. 813LMX and Model No. 811LMX are electrically identical aside from the following:

- Model No. 813LMX circuit board is fully populated and Model No. 811LMX circuit board is only populated with a single button.

The EUTs, Model No. 813LMX and Model No. 811LMX, 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. 813LMX and Model No. 811LMX, 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. 813LMX and Model No. 811LMX, 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.	813LMX
S/N	None Assigned
Band of Operation	310, 315 and 390 MHz EDIP Code 315 and 390MHz C Code
20dB Bandwidth	56.9kHz
99% Bandwidth	106.39kHz
Size of EUT	8cm x 4.5cm x 1.5cm
Product Description	Door and Gate Operator
Model/Part No.	811LMX
S/N	None Assigned
Band of Operation	310, 315 and 390 MHz EDIP Code 315 and 390MHz C Code
20dB Bandwidth	56.9kHz
99% Bandwidth	106.39kHz
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 EUTs were 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 EUTs 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	21°C
Relative Humidity	18%
Atmospheric Pressure	1004.1mb

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, Model No. 813LMX and Model No. 811LMX, 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

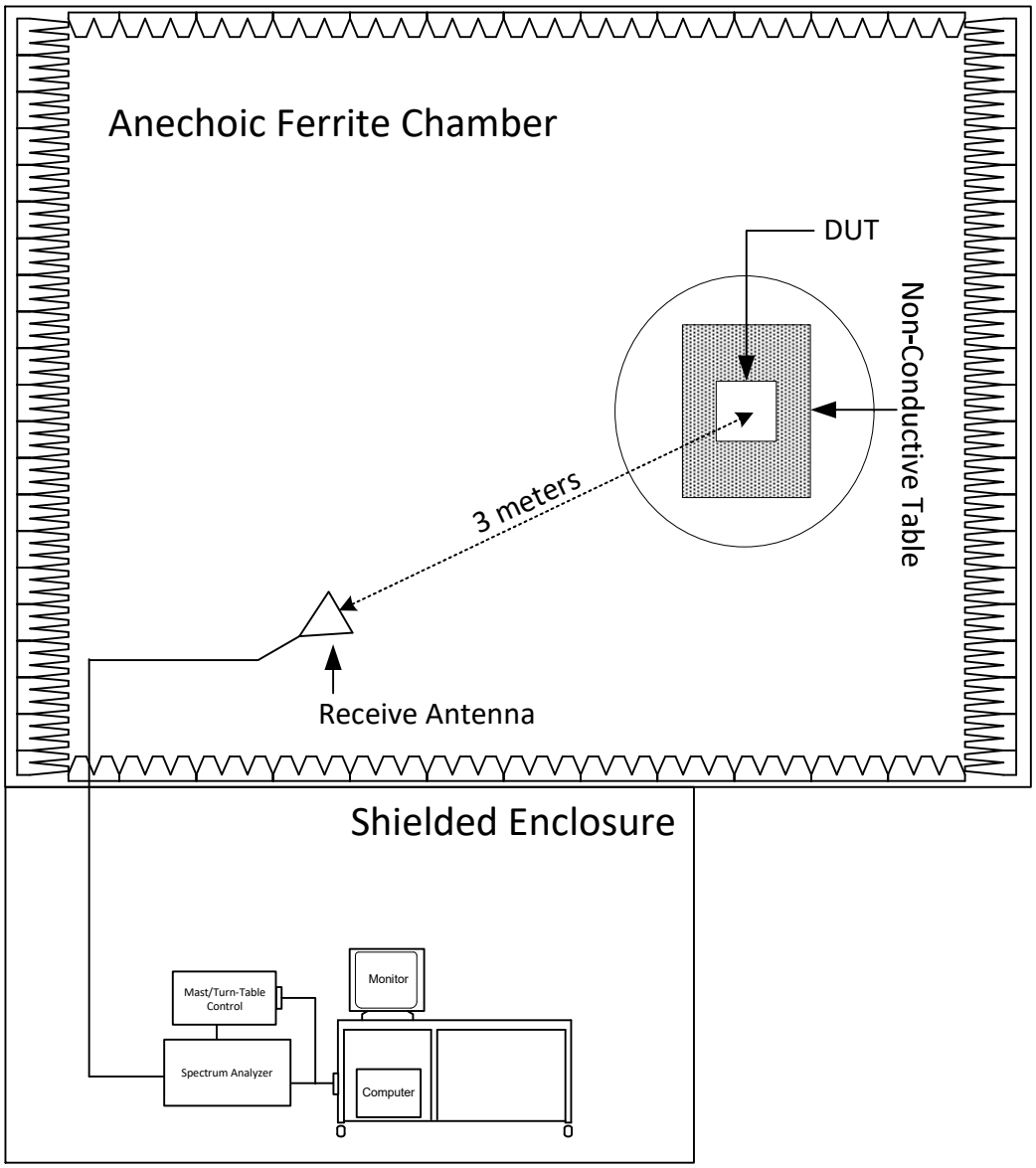
811LMX

811LMX

813LMX

813LMX

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	
NTA3	BILOG ANTENNA	TESEQ	6112D	32853	25-1000MHz	10/20/2020	10/20/2021
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
RBG3	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101592	2HZ-44GHZ	4/20/2020	5/20/2021
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	Door and Gate Operator
Model	813LMX & 811LMX
Serial No	None Assigned
Mode	Normal Operation
Test Date	March 23 to 24, 2021

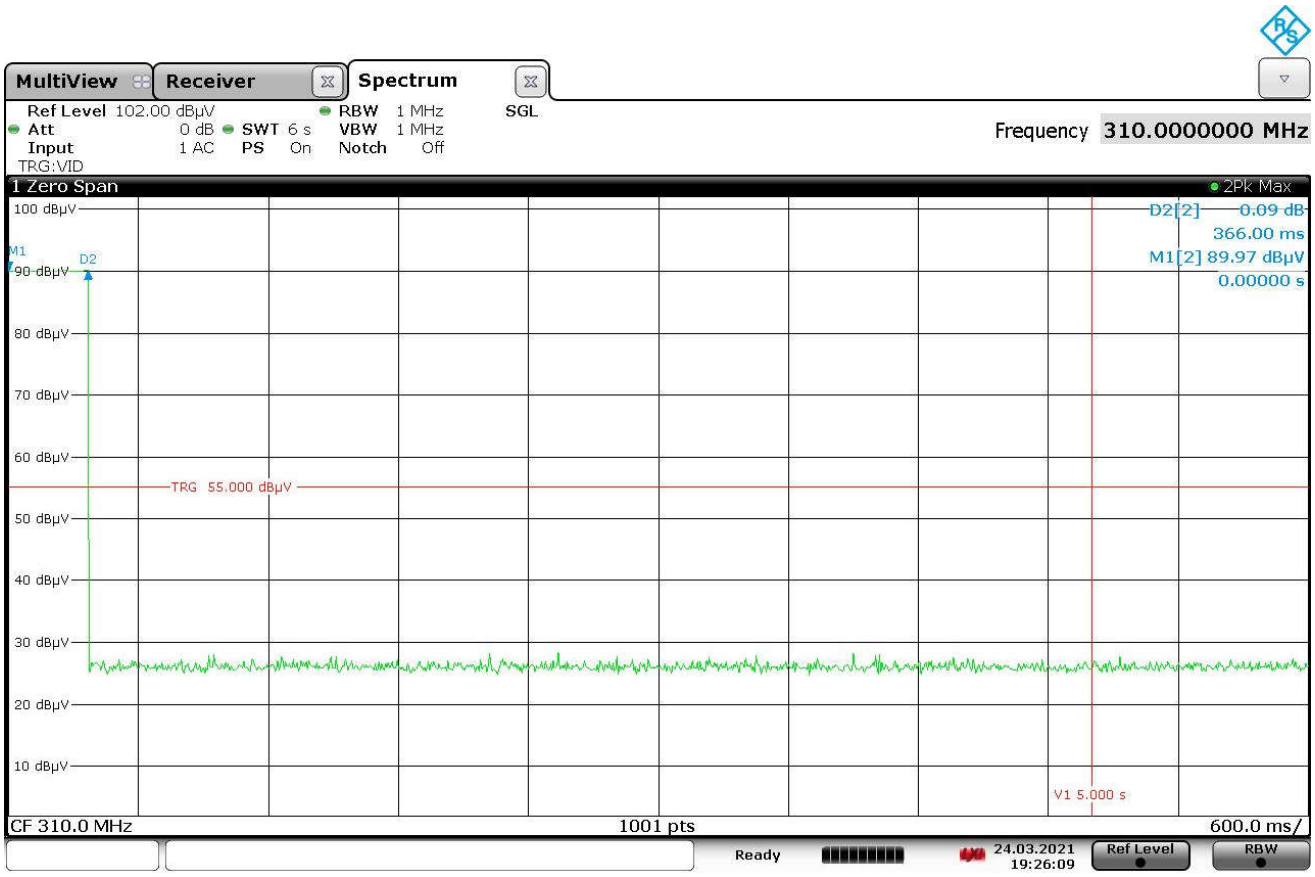
Test Setup Details	
Setup Format	Tabletop
Height of Support	NA
Type of Test Site	Shielded Enclosure
Note	None

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.

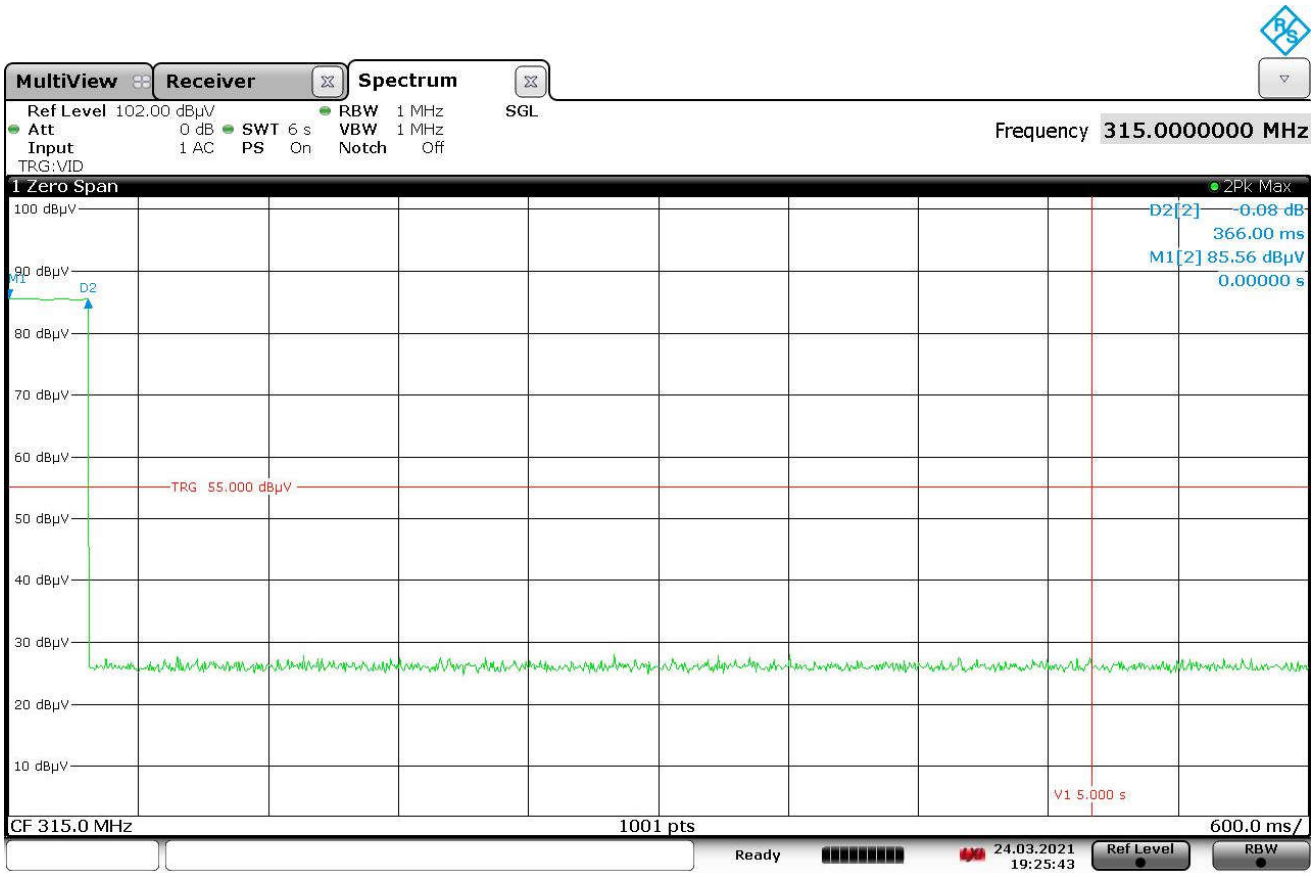
Procedures
The spectrum analyzer was setup to display the time domain trace. The EUT was set to transmit normally. The spectrum analyzer was used to record the amount of time that the EUT remained active following activation.

