Engineering Test Report No. 2202429-03		
Report Date	December 15, 2022	
Manufacturer Name	Chamberlain Group, LLC.	
Manufacturer Address	300 Windsor Drive Oak Brook, IL 60523	
Test Item Name Model No.	Residential Jackshaft Opener RJOA MPP	
Date Received	November 23, 2022	
Test Dates	November 28, 2022 through December 5, 2022	
Specifications	FCC “Code of Federal Regulations” Title 47, Part 15, Subpart B FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 Innovation, Science, and Economic Development Canada, RSS-GEN Innovation, Science, and Economic Development Canada, RSS-247	
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	4900084893	

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 B, FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 and Innovation, Science, and Economic Development Canada, RSS-247 test specifications. The data presented in this test report pertains to the EUT on the test dates 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
–	16 DEC 2022	Initial Release of Engineering Test Report No. 2202429-03

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, LLC. Residential Jackshaft Openers (hereinafter referred to as the Equipment Under Test (EUT)). The EUTs were manufactured and submitted for testing by Chamberlain Group, LLC. located in Oak Brook, IL.

2.2. Purpose

The test series was performed to determine if the EUTs meet the RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, §15.247 for a Frequency Hopping Spread Spectrum intentional radiator, operating within the 902 – 928MHz band.

The test series was also performed to determine if the EUTs meet the RF emission requirements of the Innovation, Science, and Economic Development Canada Radio Standards Specification RSS-Gen and Innovation, Science, and Economic Development Canada Radio Standards Specification RSS-247 for a Frequency Hopping Spread Spectrum intentional radiator operating within the 902 – 928MHz band.

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

2.3. Identification of the EUT

The EUTs were identified as follows:

EUT Identification	
Test Item #1	
Product Description	Residential Jackshaft Opener
Model/Part No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Size of EUT	54 cm x 18.5 cm x 16.5 cm
Software/Firmware Version	V 1.12 (126A0544.hex)
Device Type	Frequency Hopping Transmission Device
Band of Operation	902 – 928MHz
Modulation Type	GFSK
Antenna Type	Monopole made from 20AWG wire
Antenna Gain (dBi) [1]	-0.8dBi
Conducted Output Power	17.36dBm (54.5mW)
20dB Bandwidth	201.8kHz
Occupied Bandwidth (99% CBW)	215.8kHz
Emission Classification	216KF1D
Test Item #2	
Product Description	Residential Jackshaft Opener
Model/Part No.	RJOA MPP
Serial No.	Radiated Sample 2
Size of EUT	54 cm x 18.5 cm x 16.5 cm
Software/Firmware Version	V 1.12 (126A0544.hex)
Device Type	Frequency Hopping Transmission Device
Band of Operation	902 – 928MHz
Modulation Type	FHSS
Antenna Type	Monopole made from 20AWG wire
Antenna Gain (dBi) [1]	-0.8dBi
EIRP	15.2dBm (33.1mW)
Emission Classification	216KF1D

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

The EUTs listed above were used throughout the test series.

3. Power Input

The EUTs obtained 115V 60Hz power via a 3 wire, 1.75 meter long, unshielded power cord.

4. Grounding

The EUTs were connected to ground through the third wire of its input power cord.

5. Support Equipment

The EUTs were submitted for testing along with the following support equipment:

Description	Model #
Automatic Garage Door Lock	001D8875
Smart Control Panel	880LMW
Safety Reversing Sensors	041-0136
Laptop Computer	Dell Latitude 7480

6. Interconnect Leads

The following interconnect cables were submitted with the test item:

Item	Description
USB Cable	Connects laptop to EUT
2 wires	Used to connect Automatic Garage Door Lock to EUT
2 wires	Used to connect Smart Control Panel to EUT
4 wires	Used to Connect Safety Reversing Sensors to EUT

7. Modifications Made to the EUT

No modifications were made to the EUTs during the testing.

8. Modes of Operation

The EUTs and all peripheral equipment were energized. The units were programmed to transmit in one of the following modes:

- Transmit at 902.25MHz
- Transmit at 914.75MHz
- Transmit at 926.75MHz
- Transmit, Hopping Enabled
- Receive at 902.25MHz
- Receive at 914.75MHz
- Receive at 926.75MHz

9. Test Specifications

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

- Federal Communications Commission "Code of Federal Regulations", Title 47, Chapter I, Subchapter A, Part 15, Subpart B

- Federal Communications Commission "Code of Federal Regulations", Title 47, Chapter I, Subchapter A, 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 40GHz”

- ANSI C63.10-2013, “American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices”

- Federal Communications Commission Office of Engineering and Technology Laboratory Division, Guidance For Compliance Measurements On Digital Transmission Systems, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating Under Section 15.247 April 2, 2019 KDB 558074 D01v05r02

- RSS-Gen Issue 5, February 2020, Amendment 2, Innovation, Science, and Economic Development Canada, “General Requirements for Compliance of Radio Apparatus”

- RSS-247 Issue 2, February 2017, “Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices”

10. Test Plan

No test plan was provided. Instructions were provided by personnel from Chamberlain Group, LLC. and used in conjunction with the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247, Innovation, Science, and Economic Development Canada, RSS-247, ANSI C63.4-2014, 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

The ambient parameters of the laboratory during testing were as follows:

Ambient Parameters	Value
Temperature	22°C
Relative Humidity	23%
Atmospheric Pressure	1017mb

13. Summary

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

Test Description	Requirements	Test Method	S/N	Results
Receiver Conducted Emissions (AC Mains)	FCC 15.107 ISED RSS-GEN	ANSI C63.4:2014	Radiated Sample 2	Conforms
Receiver Radiated Emissions	FCC 15.107 ISED RSS-GEN	ANSI C63.4:2014	Radiated Sample 2	Conforms
Transmitter Conducted Emissions (AC Mains)	FCC 15.107 ISED RSS-GEN	ANSI C63.10:2013	Radiated Sample 2	Conforms
20dB Bandwidth	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Antenna Conducted Sample 1	Conforms
Occupied Bandwidth (99%)	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Antenna Conducted Sample 1	---

Carrier Frequency Separation	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Antenna Conducted Sample 1	Conforms
Number of Carrier Channels	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Antenna Conducted Sample 1	Conforms
Average Time of Occupancy	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Antenna Conducted Sample 1	Conforms
Maximum Peak Conducted Output Power	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Antenna Conducted Sample 1	Conforms
Band Edge Compliance	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Antenna Conducted Sample 1	Conforms
Duty Cycle Correction Factor	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Antenna Conducted Sample 1	---
Effective Isotropic Radiated Power (EIRP)	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Radiated Sample 2	Conforms
Case Spurious Radiated Emissions	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Radiated Sample 2	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 (dBµV) = MTR (dBµV) + 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 (dBµV/m) = MTR (dBµV) + AF (dB/m) + CF (dB) + (- PA (dB)) + DC (dB)

To convert the Field Strength dBµV/m term to µV/m, the dBµV/m is first divided by 20. The Base 10 AntiLog is taken of this quotient. The result is the Field Strength value in µV/m terms.

Formula 2: FS (µV/m) = AntiLog [(FS (dBµV/m))/20]

15. Statement of Conformity

The Chamberlain Group, LLC. Residential Jackshaft Openers, Model No. RJOA MPP, did fully conform to the selected requirements of FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 and Innovation, Science, and Economic Development Canada, RSS-247.

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 15.247 and Innovation, Science, and Economic Development Canada, RSS-247 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


FCC
LiftMaster

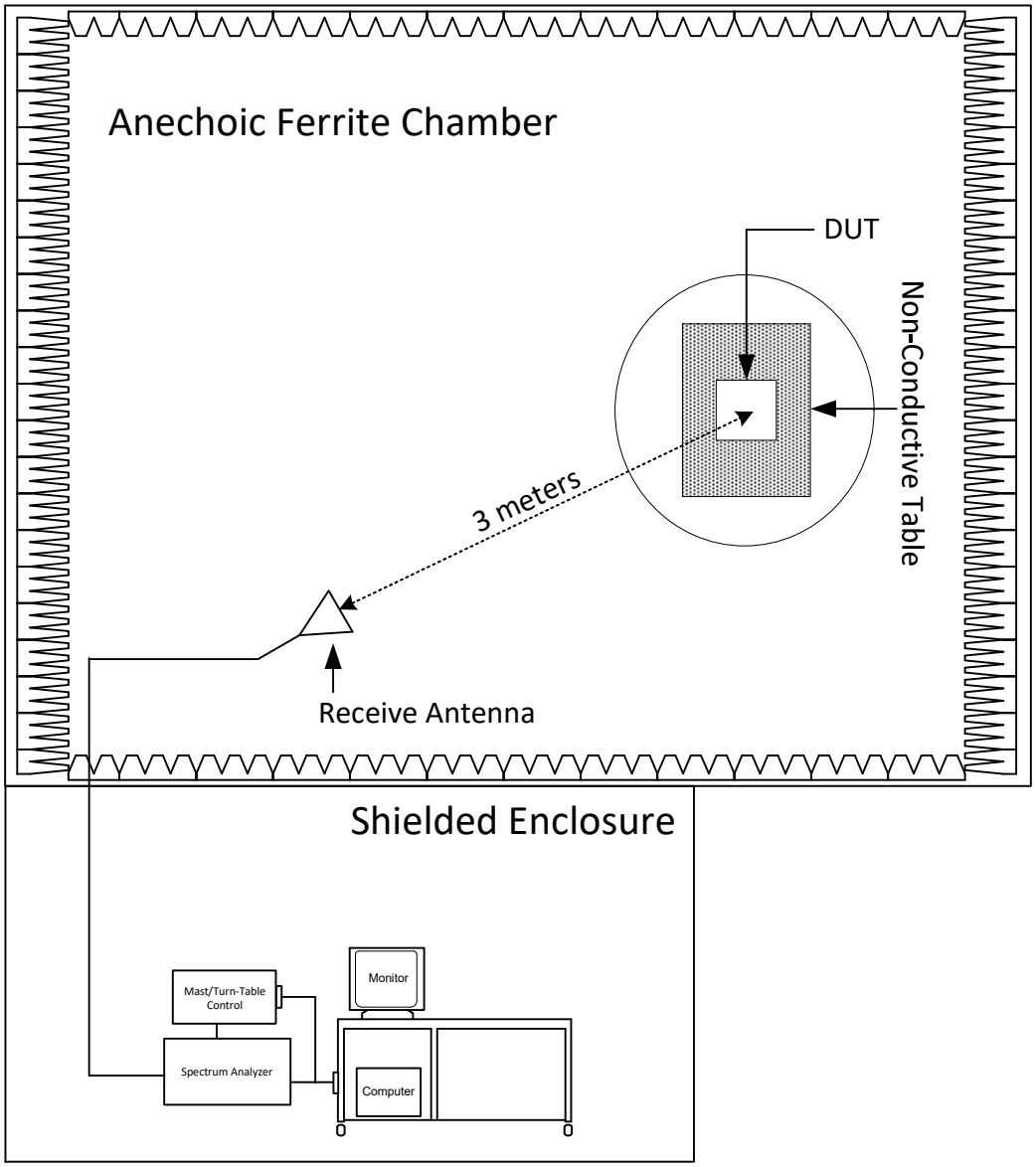
18. Equipment List

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	9/21/2022	9/21/2023
CDX7	COMPUTER	ELITE	WORKSTATION			N/A	
CDZ3	LAB WORKSTATION	ELITE	LWS-10		WINDOWS 10	CNR	
GRE2	SIGNAL GENERATOR	AGILENT	E4438C	MY42081749	250KHZ-6GHZ	3/4/2022	3/4/2023
NDQ0	TUNED DIPOLE ANTENNA	EMCO	3121C-DB4	311	400-1000MHZ	6/7/2022	6/7/2024
NTA3	BILOG ANTENNA	TESEQ	6112D	32853	25-1000MHz	11/17/2022	11/17/2024
NWQ2	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66659	1GHZ-18GHZ	4/27/2022	4/27/2024
PLF2	CISPR16 50UH LISN	ELITE	CISPR16/70A	002	.15-30MHz	4/5/2022	4/5/2023
PLF4	CISPR16 50UH LISN	ELITE	CISPR16/70A	003	.15-30MHz	4/5/2022	4/5/2023
RBE0	EMI ANALYZER	ROHDE & SCHWARZ	ESU26	100095	20Hz-26GHz	3/7/2022	3/7/2023
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	3/31/2022	3/31/2023
RBG3	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101592	2HZ-44GHZ	4/7/2022	4/7/2023
SES0	24VDC POWER SUPPLY	P-TRANS	FS-32024-1M	001	18-27VDC	NOTE 1	
T1E16	10DB 25W ATTENUATOR	WEINSCHEL	46-10-43	CM5685	DC-18GHZ	5/18/2022	5/18/2024
T1E8	10DB 25W ATTENUATOR	WEINSCHEL	46-10-34	BH7996	DC-18GHZ	1/12/2022	1/12/2024
T2DC	20DB, 25W ATTENUATOR	WEINSCHEL	46-20-34	BH5448	DC-18GHZ	1/14/2022	1/14/2024
T2SG	20DB 25W ATTENUATOR	WEINSCHEL	46-20-34	CD5016	DC-18GHZ	1/4/2022	1/4/2024
VBR8	CISPR EN FCC CE VOLTAGE.exe					N/A	
VBV2	CISPR EN FCC ICES RE.EXE	ELITE	CISPR EN FCC ICES RE.EXE	---	---	N/A	
WKA1	SOFTWARE, UNIVERSAL RCV EMI	ELITE	UNIV_RCV_EMI	1	---	I/O	
XPQ8	HIGH PASS FILTER	K&L MICROWAVE	4IH30-1804/T10000-0	6	1.8-10GHZ	2/3/2021	2/3/2023

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.

19. Block Diagram of Test Setup



Radiated Measurements Test Setup

20. Receiver Conducted Emissions (AC Mains)

Test Information	
Manufacturer	Chamberlain Group, LLC.
Product	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Radiated Sample 2
Mode	Receive at 914.75MHz

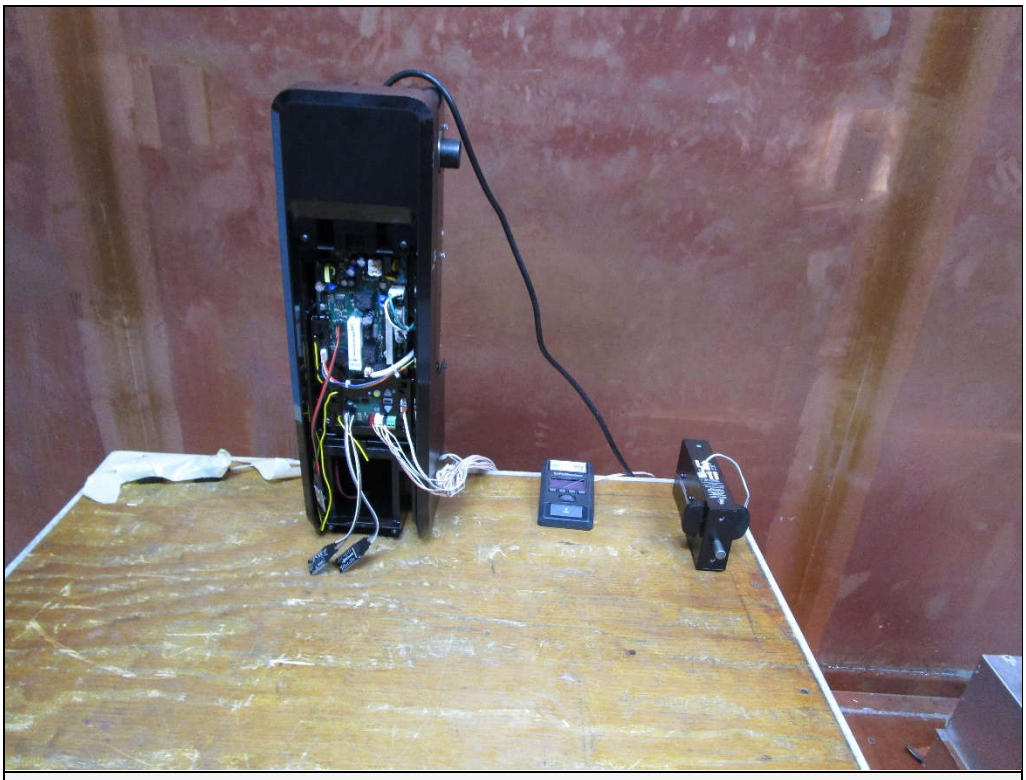
Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Type of Test Site	Semi-Anechoic Chamber
Test Site Used	Room 29
Notes	

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Conducted disturbance (mains port) (150 kHz – 30 MHz)	2.7

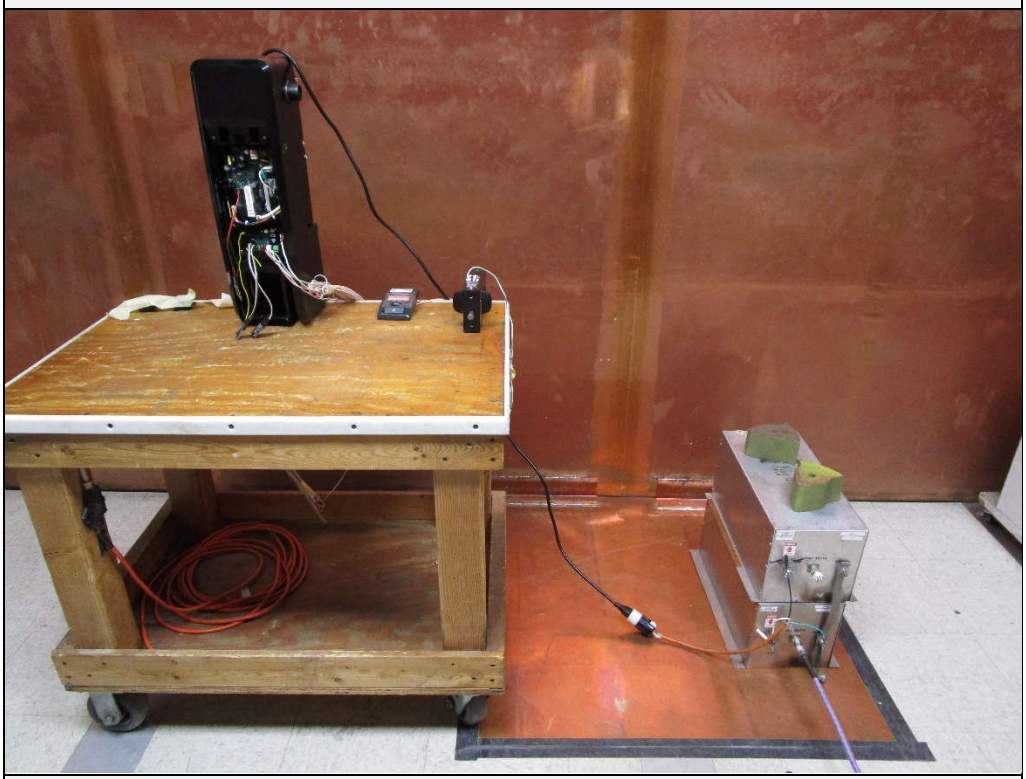
Requirements
All radio frequency voltages on the power lines for any frequency or frequencies of an unintentional radiator shall not exceed the limits in the following table.

Receiver Conducted Emissions Limits		
Frequency of Emission (MHz)	Conducted Limits (dBµV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56-46*
0.5 – 5	56	46
5 – 30	60	50
* The lower limit shall apply at the transition frequencies.		

Procedure
The interference on each power lead of the EUT was measured by connecting the measuring equipment to the appropriate meter terminal of the Line Impedance Stabilization Network (LISN). The meter terminal of the LISN not under test was terminated with 50 ohms. 1) The EUT was operated in the Receive at 914.75MHz mode. 2) Measurements were first made on the 120V, 60Hz high line. 3) The frequency range from 150kHz to 30MHz was broken up into smaller frequency sub-bands. 4) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector. 5) The data thus obtained was then searched by the computer for the highest levels. Any emissions levels that were within 3dB of the average limit were then measured again using both a quasi-peak detector and an average detector. (If no peak readings were within 10dB of the average limit, quasi-peak and average readings were taken on the highest emissions levels measured during the peak detector scan.) 6) Steps (4) and (5) were repeated for the remainder of the frequency sub-bands until the entire frequency range from 150kHz to 30MHz was investigated. The peak trace was automatically plotted. The plot also shows quasi-peak and average readings that were taken on discrete frequencies. A table showing the quasi-peak and average readings was also generated. This tabular data compares the quasi-peak and average conducted emissions to the applicable conducted emissions limits. 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 (dBµV) = MTR (dBµV) + CF (dB) 7) Steps (3) through (6) were repeated on the 120V, 60Hz return line.



