Engineering Test Report No. 2100762-01		
Report Date	April 22, 2021	
Manufacturer Name	Chamberlain Group, Inc.	
Manufacturer Address	300 Windsor Dr Oak Brook, IL 60523	
Product Name Brand/Model No.	87504 Garage Door Opener	
Date Received	April 1, 2021	
Test Dates	April 7, 2021 through April 9, 2021	
Specifications	FCC "Code of Federal Regulations" Title 47 Part 15, Subpart B Innovation, Science, and Economic Development Canada, ICES-003 FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 247 Innovation, Science, and Economic Development Canada, RSS-247 FCC KDB 99369	
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	4900074188	

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, Subpart C and Innovation, Science, and Economic Development Canada, ICES-003 and RSS-247 test specifications. 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
–	27 APR 2021	Initial Release of Engineering Test Report No. 2100762-01

2. Introduction

This document presents the results of a series of electromagnetic compatibility (EMC) tests that were performed on the Model 87504 Garage Door Opener (hereinafter referred to as the Equipment Under Test (EUT)). The EUT was identified as follows:

EUT Identification	
Description	Garage Door Opener
Model/Part No.	87504
S/N	* Sample #1 and Sample #2
Software/Firmware Version	See Section 5 for details
Size of EUT	19 x 11 x 7
Number of Interconnection Wires	6
Type of Interconnection Wires	3 pairs of wires
Highest Internal Frequency of the EUT:	5825MHz

* Sample #1 was used for all EIRP and spurious radiated emissions. Sample #2 was used for all power line conducted emissions tests.

The EUT contained the following radio transmitters:

900MHz frequency hopping spread spectrum transmitter:

- FCC ID: HBW9612
- IC: 2666A-9612

2.4GHz WiFi LMA transmitter:

- FCC ID: HBW9586

The EUT also contained a camera with a 2.4GHz and 5GHz WiFi module:

- FCC ID: HBW-GDOCAM2

The nature of these measurements is to perform a permissive change on the 900MHz transmitter (FCC ID: HBW9612) with the addition of LED boards. No additional testing was performed on the 2.4GHz WiFi LMA transmitter (FCC ID: HBW9586) or the 2.4GHz/5GHz WiFi camera (FCC ID: HBW-GDOCAM2).

3. Power Input

The EUT receives 120V, 60Hz power via a 3-wire power cord.

4. Grounding

The EUT was connected to ground through the third wire of its input power cord.

5. Firmware/Software

RETAIL FCC FIRMWARE VERSIONS			
Sample Setup	Transceiver	FW Version	Description
For Conducted Tests	WiFi Module	3.28.86	SDK, FCC code, Rx mode
	Silicon Labs Processor	1.0 / Special	Sub 1GHz Radio is functional. Motor does not stop after activation. PWM Down Direction is 60%, Up Direction 100%.

	Camera	0.1.28	SDK, FCC code, Rx mode
For Radiated Tests	Wi-Fi Module	6.2	SDK, FCC code, Rx mode. Accepts UART commands
	Silicon Labs Processor	3.28	Sub 1GHz Radio is functional
	Camera	0.1.13	SDK, FCC code, Rx mode. Accepts UART commands

6. Support Equipment

The EUT was submitted for testing along with the following support equipment:

Item	Description
Dell Latitude E6410 Laptop	Used to place the EUT in test mode. The computer was disconnected from the test item and removed from the test chamber prior to testing.
LCD Wall Control	Accessory acting as a load on the board.
Photo Eyes	Accessory acting as a load on the board. Also used to provide continuous modes for some testing.

7. Interconnect Leads

No interconnect leads were used during the tests.

8. Modifications Made to the EUT

No modifications were made to the EUTs during the testing.

9. Modes of Operation for Digital Device Testing

The EMC tests were performed with the EUTs operating in one or more of the test modes described below. See the specific test section for the applicable test modes.

9.1. Light on, all transmitters in standby

The EUT was powered up. Upon power up, the light turned on and remained on. The EUT was programmed so that all transmitters were not transmitting.

10. Modes of Operation for Transmitter Testing

10.1. Motor on, 900MHz transmitter on, light on

For power line conducted emissions tests, the EUT was powered up. Upon power up, the 900MHz transmitter was on, the motor was on and turning, and the light was on.

10.2. Transmit at 902.25MHz

For EIRP measurements and transmitter case spurious radiated emissions measurements, the EUT was powered up. The laptop computer was connected to the EUT and was used to program the device to transmit continuously at 902.25MHz.

10.3. Transmit at 914.75MHz

For EIRP measurements and transmitter case spurious radiated emissions measurements, the EUTs were powered up. The laptop computer was connected to the EUTs and was used to program the device to transmit

continuously at 914.75MHz.

10.4. Transmit at 926.75MHz

For EIRP measurements and transmitter case spurious radiated emissions measurements, the EUTs were powered up. The laptop computer was connected to the EUTs and was used to program the device to transmit continuously at 926.75MHz.

11. 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 B
- 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 9 kHz to 40 GHz"
- ANSI C63.10-2013, “American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices”
- ICES-003, Issue 7, October 2020, “Spectrum Management and Telecommunications, Interference-Causing Equipment Standard, Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement”
- 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”
- RSS-247 Issue 2, February 2017, Innovation, Science, and Economic Development Canada, “Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices”

12. 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 B, Subpart C, Innovation, Science, and Economic Development Canada, ICES-003, RSS-247, ANSI C63.4-2014, ANSI C63.10-2013, and FCC KDB 996369 specifications.

13. Deviation, Additions to, or Exclusions from Test Specifications

There were no deviations, additions to, or exclusions from the test specifications during this test series.

14. Laboratory Conditions

Ambient Parameters	Value
Temperature	22°C
Relative Humidity	31%
Atmospheric Pressure	1001mb

15. Summary

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

Test Description	Test Requirements	Test Methods	Equipment Class	Results
Digital Device RF Radiated Emissions Test	FCC 15B 15.109 ISED ICES-003, Section 6.2	ANSI C63.4-2014	B	Conforms
Transmitter RF Conducted Emissions Test (AC Mains)	FCC 15C 15.207 RSS-Gen, Section 8.8	ANSI C63.10-2013	N/A	Conforms
Transmitter Peak Effective Isotropic Radiated Power (EIRP)	FCC 15C 15.247 (b) RSS-247, Section 5.4(d)	ANSI C63.10-2013	N/A	Conforms
Transmitter Duty Cycle Factor Measurements	FCC 15B, 15.35(c) RSS-Gen, Section 8.2	ANSI C63.10-2013	N/A	N/A
Transmitter Case Spurious Radiated Emissions	FCC 15C 15.247(d) RSS-247, Section 5.5 RSS-Gen, Table 5 and Table 6	ANSI C63.10-2013	N/A	Conforms

16. 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]

17. Statement of Conformity

The Chamberlain Group, Inc. Garage Door Opener, Model No. 87504, with FCC ID: HBW9612 900MHz frequency hopping spread spectrum transmitter, did meet the Class II permissive change requirements of FCC “Code of Federal Regulations” Title 47 Part 15, Subpart C, Section 247 and met the requirements of FCC "Code of Federal Regulations" Title 47 Part 15, Subpart B for Class B equipment.

The Chamberlain Group, Inc. Garage Door Opener, Model No. 87504, with IC: 2666A-9612 900MHz frequency hopping spread spectrum transmitter, did meet the Class II permissive change requirements of Innovation, Science, and Economic Development Canada RSS-247 and met the requirements of Innovation, Science, and Economic Development Canada, ICES-003 for Class B equipment.

18. 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

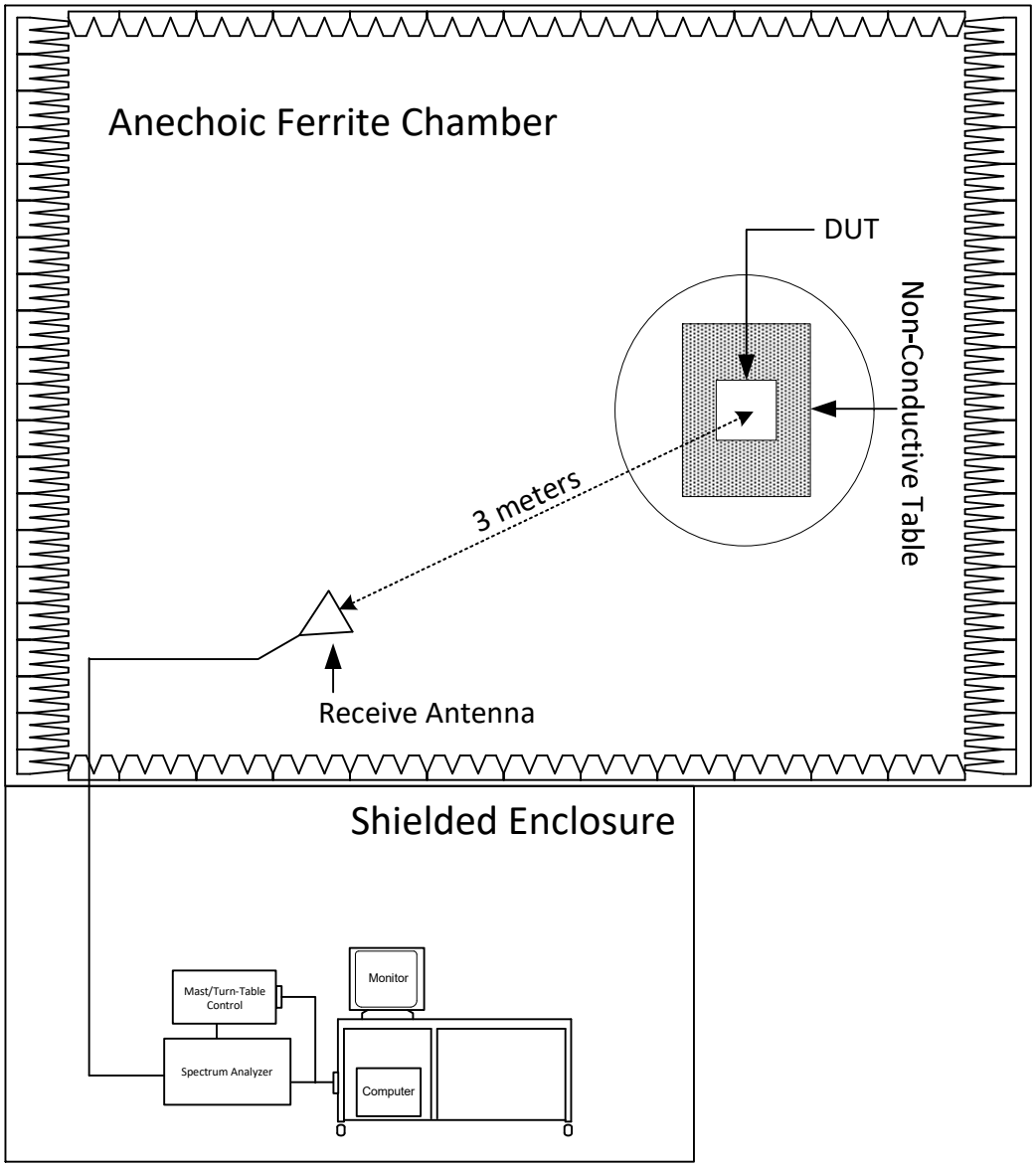
15, Subpart B and Subpart C and Innovation, Science, and Economic Development Canada, ICES-003 and RSS-247 test specifications. The data presented in this test report pertains to the EUTs on the test date specified. Any electrical or mechanical modifications made to the EUTs subsequent to the specified test date will serve to invalidate the data and void this certification.

20. Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APW1	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-30-20G20R6G-3R0-10-12-SFF	PL162015/1446	20GHZ-26.5GHZ	9/24/2020	9/24/2021
APW3	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-35-120-5R0-10-12	PL2924	1GHZ-20GHZ	3/11/2021	3/11/2022
APW5	PREAMPLIFIER	PLANAR	PE2-36-26D540G-5R0-1	PL3044/0651	26.5GHZ-40GHZ	7/18/2020	7/18/2021
CDU4	LAPTOP COMPUTER	HP				N/A	
CDW5	DESKTOP COMPUTER	ELITE	PENTIUM 4	006	3.8GHZ	N/A	
CDZ4	LAB WORKSTATION	ELITE	LWS-10		WINDOWS 10	CNR	
GSD3	SIGNAL GENERATOR	ROHDE & SCHWARZ	SMB100A	104454	9KHZ-6GHZ	9/10/2020	9/10/2021
NDQ0	TUNED DIPOLE ANTENNA	EMCO	3121C-DB4	311	400-1000MHZ	5/8/2020	5/8/2022
NHG0	STANDARD GAIN HORN ANTENNA	NARDA	638	---	18-26.5GHZ	NOTE 1	
NHH1	STANDARD GAIN HORN ANTENNA	NARDA	V637	---	26.5-40GHZ	NOTE 1	
NTA3	BILOG ANTENNA	TESEQ	6112D	32853	25-1000MHz	10/20/2020	10/20/2021
NWQ2	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66659	1GHZ-18GHZ	4/7/2020	4/7/2022
PLF1	CISPR16 50UH LISN	ELITE	CISPR16/70A	001	.15-30MHz	4/8/2021	4/8/2022
PLF3	CISPR16 50UH LISN	ELITE	CISPR16/70A	003	.15-30MHz	4/8/2021	4/8/2022
RBG0	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101533	10HZ-44GHZ	3/2/2021	3/2/2022
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	3/11/2021	3/11/2022
T1N1	10DB 20W ATTENUATOR	NARDA	766-10	---	DC-4GHZ	3/19/2020	3/19/2022
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	
XOA2	WAVE-TO-COAX ADAPTER	HEWLETT PACKARD	R281B	01138	26.5-65GHZ	NOTE 1	
XOB2	ADAPTER	HEWLETT PACKARD	K281C,012	09407	18-26.5GHZ	NOTE 1	

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.

21. Block Diagram of Test Setup



Radiated Measurements Test Setup

22. Digital Device RF Radiated Emissions Test

Manufacturer	Chamberlain Group, Inc.
Product	Garage Door Opener
Model	87504
Serial No	Sample #1
Mode	Light on, all transmitters in standby

Information	
Setup Format	Tabletop
Height of Support	N/A
Type of Test Site	Semi-Anechoic Chamber
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent)
Highest Internal Frequency of the EUT:	5825MHz
Highest Measurement Frequency:	30GHz
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
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 field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:	
Frequency of Emission (MHz)	Field Strength (μV/m)
30-88	100
88-216	150
216-960	200
Above 960	500

Procedures

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 30GHz 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.

FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 03/04/2020

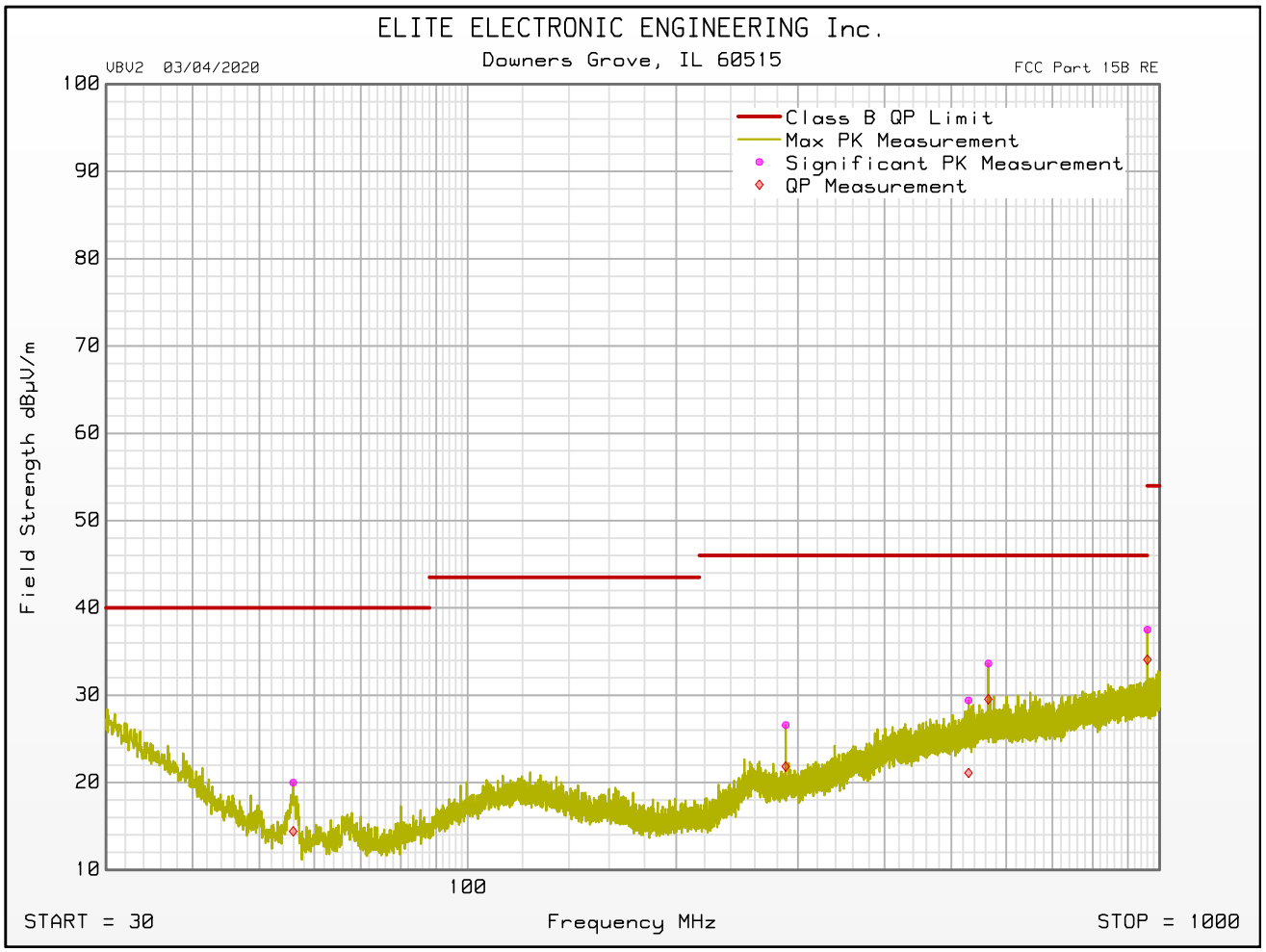
Manufacturer	:	Chamberlain
Model	:	87504
Serial Number	:	Sample #1
DUT Mode	:	Light on, transmitters in standby
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Apr 07, 2021 09:41:17 AM

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 °
30.480	4.1	-2.7	24.2	0.0	0.5	0.0	28.8	22.0	40.0	-18.0	H	120	135
55.920	6.7	1.1	12.8	0.0	0.5	0.0	20.0	14.4	40.0	-25.6	V	200	45
119.620	2.3	-5.0	18.3	0.0	0.6	0.0	21.2	13.9	43.5	-29.6	H	120	225
288.000	6.8	2.1	18.7	0.0	1.0	0.0	26.6	21.8	46.0	-24.2	V	200	90
529.260	4.2	-4.1	23.7	0.0	1.5	0.0	29.4	21.1	46.0	-24.9	V	200	315
565.440	7.5	3.4	24.7	0.0	1.5	0.0	33.6	29.5	46.0	-16.5	V	200	180
960.000	8.5	5.1	27.0	0.0	2.0	0.0	37.5	34.1	46.0	-11.9	V	120	90

FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 03/04/2020

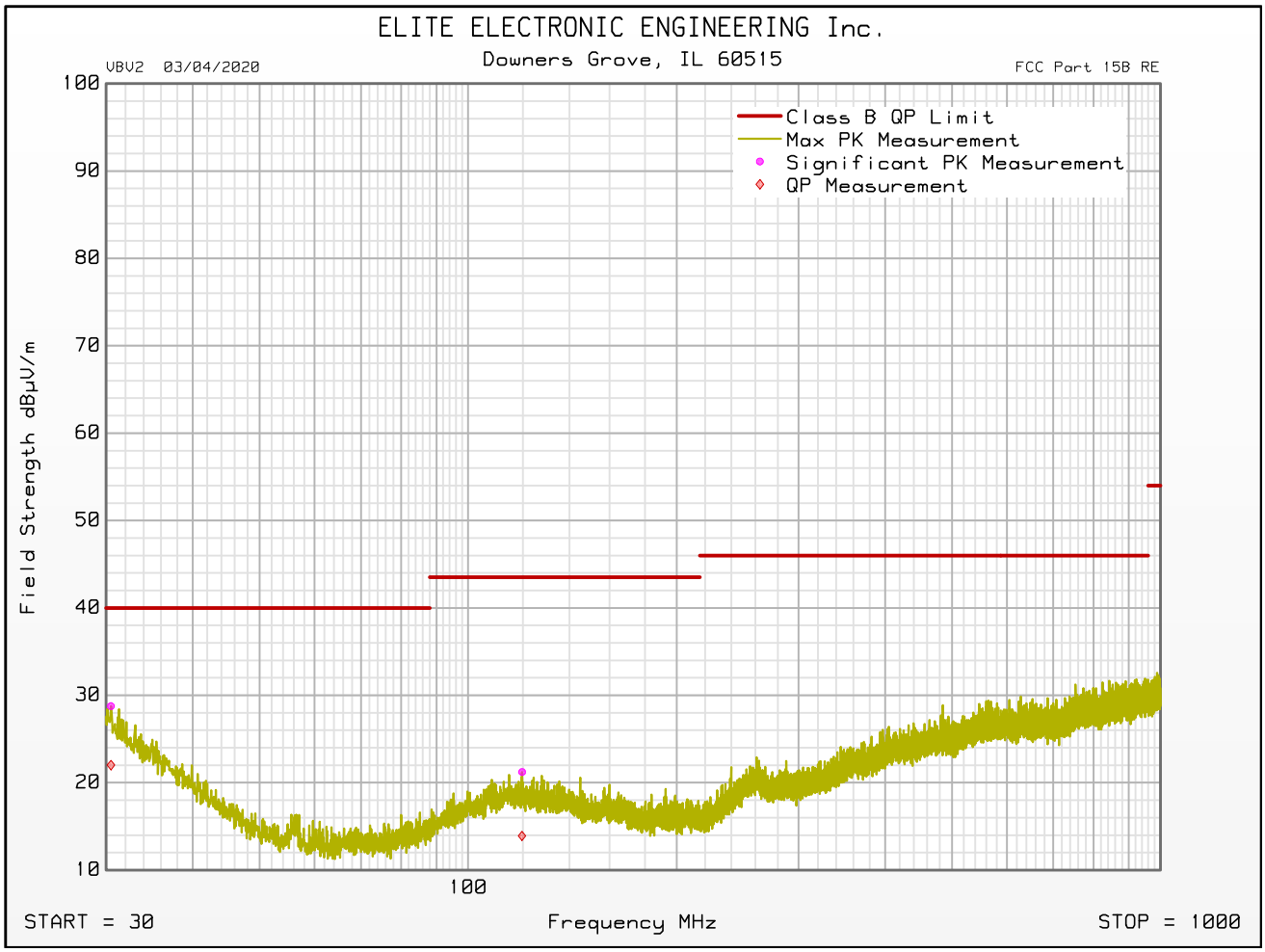
Manufacturer	:	Chamberlain
Model	:	87504
Serial Number	:	Sample #1
DUT Mode	:	Light on, transmitters in standby
Ant. Polarization(s)	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Apr 07, 2021 09:41:17 AM



FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 03/04/2020

Manufacturer	:	Chamberlain
Model	:	87504
Serial Number	:	Sample #1
DUT Mode	:	Light on, transmitters in standby
Ant. Polarization(s)	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	120 kHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Apr 07, 2021 09:41:17 AM



FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 03/22/2021

Manufacturer	:	Chamberlain
Model	:	87504
Serial Number	:	Sample #1
DUT Mode	:	Light on, transmitters in standby
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Apr 07, 2021 02:20:58 PM

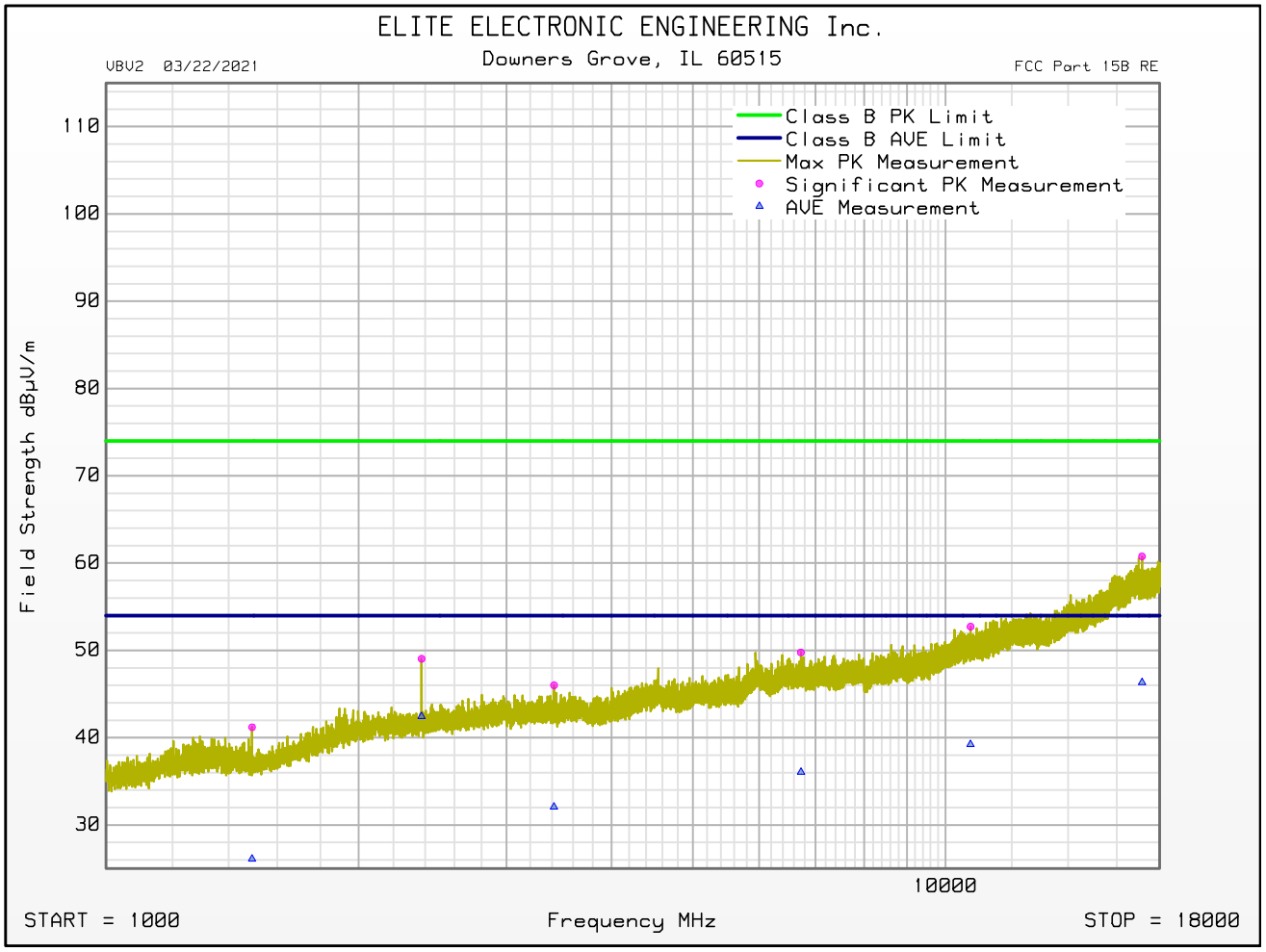
Freq MHz	Peak Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	Peak Limit dBµV/m	Peak Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excess. Peak Level
1492.500	51.8	28.0	-41.2	2.6	0.0	41.2	74.0	-32.8	H	340	45	
2376.000	54.6	32.1	-41.0	3.4	0.0	49.0	74.0	-24.9	H	340	315	
3417.500	49.4	32.9	-40.5	4.2	0.0	46.0	74.0	-28.0	H	120	0	
6727.000	48.6	35.9	-40.6	5.9	0.0	49.8	74.0	-24.2	H	120	270	
10712.500	48.1	37.8	-40.5	7.4	0.0	52.7	74.0	-21.3	H	120	45	
17149.000	49.2	41.7	-39.8	9.6	0.0	60.8	74.0	-13.2	H	120	90	

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
1492.500	36.7	28.0	-41.2	2.6	0.0	26.1	54.0	-27.9	H	340	45	
2376.000	48.1	32.1	-41.0	3.4	0.0	42.4	54.0	-11.5	H	340	315	
3417.500	35.5	32.9	-40.5	4.2	0.0	32.1	54.0	-21.9	H	120	0	
6727.000	34.9	35.9	-40.6	5.9	0.0	36.1	54.0	-17.9	H	120	270	
10712.500	34.6	37.8	-40.5	7.4	0.0	39.2	54.0	-14.7	H	120	45	
17149.000	34.8	41.7	-39.8	9.6	0.0	46.3	54.0	-7.7	H	120	90	

FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 03/22/2021

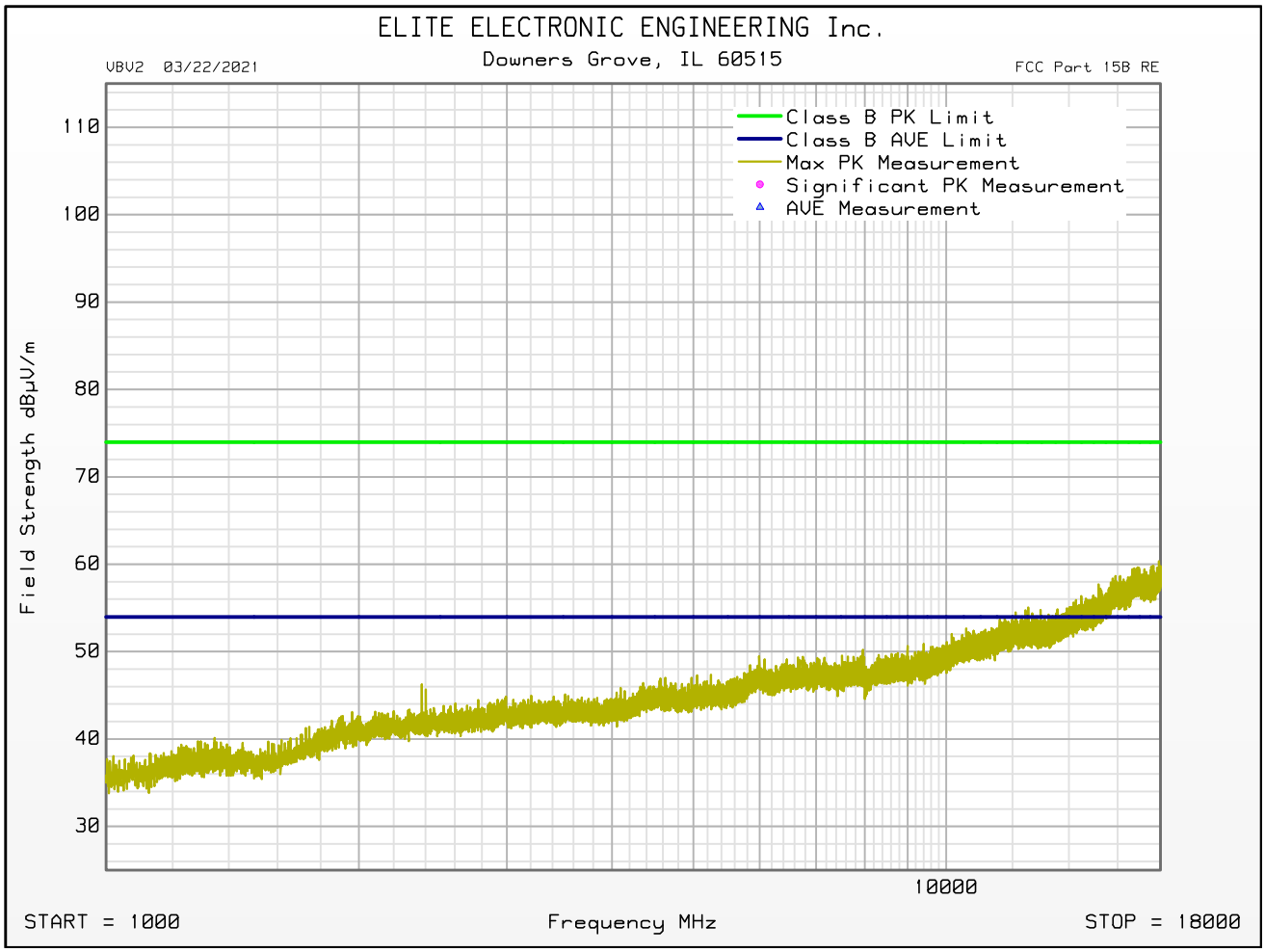
Manufacturer	:	Chamberlain
Model	:	87504
Serial Number	:	Sample #1
DUT Mode	:	Light on, transmitters in standby
Antenna Polarization	:	Horizontal
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Apr 07, 2021 02:20:58 PM



FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 03/22/2021

Manufacturer	:	Chamberlain
Model	:	87504
Serial Number	:	Sample #1
DUT Mode	:	Light on, transmitters in standby
Antenna Polarization	:	Vertical
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Apr 07, 2021 02:20:58 PM



FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 01/02/2019

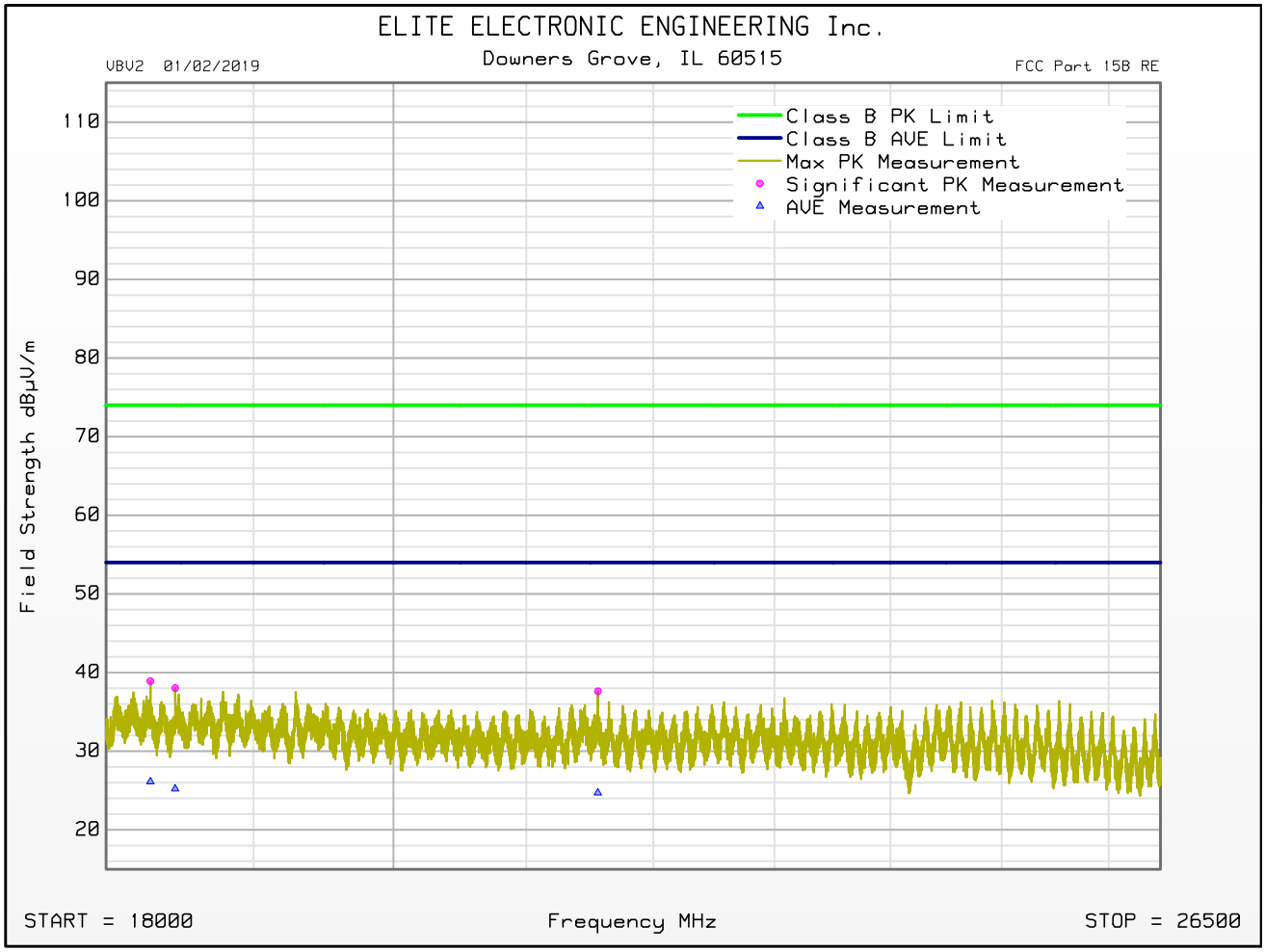
Manufacturer	:	Chamberlain
Model	:	87504
Serial Number	:	Sample #1
DUT Mode	:	Light On, Transmitters in Standby
Antenna Polarization	:	Horizontal
Mast Positions (cm)	:	100
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Apr 09, 2021 09:02:49 AM

Freq MHz	Peak Mtr Rdg dBuV	Average Mtr Rdg dBuV	Ant Fac dB	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	Peak Limit dBµV/m	Peak Lim Mrg dB	Average Total dBµV/m	Average Limit dBµV/m	Average Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °
18294.000	26.2	13.4	40.3	-29.8	2.2	0.0	38.9	74.0	-35.1	26.1	54.0	-27.9	H	100	0
18461.500	25.3	12.4	40.3	-29.7	2.2	0.0	38.0	74.0	-36.0	25.2	54.0	-28.8	H	100	0
21558.500	23.2	10.3	40.6	-28.3	2.3	0.0	37.6	74.0	-36.4	24.7	54.0	-29.3	H	100	0

FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 01/02/2019

Manufacturer	:	Chamberlain
Model	:	87504
Serial Number	:	Sample #1
DUT Mode	:	Light On, Transmitters in Standby
Antenna Polarization	:	Horizontal
Mast Positions (cm)	:	100
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Apr 09, 2021 09:02:49 AM



FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 01/02/2019

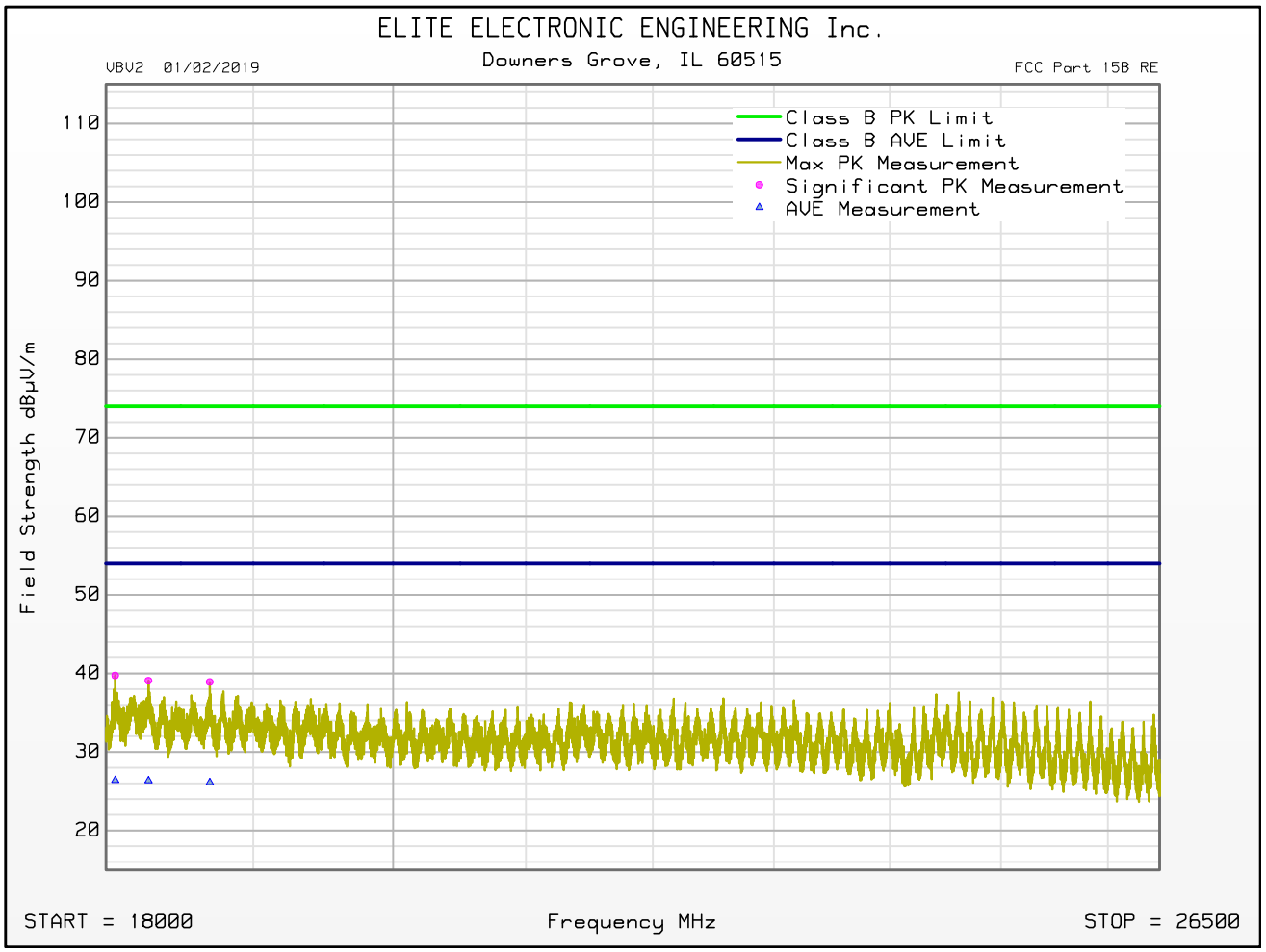
Manufacturer	:	Chamberlain
Model	:	87504
Serial Number	:	Sample #1
DUT Mode	:	Light On, Transmitters in Standby
Antenna Polarization	:	Vertical
Mast Positions (cm)	:	100
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Apr 09, 2021 08:59:14 AM

Freq MHz	Peak Mtr Rdg dBuV	Average Mtr Rdg dBuV	Ant Fac dB	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	Peak Limit dBµV/m	Peak Lim Mrg dB	Average Total dBµV/m	Average Limit dBµV/m	Average Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °
18060.500	27.8	14.5	40.3	-30.5	2.2	0.0	39.7	74.0	-34.2	26.4	54.0	-27.6	V	100	0
18282.000	26.4	13.7	40.3	-29.8	2.2	0.0	39.1	74.0	-34.9	26.4	54.0	-27.6	V	100	0
18698.000	25.7	12.9	40.3	-29.3	2.2	0.0	38.9	74.0	-35.1	26.1	54.0	-27.8	V	100	0

FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 01/02/2019

Manufacturer	:	Chamberlain
Model	:	87504
Serial Number	:	Sample #1
DUT Mode	:	Light On, Transmitters in Standby
Antenna Polarization	:	Vertical
Mast Positions (cm)	:	100
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Apr 09, 2021 08:59:14 AM



FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 03/22/2021

Manufacturer	:	Chamberlain
Model	:	87504
Serial Number	:	Sample #1
DUT Mode	:	Light On, Transmitters in Standby
Antenna Polarization	:	Horizontal
Mast Positions (cm)	:	100
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Apr 09, 2021 09:35:46 AM