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	310MHz
Parameters	Operation Time = 366msec
Notes	EDIP Code



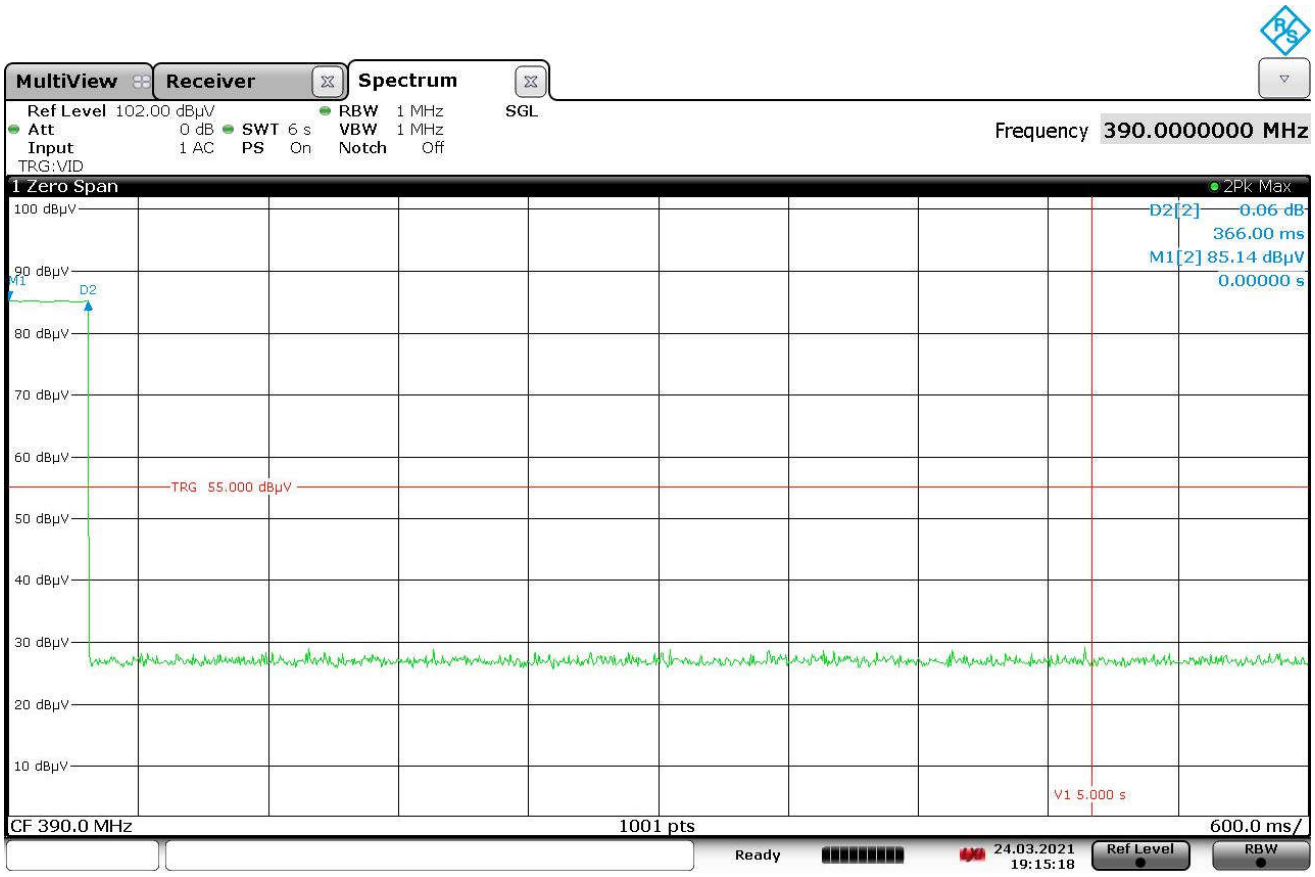
19:26:10 24.03.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	315MHz
Parameters	Operation Time = 366msec
Notes	EDIP Code



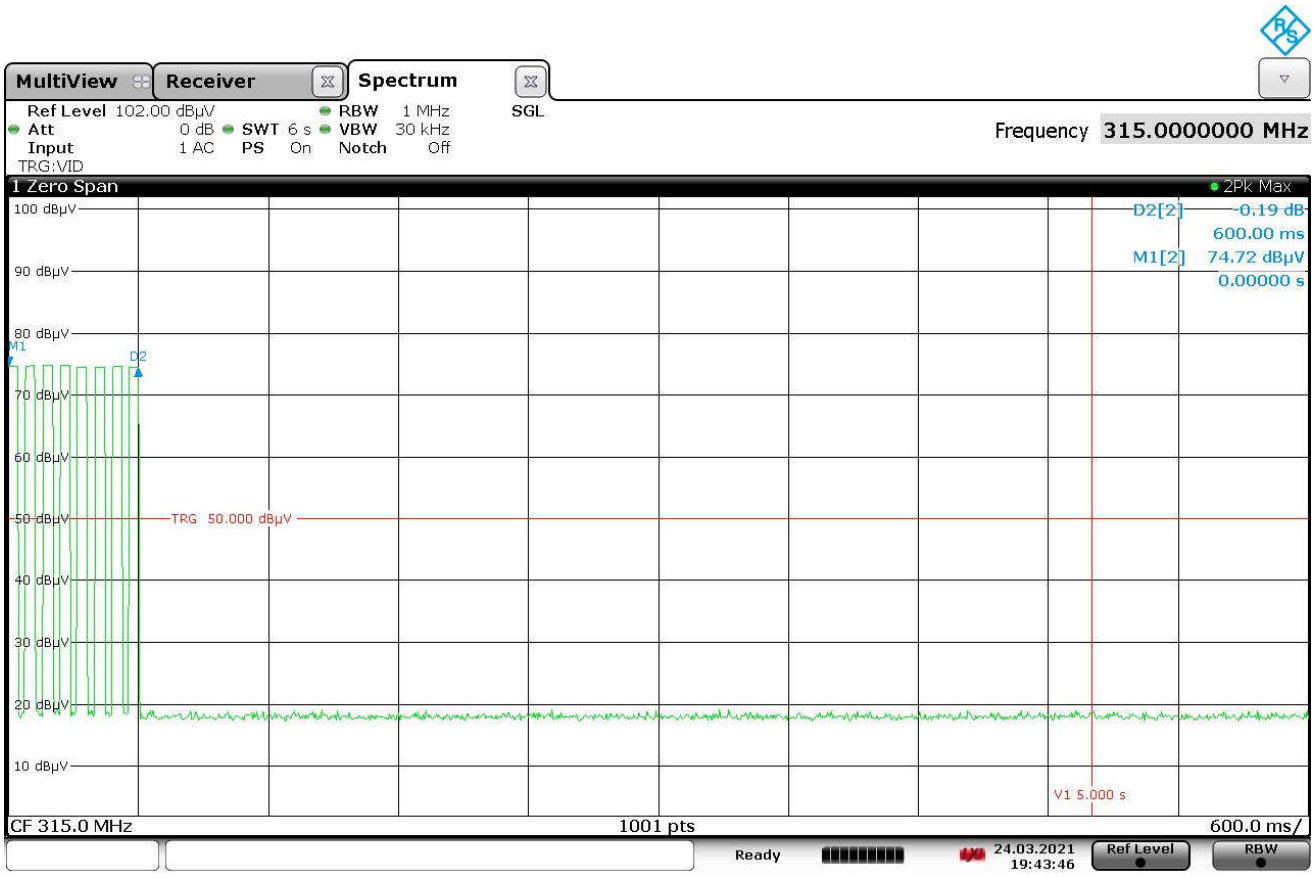
19:25:43 24.03.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	390MHz
Parameters	Operation Time = 366msec
Notes	EDIP Code



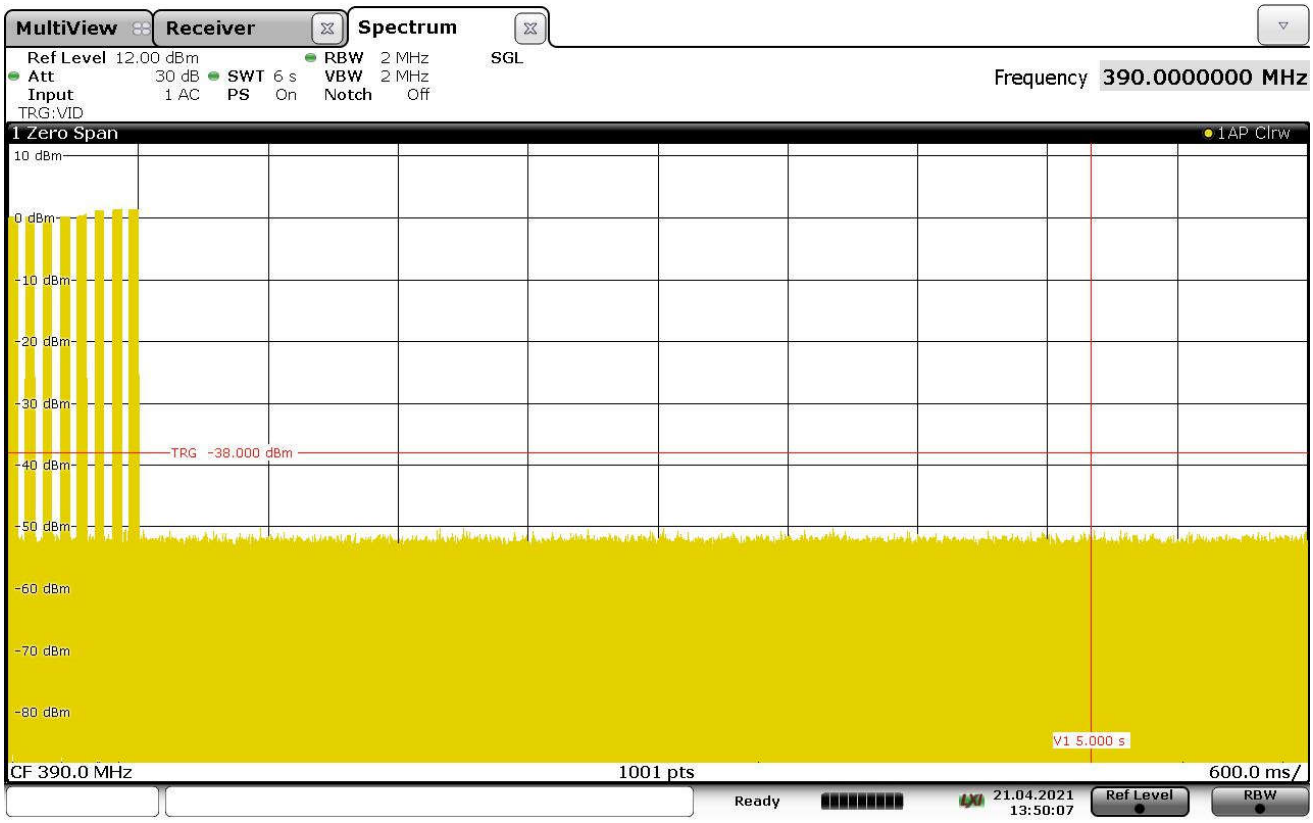
19:15:19 24.03.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	811LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	315MHz
Parameters	Operation Time = 600msec
Notes	C Code