Test Setup for RF Conducted Emissions (AC Mains)



Test Setup for RF Conducted Emissions (AC Mains)

FCC Part 15 Subpart B 2017-2022 Conducted Emissions Test

Significant Emissions Data

VBR8 11/08/2022

Manufacturer	:	Chamberlain
Model	:	RJOA MPP
DUT Revision	:	
Serial Number	:	
DUT Mode	:	Receive at 914.75MHz
Line Tested	:	120V, 60Hz high
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-3
Notes	:	
Test Engineer	:	M. Longinotti
Limit	:	Receiver
Test Date	:	Nov 28, 2022 03:46:17 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 3 dB margin below limit

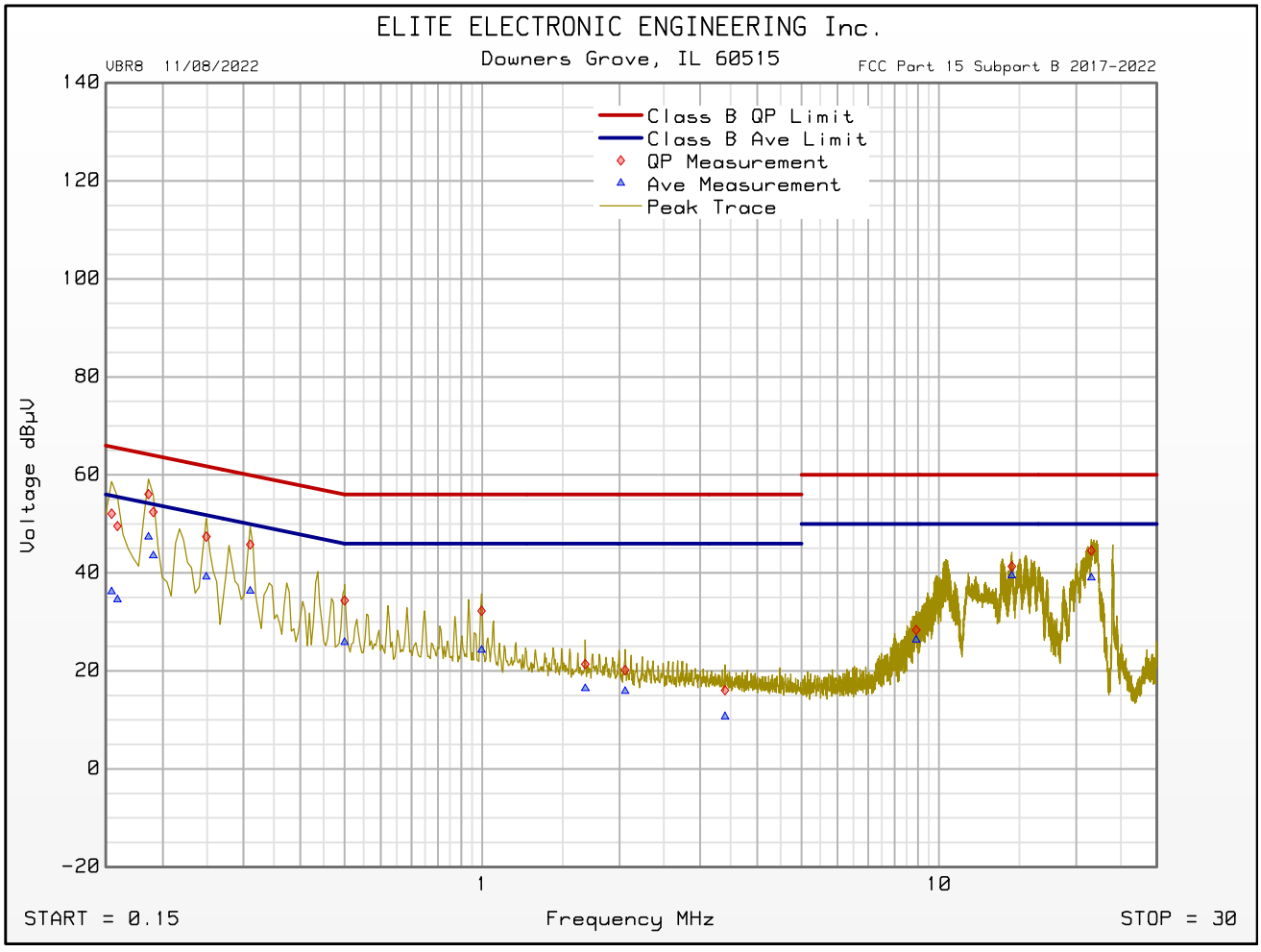
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.186	56.1	64.2		47.3	54.2	
0.311	45.8	60.0		36.3	50.0	
0.500	34.4	56.0		25.8	46.0	
0.997	32.3	56.0		24.3	46.0	
1.682	21.4	56.0		16.4	46.0	
2.057	20.2	56.0		15.8	46.0	
3.401	16.1	56.0		10.7	46.0	
8.920	28.3	60.0		26.3	50.0	
14.441	41.3	60.0		39.4	50.0	
21.560	44.5	60.0		39.0	50.0	

FCC Part 15 Subpart B 2017-2022 Conducted Emissions Test

Cumulative Data

VBR8 11/08/2022

Manufacturer	:	Chamberlain
Model	:	RJOA MPP
DUT Revision	:	
Serial Number	:	
DUT Mode	:	Receive at 914.75MHz
Line Tested	:	120V, 60Hz high
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-3
Notes	:	
Test Engineer	:	M. Longinotti
Limit	:	Receiver
Test Date	:	Nov 28, 2022 03:46:17 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B 2017-2022 Conducted Emissions Test

Significant Emissions Data

VBR8 11/08/2022

Manufacturer	:	Chamberlain
Model	:	RJOA MPP
DUT Revision	:	
Serial Number	:	
DUT Mode	:	Receive at 914.75MHz
Line Tested	:	120V, 60Hz return
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-3
Notes	:	
Test Engineer	:	M. Longinotti
Limit	:	Receiver
Test Date	:	Nov 28, 2022 03:40:14 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 3 dB margin below limit

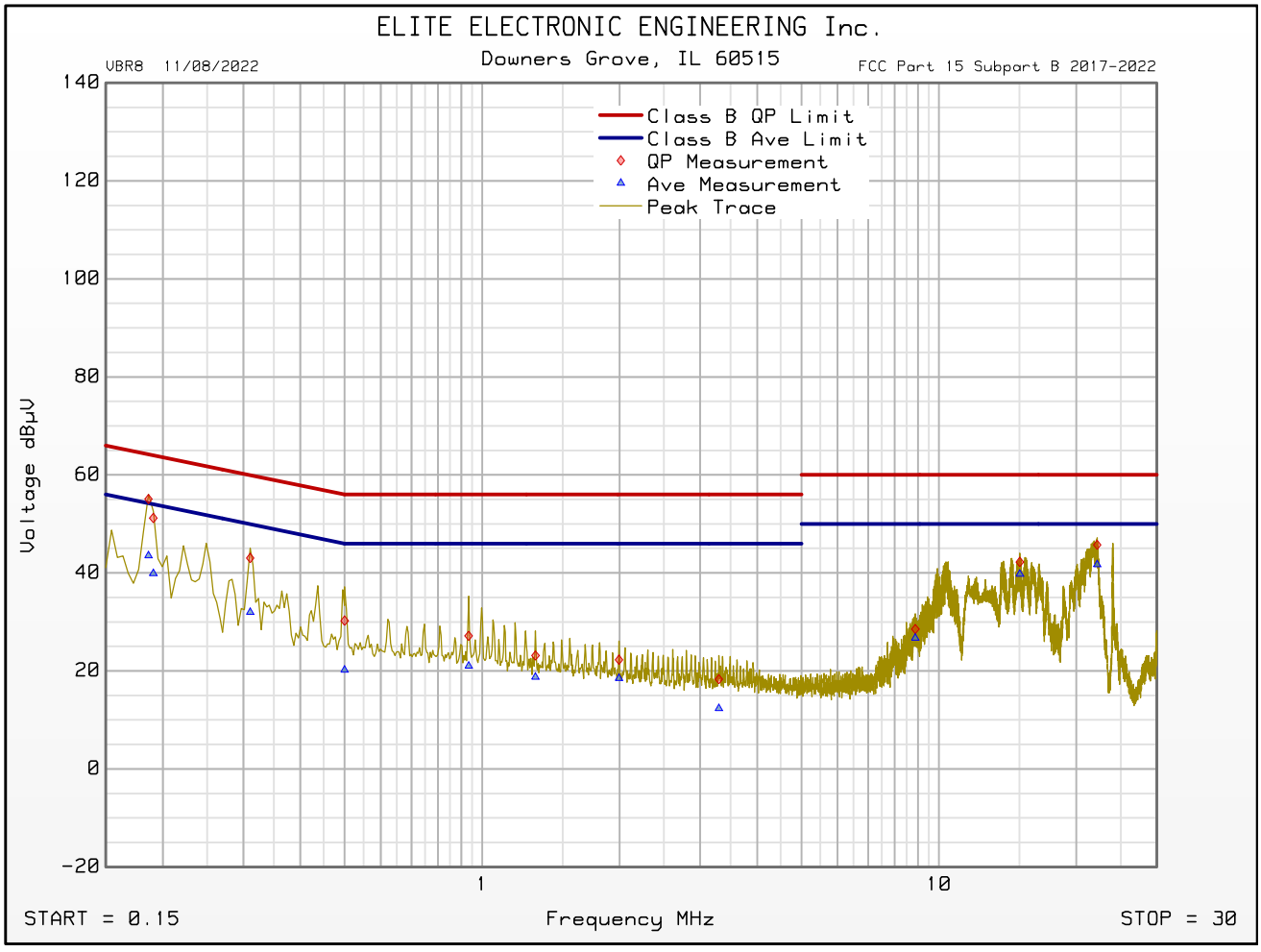
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.186	55.1	64.2		43.5	54.2	
0.311	43.1	60.0		32.0	50.0	
0.500	30.2	56.0		20.2	46.0	
0.934	27.1	56.0		21.0	46.0	
1.309	23.1	56.0		18.7	46.0	
1.994	22.3	56.0		18.5	46.0	
3.298	18.3	56.0		12.4	46.0	
8.879	28.5	60.0		26.7	50.0	
15.039	42.2	60.0		39.8	50.0	
22.199	45.7	60.0		41.7	50.0	

FCC Part 15 Subpart B 2017-2022 Conducted Emissions Test

Cumulative Data

VBR8 11/08/2022

Manufacturer	:	Chamberlain
Model	:	RJOA MPP
DUT Revision	:	
Serial Number	:	
DUT Mode	:	Receive at 914.75MHz
Line Tested	:	120V, 60Hz return
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-3
Notes	:	
Test Engineer	:	M. Longinotti
Limit	:	Receiver
Test Date	:	Nov 28, 2022 03:40:14 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

21. Receiver Radiated Emissions

EUT Information	
Manufacturer	Chamberlain Group, LLC.
Product	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Radiated Sample 2
Mode	Receive at 902.25MHz Receive at 914.75MHz Receive at 926.75MHz

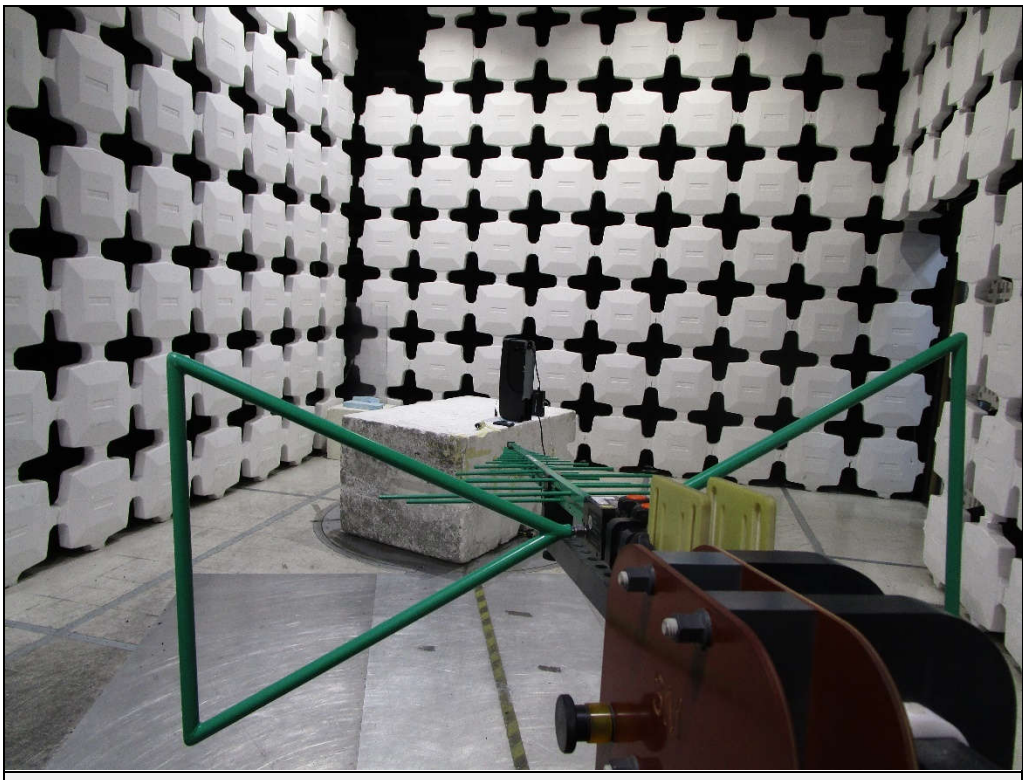
Test Site Information	
Setup Format	Tabletop
Height of Support	N/A
Type of Test Site	Shielded Enclosure
Test Site Used	Room 23S
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)
Highest Internal Frequency	926.75MHz
Highest Measurement Frequency	5GHz
Notes	The cables were manually maximized during the preliminary emissions sweeps. The cable arrangement which resulted in the worst-case emissions was utilized.

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2

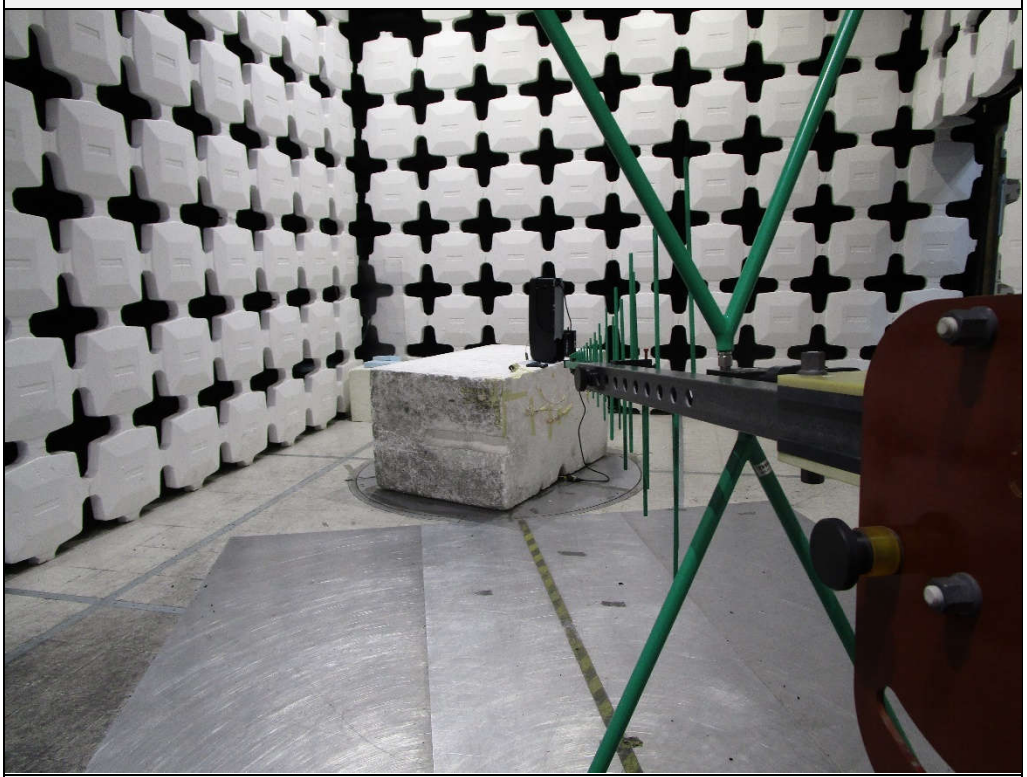
Requirements
The field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the values in the following table.

Radiated Emissions Limits (30MHz to 1GHz)		
Frequency of Emission (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)
30 – 88	100	40
88 – 216	150	43.5
216 – 960	200	46
Above 960	500	54
Radiated Emissions Limits (Above 1GHz)		
Frequency of Emission (MHz)	Peak Limit (dBµV/m)	Average Limit (dBµV/m)
Above 1000	74	54

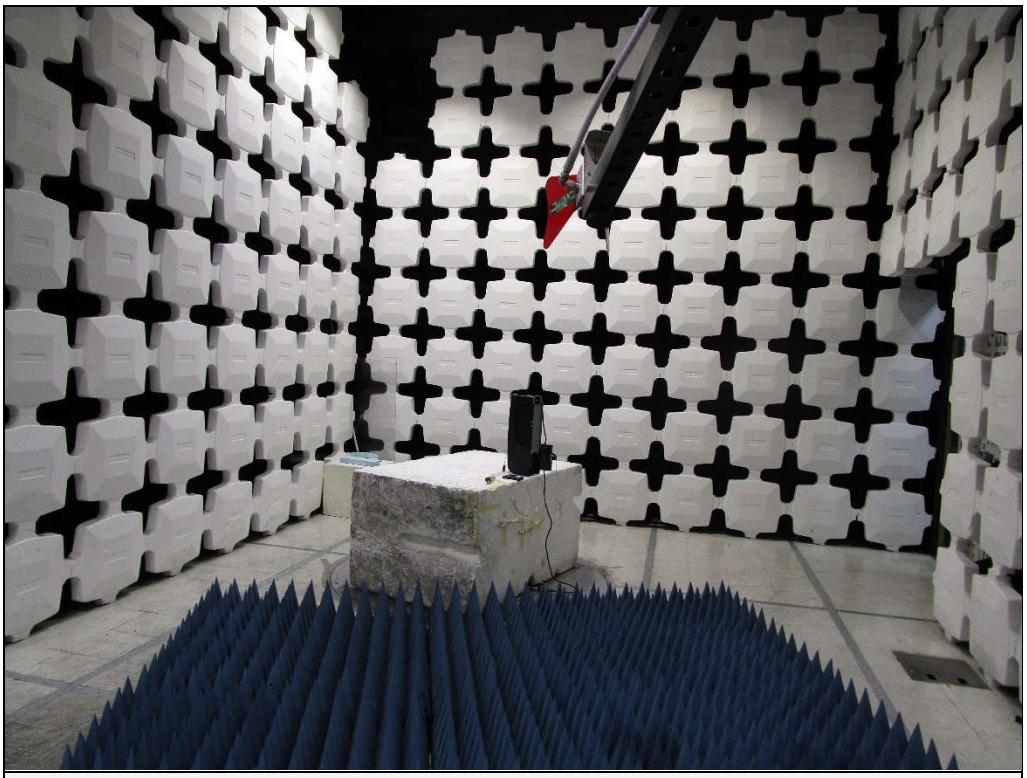
Procedure
Since a quasi-peak detector and an average detector require long integration times, it is not practical to automatically sweep through the quasi-peak and average levels. Therefore, radiated emissions from the EUT were first scanned using a peak detector and automatically plotted. The frequencies where significant emission levels were noted were then remeasured using the quasi-peak detector or average detector. The EUT and all peripheral equipment were placed on an 80cm high non-conductive stand. The broadband measuring antenna was positioned at a 3-meter distance from the EUT. The frequency range from 30MHz to 1GHz was investigated using a peak detector function with the bilog antenna at several heights, horizontal and vertical polarization, and with several different orientations of the EUT with respect to the antenna. The frequency range from 1GHz to 5GHz was investigated using a peak detector function with the double ridged waveguide antenna at several heights, horizontal and vertical polarization, and with several different orientations of the EUT with respect to the antenna. The maximum levels for each antenna polarization were plotted. Final radiated emissions were performed on all significant broadband and narrowband emissions found in the exploratory sweeps using the following methods: 1) Measurements from 30MHz to 1GHz were made using a quasi-peak detector and a broadband bilog antenna. Measurements above 1GHz were made using an average detector and a broadband double ridged waveguide antenna. 2) To ensure that maximum or worst case, emission levels were measured, the following steps were taken: a) The EUT was rotated so that all sides were exposed to the receiving antenna. b) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured. c) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings. d) For hand-held or body-worn devices, the EUT was rotated through three orthogonal axes to determine which orientation produces the highest emission relative to the limit.



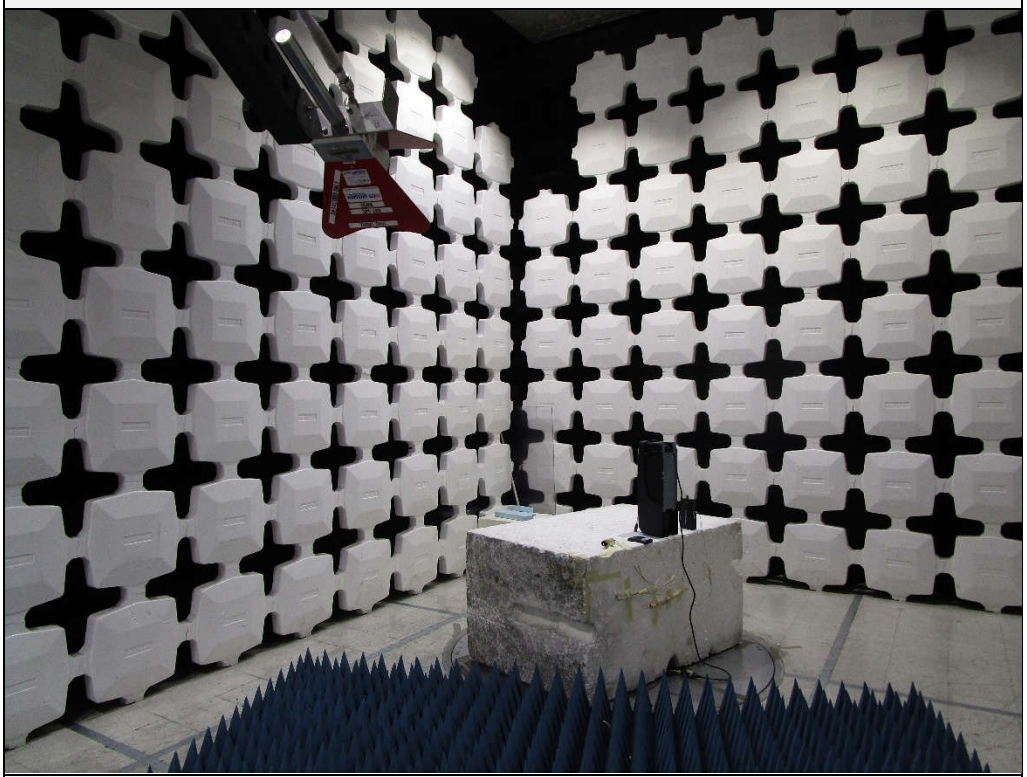
Test Setup for Radiated Emissions: 30MHz to 1GHz, Horizontal Polarization



Test Setup for Radiated Emissions: 30MHz to 1GHz, Vertical Polarization



Test Setup for Radiated Emissions: 1GHz to 5GHz, Horizontal Polarization



Test Setup for Radiated Emissions: 1GHz to 5GHz, Vertical Polarization

FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

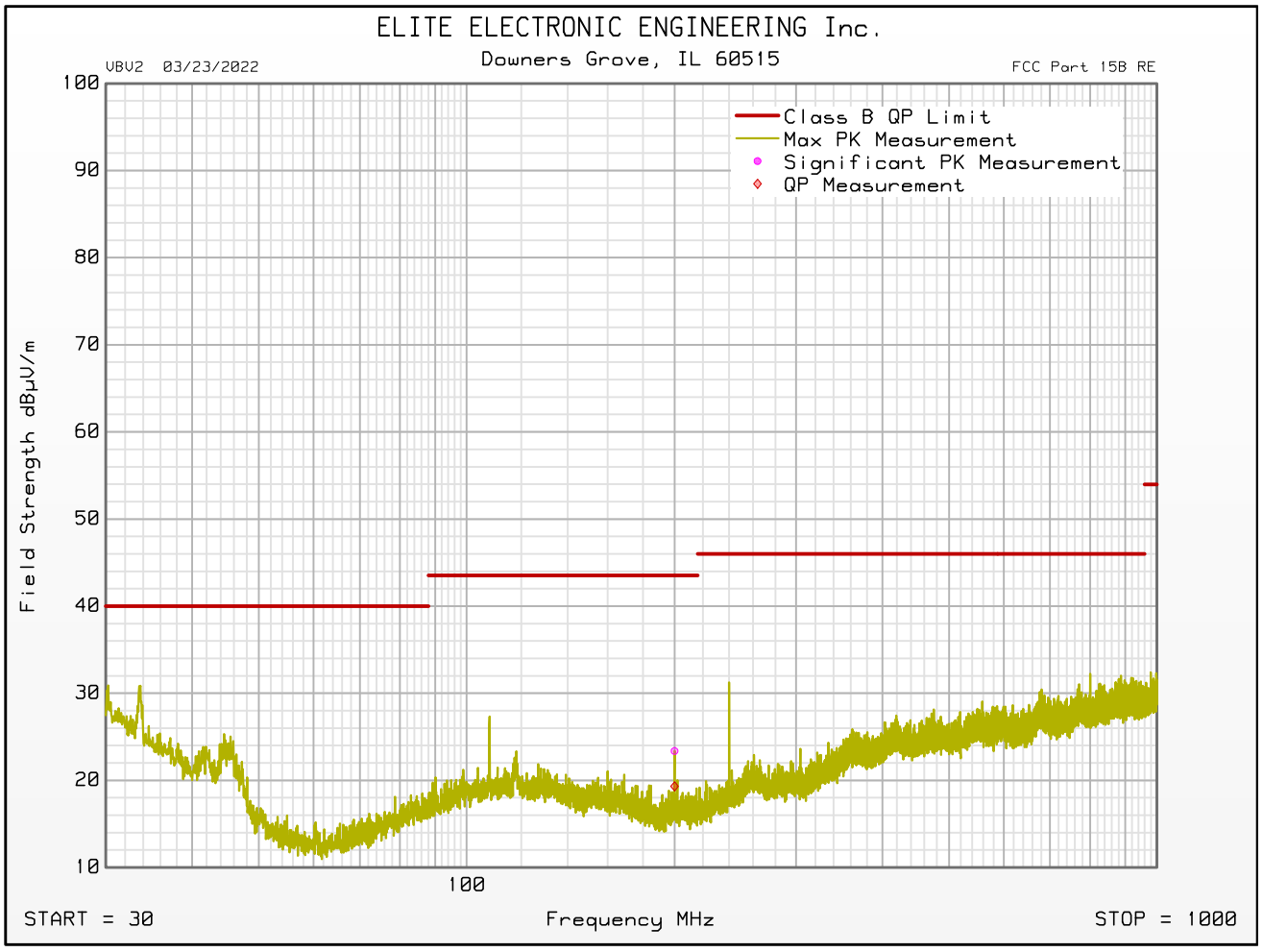
Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 902.25MHz
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 12, 2022 01:33:42 PM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive QP Level
31.380	12.5	0.1	24.6	0.0	0.4	0.0	37.5	25.1	40.0	-14.9	Vertical	120	45	
52.620	9.6	-2.4	13.5	0.0	0.4	0.0	23.6	11.6	40.0	-28.4	Vertical	200	270	
53.340	12.6	-0.7	13.3	0.0	0.4	0.0	26.3	13.0	40.0	-27.0	Vertical	120	135	
54.600	8.0	-4.3	13.0	0.0	0.4	0.0	21.3	9.1	40.0	-30.9	Vertical	340	315	
64.440	20.6	-3.8	12.5	0.0	0.4	0.0	33.5	9.1	40.0	-30.9	Vertical	120	45	
80.040	5.7	0.1	15.4	0.0	0.4	0.0	21.5	15.9	40.0	-24.1	Vertical	120	270	
107.860	11.0	7.1	19.1	0.0	0.4	0.0	30.5	26.5	43.5	-17.0	Vertical	120	90	
160.000	8.8	5.0	17.2	0.0	0.6	0.0	26.6	22.8	43.5	-20.7	Vertical	120	225	
200.020	6.7	2.6	15.9	0.0	0.8	0.0	23.4	19.3	43.5	-24.2	Horizontal	340	315	
240.000	15.9	13.5	17.7	0.0	0.8	0.0	34.4	31.9	46.0	-14.1	Vertical	340	0	
546.240	2.8	-4.5	24.7	0.0	1.1	0.0	28.7	21.3	46.0	-24.7	Vertical	200	270	
939.600	4.0	-4.1	27.0	0.0	1.5	0.0	32.5	24.4	46.0	-21.6	Vertical	120	0	

FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

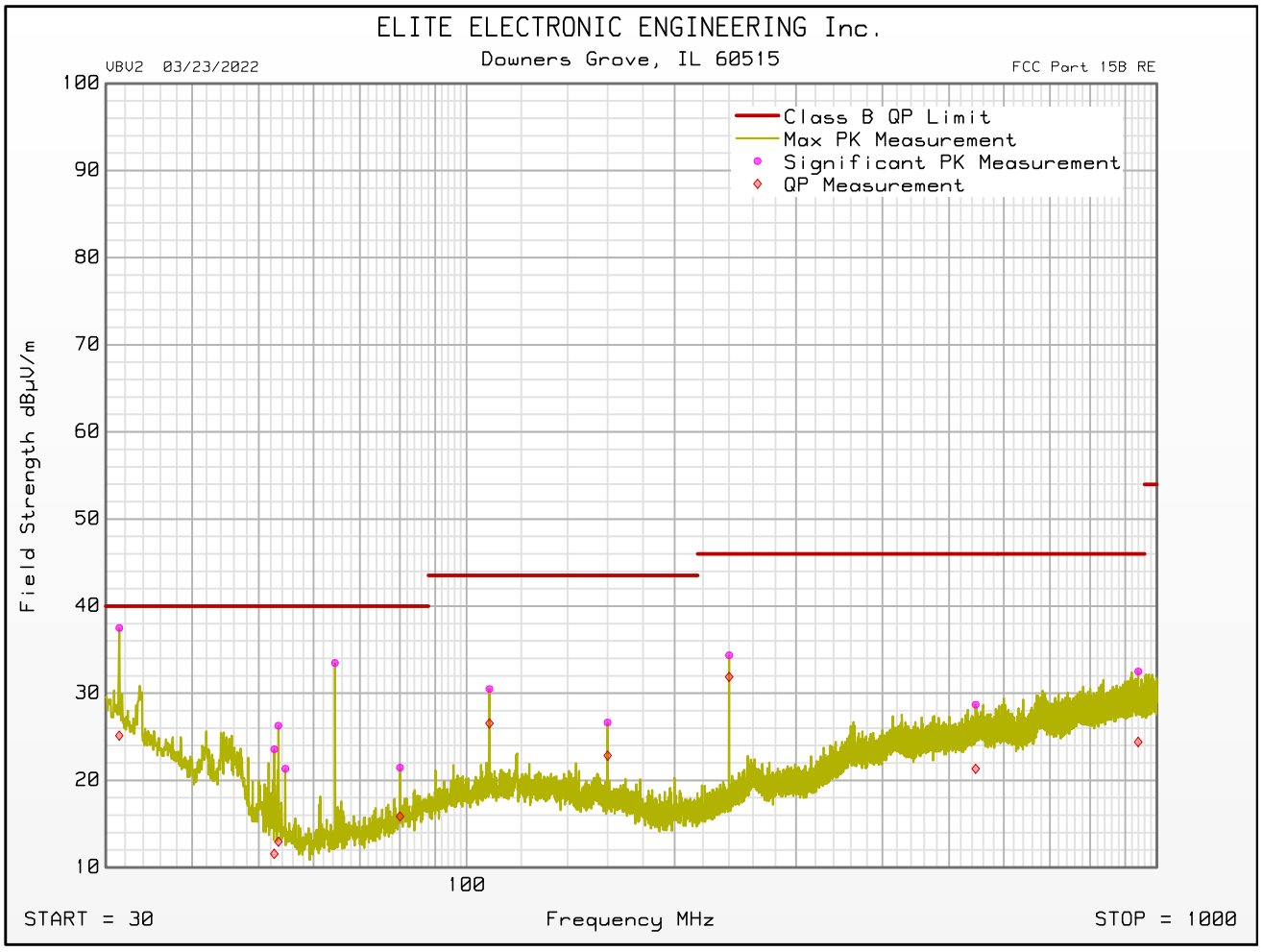
Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 902.25MHz
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 12, 2022 01:33:42 PM



FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 902.25MHz
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 12, 2022 01:33:42 PM



FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 902.25MHz
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 13, 2022 09:41:22 AM

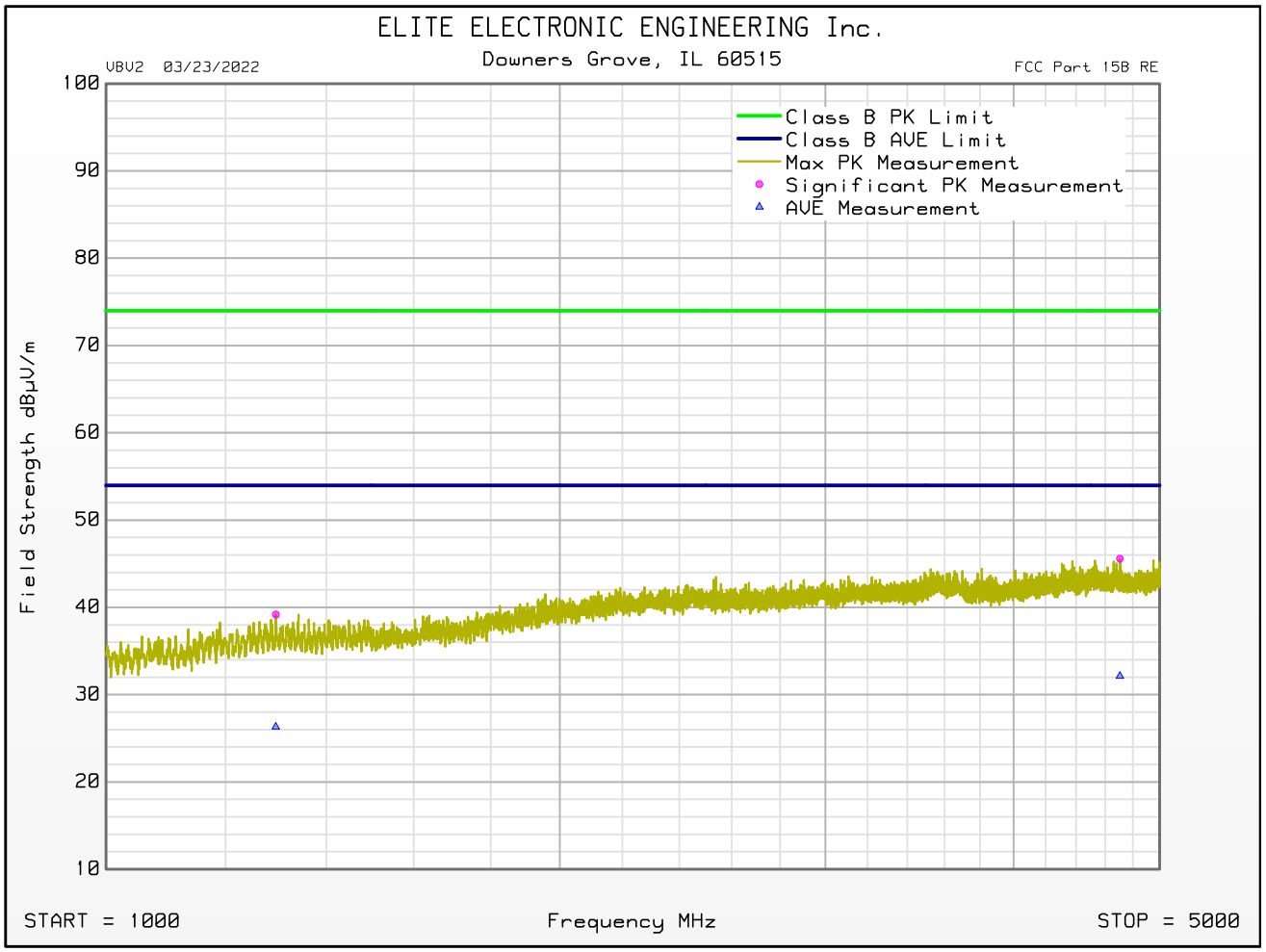
Freq MHz	Peak Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	Peak Limit dBµV/m	Peak Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive Peak Level
1296.000	49.1	28.8	-40.6	1.8	0.0	39.2	74.0	-34.8	Horizontal	120	135	
1618.500	48.5	29.0	-40.2	2.0	0.0	39.4	74.0	-34.6	Vertical	340	135	
2064.000	48.2	31.6	-39.9	2.3	0.0	42.3	74.0	-31.7	Vertical	340	135	
2586.500	49.1	32.7	-40.2	2.7	0.0	44.3	74.0	-29.7	Vertical	340	135	
3624.000	47.1	33.6	-39.5	3.3	0.0	44.5	74.0	-29.5	Vertical	120	315	
4705.000	47.2	34.4	-39.7	3.7	0.0	45.6	74.0	-28.4	Horizontal	340	135	

Freq MHz	Average Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Average Total dBµV/m	Average Limit dBµV/m	Average Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive Average Level
1296.000	36.2	28.8	-40.6	1.8	0.0	26.3	54.0	-27.7	Horizontal	120	135	
1618.500	35.4	29.0	-40.2	2.0	0.0	26.2	54.0	-27.8	Vertical	340	135	
2064.000	35.1	31.6	-39.9	2.3	0.0	29.2	54.0	-24.8	Vertical	340	135	
2586.500	34.7	32.7	-40.2	2.7	0.0	29.9	54.0	-24.1	Vertical	340	135	
3624.000	33.9	33.6	-39.5	3.3	0.0	31.3	54.0	-22.7	Vertical	120	315	
4705.000	33.7	34.4	-39.7	3.7	0.0	32.1	54.0	-21.9	Horizontal	340	135	

FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

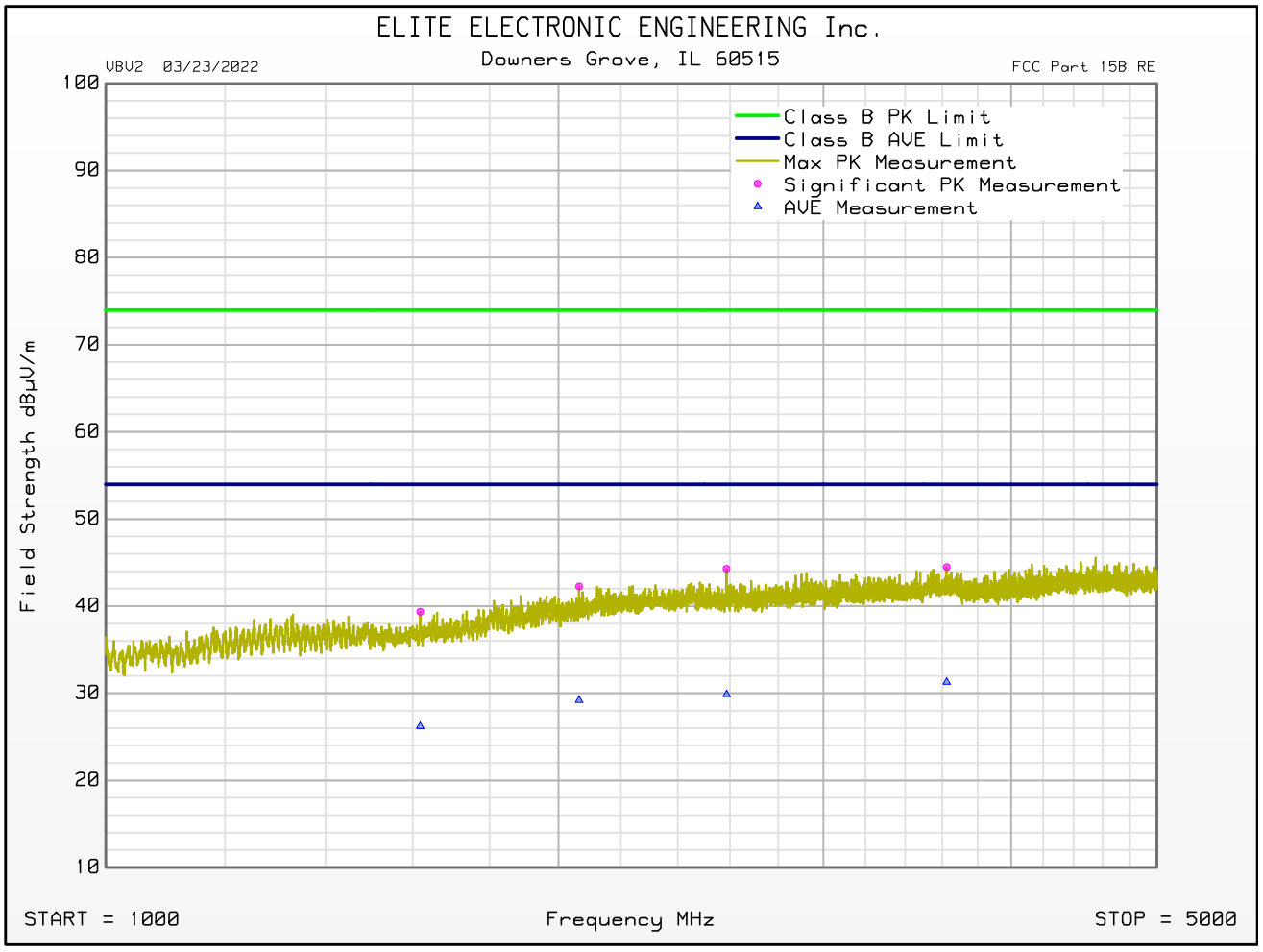
Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 902.25MHz
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 13, 2022 09:41:22 AM



FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 902.25MHz
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 13, 2022 09:41:22 AM



FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

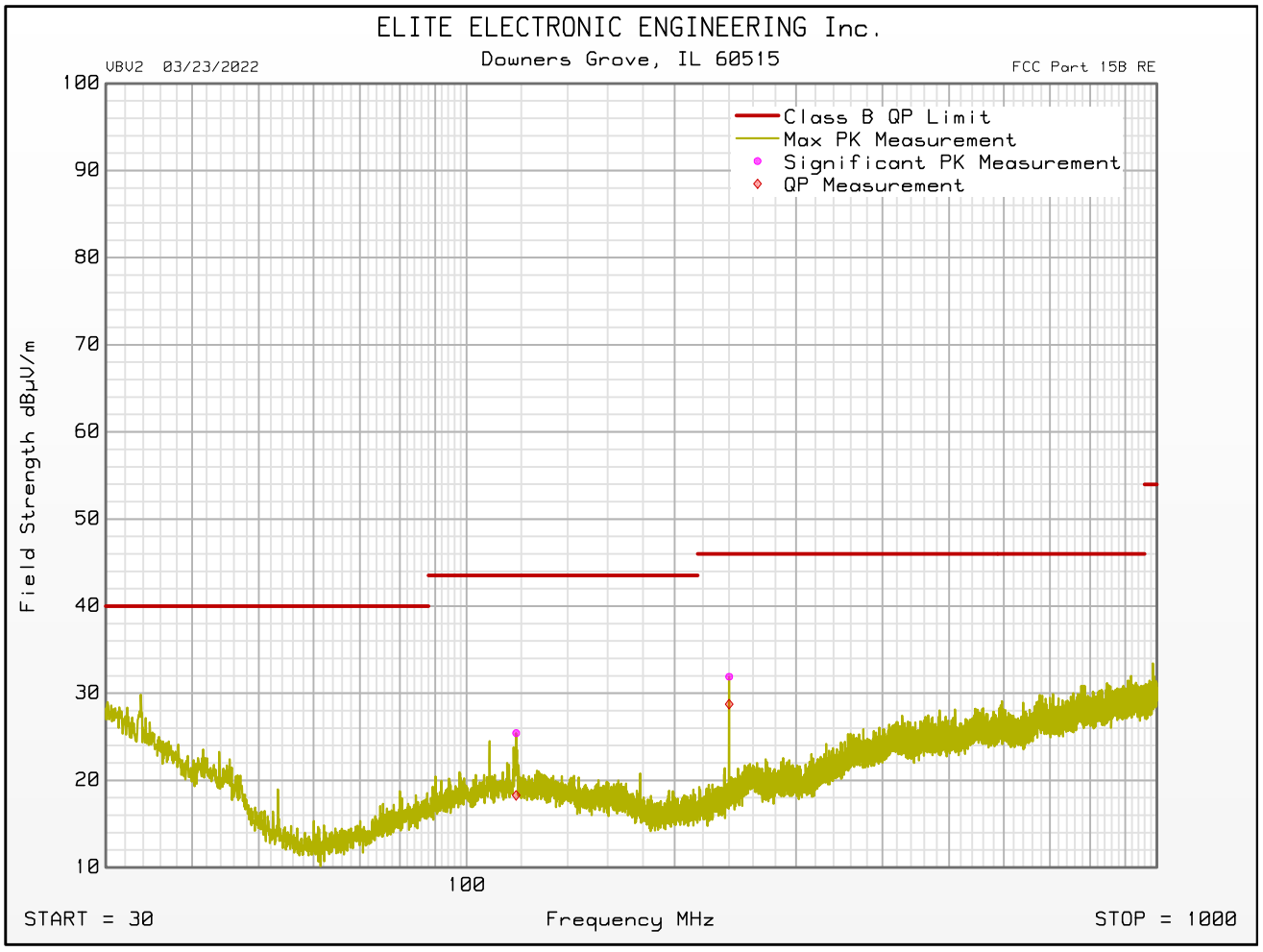
Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 914.75MHz
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 12, 2022 01:55:22 PM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive QP Level
31.560	8.2	-2.3	24.5	0.0	0.4	0.0	33.1	22.6	40.0	-17.4	Vertical	340	45	
47.460	11.7	-0.9	15.7	0.0	0.4	0.0	27.8	15.2	40.0	-24.8	Vertical	120	270	
51.120	10.0	-2.9	14.1	0.0	0.4	0.0	24.5	11.6	40.0	-28.4	Vertical	120	315	
61.800	7.5	-4.8	12.3	0.0	0.4	0.0	20.2	7.9	40.0	-32.1	Vertical	120	135	
62.220	12.9	-3.7	12.4	0.0	0.4	0.0	25.6	9.0	40.0	-31.0	Vertical	200	180	
79.980	6.1	0.3	15.4	0.0	0.4	0.0	21.9	16.1	40.0	-23.9	Vertical	200	45	
107.860	9.0	5.4	19.1	0.0	0.4	0.0	28.5	24.9	43.5	-18.7	Vertical	120	90	
117.940	5.9	-1.3	19.1	0.0	0.5	0.0	25.4	18.3	43.5	-25.2	Horizontal	340	315	
160.000	7.9	3.6	17.2	0.0	0.6	0.0	25.7	21.5	43.5	-22.0	Vertical	120	45	
240.000	13.5	10.3	17.7	0.0	0.8	0.0	31.9	28.8	46.0	-17.2	Horizontal	120	90	
535.860	3.8	-4.4	24.0	0.0	1.1	0.0	29.0	20.7	46.0	-25.3	Vertical	120	0	
914.520	3.6	-4.1	27.0	0.0	1.5	0.0	32.2	24.4	46.0	-21.6	Vertical	200	90	

FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

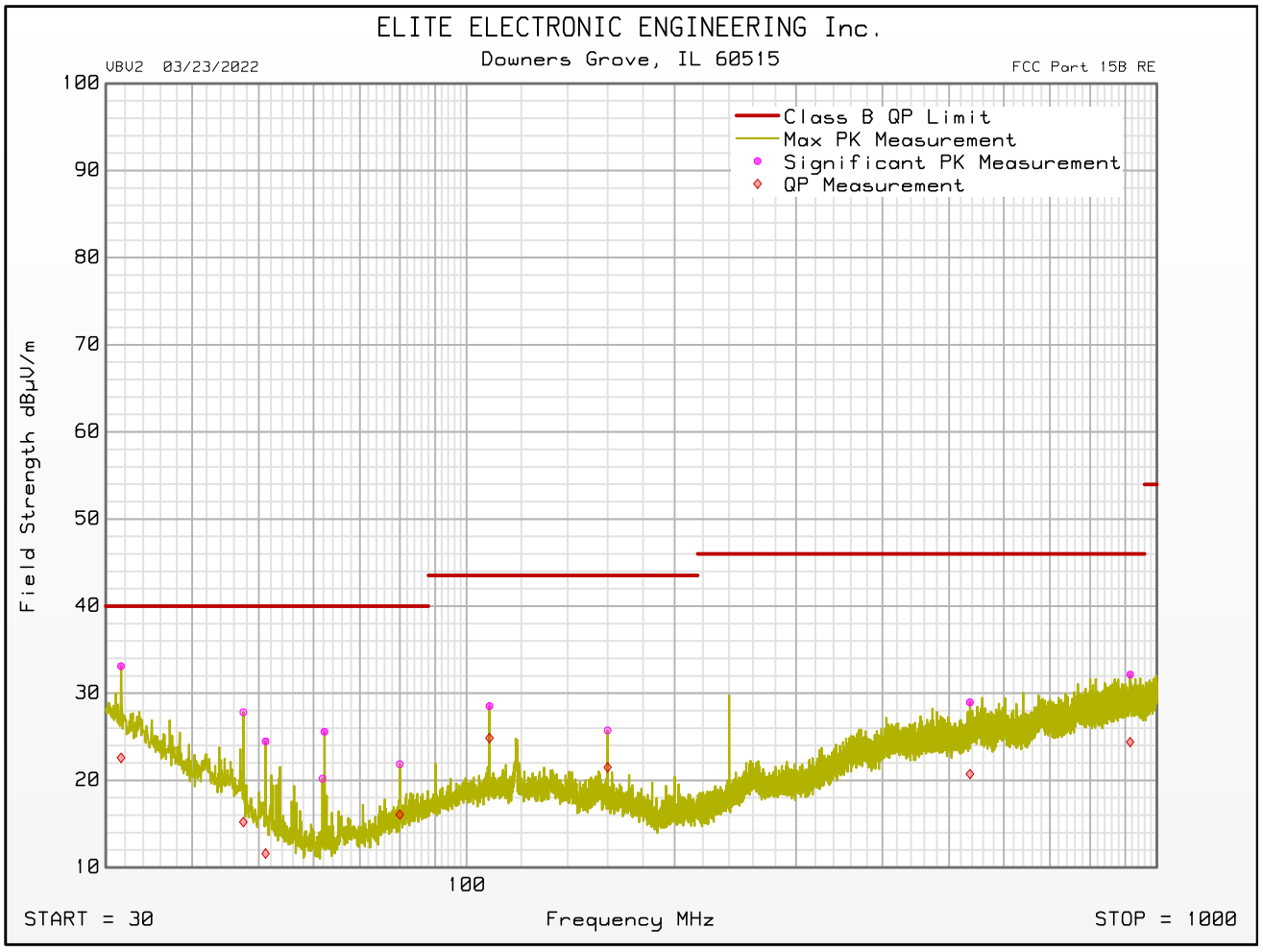
Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 914.75MHz
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 12, 2022 01:55:22 PM



FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 914.75MHz
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 12, 2022 01:55:22 PM



FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 914.75MHz
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 13, 2022 10:36:18 AM

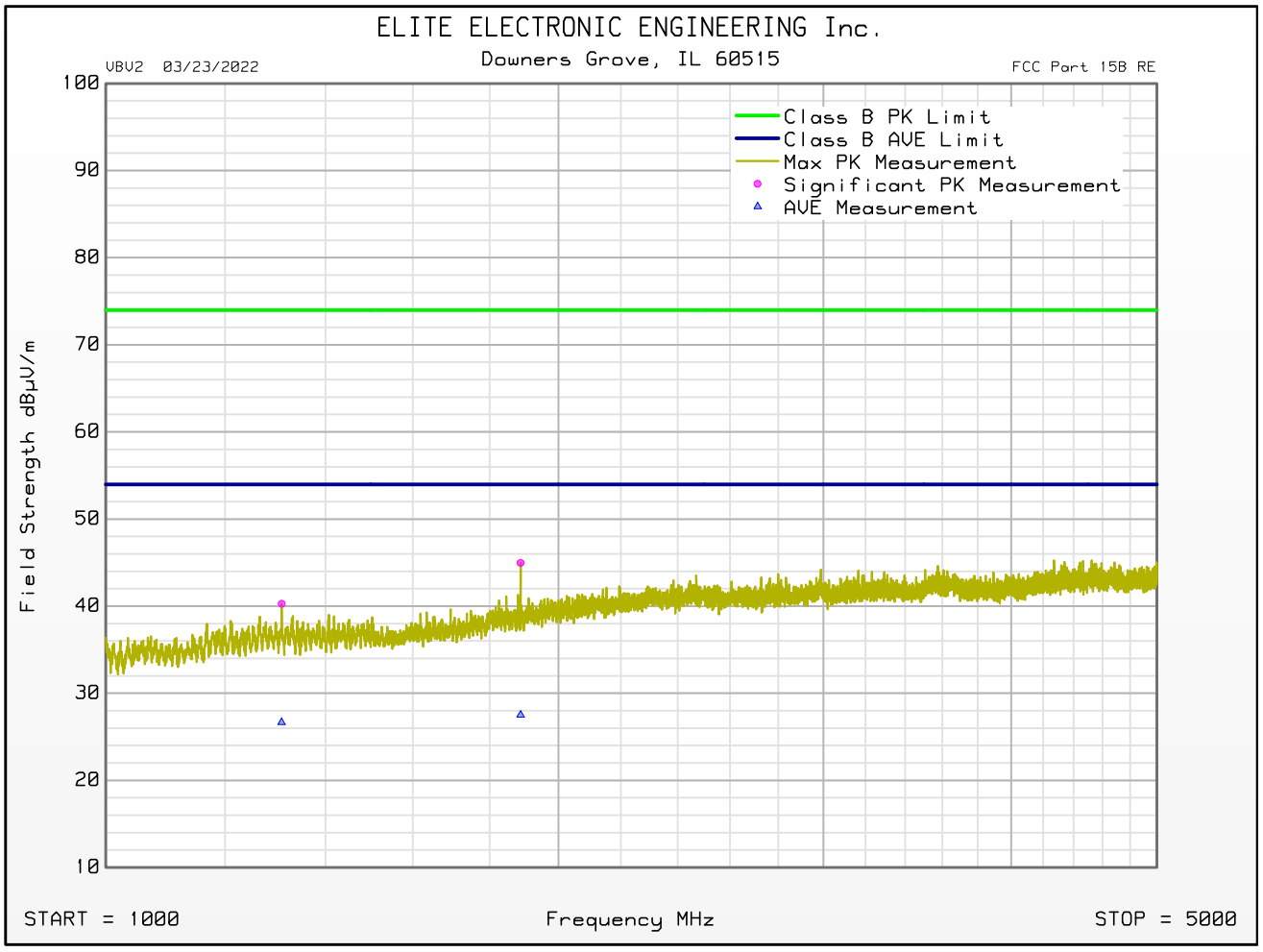
Freq MHz	Peak Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	Peak Limit dBµV/m	Peak Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive Peak Level
1276.000	49.9	28.8	-40.6	1.8	0.0	39.9	74.0	-34.1	Vertical	200	315	
1309.000	50.2	28.8	-40.5	1.8	0.0	40.3	74.0	-33.7	Horizontal	120	270	
1750.500	52.0	30.0	-40.1	2.1	0.0	44.1	74.0	-29.9	Vertical	120	45	
1887.000	52.0	30.8	-40.1	2.2	0.0	45.0	74.0	-29.0	Horizontal	120	180	
2464.000	49.3	32.7	-40.2	2.6	0.0	44.4	74.0	-29.6	Vertical	200	90	
3538.500	47.5	33.5	-39.5	3.2	0.0	44.7	74.0	-29.2	Vertical	200	90	
4556.000	47.2	34.3	-39.6	3.6	0.0	45.5	74.0	-28.5	Vertical	200	315	

Freq MHz	Average Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Average Total dBµV/m	Average Limit dBµV/m	Average Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive Average Level
1276.000	36.8	28.8	-40.6	1.8	0.0	26.8	54.0	-27.2	Vertical	200	315	
1309.000	36.6	28.8	-40.5	1.8	0.0	26.7	54.0	-27.3	Horizontal	120	270	
1750.500	35.4	30.0	-40.1	2.1	0.0	27.5	54.0	-26.5	Vertical	120	45	
1887.000	34.5	30.8	-40.1	2.2	0.0	27.5	54.0	-26.5	Horizontal	120	180	
2464.000	35.3	32.7	-40.2	2.6	0.0	30.4	54.0	-23.6	Vertical	200	90	
3538.500	34.2	33.5	-39.5	3.2	0.0	31.4	54.0	-22.6	Vertical	200	90	
4556.000	33.6	34.3	-39.6	3.6	0.0	31.9	54.0	-22.1	Vertical	200	315	

FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

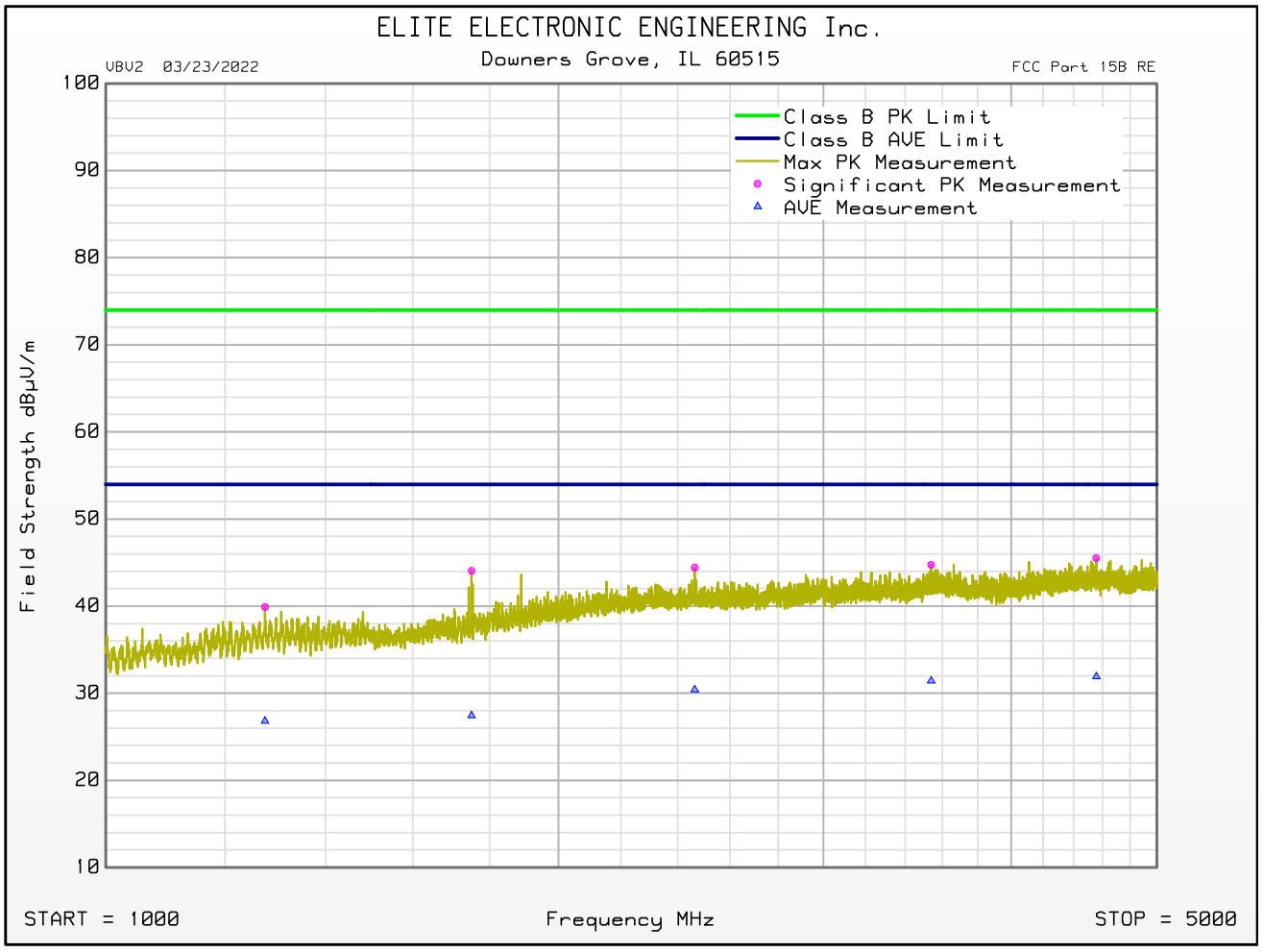
Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 914.75MHz
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 13, 2022 10:36:18 AM



FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 914.75MHz
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 13, 2022 10:36:18 AM



FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

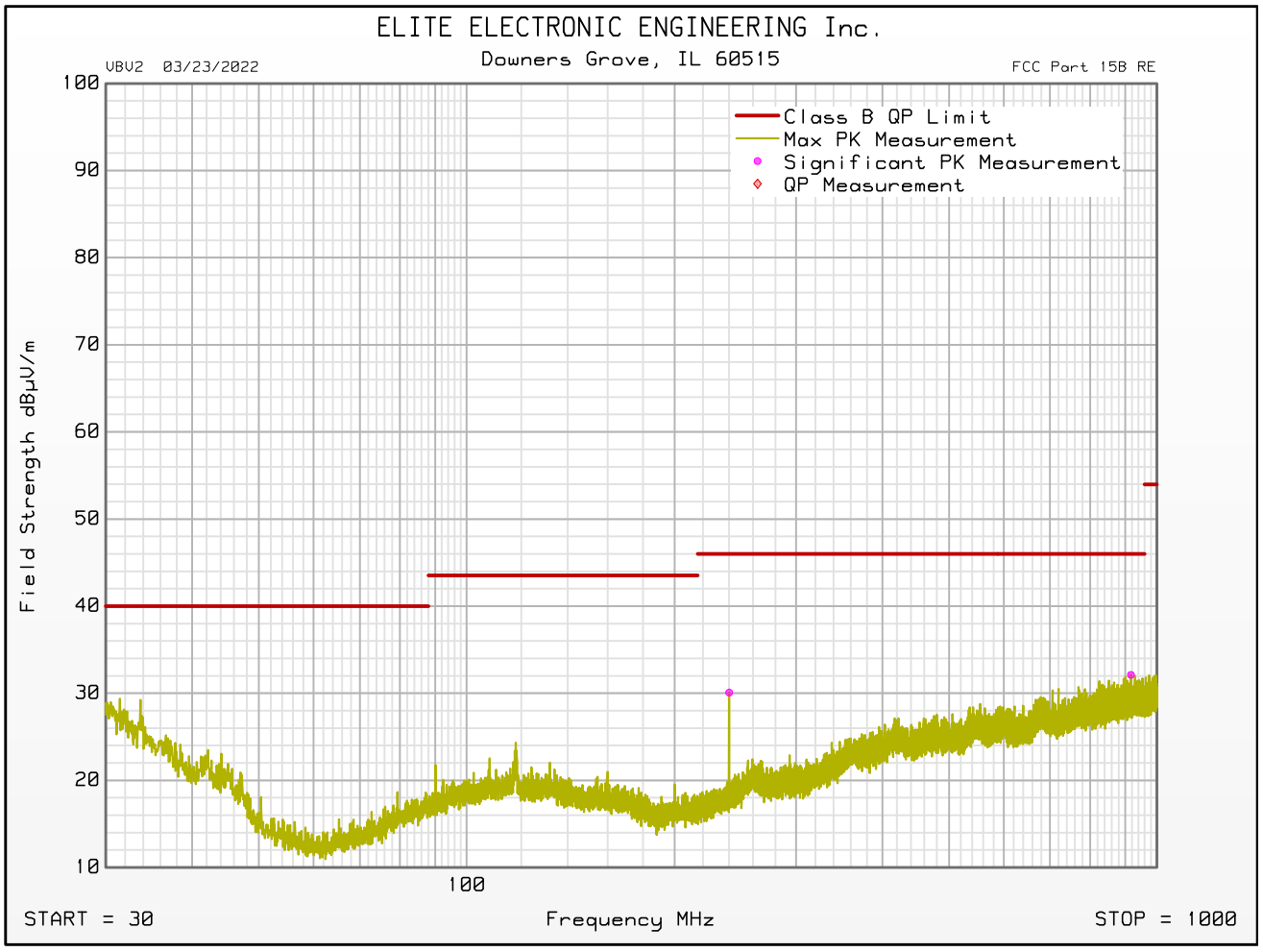
Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 926.75MHz
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 12, 2022 02:15:57 PM

Freq MHz	Peak Mtr Rdg dBuV	QP Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	QP Total dBµV/m	QP Limit dBµV/m	QP Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive QP Level
31.200	6.9		24.7	0.0	0.4	0.0	32.0		40.0		Vertical	120	180	Yes
47.760	10.8		15.6	0.0	0.4	0.0	26.8		40.0		Vertical	200	315	Yes
53.280	14.6		13.3	0.0	0.4	0.0	28.3		40.0		Vertical	200	315	Yes
55.440	8.6		12.7	0.0	0.4	0.0	21.7		40.0		Vertical	200	0	Yes
61.800	8.0		12.3	0.0	0.4	0.0	20.7		40.0		Vertical	120	315	Yes
63.360	11.1		12.4	0.0	0.4	0.0	23.9		40.0		Vertical	120	0	Yes
107.920	6.2		19.1	0.0	0.4	0.0	25.7		43.5		Vertical	120	270	Yes
118.000	5.7		19.1	0.0	0.5	0.0	25.3		43.5		Vertical	200	225	Yes
136.660	6.5		18.5	0.0	0.6	0.0	25.5		43.5		Vertical	120	180	Yes
240.000	11.7		17.7	0.0	0.8	0.0	30.1		46.0		Horizontal	120	90	Yes
429.180	4.6		23.1	0.0	1.1	0.0	28.8		46.0		Vertical	120	225	Yes
916.980	3.6		27.0	0.0	1.5	0.0	32.1		46.0		Horizontal	340	45	Yes

FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

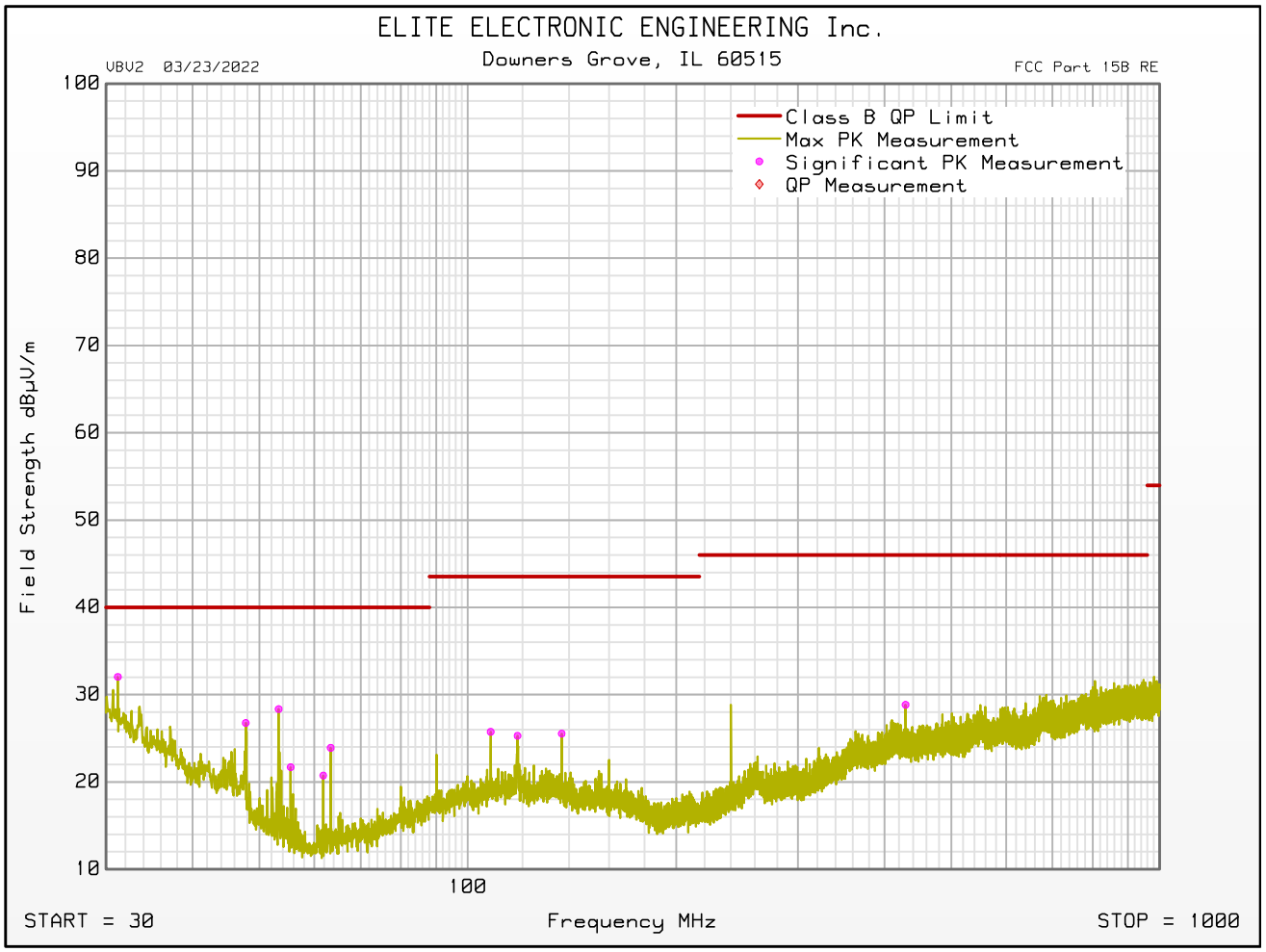
Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 926.75MHz
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 12, 2022 02:15:57 PM



FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 926.75MHz
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 12, 2022 02:15:57 PM



FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 926.75MHz
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 13, 2022 11:05:03 AM

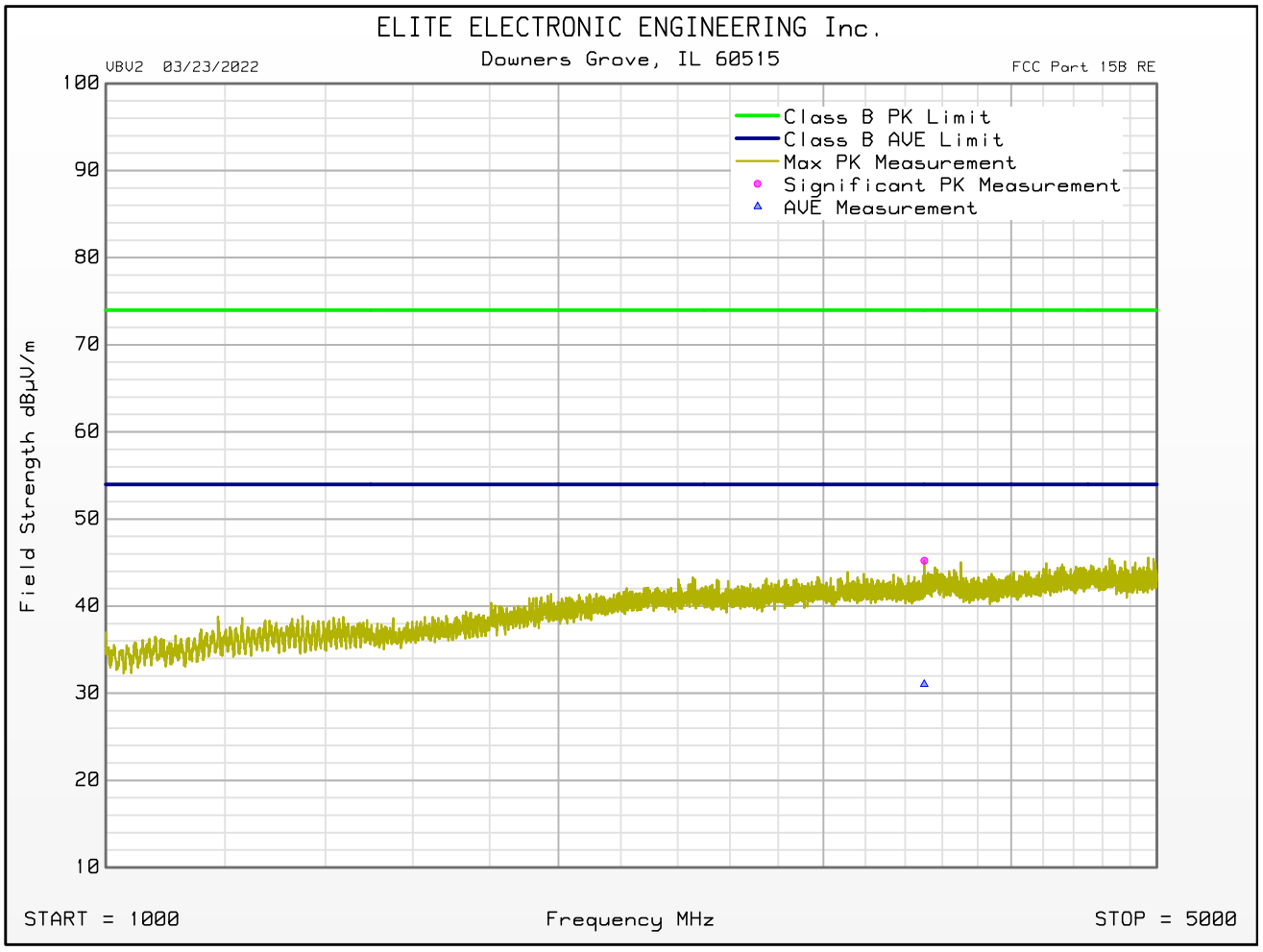
Freq MHz	Peak Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	Peak Limit dBµV/m	Peak Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive Peak Level
1288.000	49.5	28.8	-40.6	1.8	0.0	39.5	74.0	-34.4	Vertical	340	0	
1670.500	52.9	29.4	-40.2	2.1	0.0	44.2	74.0	-29.8	Vertical	340	180	
2220.500	47.8	32.2	-39.9	2.5	0.0	42.5	74.0	-31.5	Vertical	200	90	
2479.500	50.2	32.7	-40.2	2.6	0.0	45.3	74.0	-28.7	Vertical	200	0	
3501.500	48.2	33.3	-39.5	3.2	0.0	45.2	74.0	-28.8	Horizontal	200	90	
4278.500	47.8	33.9	-39.6	3.5	0.0	45.6	74.0	-28.4	Vertical	340	135	