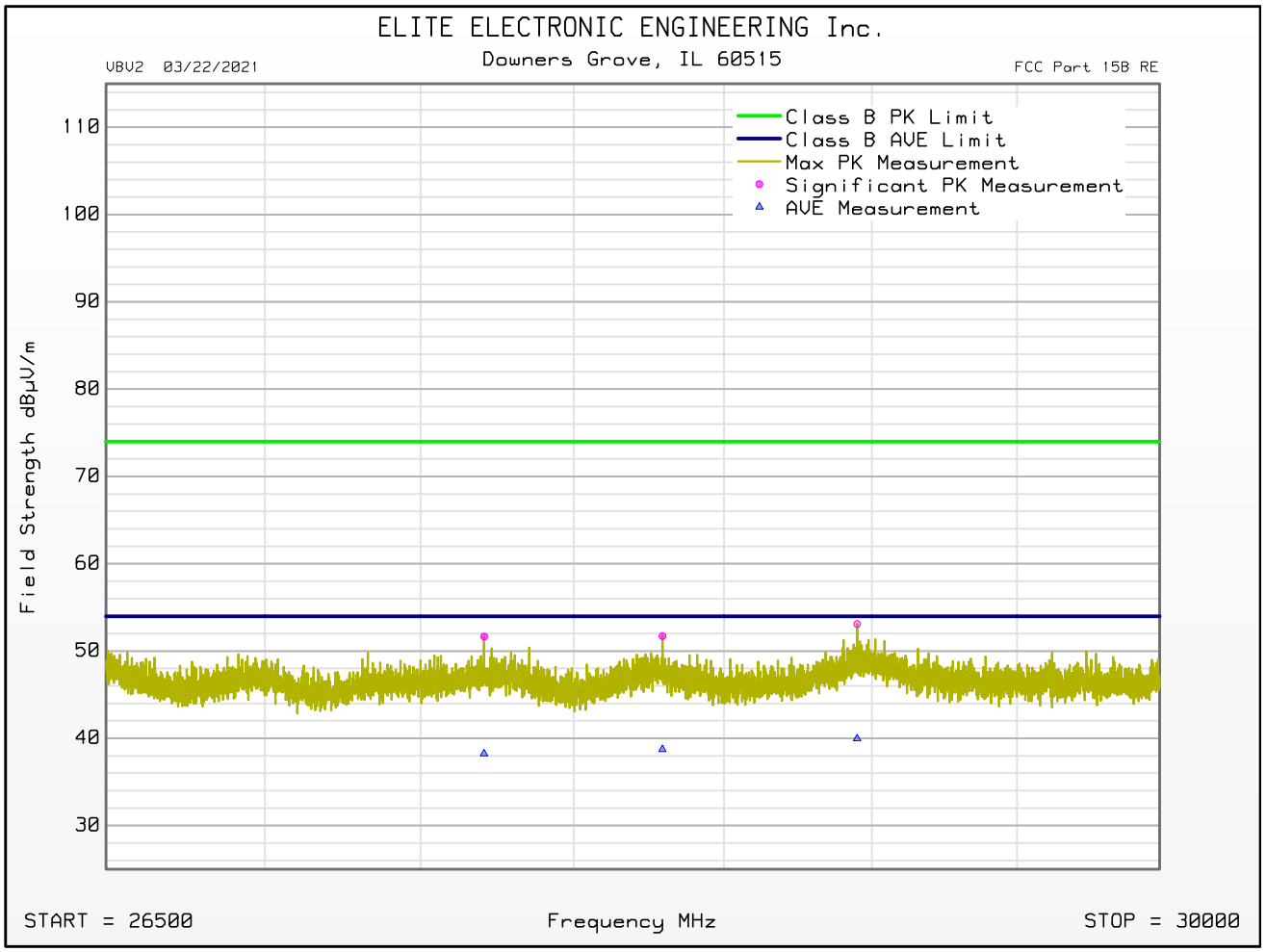
Freq MHz	Peak Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	Peak Limit dBµV/m	Peak Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive Peak Level
27706.000	40.7	43.8	-34.7	1.9	0.0	51.7	74.0	-22.3	H	100	0	
28294.000	40.7	43.8	-34.8	2.0	0.0	51.7	74.0	-22.3	H	100	0	
28950.000	41.8	43.8	-34.6	2.0	0.0	53.1	74.0	-20.9	H	100	0	

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
27706.000	27.2	43.8	-34.7	1.9	0.0	38.2	54.0	-15.8	H	100	0	
28294.000	27.7	43.8	-34.8	2.0	0.0	38.7	54.0	-15.3	H	100	0	
28950.000	28.7	43.8	-34.6	2.0	0.0	40.0	54.0	-14.0	H	100	0	

FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 03/22/2021

Manufacturer	:	Chamberlain
Model	:	87504
Serial Number	:	Sample #1
DUT Mode	:	Light On, Transmitters in Standby
Antenna Polarization	:	Horizontal
Mast Positions (cm)	:	100
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Apr 09, 2021 09:35:46 AM



FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 03/22/2021

Manufacturer	:	Chamberlain
Model	:	87504
Serial Number	:	Sample #1
DUT Mode	:	Light On, Transmitters in Standby
Turntable Step Angle (°)	:	360
Mast Positions (cm)	:	100
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Apr 09, 2021 10:03:02 AM

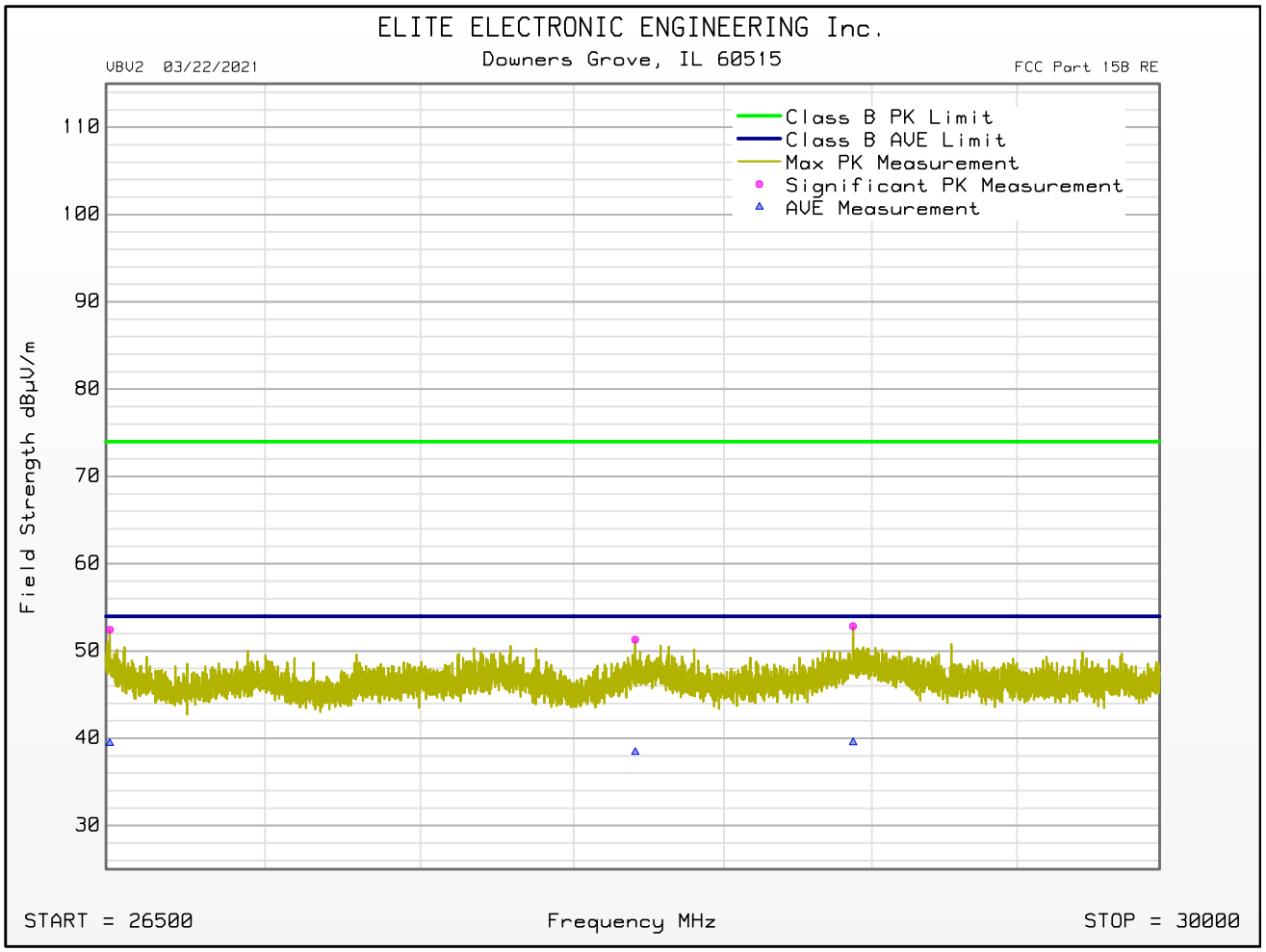
Freq MHz	Peak Mtr Rdg dBuV	Ant Fac dB/m	Amp Fac dB	Cbl Fac dB	Dist Corr dB	Peak Total dBµV/m	Peak Limit dBµV/m	Peak Lim Mrg dB	Ant Pol	Mast Ht cm	Azim °	Excessive Peak Level
26511.500	41.6	43.7	-34.8	1.9	0.0	52.4	74.0	-21.5	V	100	0	
28203.500	40.4	43.8	-34.9	2.0	0.0	51.3	74.0	-22.7	V	100	0	
28936.000	41.7	43.8	-34.7	2.0	0.0	52.8	74.0	-21.1	V	100	0	

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
26511.500	28.6	43.7	-34.8	1.9	0.0	39.4	54.0	-14.5	V	100	0	
28203.500	27.5	43.8	-34.9	2.0	0.0	38.4	54.0	-15.6	V	100	0	
28936.000	28.4	43.8	-34.7	2.0	0.0	39.5	54.0	-14.5	V	100	0	

FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 03/22/2021

Manufacturer	:	Chamberlain
Model	:	87504
Serial Number	:	Sample #1
DUT Mode	:	Light On, Transmitters in Standby
Antenna Polarization	:	Vertical
Mast Positions (cm)	:	100
Scan Type	:	Stepped Scan
Test RBW	:	1 MHz
Prelim Dwell Time (s)	:	0.0001
Notes	:	
Test Engineer	:	M. Longinotti
Test Date	:	Apr 09, 2021 10:03:02 AM



23. Transmitter RF Conducted Emissions Test (AC Mains)

Manufacturer	Chamberlain Group, Inc.
Product	Garage Door Opener
Model	87504
Serial No	Sample #2
Mode	900MHz transmitter on, light on, motor on

Information	
Setup Format	Tabletop
Height of Support	N/A
Type of Test Site	Semi-Anechoic Chamber
Note	None

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

Requirements

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limits (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30	60	50

*- Decreases with the logarithm of the frequency.

Procedures

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 900MHz transmitter on, light on, motor on mode.
2) Measurements were first made on the 120V, 60Hz high line of the EUT.
3) The frequency range from 150 kHz to 30 MHz 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 5dB of the average limit were then measured again using both a quasi-peak detector and an average detector. (If no peak readings were within 5dB 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.
7) Steps (3) through (6) were repeated on the 120V, 60Hz return line of the EUT.

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 05/14/2020

Manufacturer	:	Chamberlain
Model	:	87504
DUT Revision	:	
Serial Number	:	Sample #2
DUT Mode	:	Motor On, 900MHz transmitter on, Light on
Line Tested	:	120V, 60Hz High
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-4
Notes	:	
Test Engineer	:	M. Longinotti
Limit	:	Class B
Test Date	:	Apr 08, 2021 02:20:09 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 4 dB margin below limit

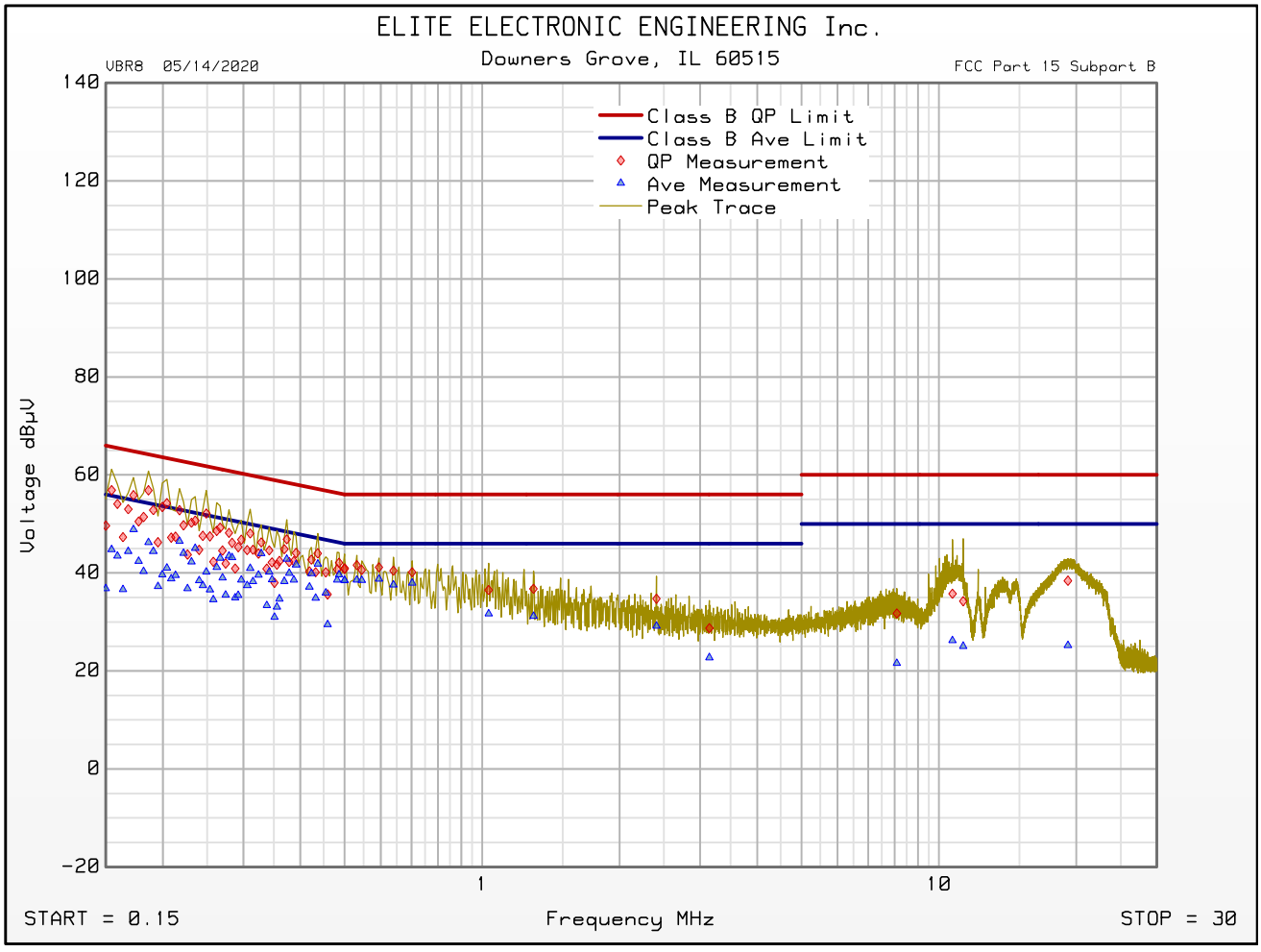
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.186	56.8	64.2		46.2	54.2	
0.374	46.9	58.4		42.8	48.4	
0.532	41.6	56.0		38.6	46.0	
1.033	36.5	56.0		31.7	46.0	
1.295	36.8	56.0		31.1	46.0	
2.408	34.7	56.0		29.2	46.0	
3.145	28.7	56.0		22.7	46.0	
8.092	31.7	60.0		21.6	50.0	
10.710	35.7	60.0		26.2	50.0	
19.153	38.4	60.0		25.2	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 05/14/2020