19:43:47 24.03.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	811LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	390MHz
Parameters	Operation Time = 600msec
Notes	C Code



13:50:07 21.04.2021

21. Duty Cycle Factor Measurements

Test Information	
Manufacturer	Chamberlain Group, Inc.
Product	Door and Gate Operator
Model	813LMX & 811LMX
Serial No	None Assigned
Mode	Normal Operation
Test Date	March 23 to 24, 2021

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

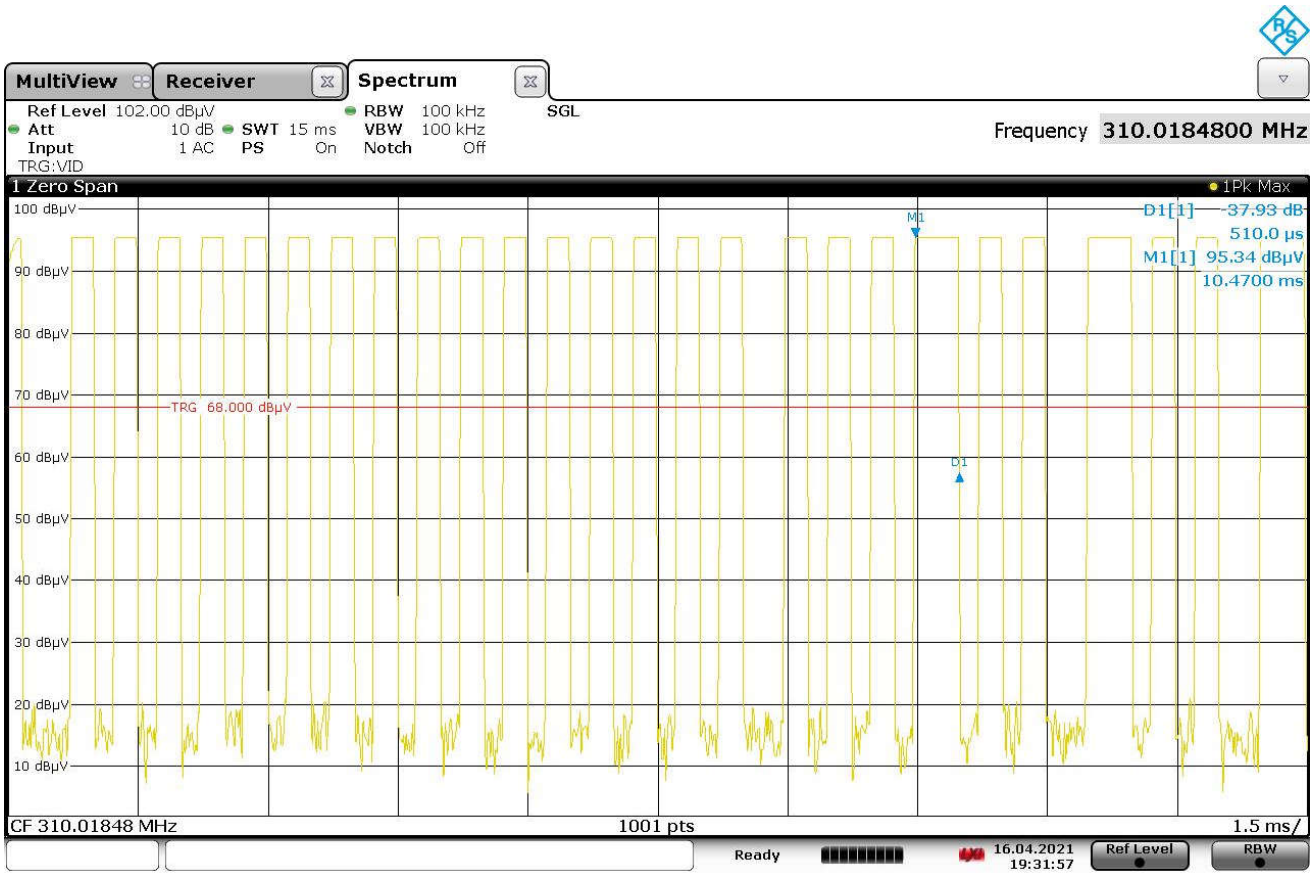
Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 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	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	310MHz
Parameters	Short Pulse = 250usec
Notes	EDIP Code

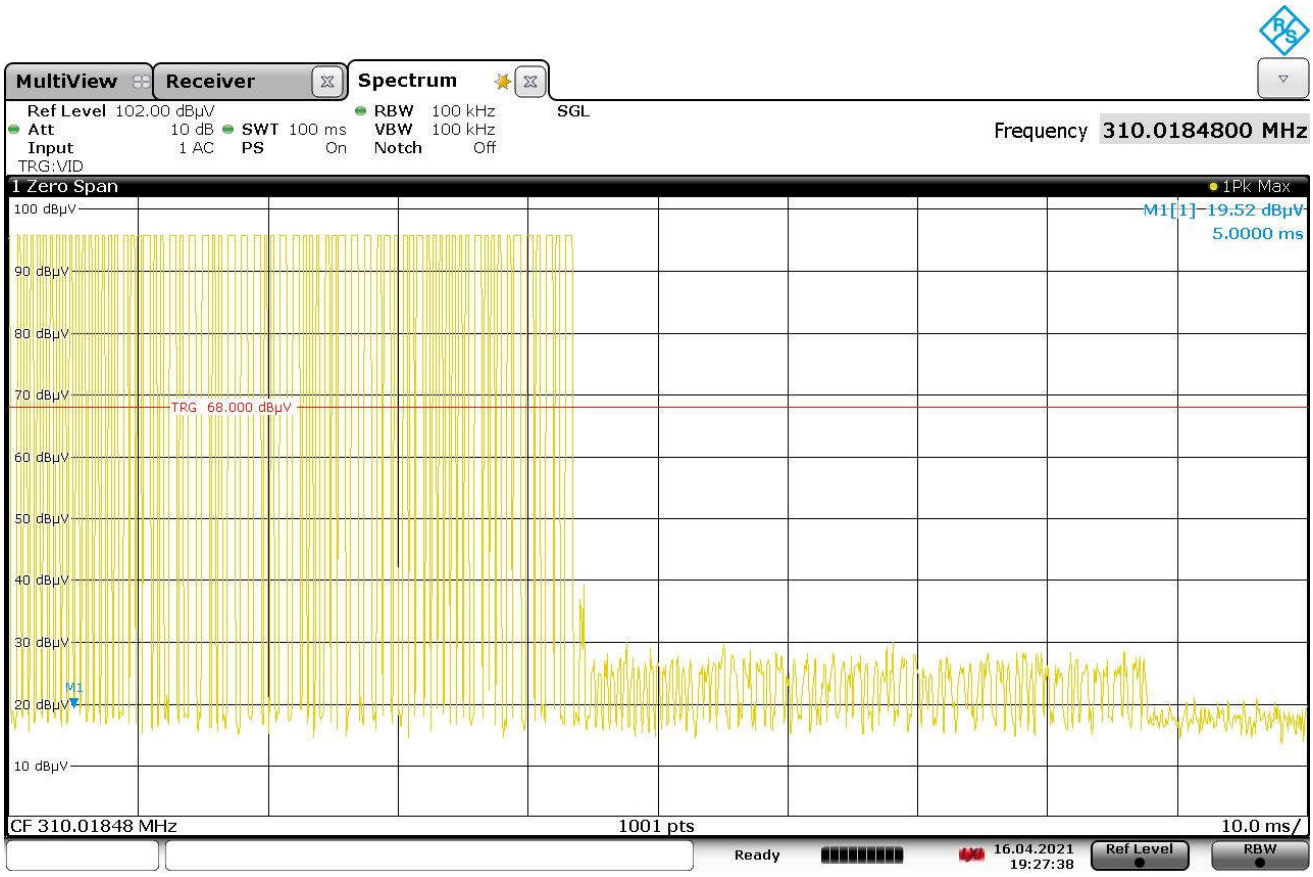
19:30:25 16.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	310MHz
Parameters	Long Pulse = 510usec
Notes	EDIP Code



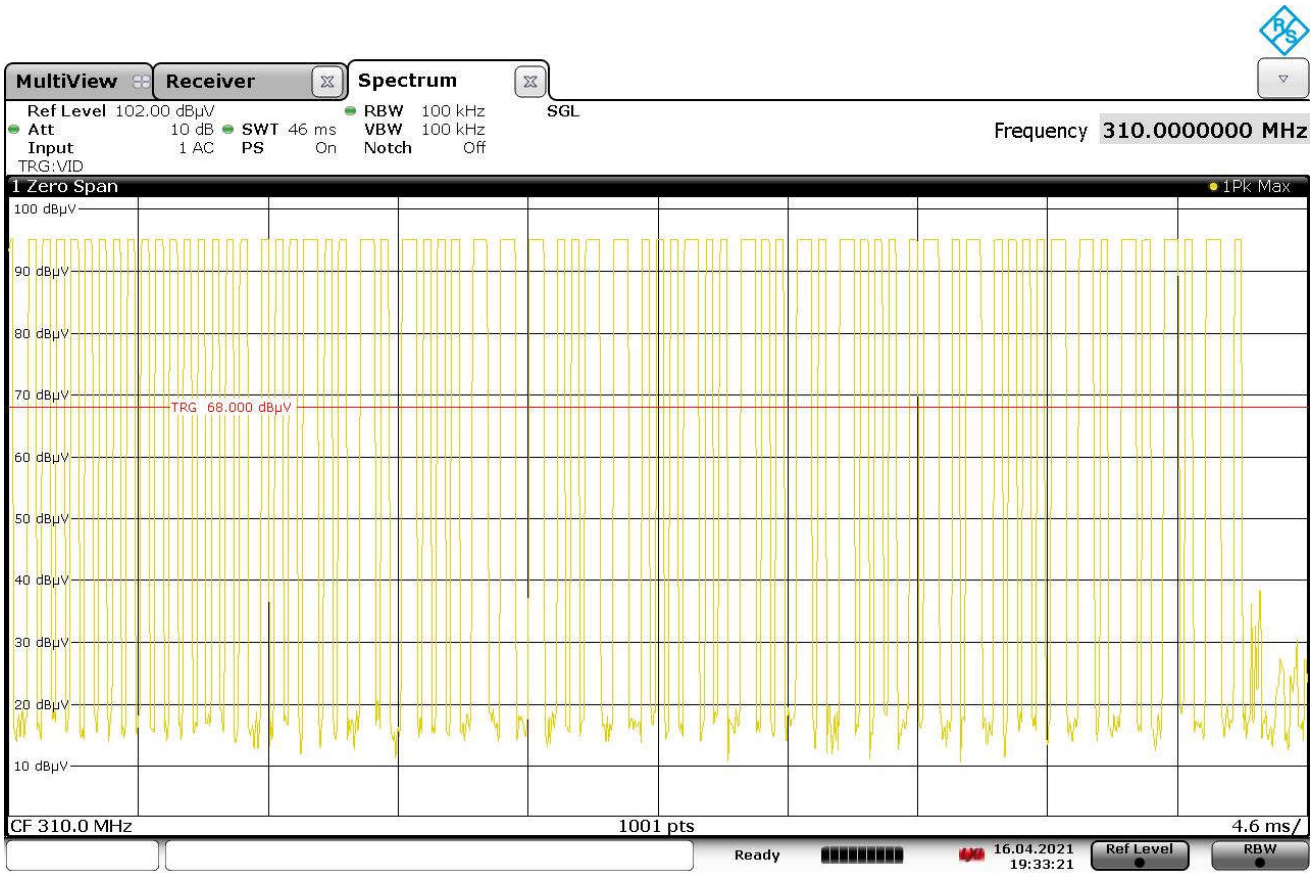
19:31:58 16.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	310MHz
Parameters	100msec
Notes	EDIP Code