Freq MHz	Average Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Average Total dBµV/m	Average Limit dBµV/m	Average Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive Average Level
1288.000	36.6	28.8	-40.6	1.8	0.0	26.6	54.0	-27.4	Vertical	340	0	
1670.500	35.2	29.4	-40.2	2.1	0.0	26.5	54.0	-27.5	Vertical	340	180	
2220.500	35.1	32.2	-39.9	2.5	0.0	29.7	54.0	-24.3	Vertical	200	90	
2479.500	34.9	32.7	-40.2	2.6	0.0	30.0	54.0	-23.9	Vertical	200	0	
3501.500	34.1	33.3	-39.5	3.2	0.0	31.0	54.0	-22.9	Horizontal	200	90	
4278.500	33.9	33.9	-39.6	3.5	0.0	31.7	54.0	-22.3	Vertical	340	135	

FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

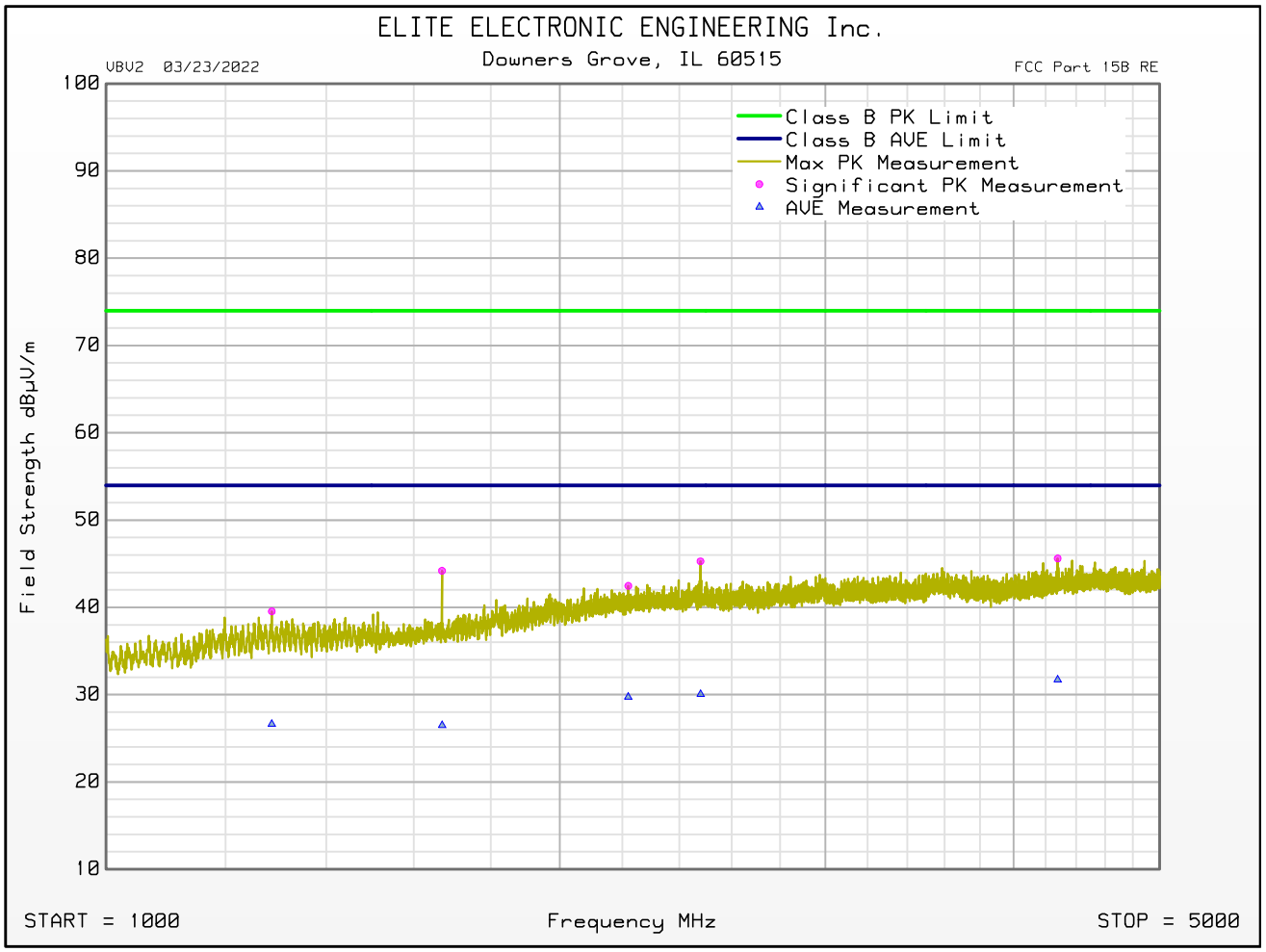
Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 926.75MHz
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 13, 2022 11:05:03 AM



FCC Part 15B Class B
Radiated RF Emissions Test

SW ID/Rev: VBV2 03/23/2022

Manufacturer	:	Chamberlain Group
Model	:	RJOA MPP
Serial Number	:	Radiated Sample 2
DUT Mode	:	Receive at 926.75MHz
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Dec 13, 2022 11:05:03 AM



22. Transmitter Conducted Emissions (AC Mains)

Test Information	
Manufacturer	Chamberlain Group, LLC.
Product	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Radiated Sample 2
Mode	Transmit at 914.75MHz

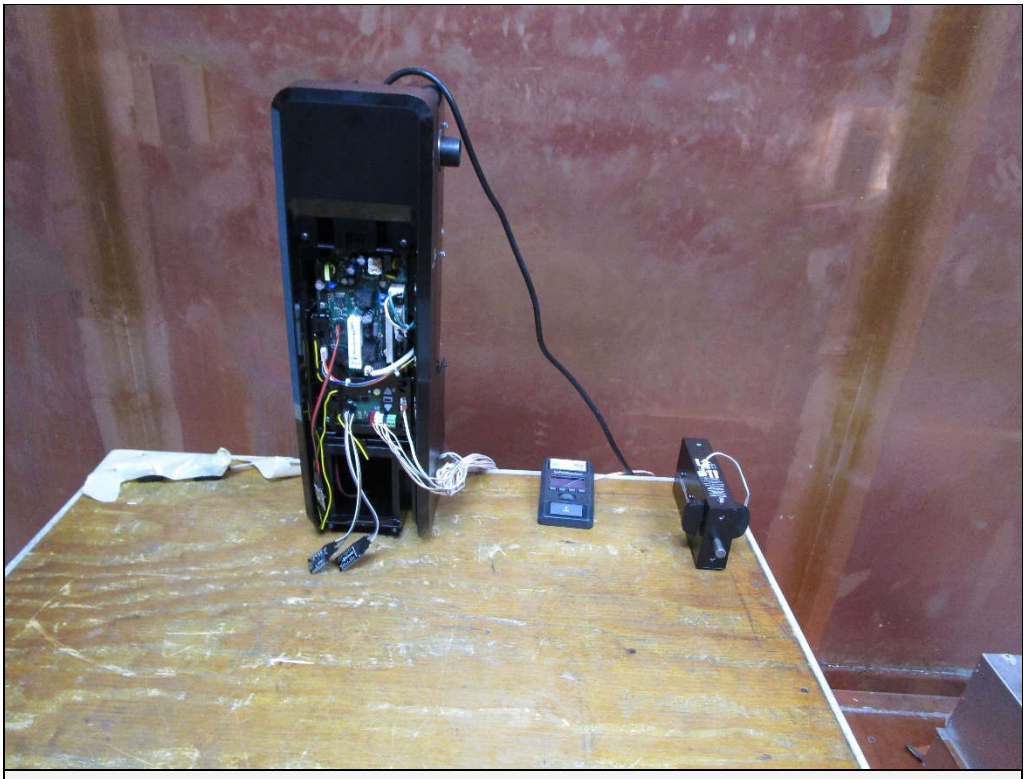
Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Type of Test Site	Shielded Enclosure
Test Site Used	Room 23S
Notes	

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Conducted disturbance (mains port) (150 kHz – 30 MHz)	2.7

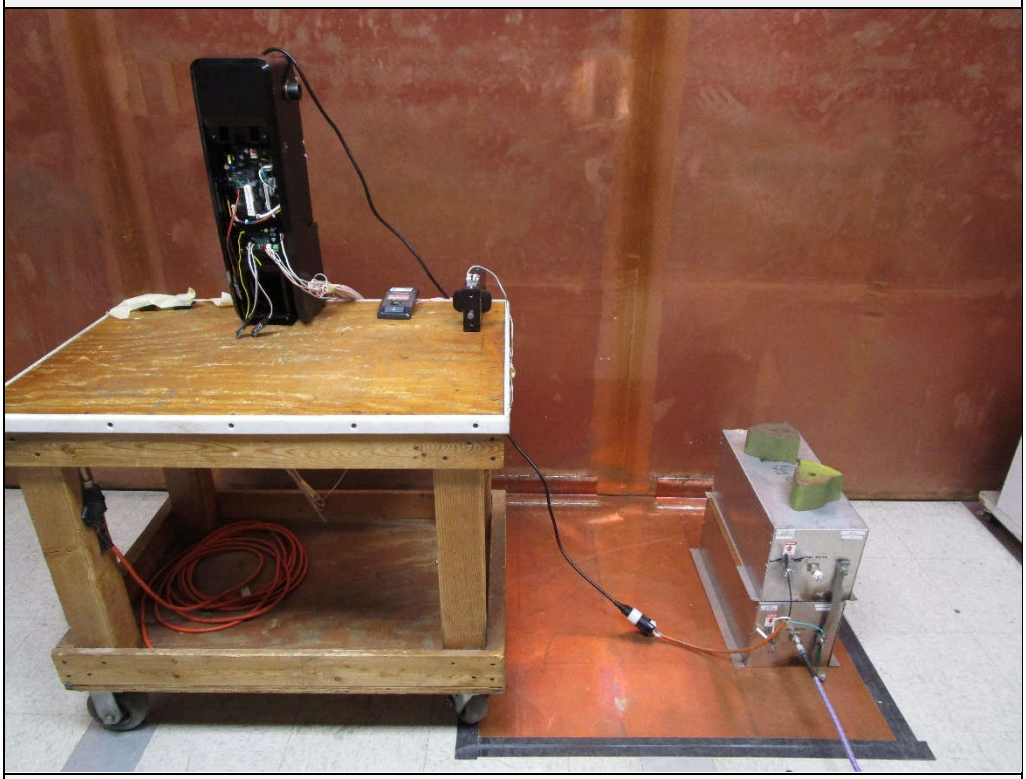
Requirements
All radio frequency voltages on the power lines for any frequency or frequencies of an intentional radiator shall not exceed the limits in the following table:

Transmitter Conducted Emissions Limits		
Frequency of Emission (MHz)	Conducted Limits (dBµV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56-46*
0.5 – 5	56	46
5 – 30	60	50
* The lower limit shall apply at the transition frequencies.		

Procedure
The interference on each power lead of the EUT was measured by connecting the measuring equipment to the appropriate meter terminal of the Line Impedance Stabilization Network (LISN). The meter terminal of the LISN not under test was terminated with 50 ohms. 1) The EUT was operated in the Transmit at 914.75MHz mode. 2) Measurements were first made on the 120V, 60Hz high line. 3) The frequency range from 150kHz to 30MHz was broken up into smaller frequency sub-bands. 4) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector. 5) The data thus obtained was then searched by the computer for the highest levels. Any emissions levels that were within 3dB of the average limit were then measured again using both a quasi-peak detector and an average detector. (If no peak readings were within 3dB of the average limit, quasi-peak and average readings were taken on the highest emissions levels measured during the peak detector scan.) 6) Steps (4) and (5) were repeated for the remainder of the frequency sub-bands until the entire frequency range from 150kHz to 30MHz was investigated. The peak trace was automatically plotted. The plot also shows quasi-peak and average readings that were taken on discrete frequencies. A table showing the quasi-peak and average readings was also generated. This tabular data compares the quasi-peak and average conducted emissions to the applicable conducted emissions limits. 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 (dBµV) = MTR (dBµV) + CF (dB) 7) Steps (3) through (6) were repeated on the 120V, 60Hz return line.



Test Setup for RF Conducted Emissions (AC Mains)



Test Setup for RF Conducted Emissions (AC Mains)

FCC Part 15 Subpart C 2017-2022 Conducted Emissions Test

Significant Emissions Data

VBR8 11/08/2022

Manufacturer	:	Chamberlain
Model	:	RJOA MPP
DUT Revision	:	
Serial Number	:	
DUT Mode	:	Tx @ 914.75MHx
Line Tested	:	120V, 60Hz high
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-3
Notes	:	Realtek BLE transmit at 2402MHz, power = 4.5dBm
Test Engineer	:	M. Longinotti
Limit	:	15.207
Test Date	:	Nov 28, 2022 03:18:10 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 3 dB margin below limit

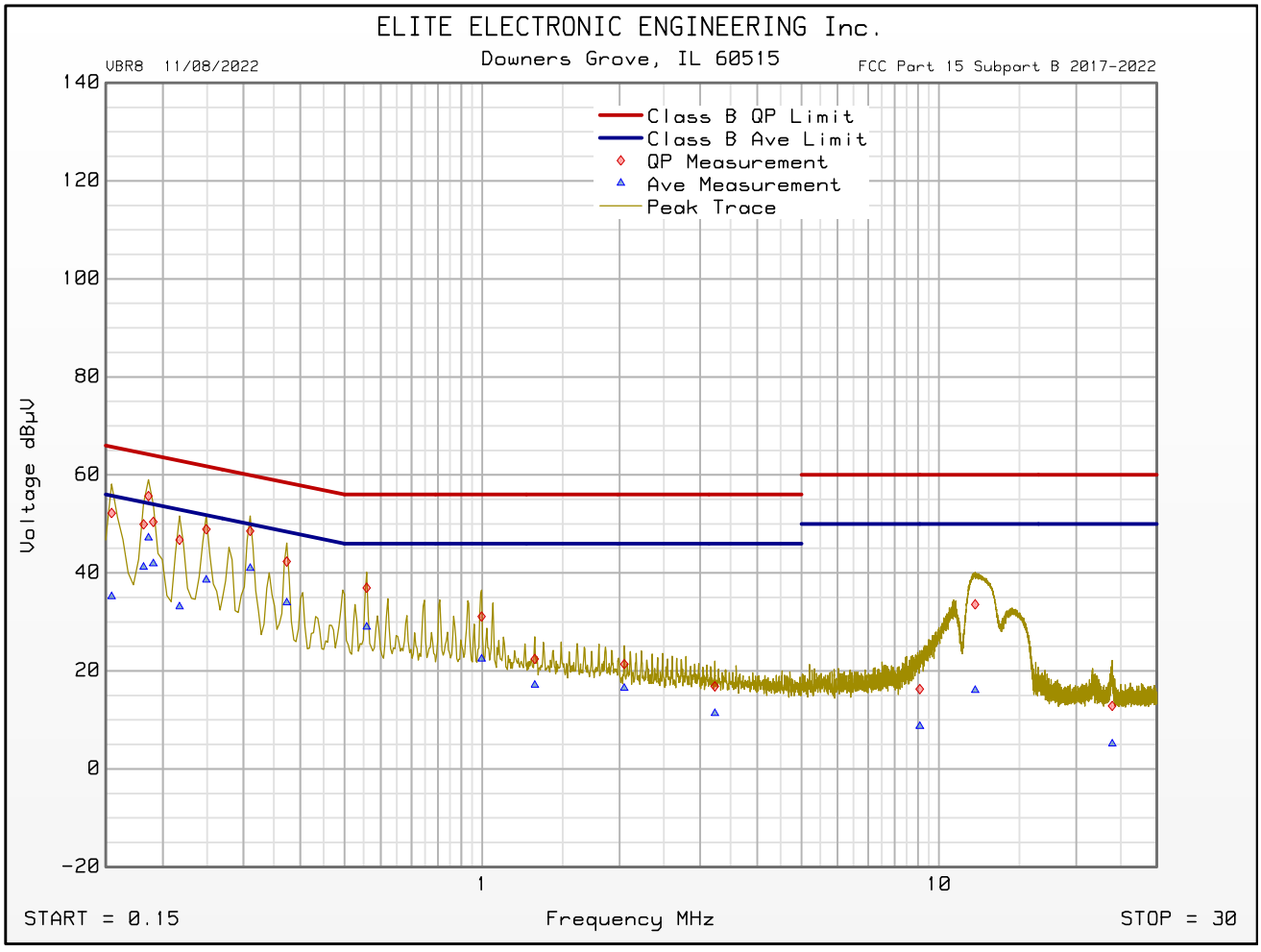
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.186	55.7	64.2		47.2	54.2	
0.311	48.5	60.0		40.9	50.0	
0.559	36.9	56.0		29.0	46.0	
0.997	31.1	56.0		22.4	46.0	
1.304	22.4	56.0		17.1	46.0	
2.048	21.4	56.0		16.5	46.0	
3.230	16.8	56.0		11.3	46.0	
9.077	16.3	60.0		8.7	50.0	
12.006	33.6	60.0		16.1	50.0	
23.945	12.8	60.0		5.1	50.0	

FCC Part 15 Subpart C 2017-2022 Conducted Emissions Test

Cumulative Data

VBR8 11/08/2022

Manufacturer	:	Chamberlain
Model	:	RJOA MPP
DUT Revision	:	
Serial Number	:	
DUT Mode	:	Tx @ 914.75MHx
Line Tested	:	120V, 60Hz high
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-3
Notes	:	Realtek BLE transmit at 2402MHz, power = 4.5dBm
Test Engineer	:	M. Longinotti
Limit	:	15.207
Test Date	:	Nov 28, 2022 03:18:10 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart C 2017-2022 Conducted Emissions Test

Significant Emissions Data

VBR8 11/08/2022

Manufacturer	:	Chamberlain
Model	:	RJOA MPP
DUT Revision	:	
Serial Number	:	
DUT Mode	:	Tx @ 914.75MHx
Line Tested	:	120V, 60Hz return
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-3
Notes	:	Realtek BLE transmit at 2402MHz, power = 4.5dBm
Test Engineer	:	M. Longinotti
Limit	:	15.207
Test Date	:	Nov 28, 2022 03:11:33 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 3 dB margin below limit

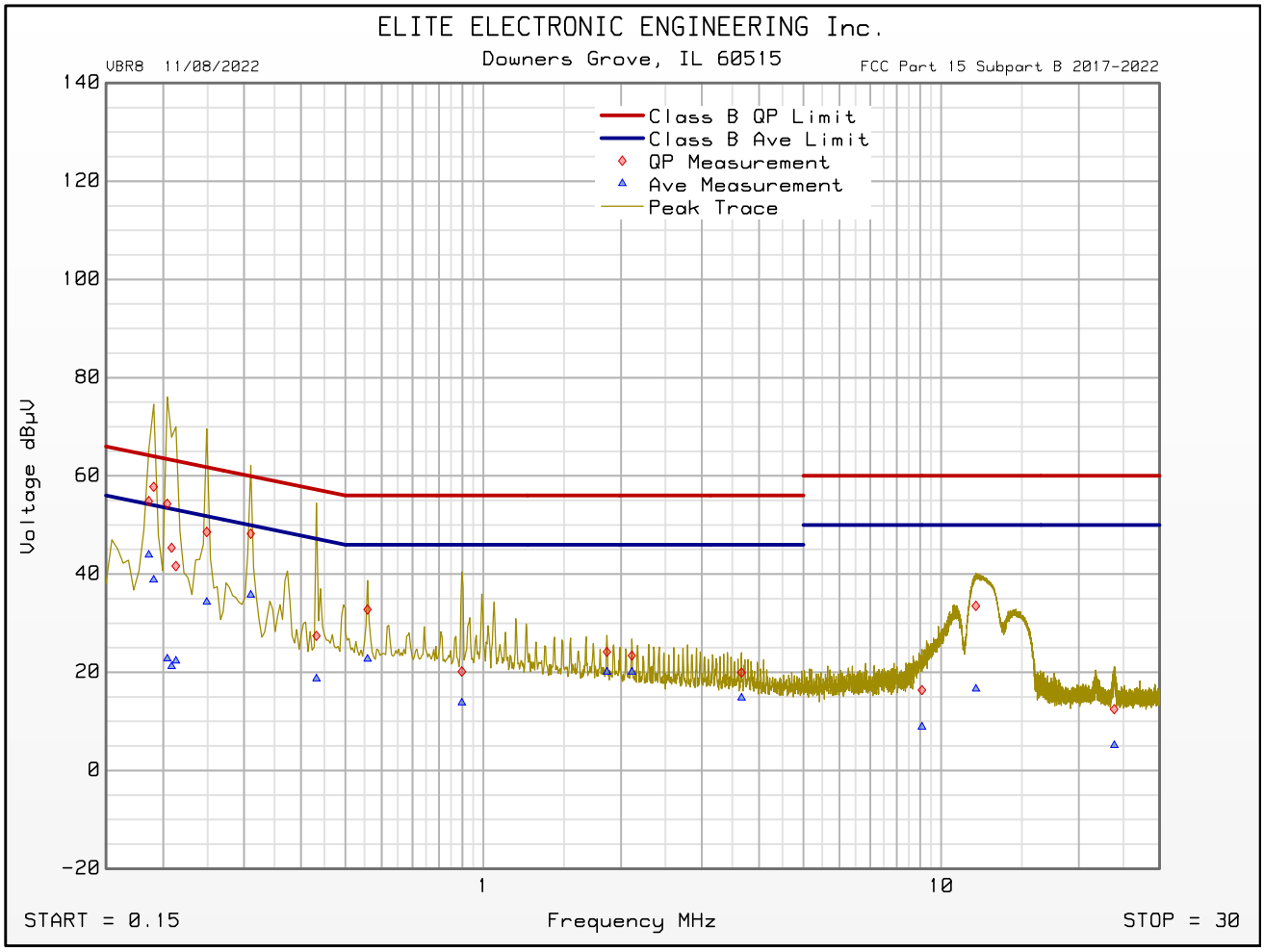
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.191	57.8	64.0		38.8	54.0	
0.311	48.2	60.0		35.8	50.0	
0.559	32.8	56.0		22.7	46.0	
0.898	20.1	56.0		13.8	46.0	
1.862	24.1	56.0		20.1	46.0	
2.111	23.4	56.0		20.0	46.0	
3.662	19.9	56.0		14.8	46.0	
9.077	16.4	60.0		8.9	50.0	
11.907	33.5	60.0		16.6	50.0	
23.873	12.5	60.0		5.1	50.0	

FCC Part 15 Subpart C 2017-2022 Conducted Emissions Test

Cumulative Data

VBR8 11/08/2022

Manufacturer	:	Chamberlain
Model	:	RJOA MPP
DUT Revision	:	
Serial Number	:	
DUT Mode	:	Tx @ 914.75MHx
Line Tested	:	120V, 60Hz return
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-3
Notes	:	Realtek BLE transmit at 2402MHz, power = 4.5dBm
Test Engineer	:	M. Longinotti
Limit	:	15.207
Test Date	:	Nov 28, 2022 03:11:33 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