Manufacturer	:	Chamberlain
Model	:	87504
DUT Revision	:	
Serial Number	:	Sample #2
DUT Mode	:	Motor On, 900MHz transmitter on, Light on
Line Tested	:	120V, 60Hz High
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-4
Notes	:	
Test Engineer	:	M. Longinotti
Limit	:	Class B
Test Date	:	Apr 08, 2021 02:20:09 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 05/14/2020

Manufacturer	:	Chamberlain
Model	:	87504
DUT Revision	:	
Serial Number	:	Sample #2
DUT Mode	:	Motor On, 900MHz transmitter on, Light on
Line Tested	:	120V, 60Hz Return
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-4
Notes	:	
Test Engineer	:	M. Longinotti
Limit	:	Class B
Test Date	:	Apr 08, 2021 02:06:44 PM
Data Filter	:	Up to 80 maximum levels detected with 6 dB level excursion threshold over 4 dB margin below limit

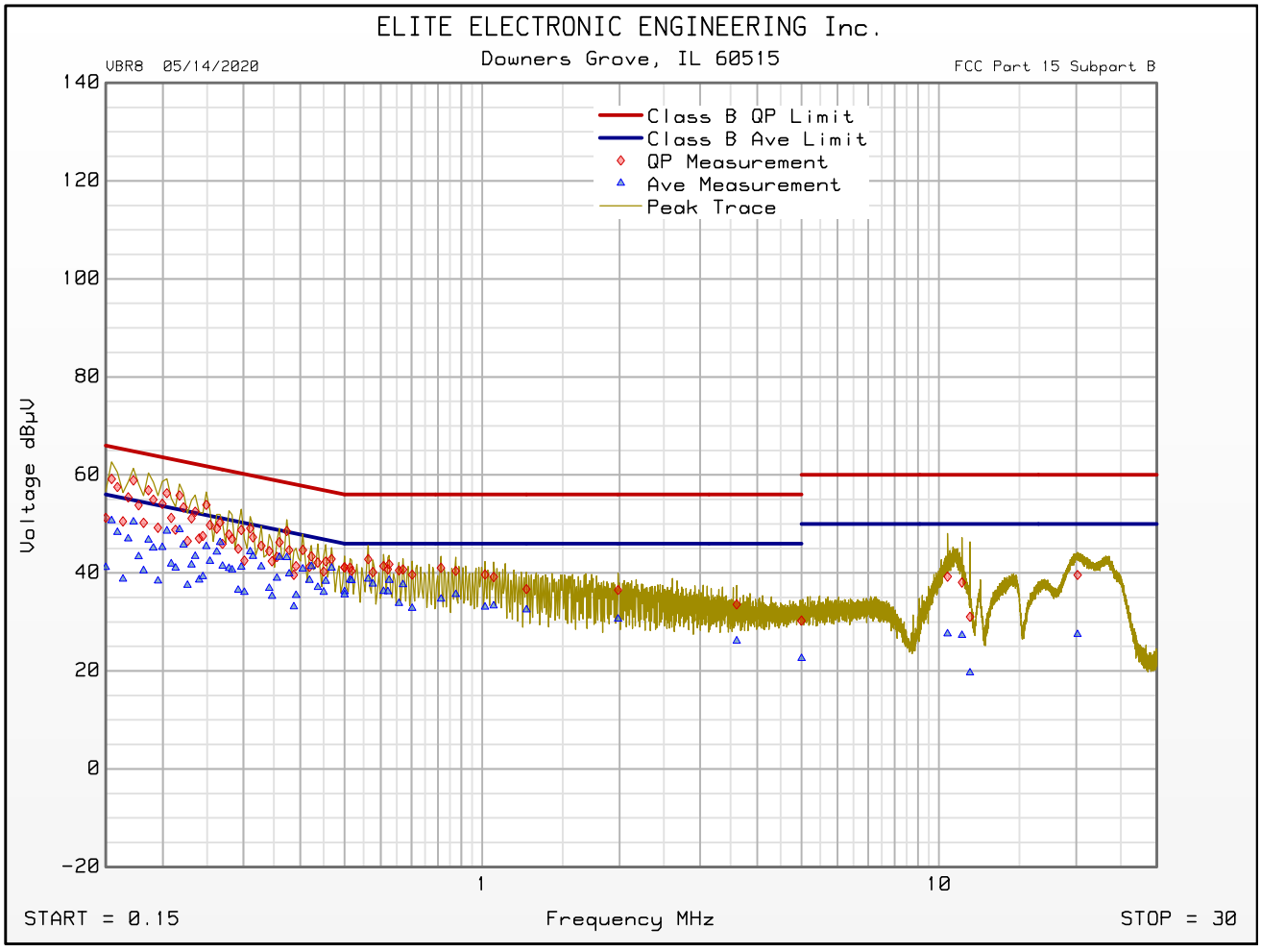
Freq MHz	Quasi-peak Level dBµV	Quasi-peak Limit dBµV	Excessive Quasi-peak Emissions	Average Level dBµV	Average Limit dBµV	Excessive Average Emissions
0.173	58.9	64.8		50.4	54.8	
0.374	48.5	58.4		43.1	48.4	
0.563	42.8	56.0		38.8	46.0	
0.813	41.0	56.0		34.7	46.0	
1.250	36.7	56.0		32.5	46.0	
1.985	36.5	56.0		30.6	46.0	
3.608	33.6	56.0		26.1	46.0	
5.000	30.2	56.0		22.6	46.0	
10.449	39.2	60.0		27.6	50.0	
20.120	39.6	60.0		27.5	50.0	

FCC Part 15 Subpart B Conducted Emissions Test

Cumulative Data

VBR8 05/14/2020

Manufacturer	:	Chamberlain
Model	:	87504
DUT Revision	:	
Serial Number	:	Sample #2
DUT Mode	:	Motor On, 900MHz transmitter on, Light on
Line Tested	:	120V, 60Hz Return
Scan Step Time [ms]	:	30
Meas. Threshold [dB]	:	-4
Notes	:	
Test Engineer	:	M. Longinotti
Limit	:	Class B
Test Date	:	Apr 08, 2021 02:06:44 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

24. Transmitter Peak Effective Isotropic Radiated Power (EIRP)

Test Information	
Manufacturer	Chamberlain Group, Inc.
Product	Garage Door Opener
Model	87504
Serial No	Sample #1
Mode	See Below

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent) NA
Notes	None

Requirements

Per FCC 15.247, Section (b)(3) and ISED RSS-247, Section 5.4(d), for systems using frequency hopping spread spectrum in the 902MHz to 928MHz and incorporating at least 50 channels, the maximum peak conducted output power shall not exceed 1 watt.

Per FCC 15.247, Section (b)(4), and ISED RSS-247, Section 5.4(d), the conducted output power limit is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Procedures

C63.10 Annex G and Section 11.9.1.1:

The EUT was placed on an 80cm high non-conductive stand and set to transmit. A bilog antenna was placed at a test distance of 3 meters from the EUT.

a) The following settings were employed on the EMI Test Receiver:

1)	Center Frequency	= Transmit frequency of EUT
2)	Span	≥ 3 x RBW
3)	RBW	≥ 20dB Bandwidth
4)	VBW	≥ 3 x RBW
5)	Number of points in sweep	≥ (2 x span /RBW)
6)	Sweep time	= Auto
7)	Detector	= Peak
8)	Trace	= Max hold

b) Allow trace to stabilize

c) Use peak marker function to determine the peak amplitude level.

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 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.

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

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 902.25MHz
Parameters	EIRP = 18.6mW (12.7dBm)
Notes	None

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	82.0	11.8	2.2	1.2	12.7	36.0	-23.3
902.25	V	72.9	5.7	2.2	1.2	6.6	36.0	-29.4

Peak EIRP (dBm) = Matched Sig. Gen. Reading (dBm) + Equivalent Antenna Gain(dB) – Cable Loss (dB)

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 914.75MHz
Parameters	EIRP = 24mW (13.8dBm)
Notes	None

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)
914.75	H	83.1	12.9	2.2	1.2	13.8	36.0	-22.2
914.75	V	74.8	7.2	2.2	1.2	8.1	36.0	-27.9

Peak EIRP (dBm) = Matched Sig. Gen. Reading (dBm) + Equivalent Antenna Gain(dB) – Cable Loss (dB)

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 926.75MHz
Parameters	EIRP = 21.9mW (13.4dBm)
Notes	None

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)
926.75	H	82.5	12.5	2.2	1.2	13.4	30.0	-16.6
926.75	V	76.0	8.4	2.2	1.2	9.3	30.0	-20.7

Peak EIRP (dBm) = Matched Sig. Gen. Reading (dBm) + Equivalent Antenna Gain(dB) – Cable Loss (dB)

25. Transmitter Duty Cycle Factor Measurements

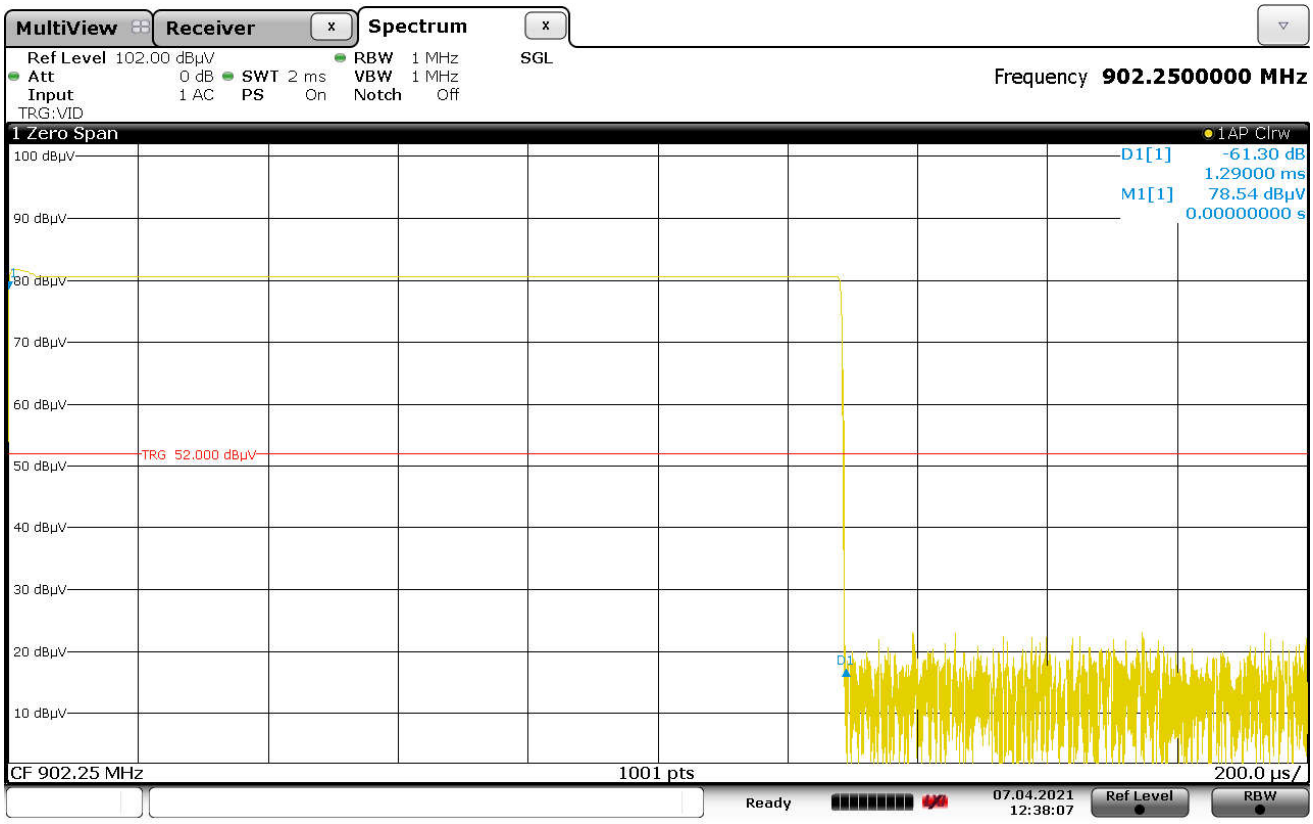
Test Information	
Manufacturer	Chamberlain Group, Inc.
Product	Garage Door Opener
Model	87504
Serial No	Sample #1
Mode	See Below

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Notes	None

Procedures
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 the center frequency of the spectrum analyzer to the transmitter frequency of the EUT and then setting the frequency span to 0 Hz with a sweep rate of 200usec/div. The amplitude settings are adjusted so that the on/off transitions clear the 4th division from the bottom of the display. 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 the (On-time/ word period) where the word period = (On-time + Off-time).