19:27:38 16.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	310MHz
Parameters	Duty Cycle
Notes	EDIP Code



19:33:22 16.04.2021

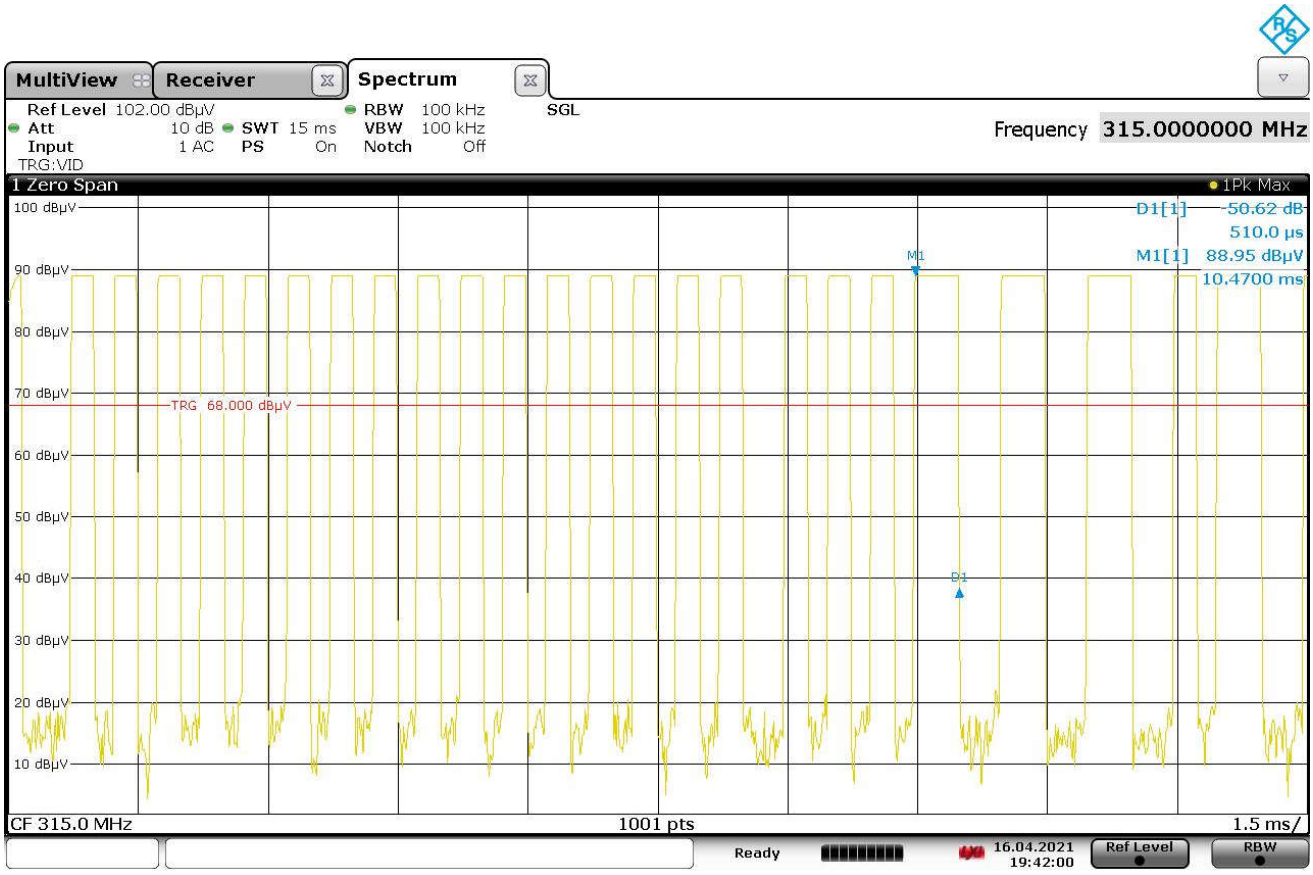
On time = (48 short pulses x 250usec/short pulse) + (19 long pulses x 510usec/long pulse) = 21.69msec

$$\text{Duty Cycle Factor} = 20\log\left(\frac{21.69msec}{(100\text{msec})}\right) = -13.27\text{dB}$$

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	315MHz
Parameters	Short Pulse = 255usec
Notes	EDIP Code

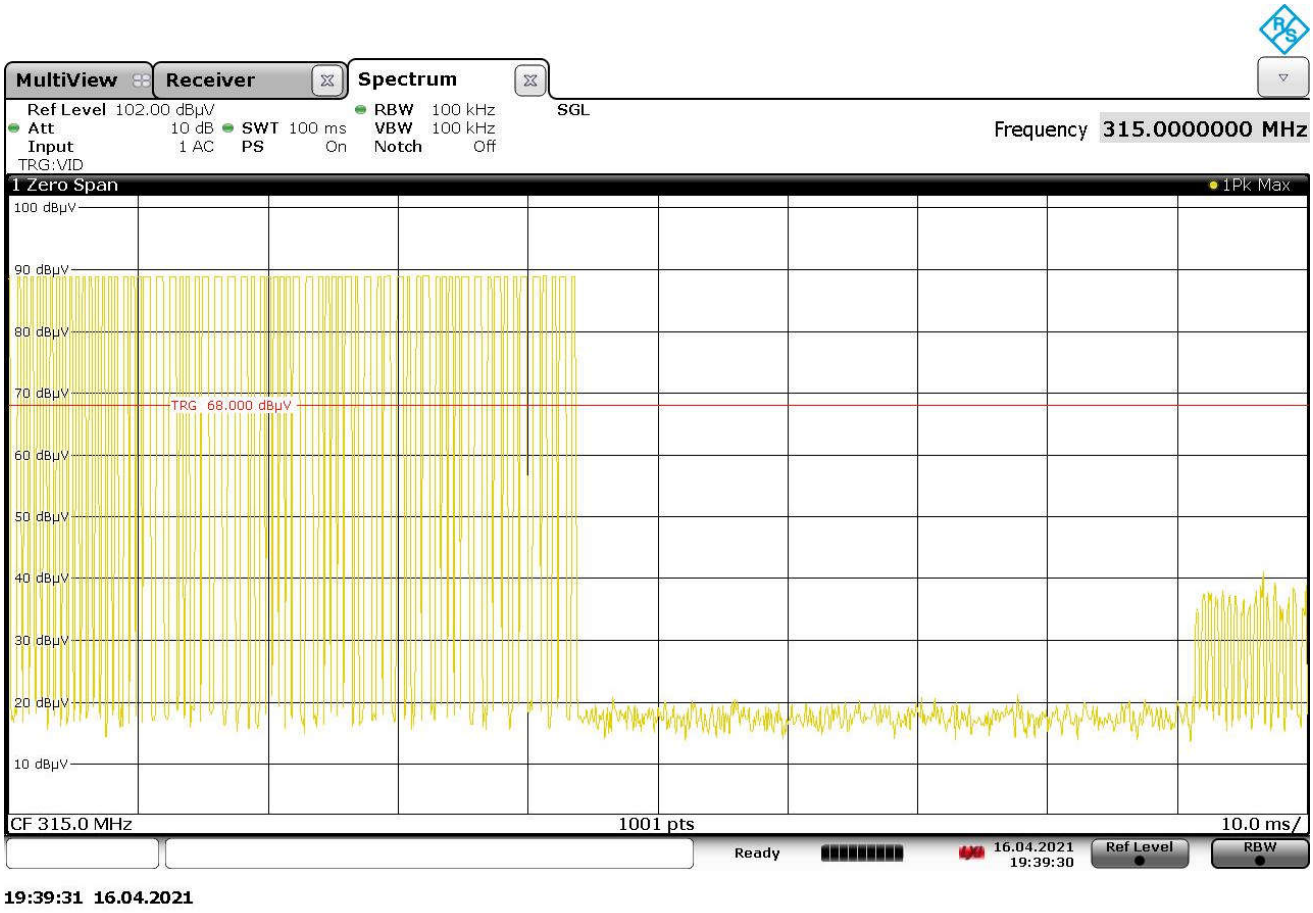
19:41:05 16.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	315MHz
Parameters	Long Pulse = 510usec
Notes	EDIP Code



19:42:00 16.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	315MHz
Parameters	Duty Cycle
Notes	EDIP Code



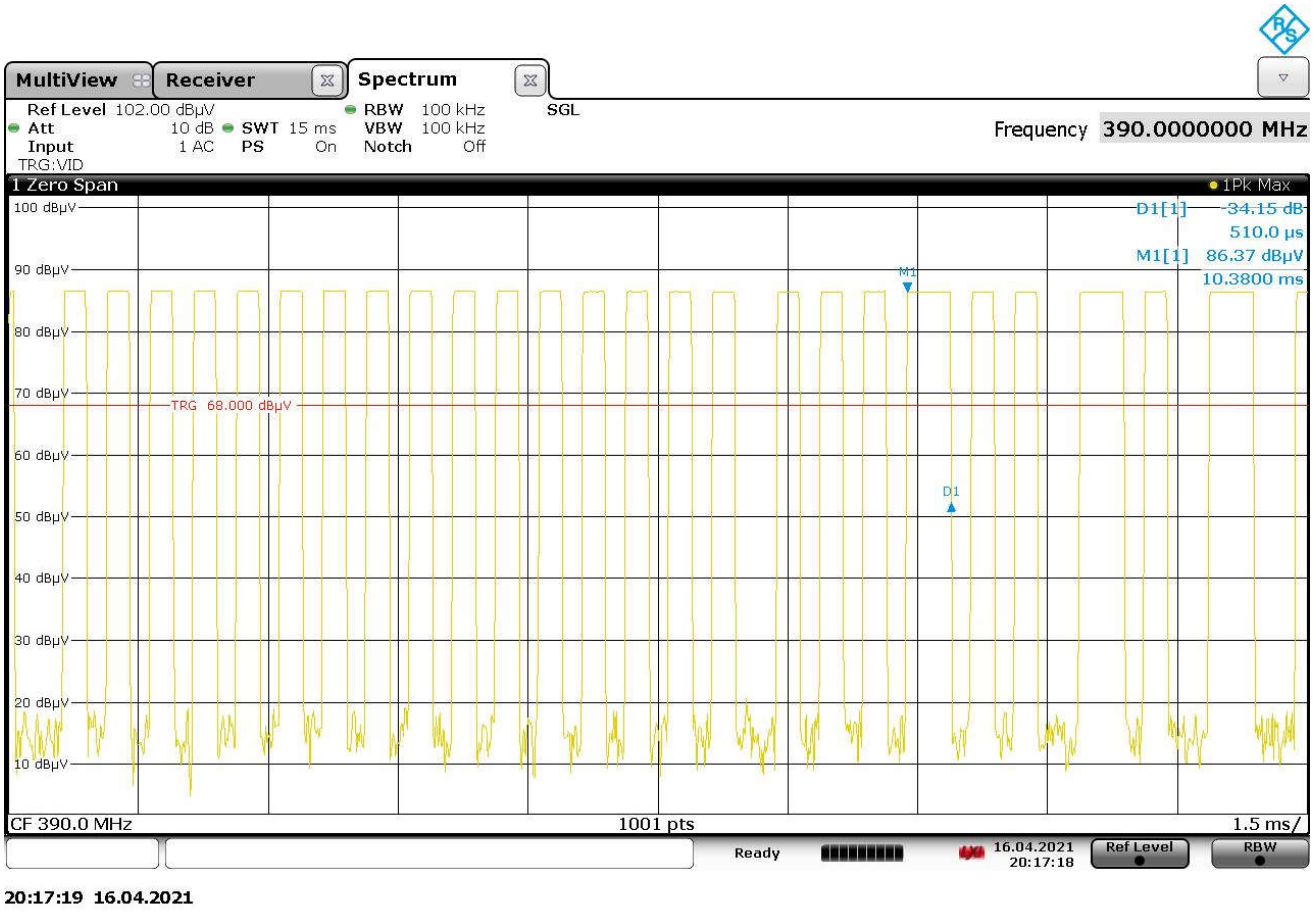
On time = (50 short pulses x 255usec/short pulse) + (18 long pulses x 510usec/long pulse) = 21.9msec

$$\text{Duty Cycle Factor} = 20\log\left(\frac{21.9msec}{(100\text{msec})}\right) = -13.19\text{dB}$$