23. 20dB Bandwidth

EUT Information	
Manufacturer	Chamberlain Group, LLC.
Product	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 902.25MHz Transmit at 914.75MHz Transmit at 926.75MHz

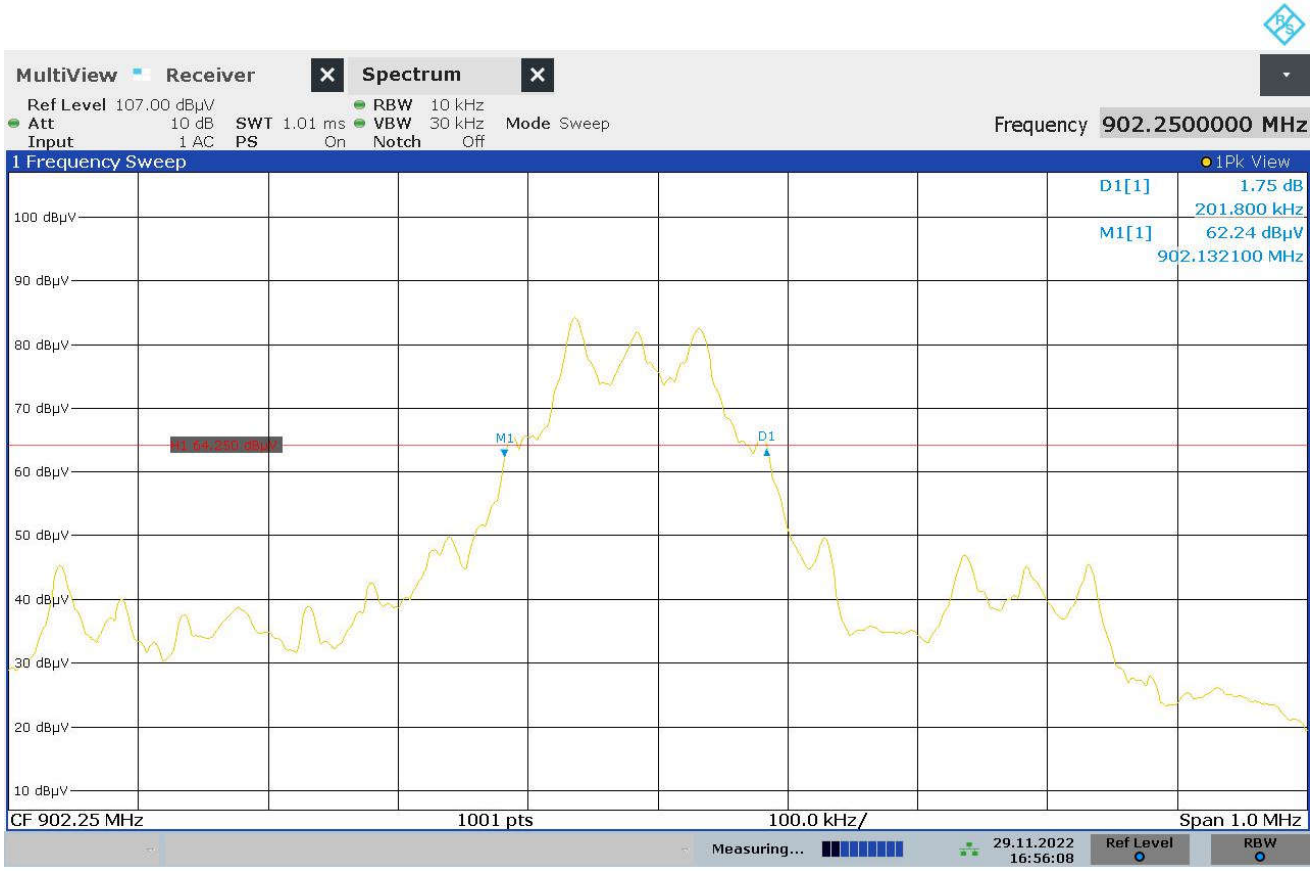
Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Antenna Conducted
Type of Test Site	Tabletop
Test Site Used	N/A
Notes	

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

Requirements
For frequency hopping systems operating in the 902-928 MHz band: Systems using frequency hopping techniques operating in the 902 – 928MHz band are allowed a maximum 20dB bandwidth of 500kHz.

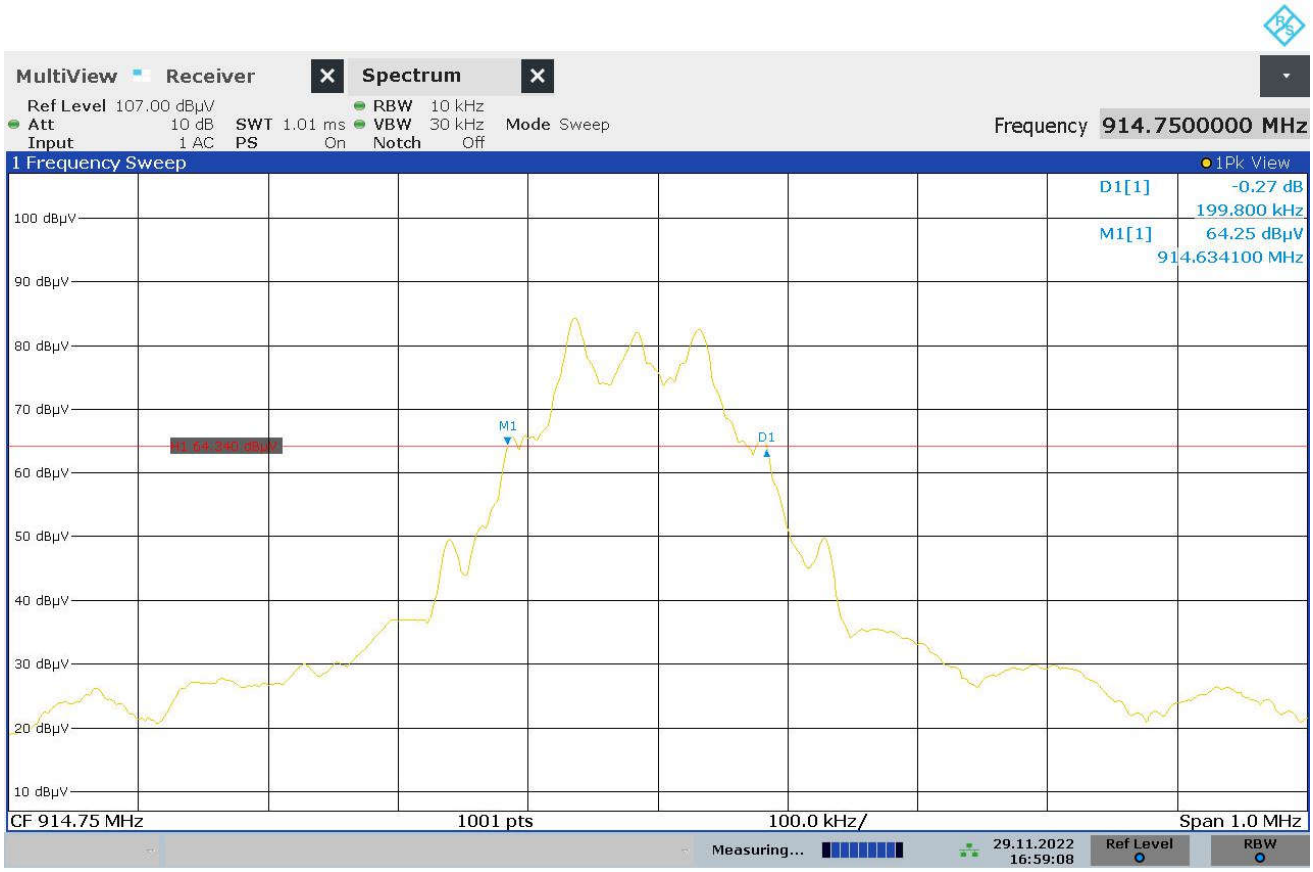
Procedure
The antenna port of the EUT was connected to the spectrum analyzer through 40dB of attenuation. With the hopping function disabled, the EUT was allowed to transmit continuously. The frequency hopping channel was set separately to low, middle, and high hopping channels. The resolution bandwidth (RBW) was set to 1% to 5% of the 20dB BW. The span was set to approximately 2 to 5 times the 20dB bandwidth. The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. The analyzer's display was then screenshot and saved.

Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 902.25MHz
Result	20dB BW = 201.8kHz
Test Date	November 18, 2022
Notes	



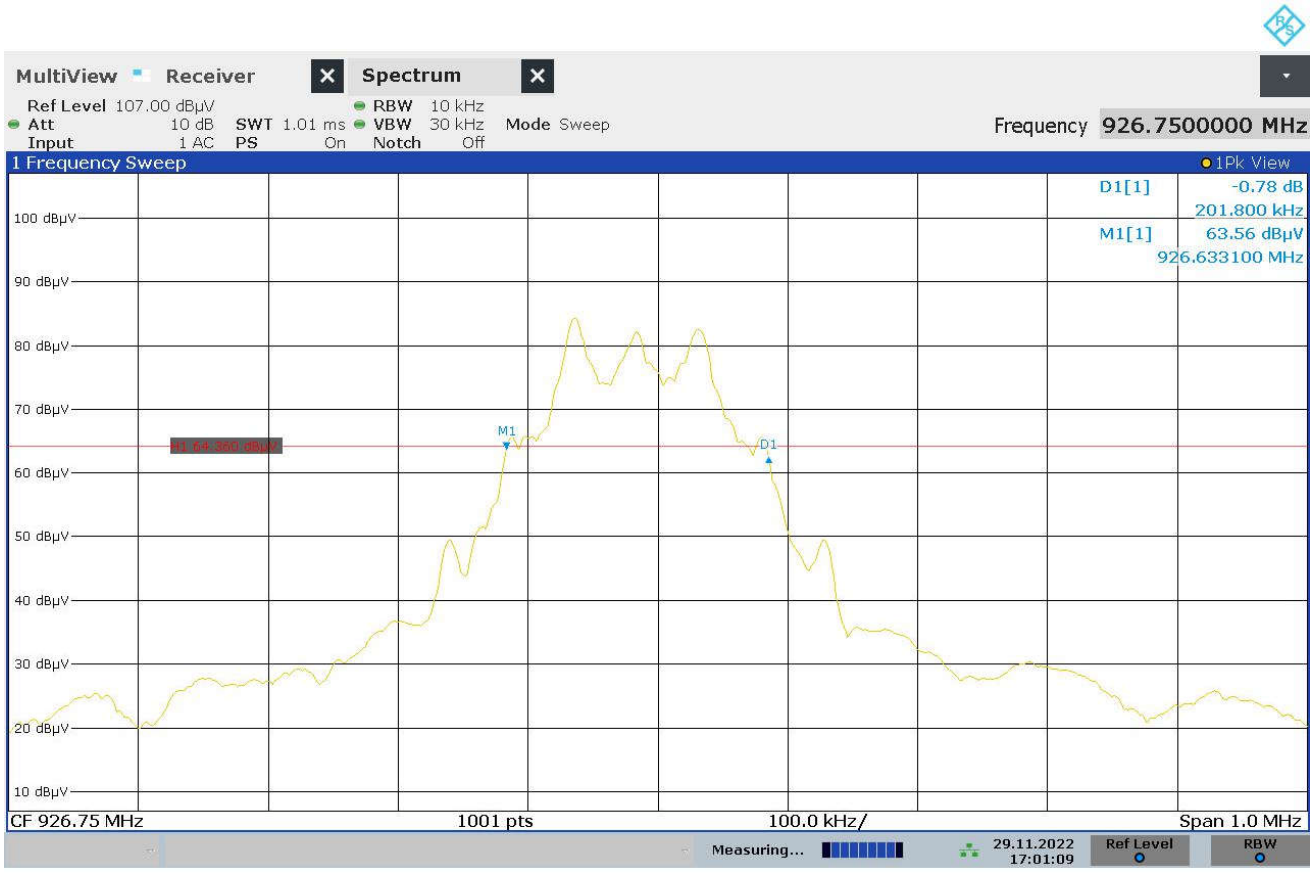
16:56:08 29.11.2022

Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Receive at 914.75MHz
Result	20dB BW = 199.8kHz
Date Tested	November 29, 2022
Notes	



16:59:09 29.11.2022

Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 926.75MHz
Result	20dB BW = 201.8kHz
Date Tested	November 29, 2022
Notes	



17:01:09 29.11.2022

24. Occupied Bandwidth (99%)

EUT Information	
Manufacturer	Chamberlain Group, LLC.
Product	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 902.25MHz Transmit at 914.75MHz Transmit at 926.75MHz

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Antenna Conducted
Type of Test Site	Tabletop
Test Site Used	N/A
Notes	

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

Procedure
The antenna port of the EUT was connected to the spectrum analyzer through 40dB of attenuation. The EUT was allowed to transmit continuously. The transmit channel was set separately to low, middle, and high channels. The resolution bandwidth (RBW) was set to 1% to 5% of the actual occupied / x dB bandwidth, the video bandwidth (VBW) was set 3 times greater than the RBW, and the span was set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency. The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. The analyzer's display was plotted using a 'screen dump' utility.

Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 902.25MHz
Result	OBW = 211.8kHz
Notes	
Date Tested	November 30, 2022

15:54:28 30.11.2022

Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 914.75MHz
Result	OBW = 215.8kHz
Notes	
Date Tested	November 30, 2022

15:45:18 30.11.2022

Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 926.75MHz
Frequency Tested	926.75MHz
Result	OBW = 211.8kHz
Notes	
Date Tested	November 30, 2022

15:47:53 30.11.2022

25. Carrier Frequency Separation

EUT Information	
Manufacturer	Chamberlain Group, LLC.
Product	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Hopping Enabled

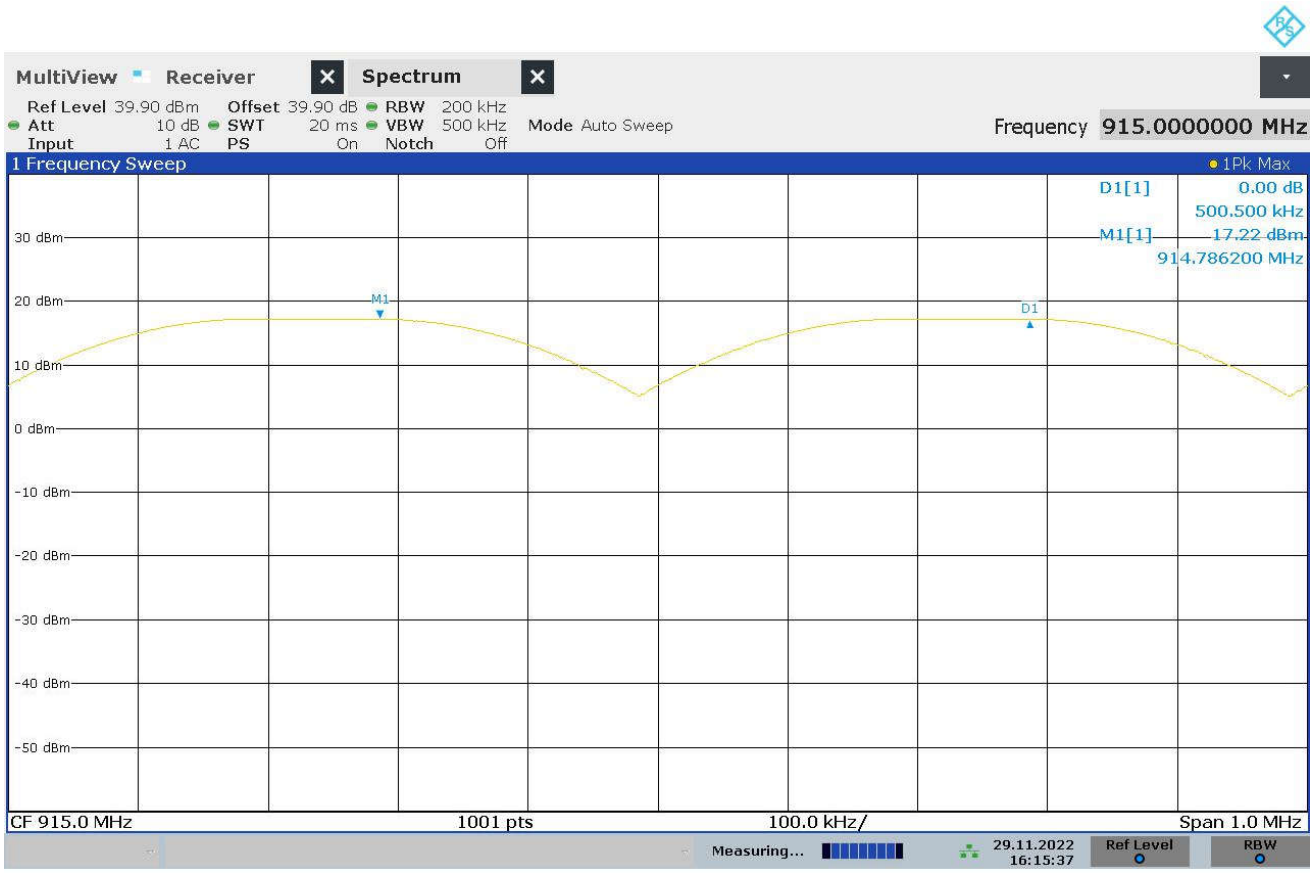
Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Antenna Conducted
Type of Test Site	Tabletop
Test Site Used	N/A
Notes	

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

Requirement
Channel carrier frequencies shall be separated by a minimum of 25kHz or the 20dB bandwidth, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5MHz band may have hopping channel carrier frequencies that are separated by 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW.

Procedure
The antenna port of the EUT was connected to the spectrum analyzer through 40dB of attenuation. With the hopping function enabled, the EUT was allowed to transmit continuously. Span was set wide enough to capture the peaks of two adjacent channels. The resolution bandwidth was set greater than or equal to 1% of the span. The peak detector and 'Max-Hold' function were engaged. The span was set wide enough to capture the peaks of at least two adjacent channels. When the trace had stabilized after multiple scans, the marker-delta function was used to determine the separation between the peaks of the adjacent channels. The analyzer's display was plotted using a 'screen dump' utility.

Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Hopping Enabled
Result	Separation = 500.5kHz
Notes	
Date Tested	November 29, 2022



16:15:38 29.11.2022

26. Number of Carrier Channels

EUT Information	
Manufacturer	Chamberlain Group, LLC.
Product	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Hopping Enabled

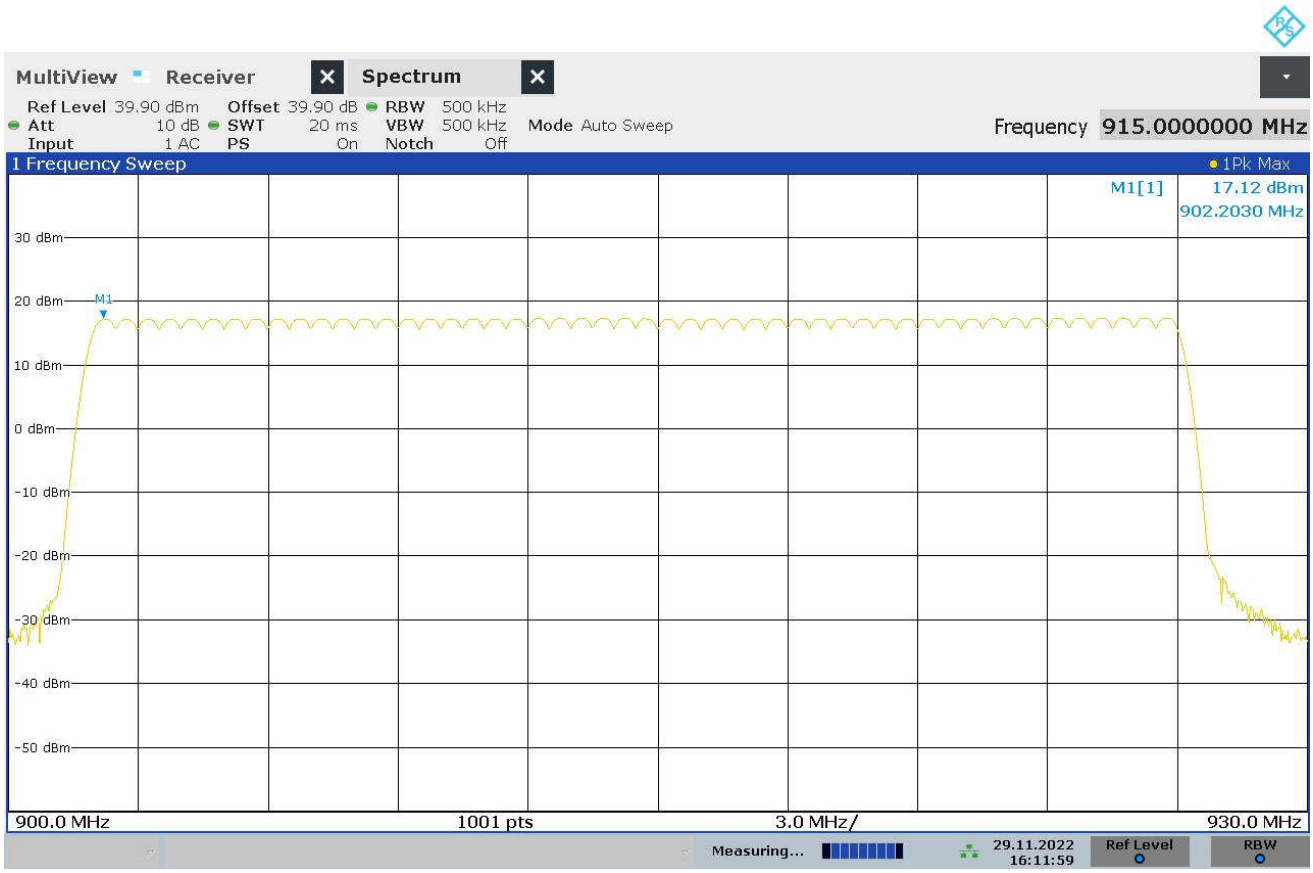
Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Antenna Conducted
Type of Test Site	Tabletop
Notes	

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

Requirements
FOR 902-928 MHz, 20dB BW < 250kHz The system shall use at least 50 hopping frequencies.

Procedure
The antenna port of the EUT was connected to the spectrum analyzer through 40dB of attenuation. With the hopping function enabled, the EUT was allowed to transmit continuously. The resolution bandwidth (RBW) was set to greater than or equal to 1% of the span. The peak detector and 'Max-Hold' function were engaged. The span was set wide enough to capture the entire frequency band of operation. The EUT's signal was allowed to stabilize after multiple scans. The number of hopping frequencies was counted. The analyzer's display was plotted using a 'screen dump' utility.

Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Hopping Enabled
Result	50 hopping frequencies
Notes	
Date Tested	November 29, 2022



16:11:59 29.11.2022

27. Average Time of Occupancy

EUT Information	
Manufacturer	Chamberlain Group, LLC.
Product	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Hopping Enabled

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Antenna Conducted
Type of Test Site	Tabletop
Notes	

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

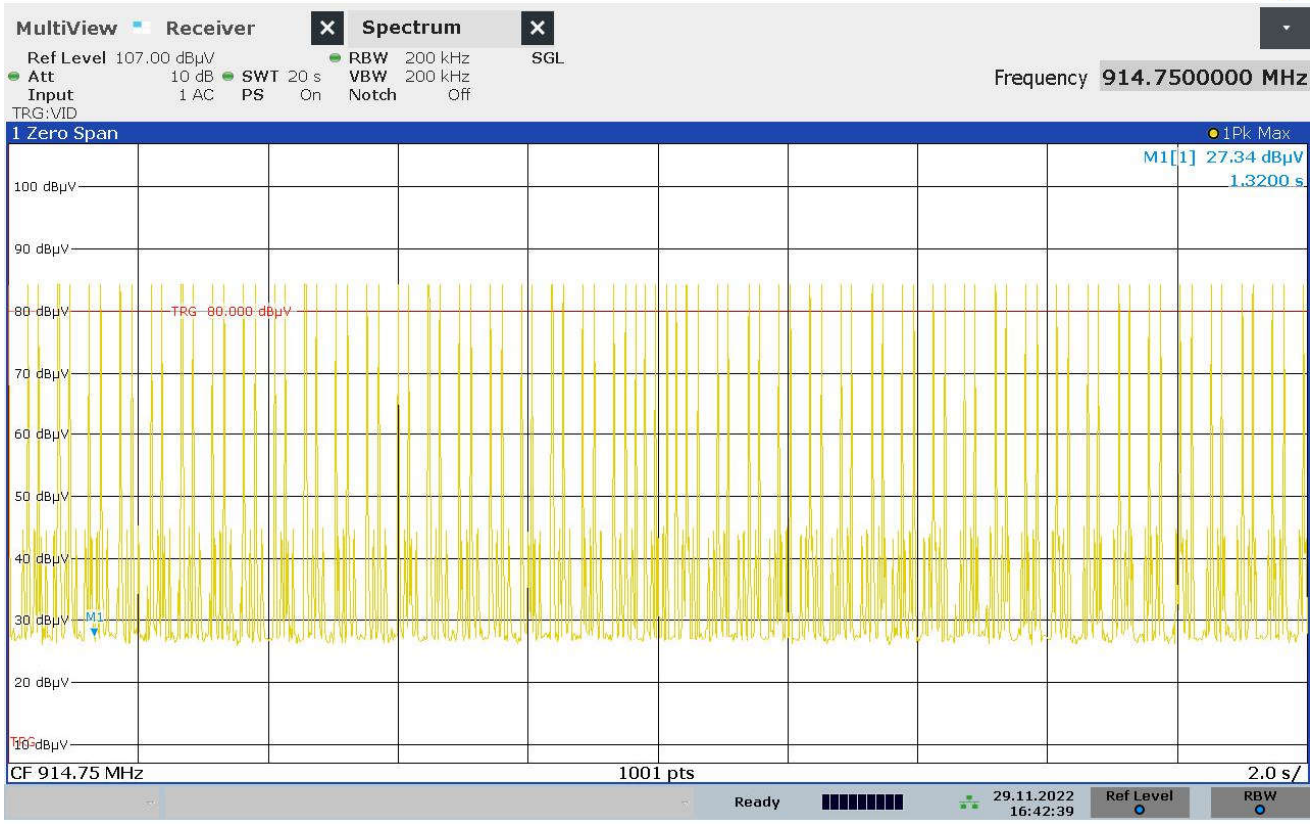
Requirements
For 902-928 MHz, 20dB BW < 250kHz The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

Procedure
The antenna port of the EUT was connected to the spectrum analyzer through 40dB of attenuation. With the hopping function enabled, the EUT was allowed to transmit continuously. The spectrum analyzer was set to zero span centered on a hopping channel. The sweep was set to capture the entire dwell time per hopping channel. The peak detector and 'Max-Hold' function were engaged. The analyzer's display was plotted using a 'screen dump' utility.

Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Hopping Enabled
Result	Transmit time per hop = 1.278msec
Notes	
Date Tested	November 29, 2022

16:35:34 29.11.2022

Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Hopping Enabled
Result	Number of hops in 20 second period = 87
Notes	Time of Occupancy = (number of hops in 20 seconds) x (transmit time per hop) Time of Occupancy = 87 X (1.278msec) = 111.186msec = 0.111186 sec which is less than 0.4 seconds
Date Tested	November 29, 2022



16:42:39 29.11.2022

28. Maximum Peak Conducted Output Power

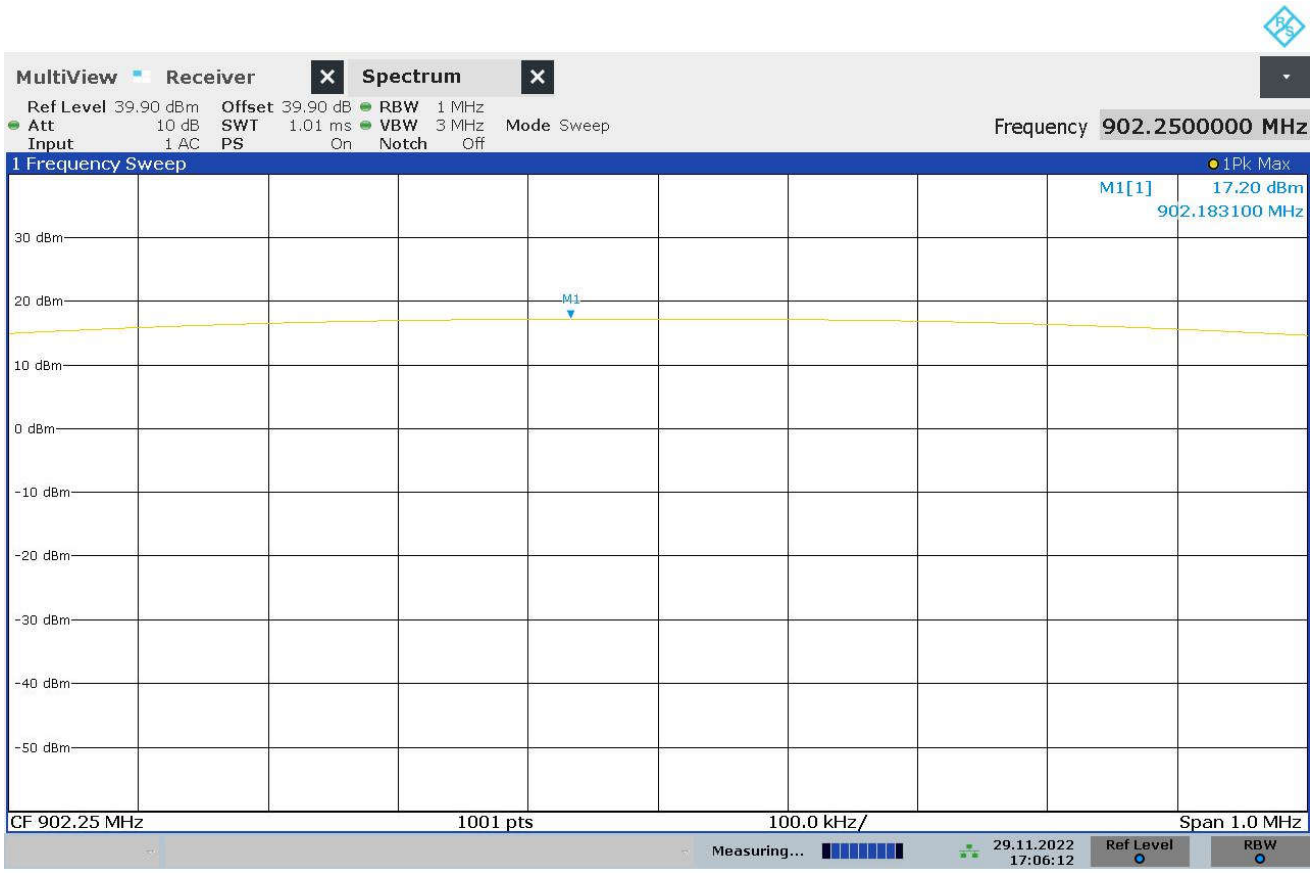
EUT Information	
Manufacturer	Chamberlain Group, LLC.
Product	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 902.25MHz Transmit at 914.75MHz Transmit at 926.75MHz

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Antenna Conducted
Type of Test Site	Tabletop
Notes	

Requirements
FOR FREQUENCY HOPPING SYSTEMS IN THE 902-928 MHz, CHANNELS ≥ 50 The output power shall not exceed 1W (30dBm).

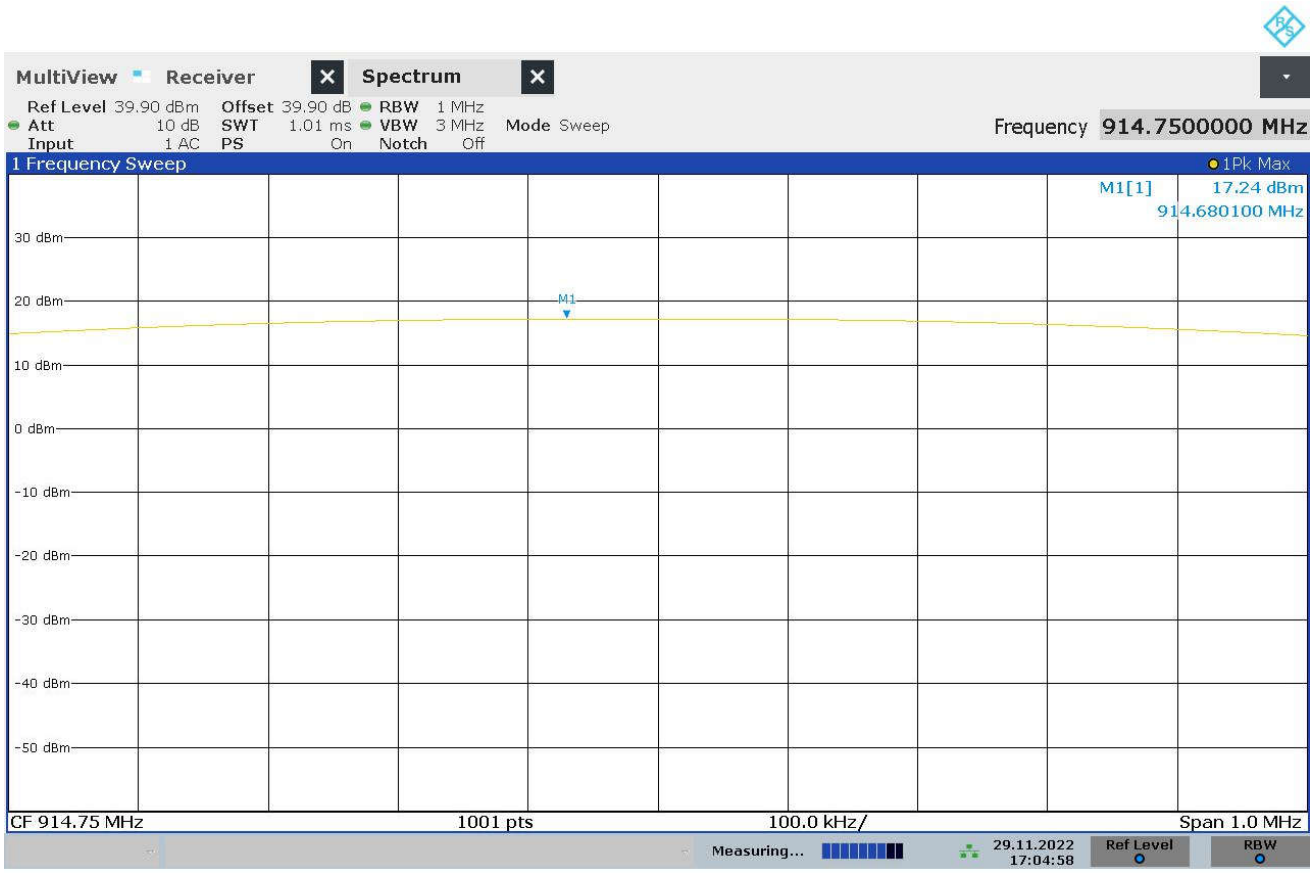
Procedure
FOR FREQUENCY HOPPING SYSTEMS The antenna port of the EUT was connected to the spectrum analyzer through 40dB of attenuation. With the hopping function disabled, the EUT was allowed to transmit continuously. The frequency hopping channel was set separately to low, middle, and high hopping channels. The resolution bandwidth (RBW) was set to greater than the 20dB bandwidth. The span was set to approximately 5 times the 20dB bandwidth. The 'Max-Hold' function was engaged. The maximum meter reading was recorded. The peak power output was calculated for the low, middle, and high hopping frequencies.

Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 902.25MHz
Result	Output Power = 52.5mW (17.2dBm)
Notes	
Date Tested	November 29, 2022



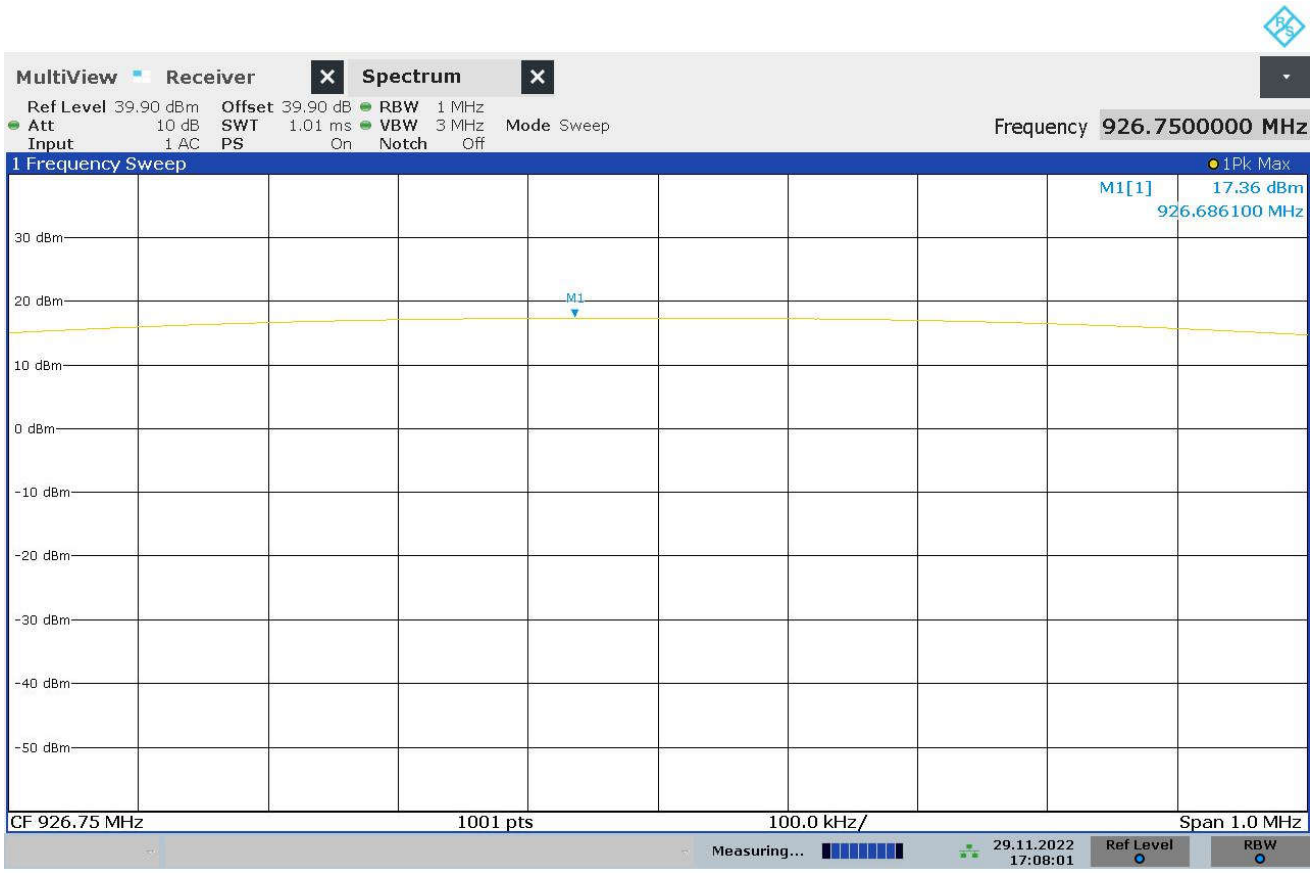
17:06:12 29.11.2022

Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 914.75MHz
Result	Output Power = 53mW (17.24dBm)
Notes	
Date Tested	November 29, 2022



17:04:59 29.11.2022

Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 926.75MHz
Result	Output Power = 54.5mW (17.36dBm)
Notes	
Date Tested	November 29, 2022



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29. Band Edge Compliance

EUT Information	
Manufacturer	Chamberlain Group, LLC.
Product	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 902.25MHz

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Antenna Conducted
Type of Test Site	Tabletop
Notes	

Requirements

Band Edge:
Per FCC 15.247, Section (d) and ISED RSS-247, Section 5.5, in any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. Attenuation below the general limits specified in FCC 15.209, Section (a) and ISED RSS-Gen is not required.

Procedure

1) Low Band Edge:
   a) The antenna port of the EUT was connected to the spectrum analyzer through 40dB of attenuation.
   b) The EUT was set to transmit continuously at the channel closest to the low band-edge, hopping function disabled.
   c) To determine the band edge compliance, the following spectrum analyzer settings were used:
      - Center Frequency = 902MHz (low band-edge frequency).
      - Span = Wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation.
      - Resolution Bandwidth (RBW) = ≥ 1% of the span.
      - 'Max-Hold' function was engaged.
   d) The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined.
   e) The marker was set on the peak of the in-band emissions. A display line was placed 20dB down from the peak of the in-band emissions. All emissions which fall outside of the authorized band of operation must be below the 20dB display line. (All emissions to the left of the center frequency (band-edge) must be below the display line.)
   f) The analyzer's display was then screenshot and saved.
   g) Steps (d) through (f) were repeated with the frequency hopping function enabled.
2) High Band Edge:

a) The antenna port of the EUT was connected to the spectrum analyzer through 40dB of attenuation.

b) The EUT was set to transmit continuously at the channel closest to the high band-edge, hopping function disabled.

c) To determine the band edge compliance, the following spectrum analyzer settings were used:

- Center Frequency = 928MHz (high band-edge frequency).
- Span = Wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation.
- Resolution Bandwidth (RBW) = ≥ 1% of the span.
- 'Max-Hold' function was engaged.

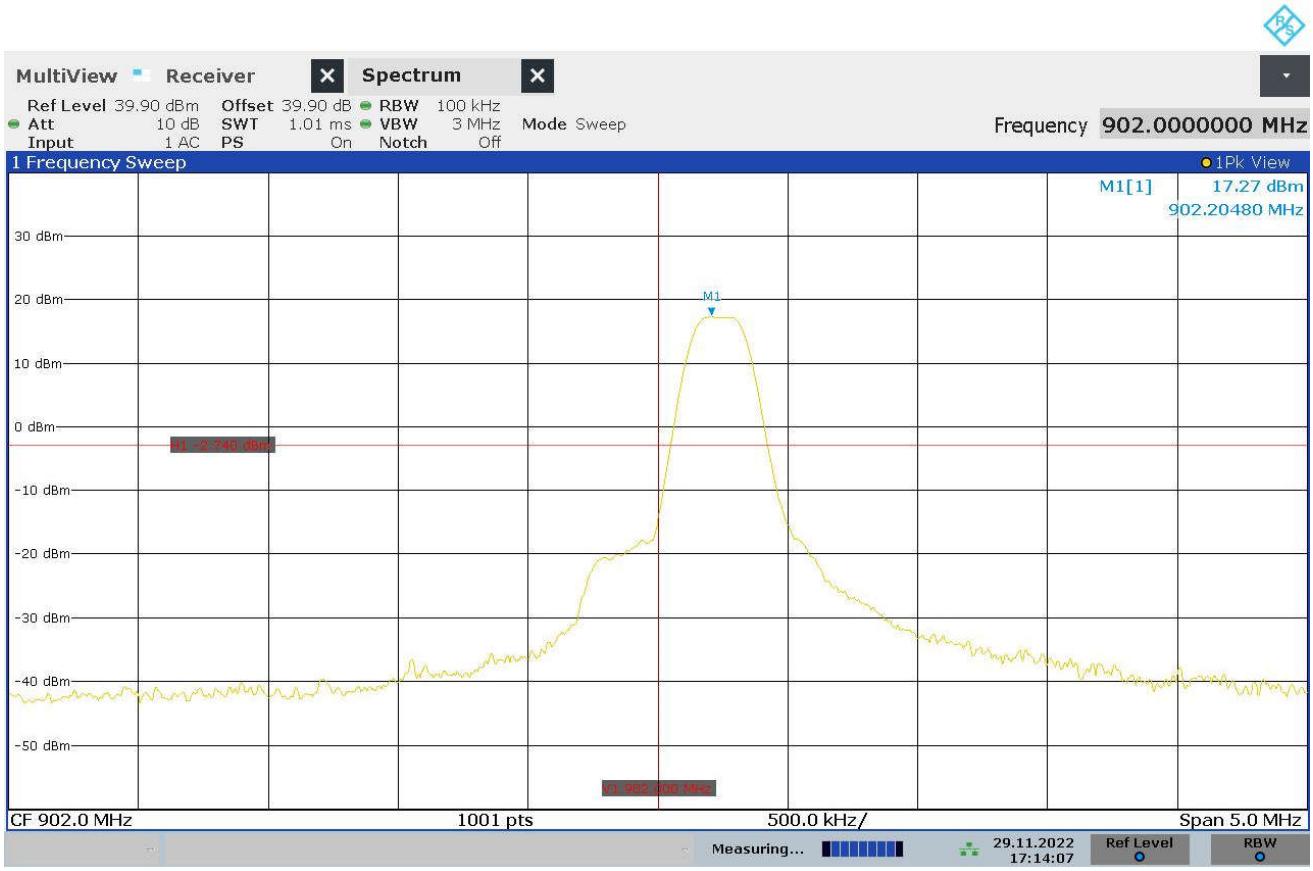
d) The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined.

e) The marker was set on the peak of the in-band emissions. A display line was placed down from the peak of the in-band emissions. All emissions which fall outside of the authorized band of operation must be below the 20dB display line. (All emissions to the right of the center frequency (band-edge) must be below the display line.)

f) The analyzer's display was then screenshot and saved.

g) Steps (d) through (f) were repeated with the frequency hopping function enabled.

Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 902.25MHz
Notes	Low Band Edge
Date Tested	November 29, 2022



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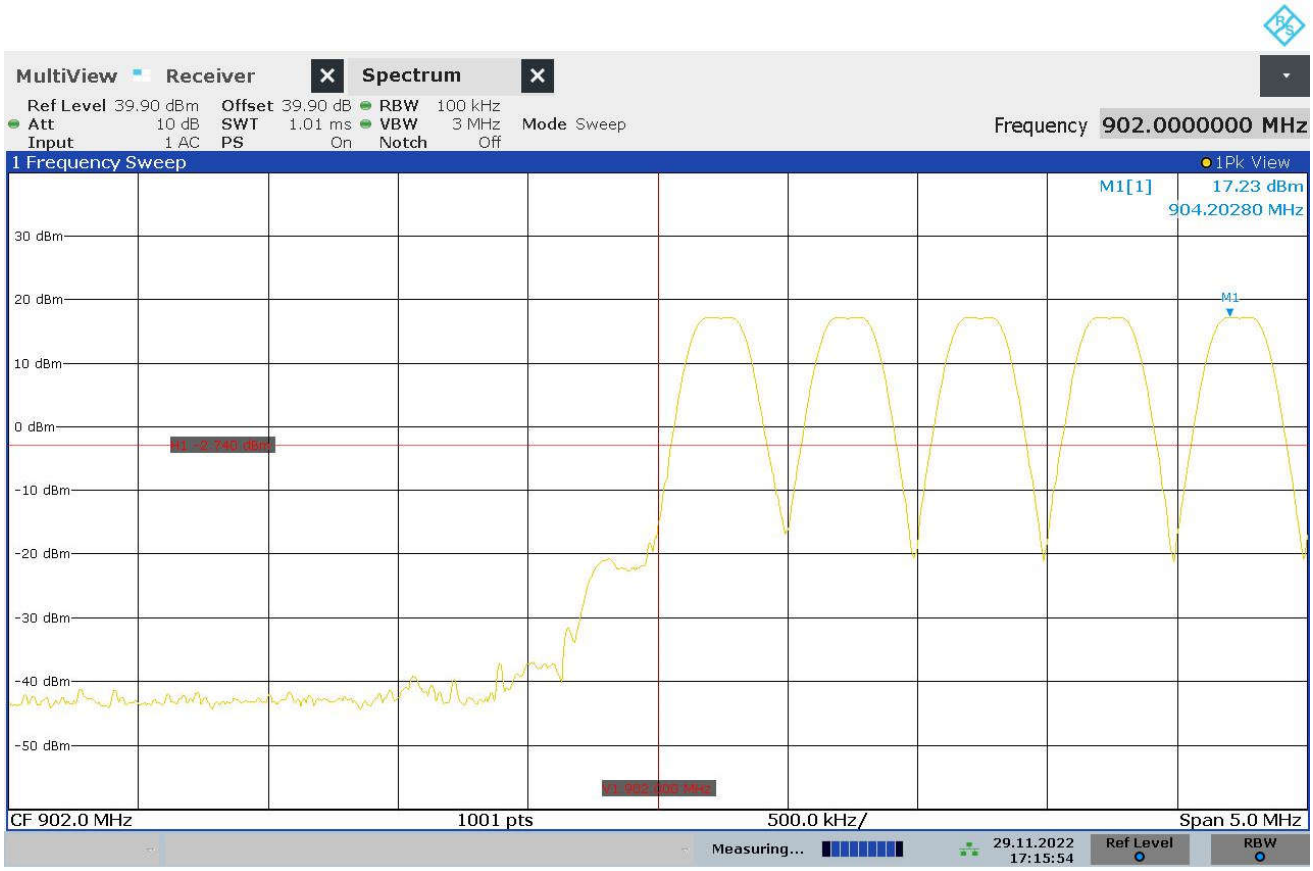
Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Hopping Enabled
Notes	Low Band Edge
Date Tested	November 29, 2022



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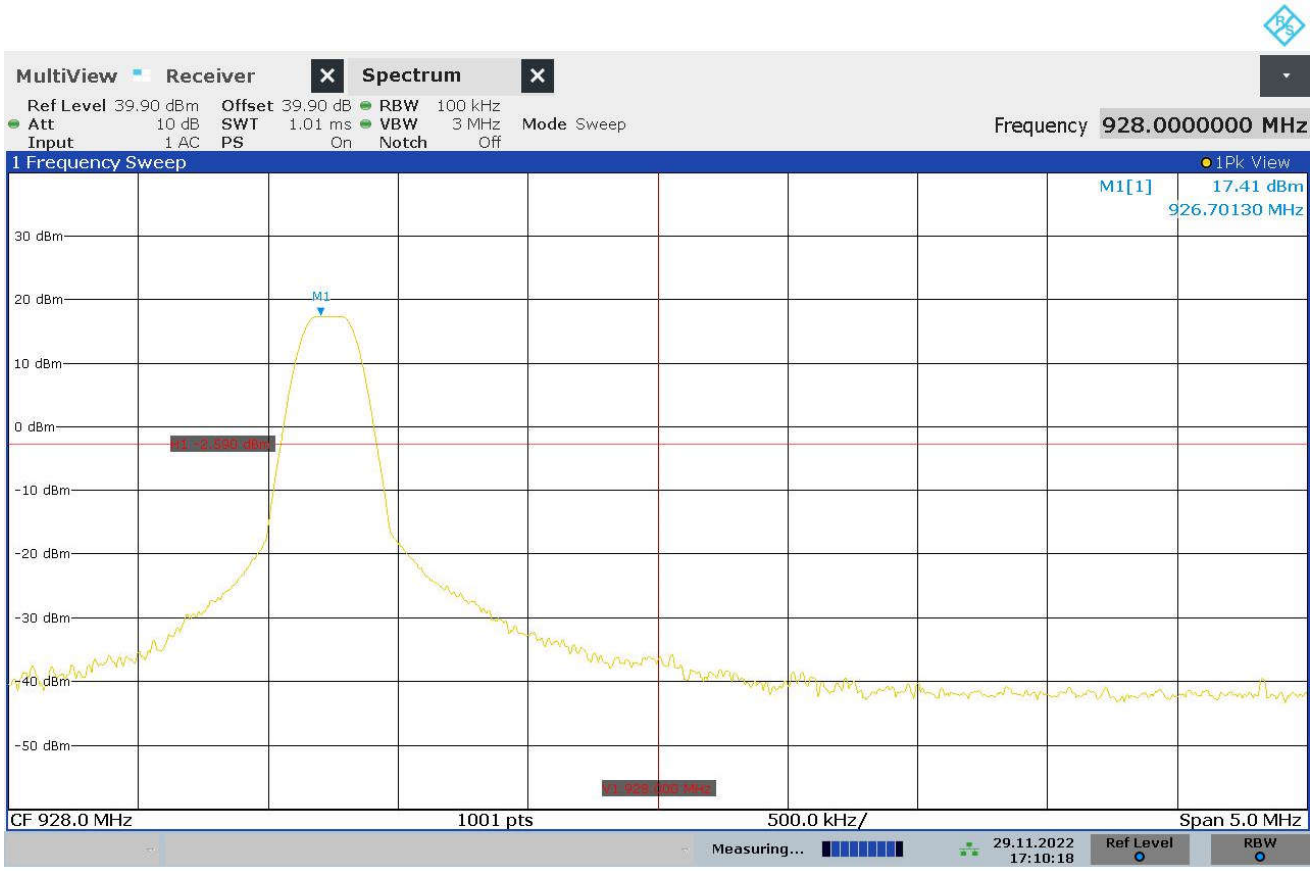
Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 926.75MHz
Notes	High Band Edge
Date Tested	November 29, 2022



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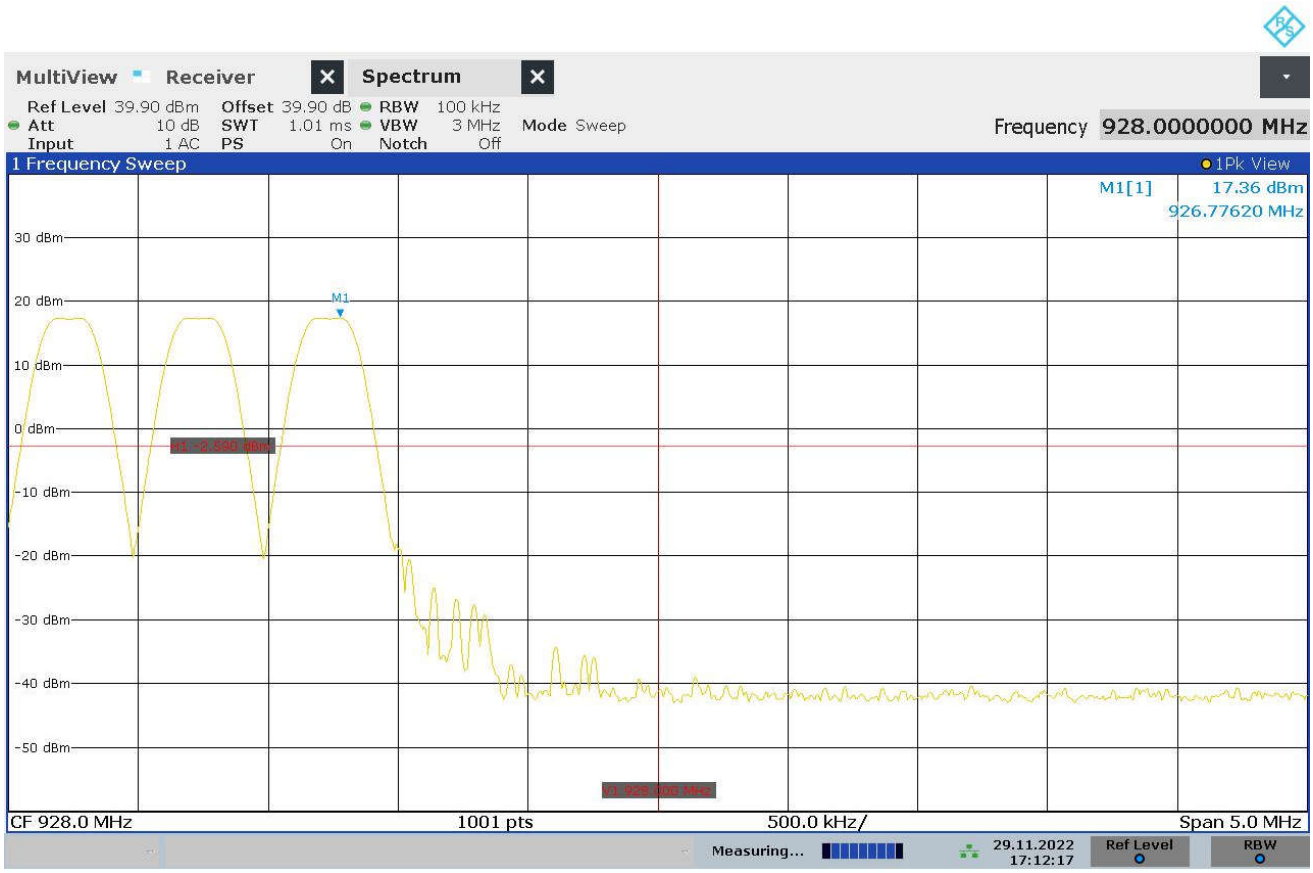
Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 902.25MHz
Frequency Tested	Hopping Enabled
Notes	High Band Edge
Date Tested	November 29, 2022



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30. Duty Cycle Correction Factor

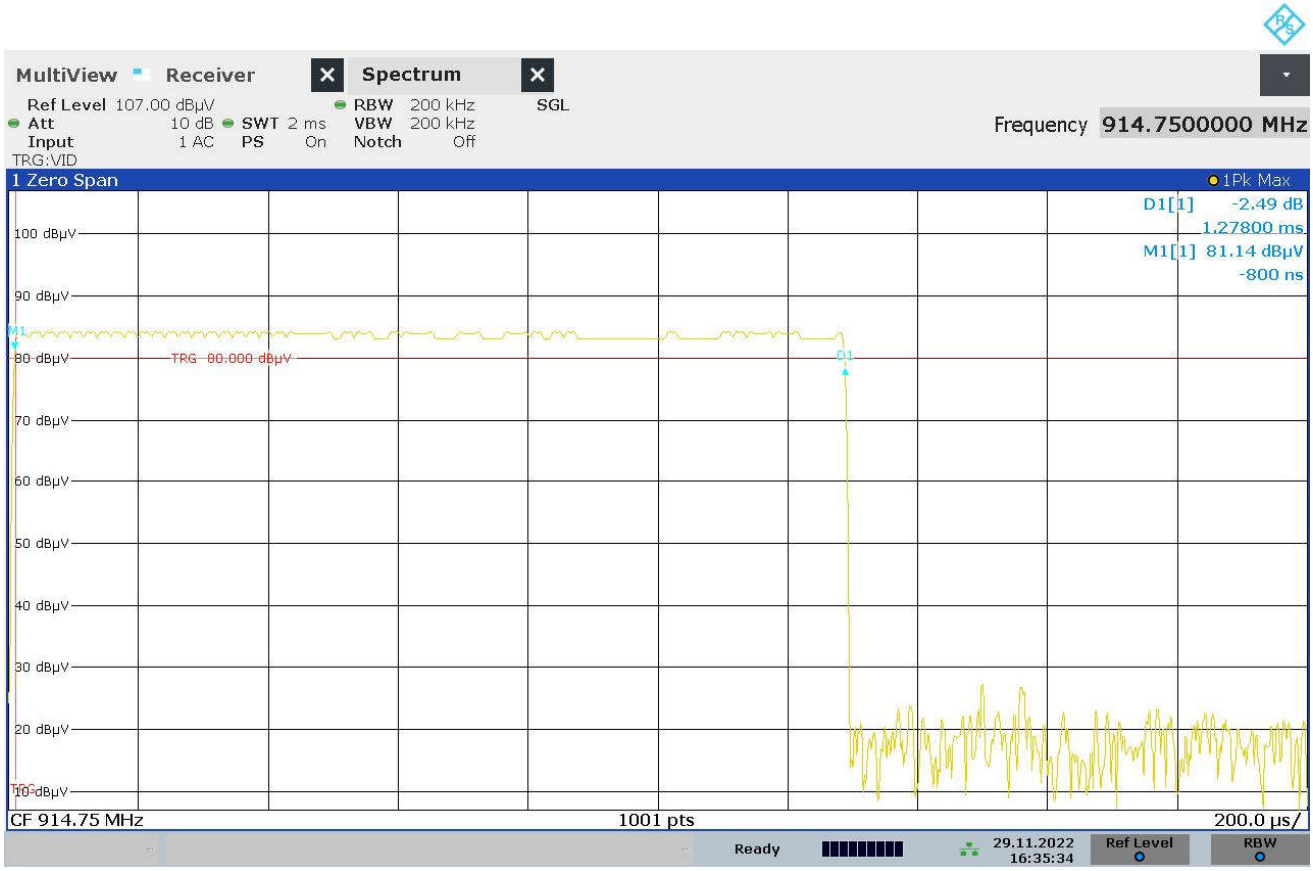
EUT Information	
Manufacturer	Chamberlain Group, LLC.
Product	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 914.75MHz

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Antenna Conducted
Type of Test Site	Tabletop
Notes	

Requirements
Per ANSI C63.10, Section 11.6, duty cycle refers to the fraction of time over which the transmitter is ON and is transmitting at its maximum power control level. When continuous transmission cannot be achieved, measurement of the duty cycle can be used to measure the average power.

Procedure
The duty cycle factor is used to convert peak detected readings to average readings when pulsed modulation is employed. This factor is computed from the time domain trace of the pulse modulation signal. With the transmitter set up to transmit for maximum pulse density, the time domain trace is displayed on the spectrum analyzer. This trace is obtained by tuning center frequency to the transmitter frequency and then setting a zero-span width with 200usec/div. The amplitude settings are adjusted so that the on/off transitions clear the 4th division from the bottom of the display. The markers are set at the beginning and end of the “on-time”. The trace is recorded. Next the spectrum analyzer center frequency is set to the transmitter frequency with a zero-span width and 10msec/div. This shows if the word is longer than 100msec or shorter than 100msec. If the word period is less than 100msec, the display is set to show at least one word. The on-time and off-time are then measured. The on-time is total time signal level exceeds the 4th division. Off-time is time under for the word period. The duty cycle is then computed as $\left(\frac{On\ Time}{Word\ Period}\right)$, where $Word\ Period\ =\ (On\ Time + Off\ Time)$.

Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 914.75MHz
Frequency Tested	Hopping Enabled
Result	On Time = 1.278ms
Notes	
Date Tested	November 29, 2022



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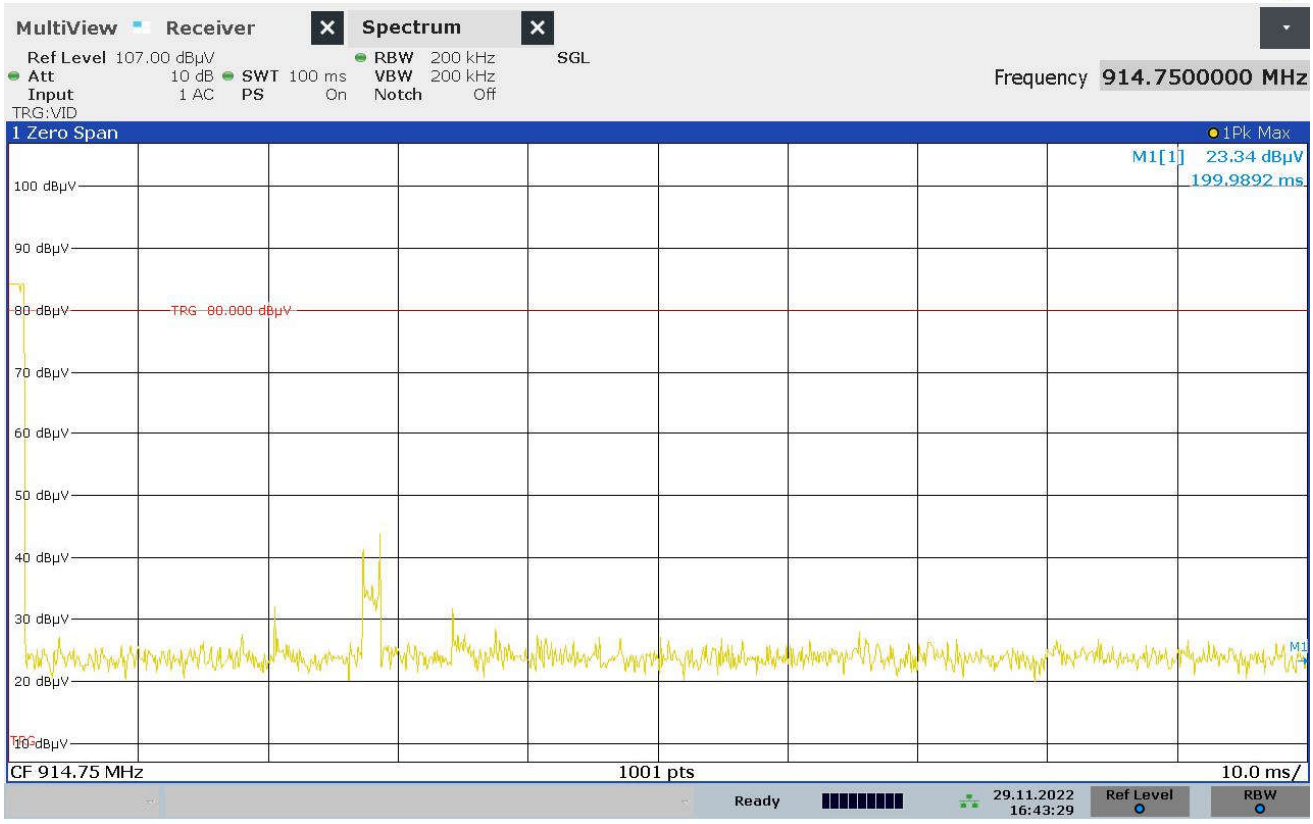
Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Antenna Conducted Sample 1
Mode	Transmit at 914.75MHz
Frequency Tested	Hopping Enabled
Result	Number of hops in 100 msec = 1 On time in 100 msec = On Time x Number of hops in 100 msec = 1.278msec x 1
Notes	Duty Cycle Correction Factor = 20 x Log((On time in 100msec)/100msec) Duty Cycle Correction Factor = 20 x Log (1.278msec/100msec) Duty Cycle Correction Factor = -37.87dB
Date Tested	November 29, 2022



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The duty cycle was the same for all frequencies.

31. Effective Isotropic Radiated Power (EIRP)

EUT Information	
Manufacturer	Chamberlain Group, LLC.
Product	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Radiated Sample 2
Mode	Transmit at 902.25MHz Transmit at 914.75MHz Transmit at 926.75MHz

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test Site Used	Room 29
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent) N/A
Notes	

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

Requirements
FOR FREQUENCY HOPPING SYSTEMS IN THE 902-928 MHz, CHANNELS ≥ 50 The output power shall not exceed 4W (36dBm).

Procedure
The EUT was placed on the non-conductive stand and set to transmit. A bilog antenna was placed at a test distance of 3 meters from the EUT. The resolution bandwidth (RBW) of the spectrum analyzer was set to greater than the 20dB bandwidth. The span was set to approximately 5 times the 20 dB bandwidth. The EUT was maximized for worst case emissions (or maximum output power) at the measuring antenna. The maximum meter reading was recorded. The peak power output was measured for the low, middle, and high hopping frequencies. The equivalent power was determined from the field intensity levels measured at 3 meters using the substitution method. To determine the emission power, a dipole antenna (double ridged waveguide antenna for all measurements above 1GHz) was then set in place of the EUT and connected to a calibrated signal generator. The output of the signal generator was adjusted to match the received level at the spectrum analyzer. The signal level was recorded. The reading was then corrected to compensate for cable loss (and antenna gain for all measurements above 1GHz), as required. The peak power output was calculated for low, middle, and high hopping frequencies.

Test Details	
Manufacturer	Chamberlain Group, LLC.
EUT	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Radiated Sample 2
Mode	Transmit at 902.25MHz Transmit at 914.75MHz Transmit at 926.75MHz
Result	Max EIRP = 33.1mW (15.2dBm)
Notes	

Freq. (MHz)	Ant Pol	Wide BW Meter Reading (dBuV)	Matched Sig. Gen. Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
902.25	H	84.5	14.7	2.2	1.6	15.2	36.0	-20.8
	V	82.1	14.1	2.2	1.6	14.6	36.0	-21.4
914.75	H	82.5	12.7	2.2	1.6	13.2	36.0	-22.8
	V	81.9	14.2	2.2	1.6	14.7	36.0	-21.3
926.75	H	82.3	12.7	2.2	1.7	13.2	36.0	-22.8
	V	81.2	12.8	2.2	1.7	13.3	36.0	-22.7

32. Case Spurious Radiated Emissions

EUT Information	
Manufacturer	Chamberlain Group, LLC.
Product	Residential Jackshaft Opener
Model No.	RJOA MPP
Serial No.	Radiated Sample 2
Mode	Transmit at 902.25MHz Transmit at 914.75MHz Transmit at 926.75MHz

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Type of Test Site	Semi-Anechoic Chamber
Test Site Used	Room 29
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz **OR** 1 – 18GHz: Double-Ridged Waveguide (or equivalent) Above 18GHz: Horn (or equivalent)
Notes	N/A

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
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

Procedure

Radiated measurements were performed in a 32ft. x 20ft. x 14ft. high shielded enclosure. 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.

Preliminary radiated emissions tests were 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 10.0GHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 30MHz to 10.0GHz.

1) For all harmonics not in the restricted bands, the following procedure was used:
   a) The field strength of the fundamental was measured using a bilog antenna. The bilog antenna was positioned at a 3-meter distance from the EUT. 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.
   b) The field strengths of all of the harmonics not in the restricted band were then measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3-meter distance from the EUT. The EUT was placed on a 1.5-meter-high non-conductive stand. A peak detector with a resolution bandwidth of 100kHz was used on the spectrum analyzer.
   c) To ensure that maximum or worst-case emission levels at the fundamental and harmonics were measured, the following steps were taken when measuring the fundamental emissions and the spurious emissions:
      i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.
      ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
      iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.
      iv) In instances where it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer, the measuring antenna was not raised or lowered to ensure maximized readings. Instead, the EUT was rotated through all axis to ensure the maximum readings were recorded for the EUT.
   d) All harmonics not in the restricted bands must be at least 20dB below levels measured at the fundamental. However, attenuation below the general limits specified in §15.209(a) is not required.
2) For all emissions in the restricted bands, the following procedure was used:
   a) The field strengths of all emissions below 1GHz were measured using a bi-log antenna. The bi-log antenna was positioned at a 3-meter distance from the EUT. 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.
   b) The field strengths of all emissions above 1GHz were measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3-meter distance from the EUT. The EUT was placed on a 1.5-meter-high non-conductive stand. A peak detector with a resolution bandwidth of 1MHz was used on the spectrum analyzer.
   c) To ensure that maximum or worst-case emission levels were measured, the following steps were taken when taking all measurements:
      i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.
      ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components

were measured.

iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.

iv) In instances where it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer, the measuring antenna was not raised or lowered to ensure maximized readings. Instead, the EUT was rotated through all axis to ensure the maximum readings were recorded for the EUT.

d) For all radiated emissions measurements below 1GHz, if the peak reading is below the limits listed in §15.209(a), no further measurements are required. If, however, the peak readings exceed the limits listed in §15.209(a), then the emissions are remeasured using a quasi-peak detector.

e) For all radiated emissions measurements above 1GHz, the peak readings must comply with the §15.35(b) limits. §15.35(b) states that when average radiated emissions measurements are specified, there also is a limit on the peak level of the radiated emissions. The limit on the peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. Therefore, all peak readings above 1GHz must be no greater than 20dB above the limits specified in §15.209(a).

f) The peak readings were converted to average readings by adding the duty cycle correction factor to the peak readings. These readings must be no greater than the limits specified in §15.209(a).