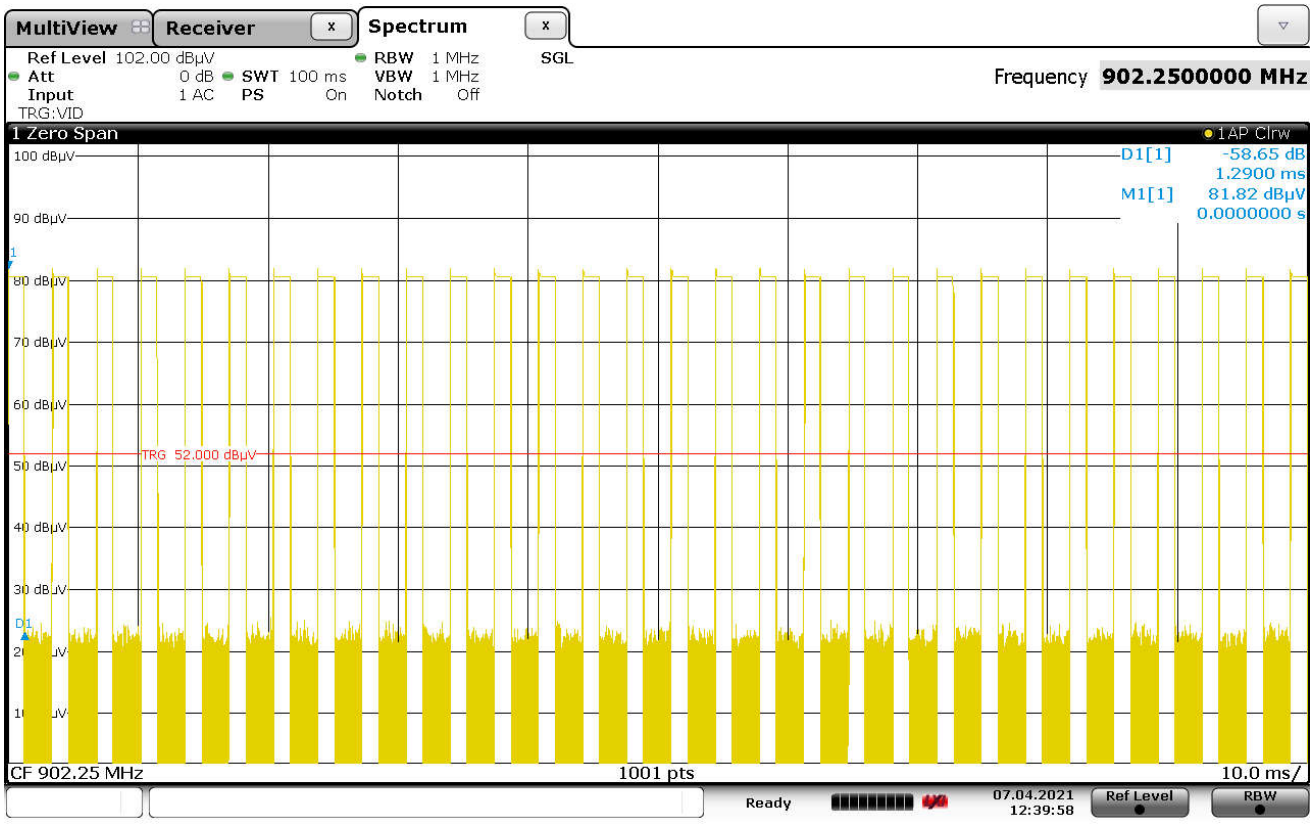
Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz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

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 902.25MHz
Parameters	On time = 1.29msec
Notes	None



Date: 7.APR.2021 12:38:07

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 902.25MHz
Parameters	On time in 100msec = 30 pulses x 1.29msec/pulse = 38.7msec
Notes	None

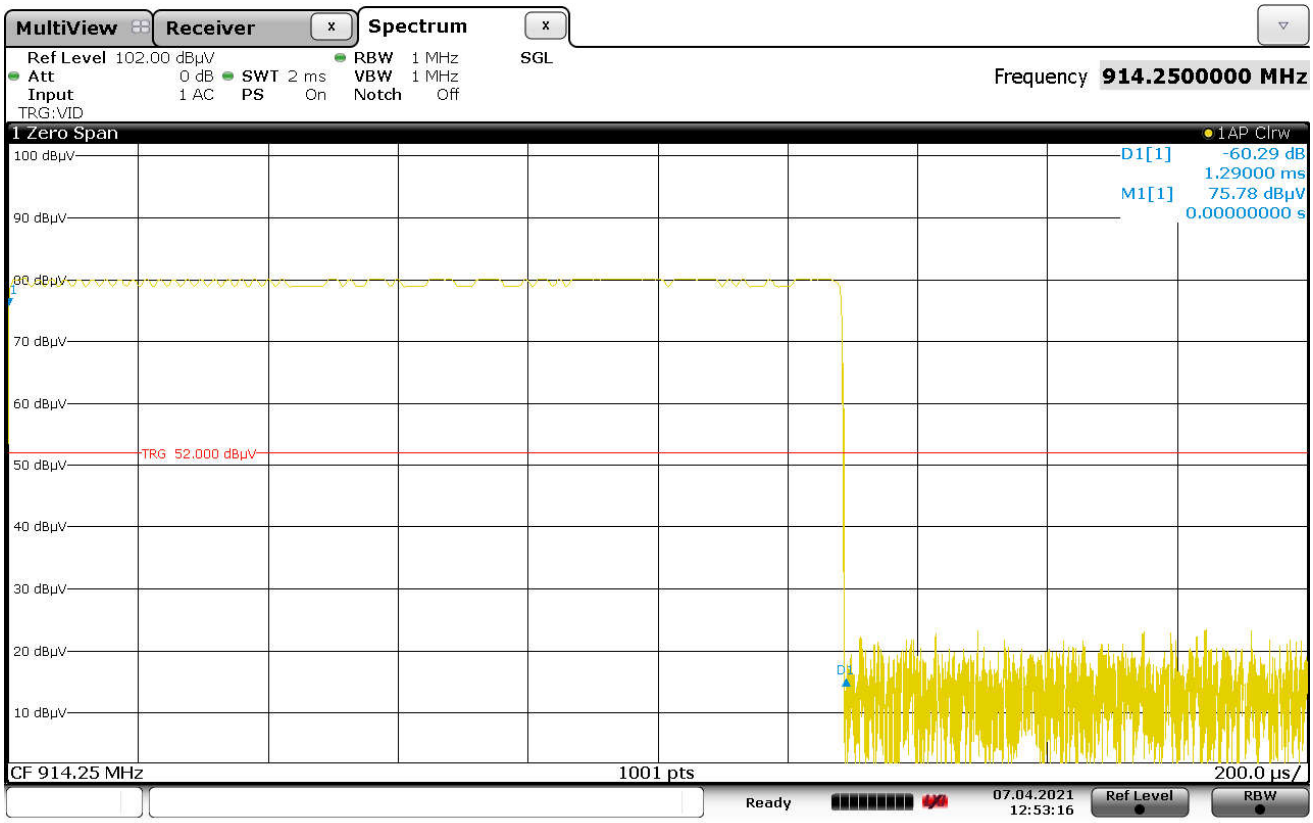


Date: 7.APR.2021 12:39:58

Duty Cycle = D = ((Total On-time in 100msec)/(100msec)) = 38.7msec/100msec = 0.387

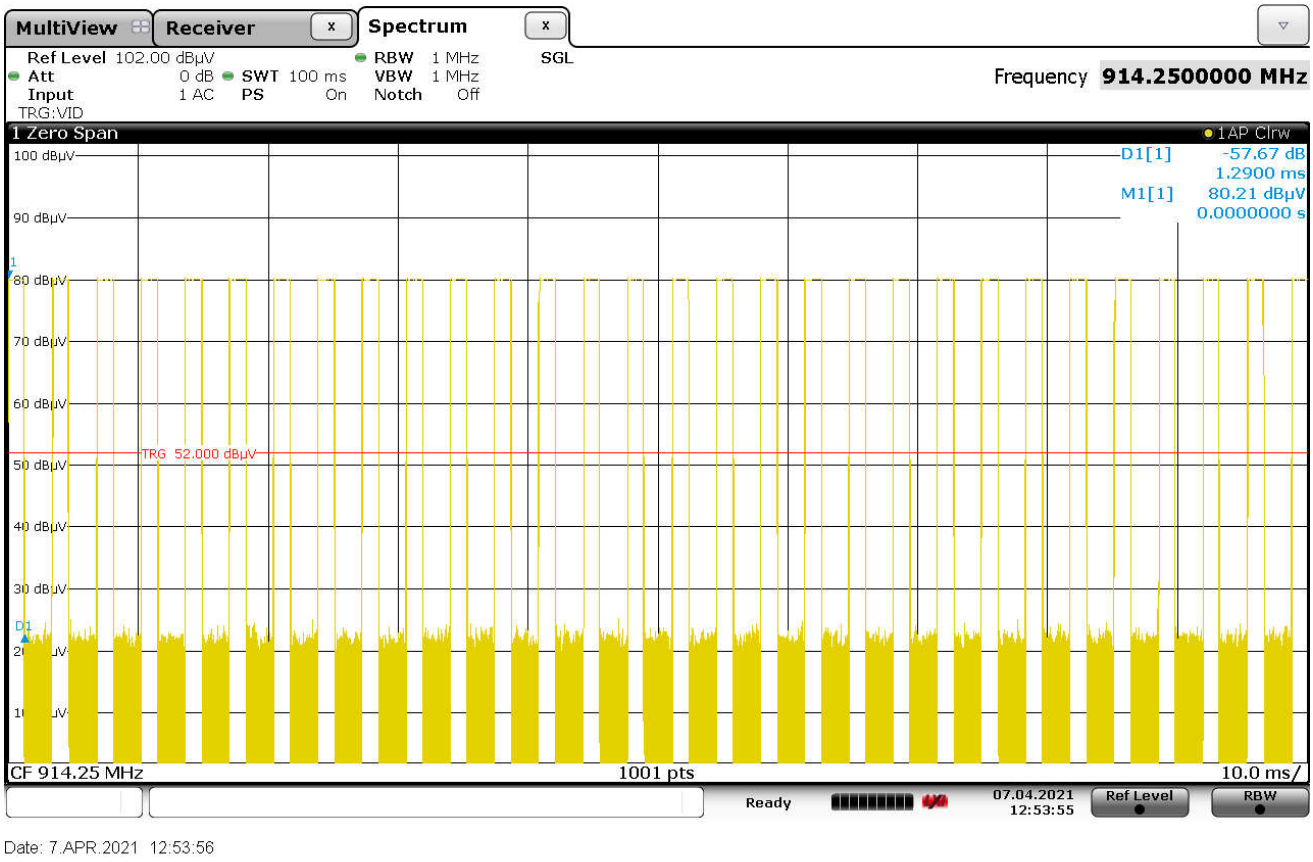
Duty Cycle Correction Factor = 20 log (1/D) = 20 log(1/0.387) = 8.3dB

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 914.75MHz
Parameters	On time = 1.29msec
Notes	None



Date: 7.APR.2021 12:53:16

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 914.75MHz
Parameters	On time in 100msec = 30 pulses x 1.29msec/pulse = 38.7msec
Notes	None

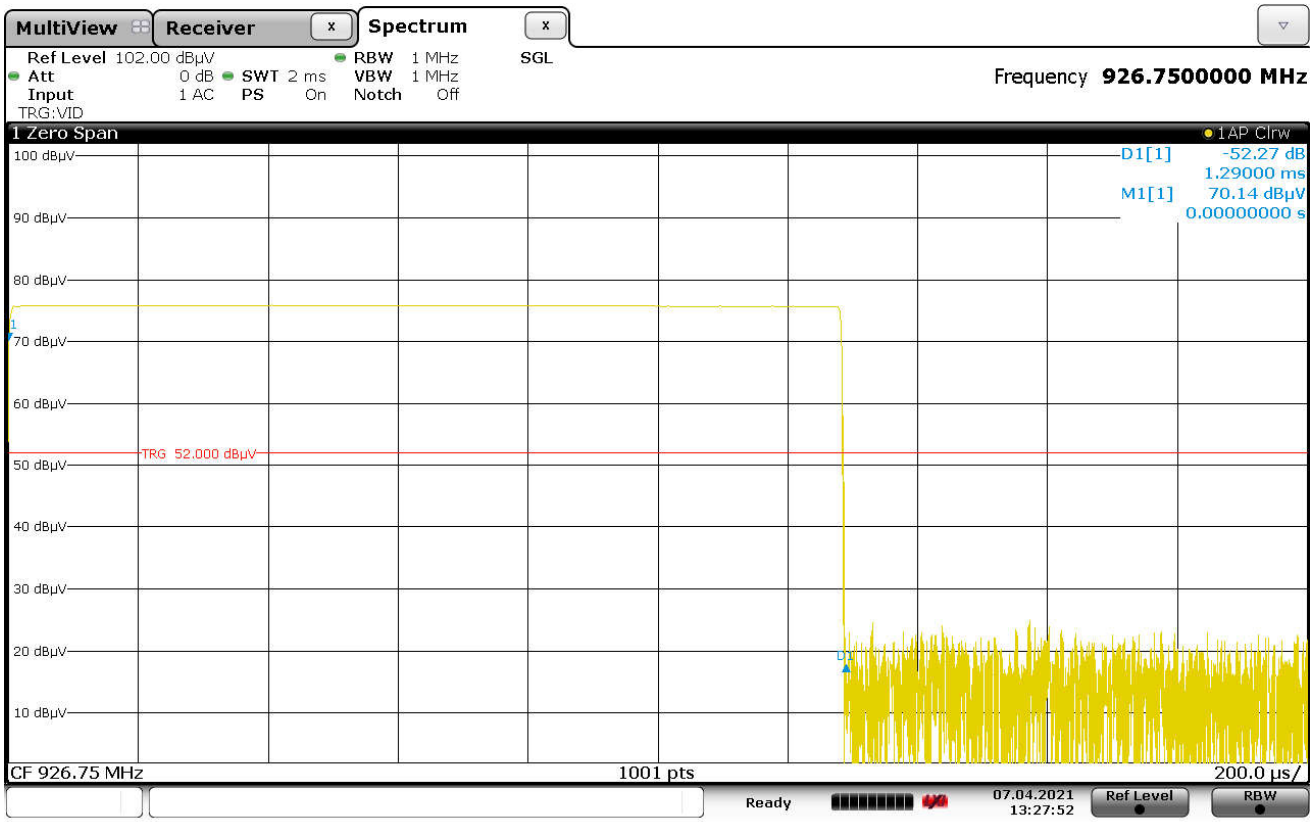


Date: 7.APR.2021 12:53:56

Duty Cycle = D = ((Total On-time in 100msec)/(100msec)) = 38.7msec/100msec = 0.387