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	390MHz
Parameters	Short Pulse = 248usec
Notes	EDIP Code

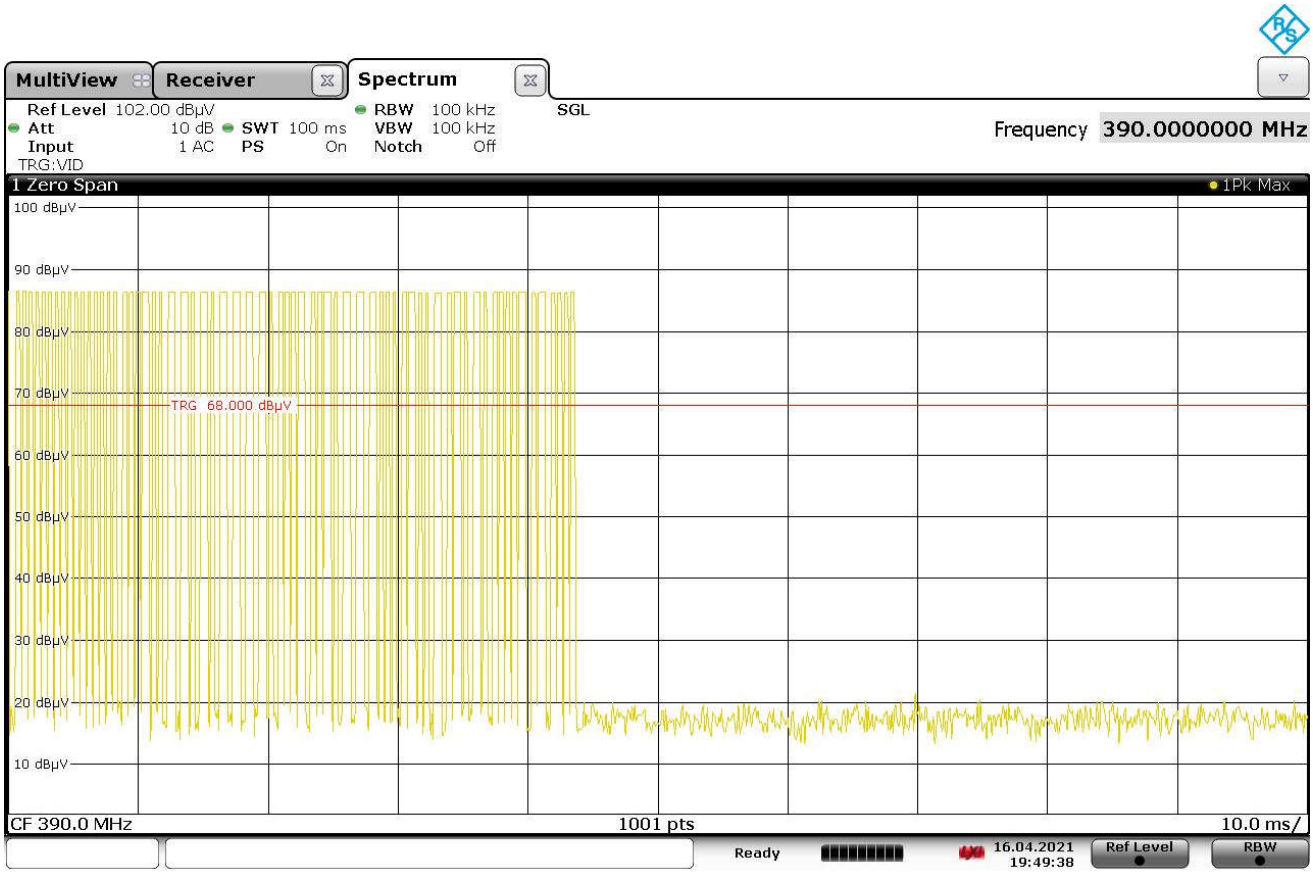
20:08:25 16.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	390MHz
Parameters	Long Pulse = 510usec
Notes	EDIP Code



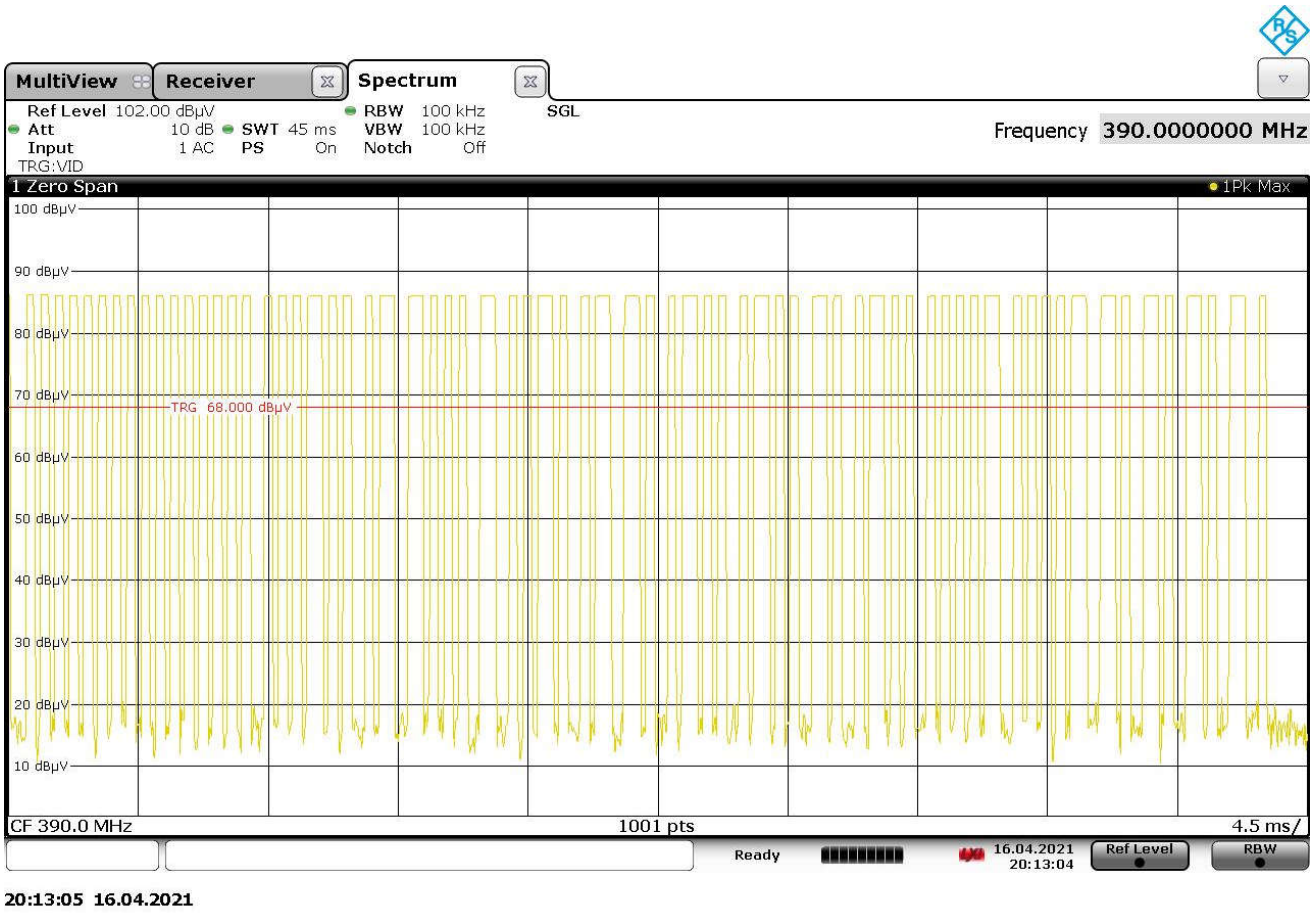
20:17:19 16.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	390MHz
Parameters	100msec
Notes	EDIP Code



19:49:38 16.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	Continuous
Mode	None Assigned
Carrier Frequency	390MHz
Parameters	Duty Cycle
Notes	EDIP Code

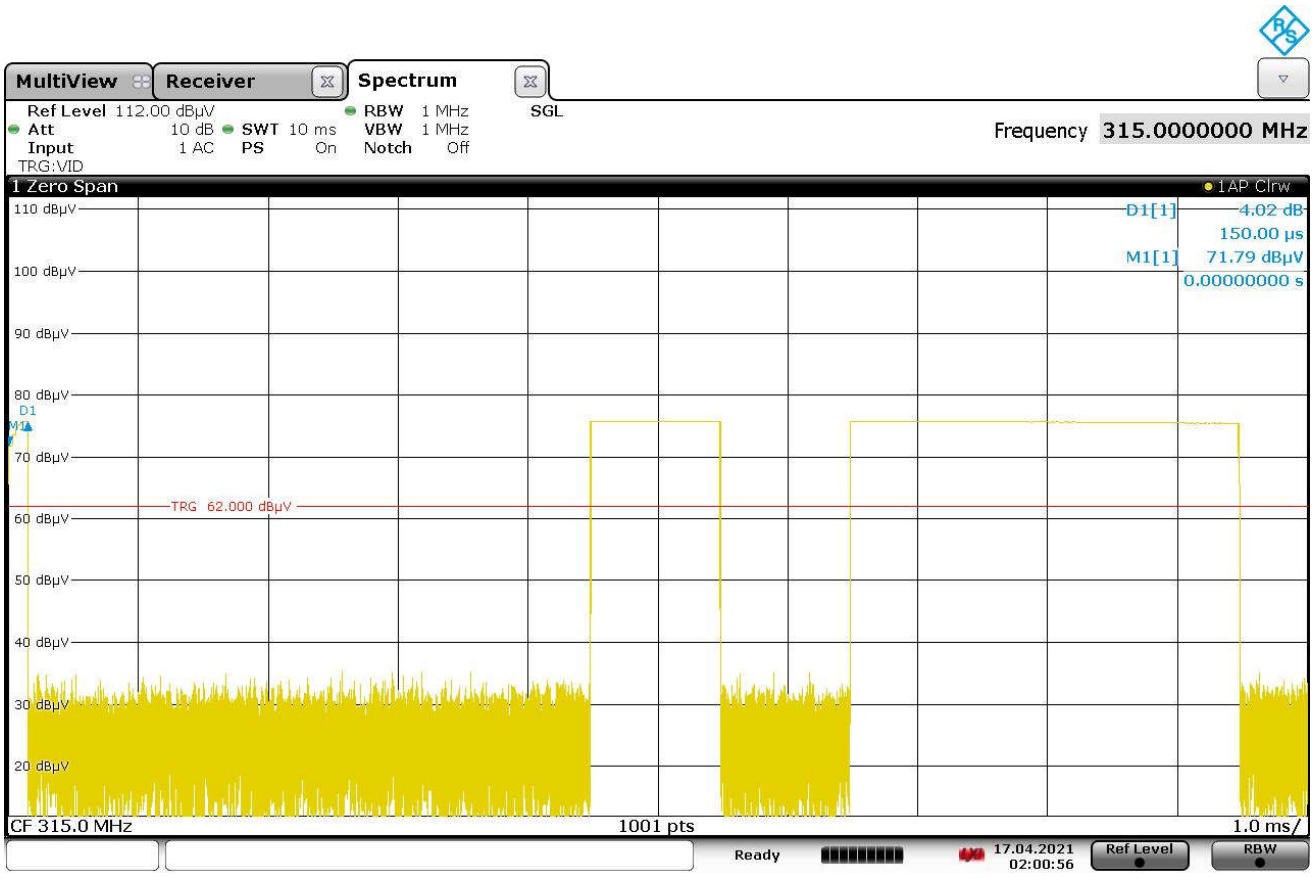


20:13:05 16.04.2021

On time = (52 short pulses x 248usec/short pulse) + (17 long pulses x 510usec/long pulse) = 21.56msec

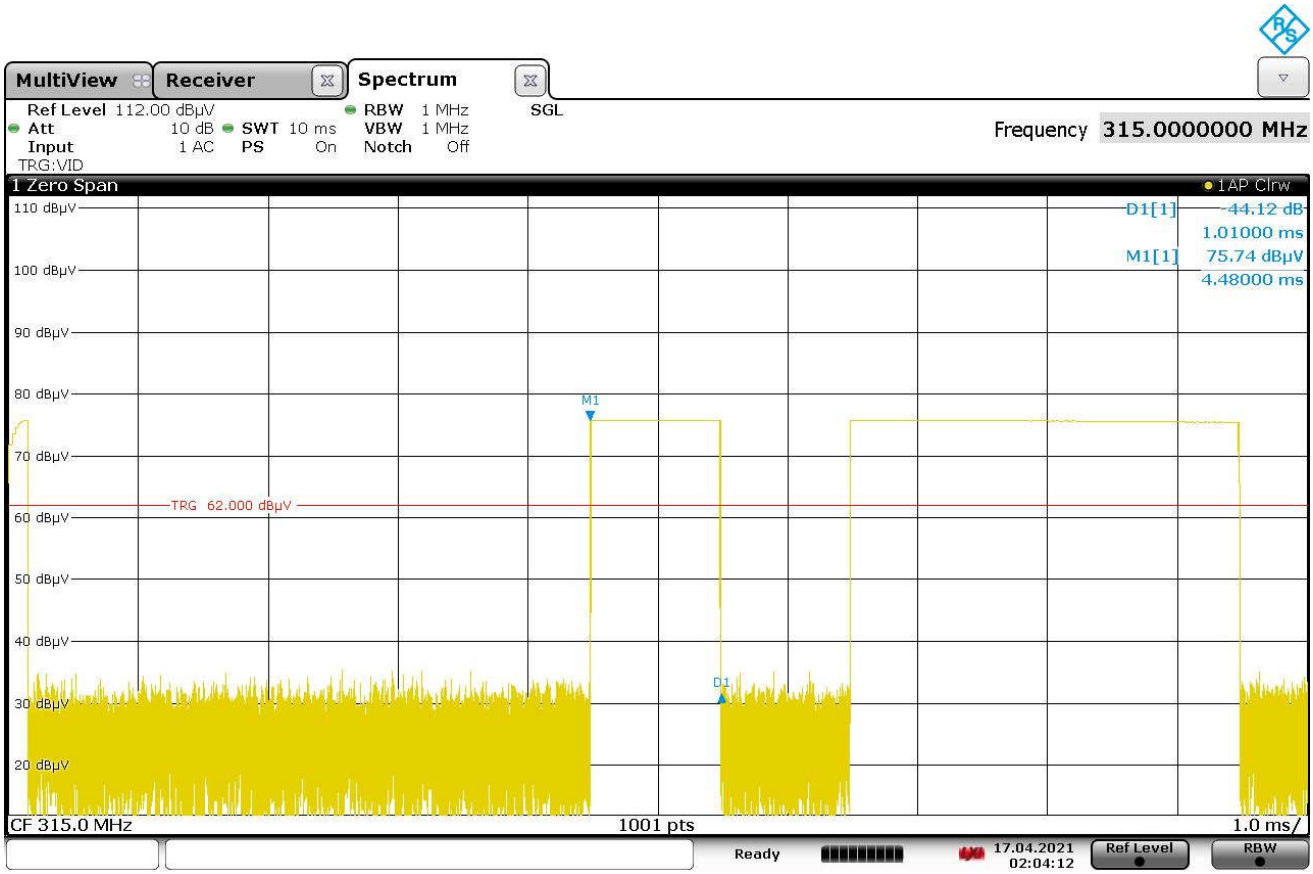
$$\text{Duty Cycle Factor} = 20\log\left(\frac{21.56msec}{(100\text{msec})}\right) = -13.32\text{dB}$$

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	315MHz
Parameters	First Pulse = 150usec
Notes	C Code



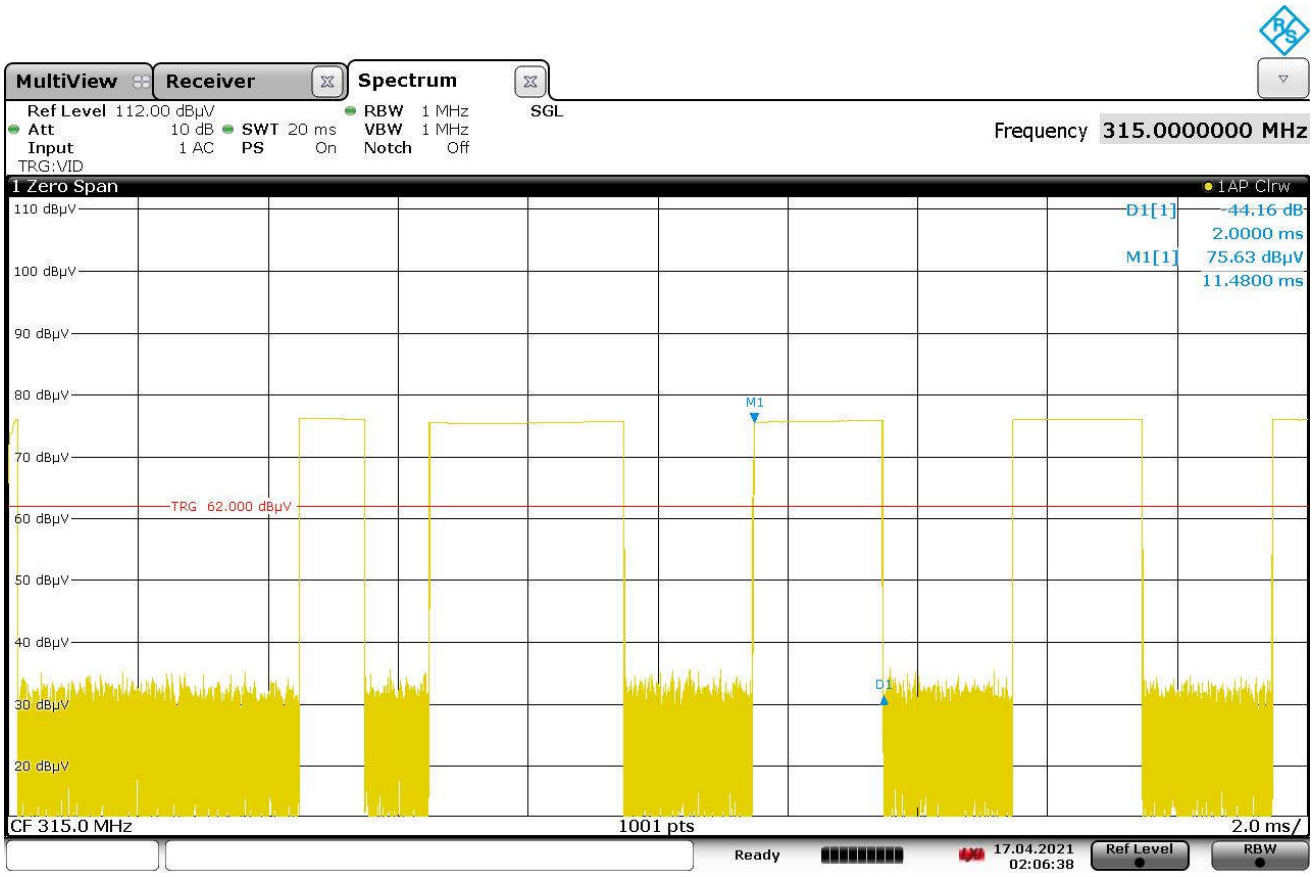
02:00:57 17.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	315MHz
Parameters	Short Pulse = 1.01msec
Notes	C Code



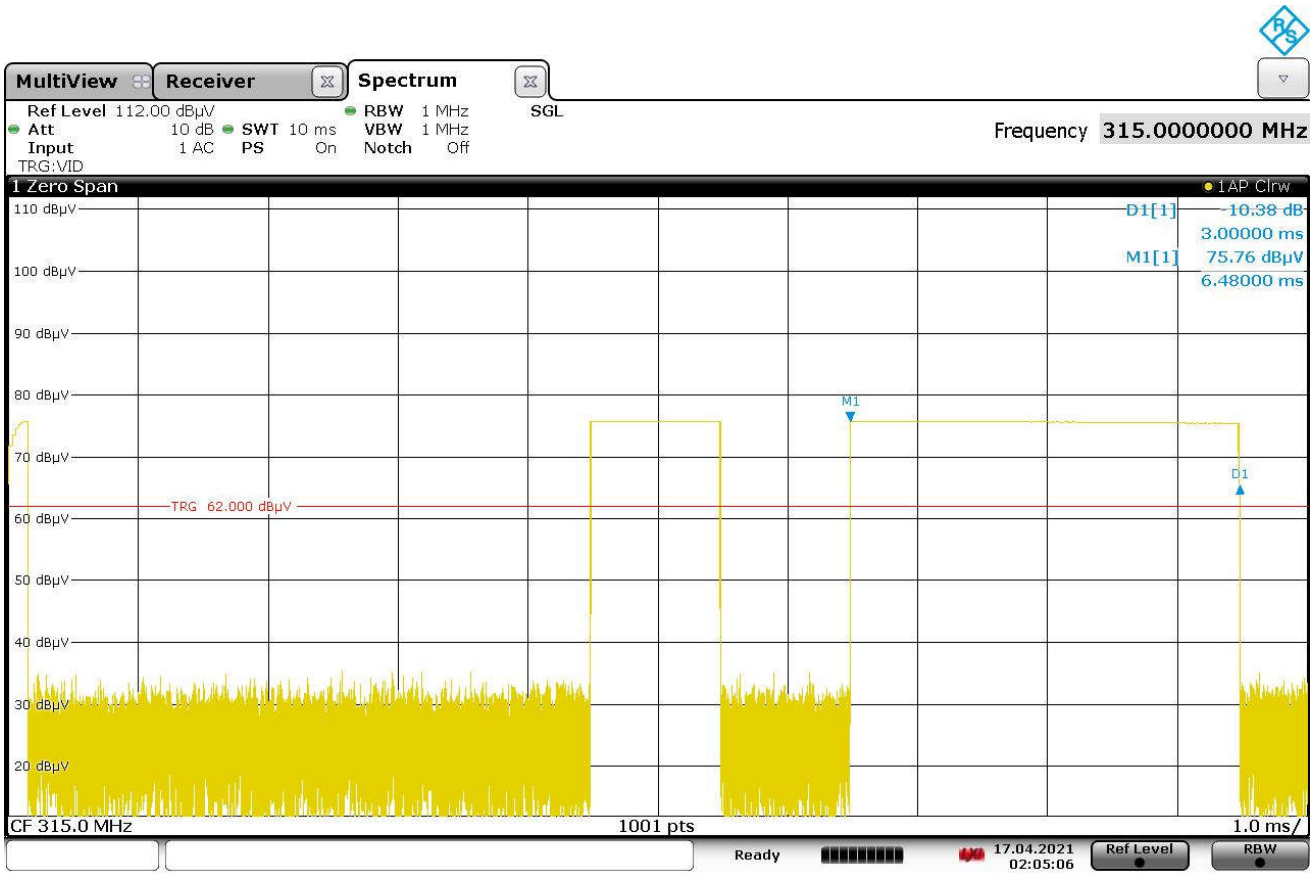
02:04:13 17.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	315MHz
Parameters	Medium Pulse = 2msec
Notes	C Code