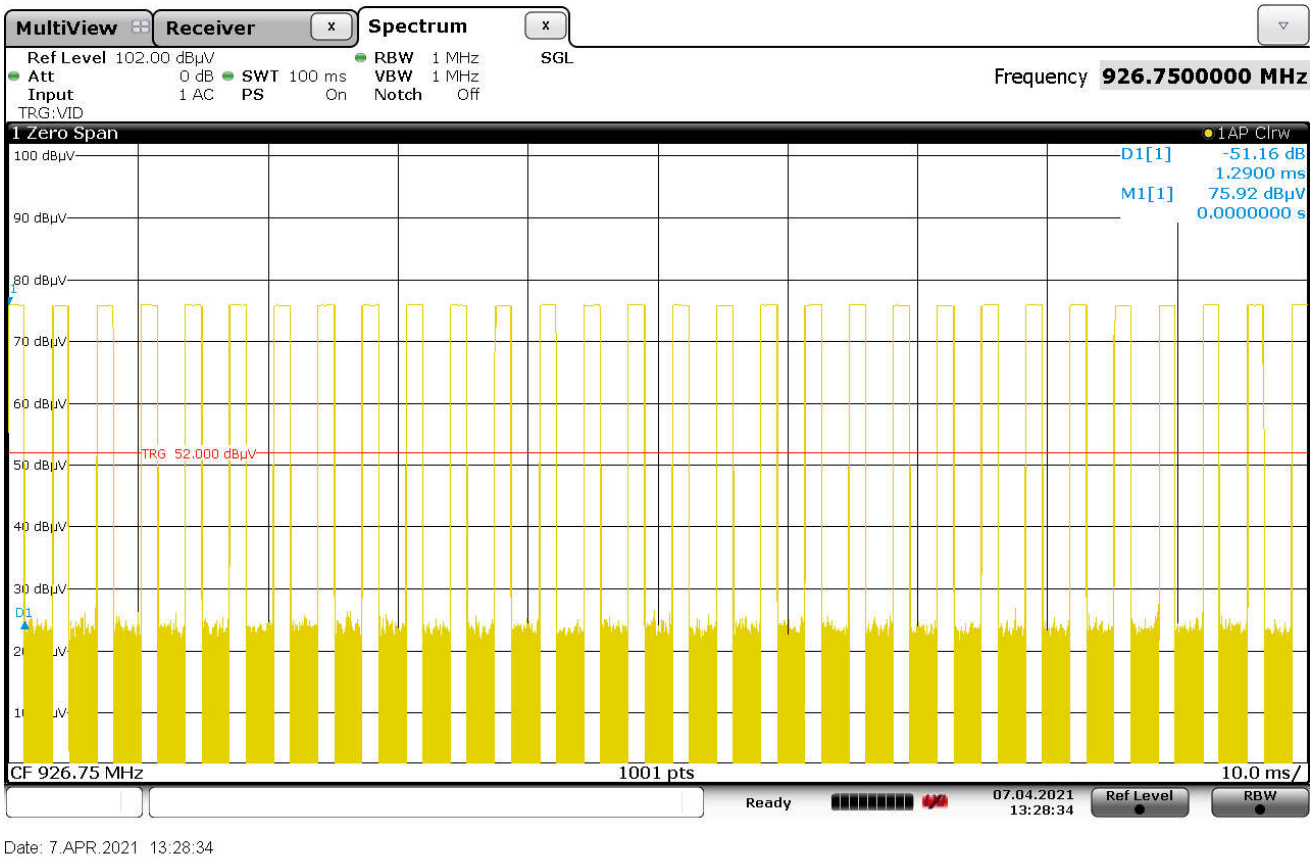
Duty Cycle Correction Factor = 20 log (1/D) = 20 log(1/0.387) = 8.3dB

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 926.75MHz
Parameters	On time = 1.29msec
Notes	None



Date: 7.APR.2021 13:27:52

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 926.75MHz
Parameters	On time in 100msec = 30 pulses x 1.29msec/pulse = 38.7msec
Notes	None



Date: 7.APR.2021 13:28:34

Duty Cycle = D = ((Total On-time in 100msec)/(100msec)) = 38.7msec/100msec = 0.387

Duty Cycle Correction Factor = 20 log (1/D) = 20 log(1/0.387) = 8.3dB

26. Transmitter Case Spurious Radiated Emissions

Test Information	
Manufacturer	Chamberlain Group, Inc.
Product	Garage Door Opener
Model	87504
Serial No	Sample #1
Mode	See Below

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Type of Antennas Used	Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent) NA
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
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
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 frequency range from 1GHz to 10GHz was investigated using a peak detector function. The final emission tests were then manually performed over the frequency range of 1GHz to 10GHz. 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 bands 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 1.5m high, non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz 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.

d) All harmonics not in the restricted bands must be at least 20 dB 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 1 GHz 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 1 GHz 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 1.5m high, non-conductive stand. A peak detector with a resolution bandwidth of 1 MHz 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.

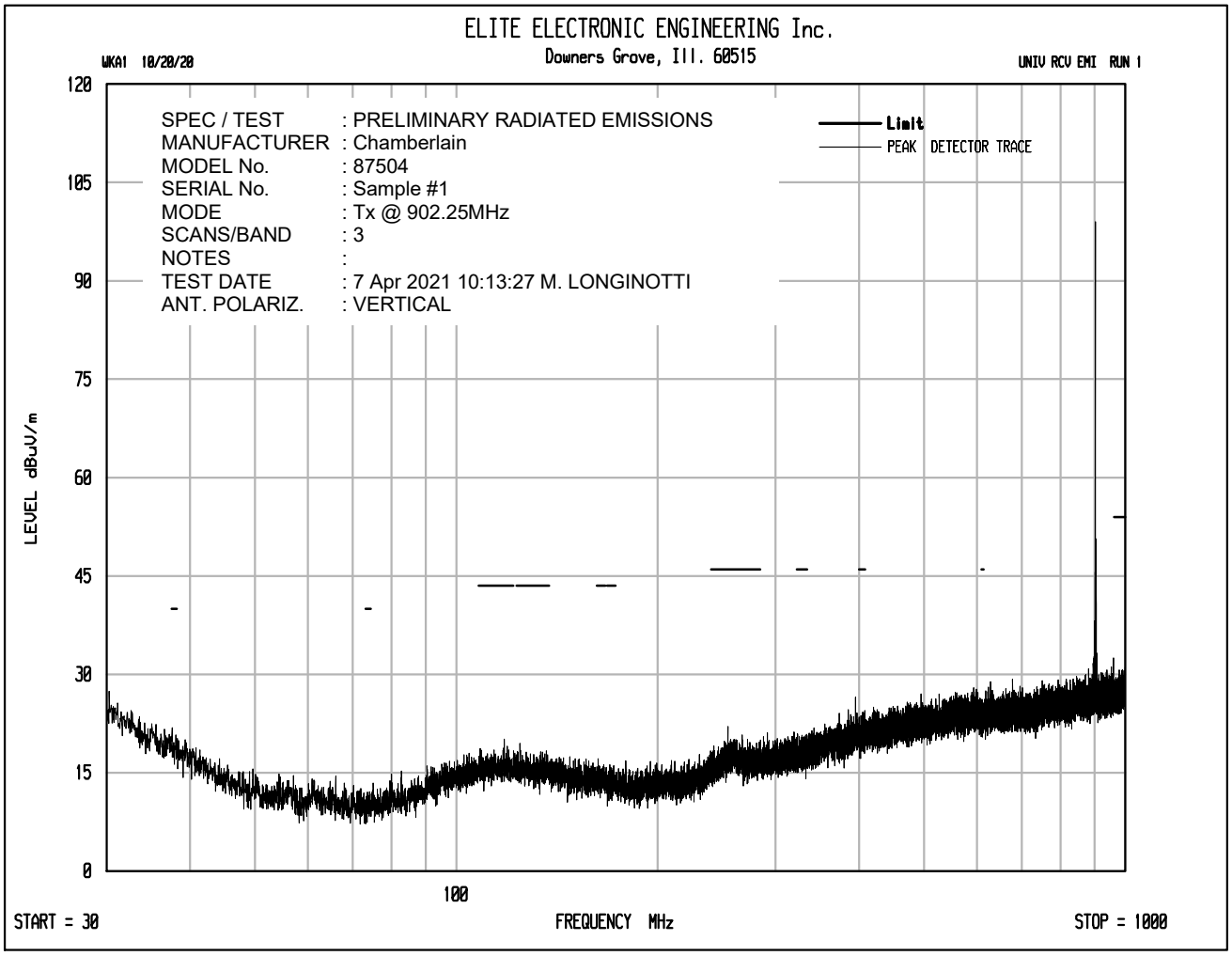
ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.

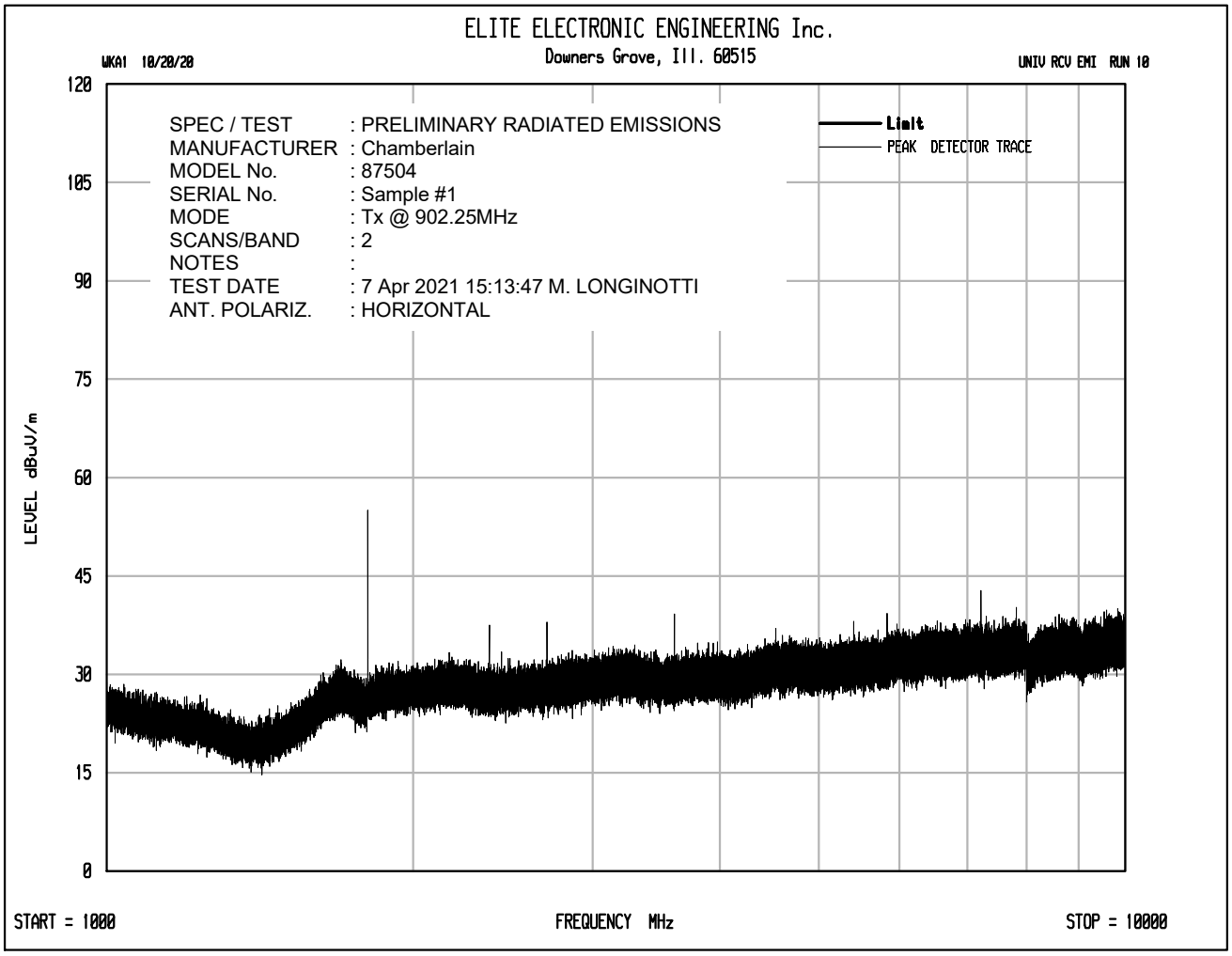
iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.

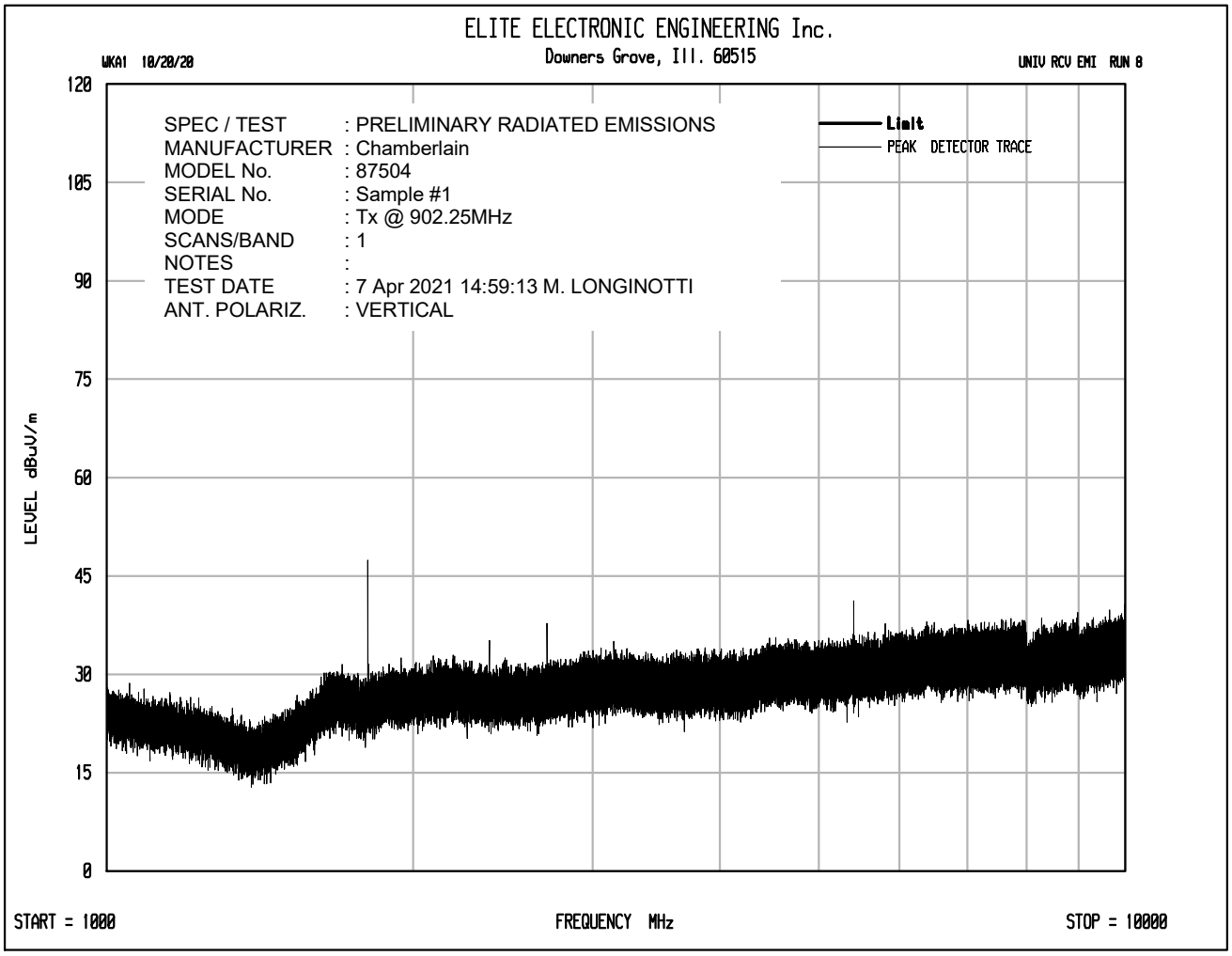
d) For all radiated emissions measurements below 1 GHz, if the peak reading is below the limits listed in 15.209(a), no further measurements are required. If however, the peak readings exceed the limits listed in 15.209(a), then the emissions are remeasured using a quasi-peak detector.

e) For all radiated emissions measurements above 1 GHz, 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 20 dB above the maximum permitted average emission limit applicable to the equipment under test. Therefore, all peak readings above 1 GHz must be no greater than 20 dB above the limits specified in 15.209(a).

f) Next, for all radiated emissions measurements above 1GHz, the resolution bandwidth was set to 1MHz. The analyzer was set to linear mode with a 10Hz video bandwidth in order to simulate an average detector. An average reading was taken. If the duty cycle of the transmitter is less than 98%, the duty cycle correction factor is added to the average reading.