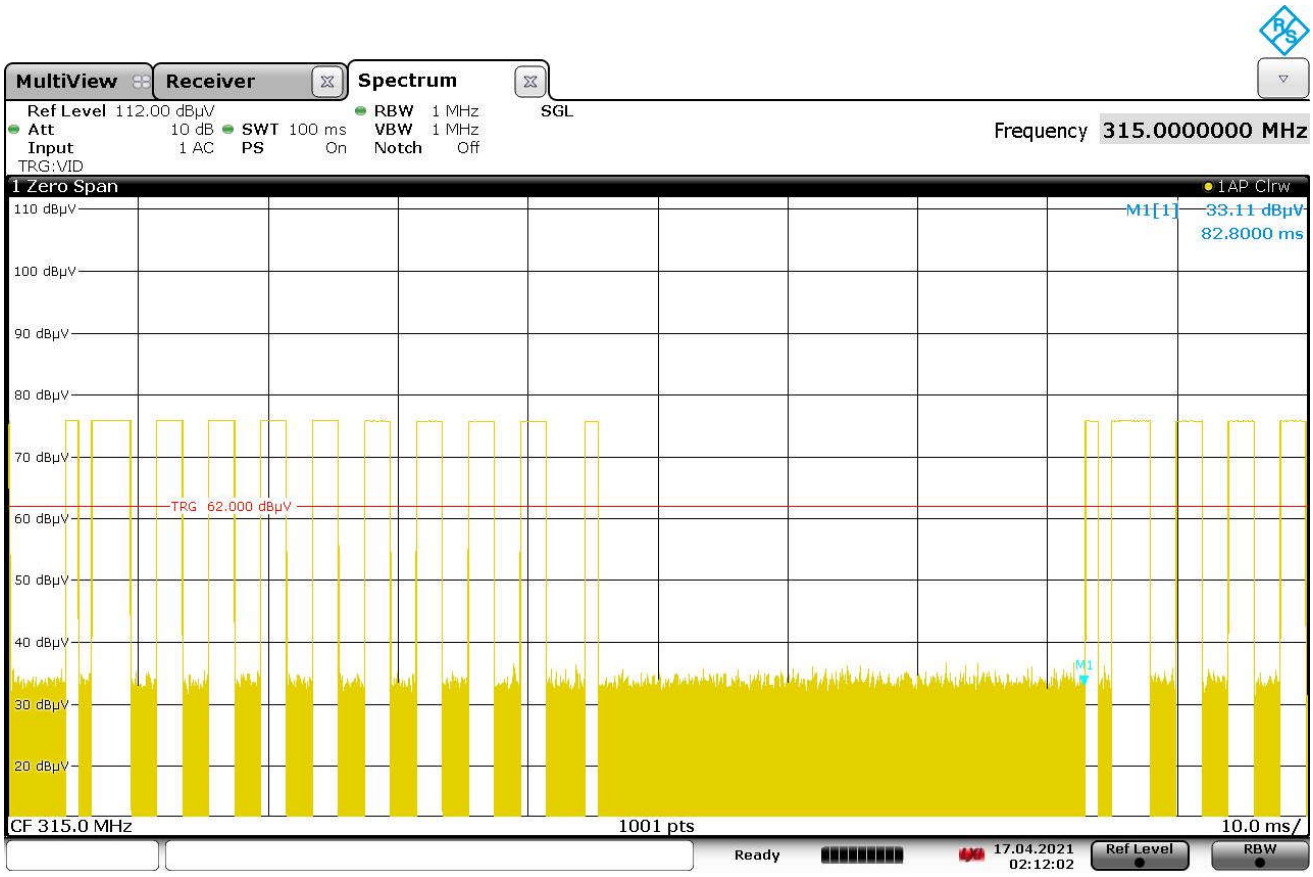
02:06:38 17.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	315MHz
Parameters	Long Pulse = 3msec
Notes	C Code



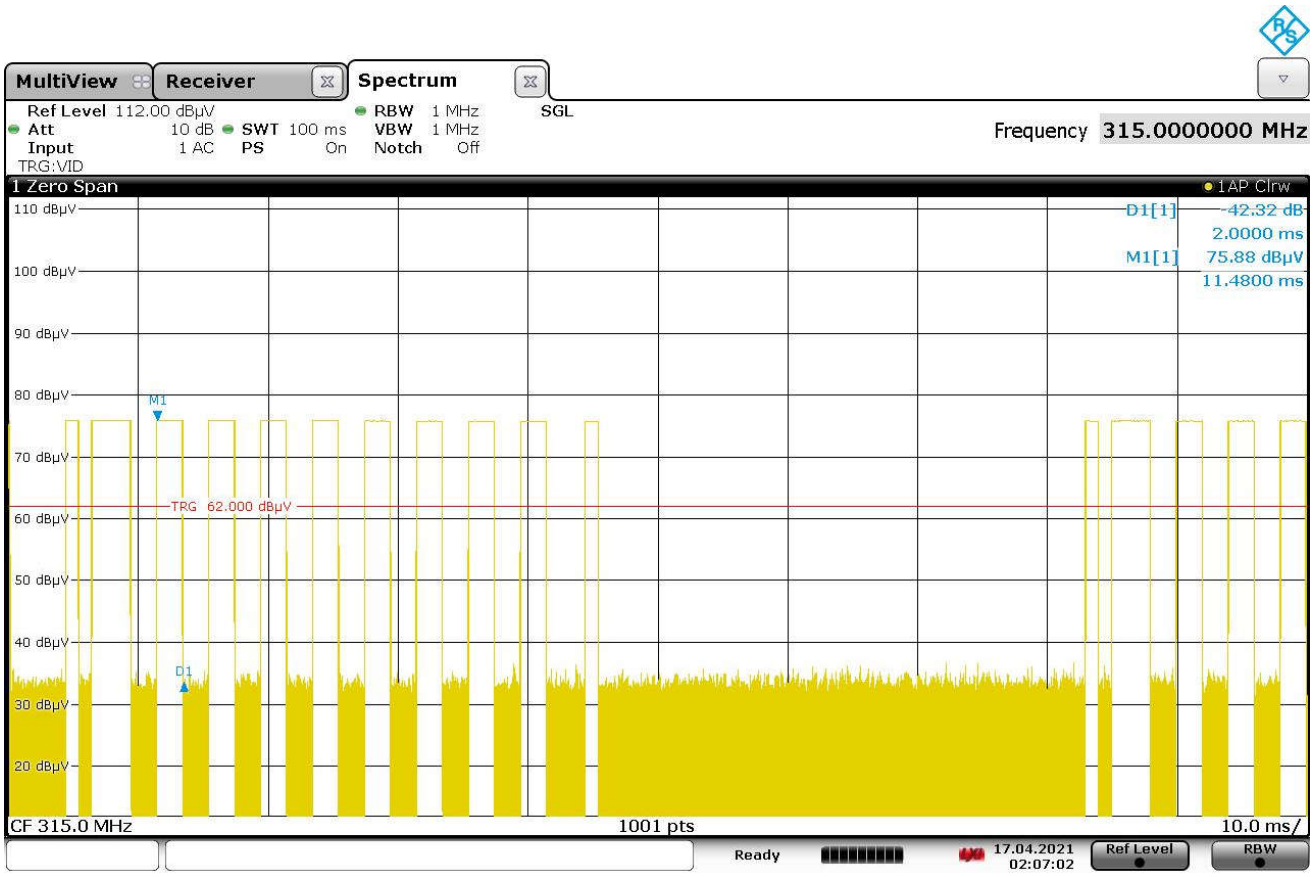
02:05:07 17.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	315MHz
Parameters	Word = 82.8msec
Notes	C Code



02:12:02 17.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	315MHz
Parameters	Duty Cycle
Notes	C Code

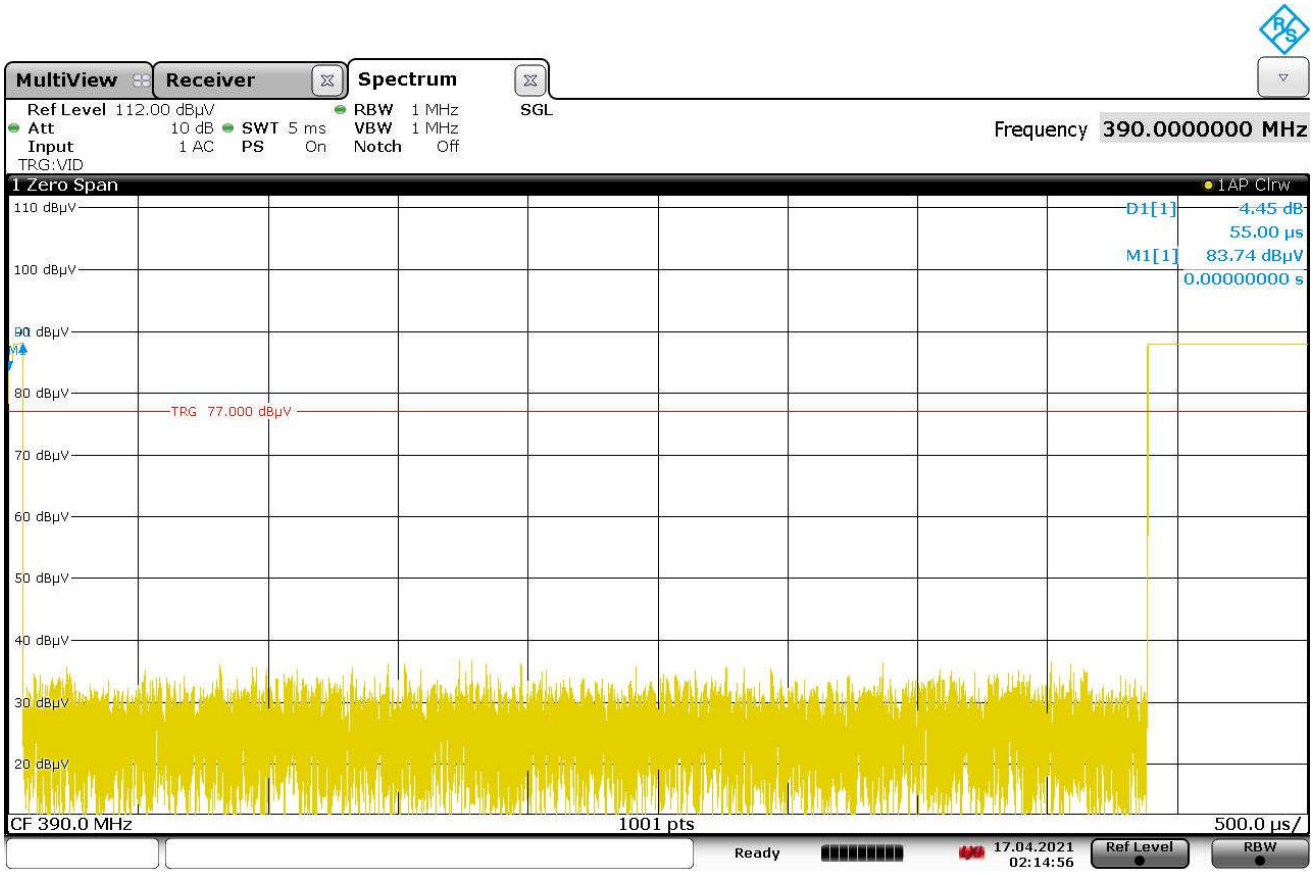


02:07:02 17.04.2021

On time = (1 first pulse x 150usec/first pulse) + (2 short pulses x 1.01msec/short pulse + (8 med. pulses x 2 msec/med. pulse) + (1 long pulses x 3msec/long pulse) = 21.17msec

$$\text{Duty Cycle Factor} = 20\log\left(\frac{21.17msec}{(82.8\text{msec})}\right) = -11.85\text{dB}$$

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	390MHz
Parameters	First Pulse = 55usec
Notes	C Code

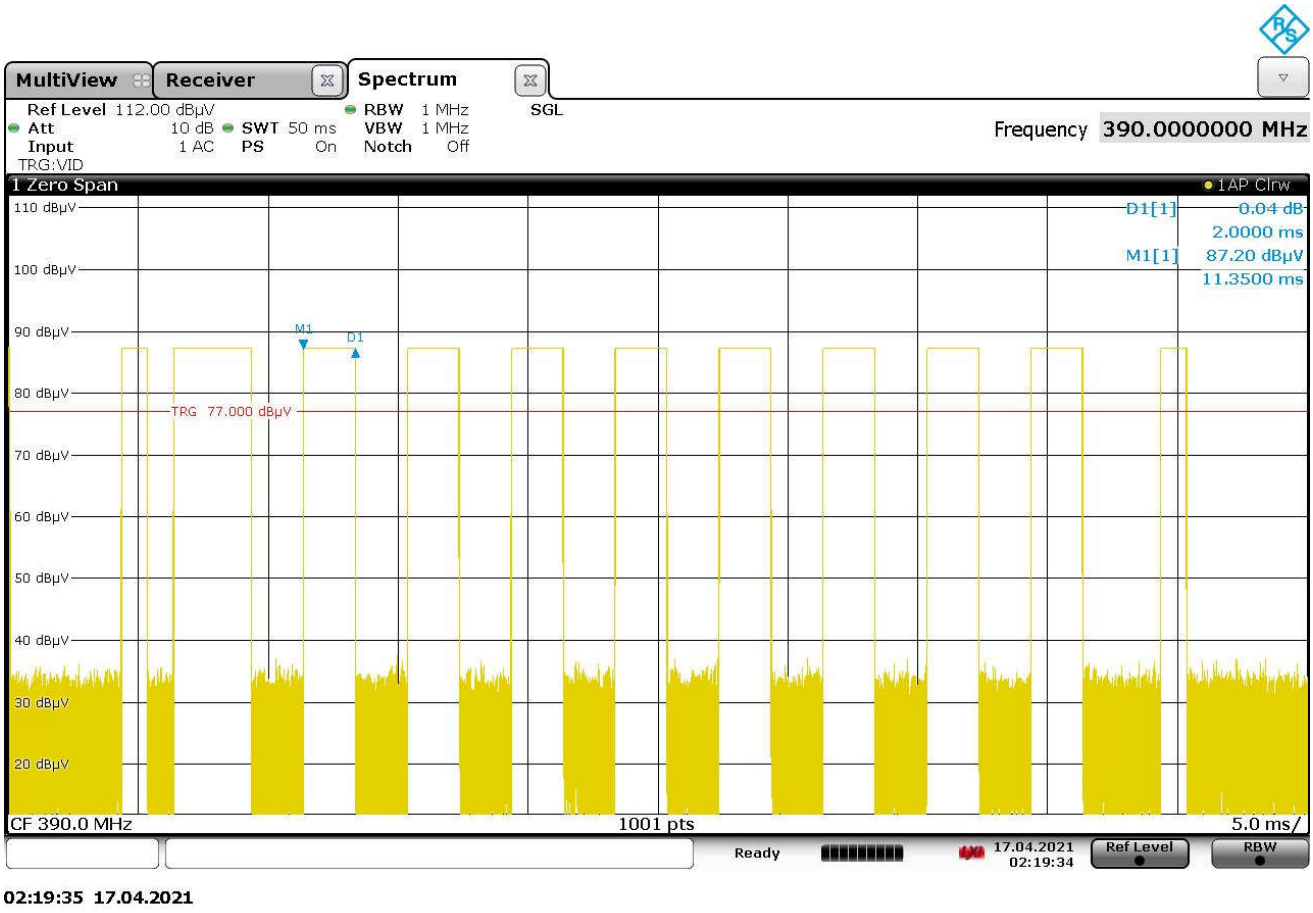


02:14:56 17.04.2021

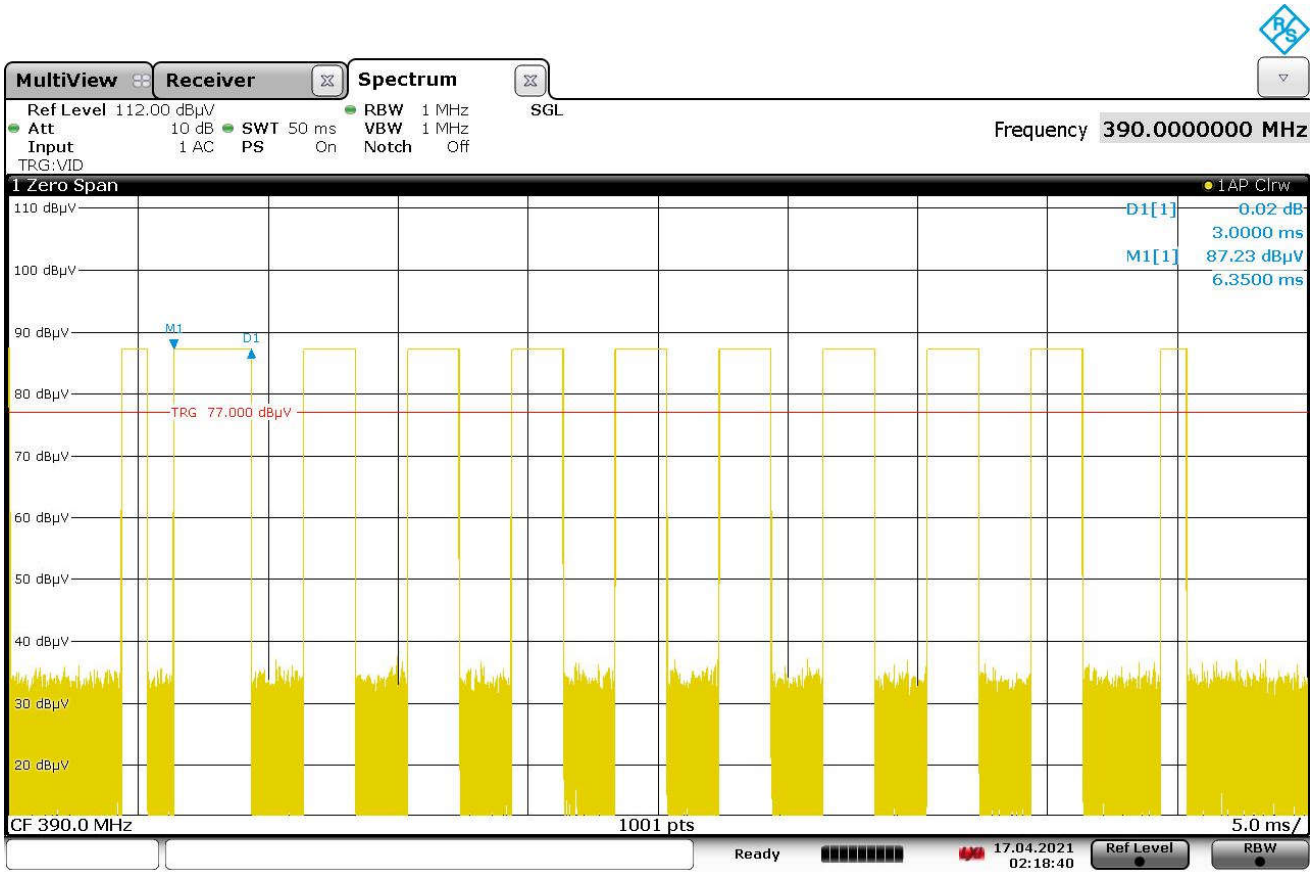
Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	390MHz
Parameters	Short Pulse = 1msec
Notes	C Code

02:17:51 17.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	390MHz
Parameters	Medium Pulse = 2msec
Notes	C Code

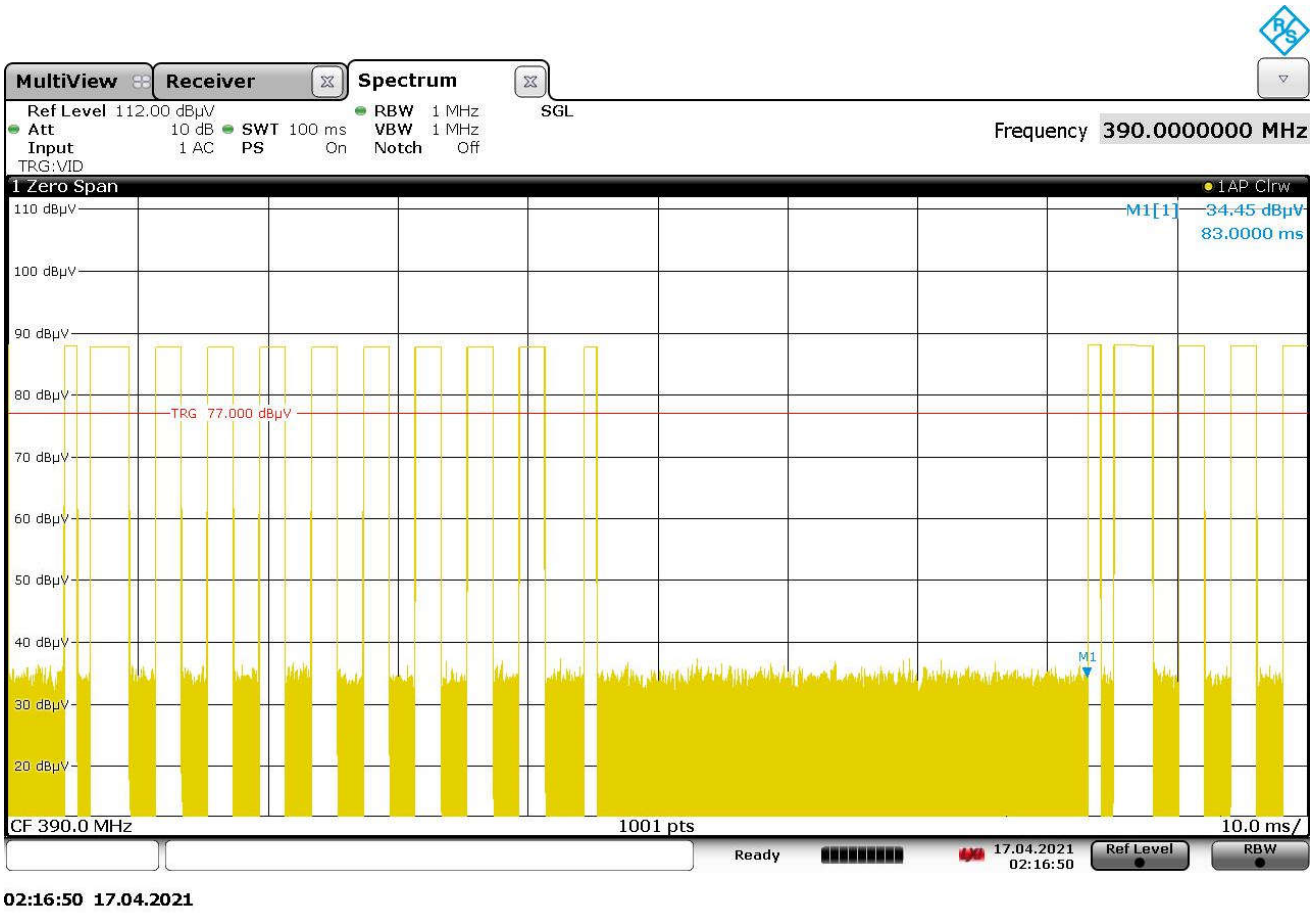


Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	390MHz
Parameters	Long Pulse = 3msec
Notes	C Code



02:18:41 17.04.2021

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	813LMX
S/N	None Assigned
Mode	Normal Operation
Carrier Frequency	390MHz
Parameters	Word = 83msec
Notes	C Code



02:16:50 17.04.2021

On time = (1 first pulse x 55usec/first pulse) + (2 short pulses x 1msec/short pulse + (8 med. pulses x 2 msec/med. pulse) + (1 long pulses x 3msec/long pulse) = 21.055msec

$$\text{Duty Cycle Factor} = 20\log\left(\frac{21.055msec}{(83\text{msec})}\right) = -11.91\text{dB}$$

22. Spurious Radiated Emissions

Test Information	
Manufacturer	Chamberlain Group, Inc.
Product	Door and Gate Operator
Model	813LMX
Serial No	None Assigned
Mode	Continuous Transmission
Test Date	March 24 to 26, 2021

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)
40.66-40.70 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.