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 1
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Chamberlain
MODEL No. : 87504
SERIAL No. : Sample #1
MODE : Tx @ 902.25MHz
SCANS/BAND : 3
NOTES :
TEST DATE : 7 Apr 2021 10:13:27 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 10
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Chamberlain
MODEL No. : 87504
SERIAL No. : Sample #1
MODE : Tx @ 902.25MHz
SCANS/BAND : 2
NOTES :
TEST DATE : 7 Apr 2021 15:13:47 M. LONGINOTTI
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 8
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Chamberlain
MODEL No. : 87504
SERIAL No. : Sample #1
MODE : Tx @ 902.25MHz
SCANS/BAND : 1
NOTES :
TEST DATE : 7 Apr 2021 14:59:13 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 902.25MHz
Parameters	Peak Measurements in the Restricted Bands
Notes	None

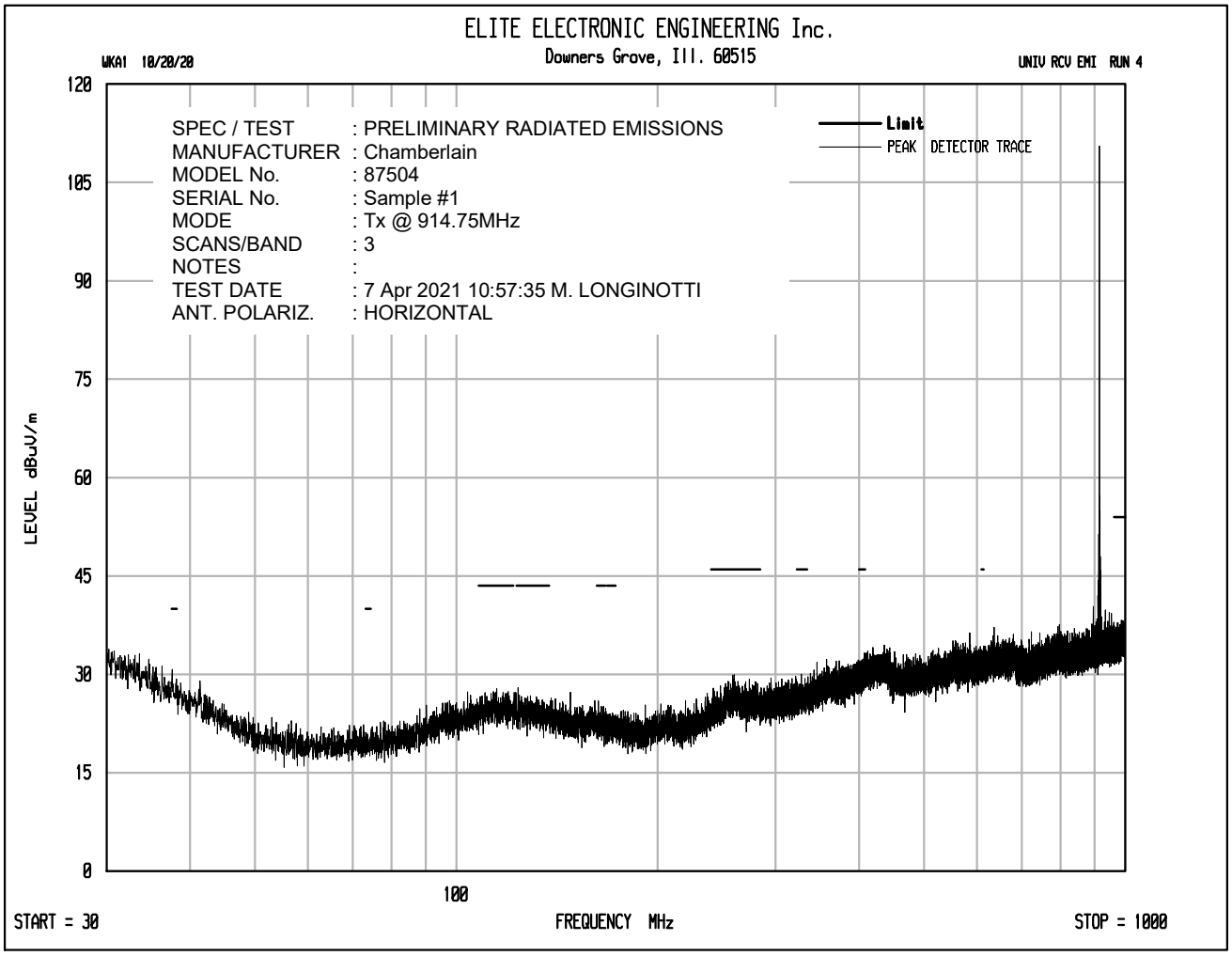
Frequency (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBµV/m at 3m	Peak Total µV/m at 3 m	Peak Limit µV/m at 3 m	Margin (dB)
2706.75	H	55.0		3.7	33.4	-40.4	51.7	384.9	5000.0	-22.3
2706.75	V	55.3		3.7	33.4	-40.4	52.0	398.4	5000.0	-22.0
3609.00	H	55.3	Ambient	4.3	34.6	-40.3	53.8	492.3	5000.0	-20.1
3609.00	V	52.1	Ambient	4.3	34.6	-40.3	50.6	340.6	5000.0	-23.3
4511.25	H	51.1	Ambient	4.7	35.9	-40.1	51.6	381.6	5000.0	-22.3
4511.25	V	50.6	Ambient	4.7	35.9	-40.1	51.1	360.3	5000.0	-22.8
5413.50	H	59.1		5.1	36.6	-40.2	60.6	1066.0	5000.0	-13.4
5413.50	V	58.5		5.1	36.6	-40.2	60.0	994.9	5000.0	-14.0
8120.25	H	49.3	Ambient	6.5	38.3	-40.0	54.1	506.5	5000.0	-19.9
8120.25	V	49.5	Ambient	6.5	38.3	-40.0	54.3	518.3	5000.0	-19.7
9022.50	H	50.5	Ambient	6.5	38.6	-39.7	55.9	624.0	5000.0	-18.1
9022.50	V	49.4	Ambient	6.5	38.6	-39.7	54.8	549.8	5000.0	-19.2

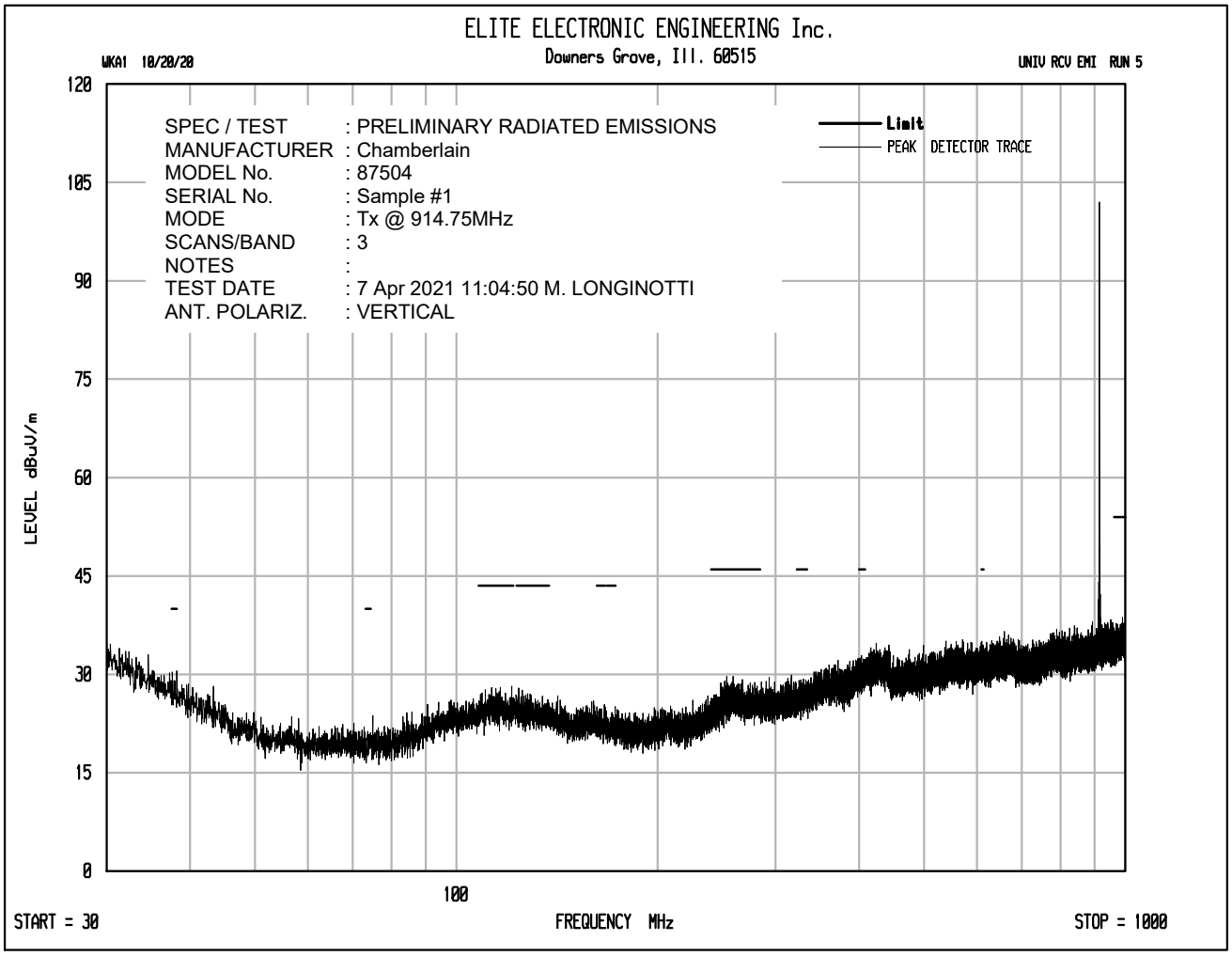
Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 902.25MHz
Parameters	Average Measurements in the Restricted Bands
Notes	None

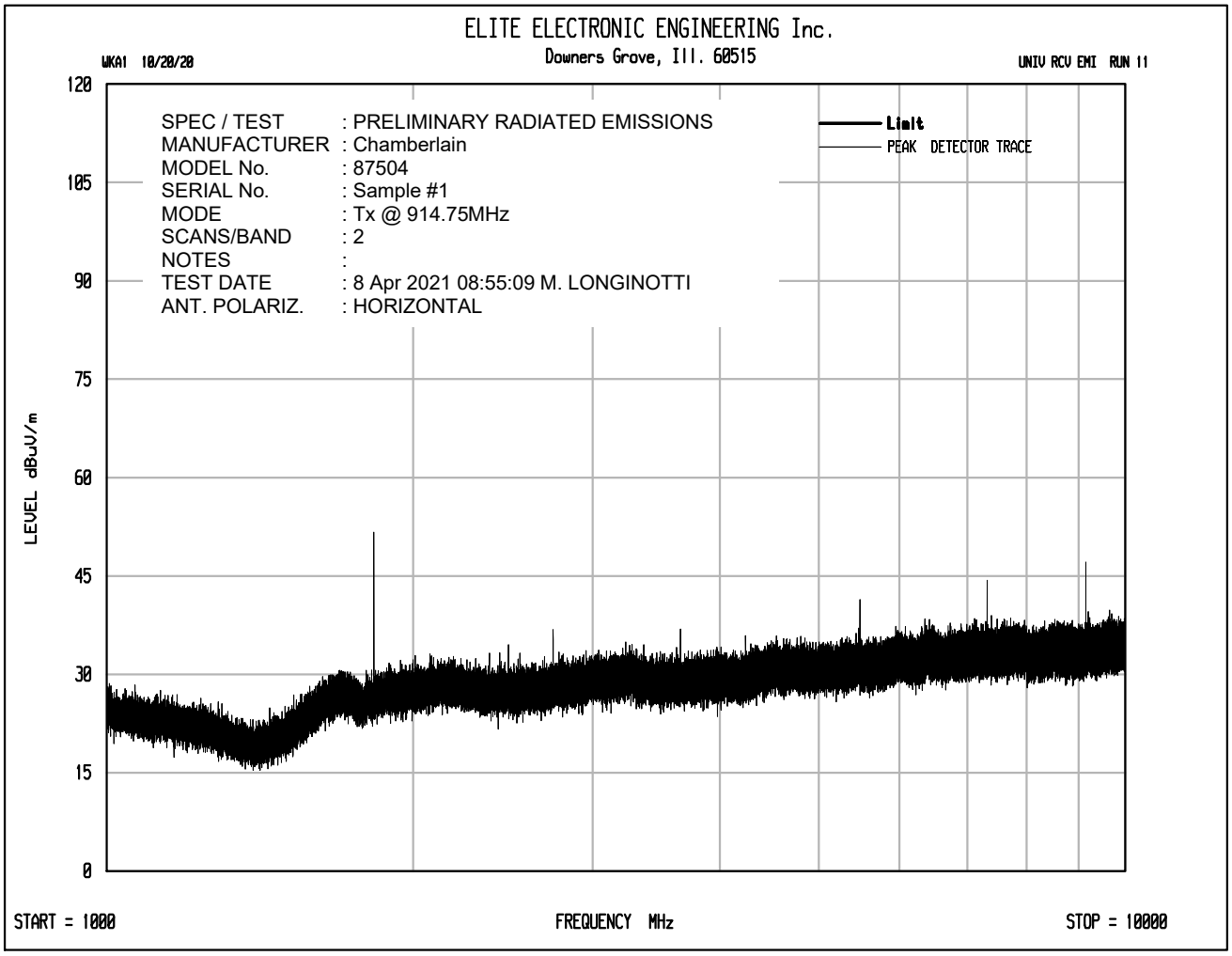
Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2706.75	H	40.00		3.7	33.4	-40.4	8.3	45.0	178.0	500.0	-9.0
2706.75	V	40.8		3.7	33.4	-40.4	8.3	45.8	195.1	500.0	-8.2
3609.00	H	37.2		4.3	34.6	-40.3	8.3	44.0	159.3	500.0	-9.9
3609.00	V	35.3	Ambient	4.3	34.6	-40.3	8.3	42.1	128.0	500.0	-11.8
4511.25	H	35.6	Ambient	4.7	35.9	-40.1	8.3	44.4	166.6	500.0	-9.5
4511.25	V	35.3	Ambient	4.7	35.9	-40.1	8.3	44.1	160.9	500.0	-9.8
5413.50	H	41.8		5.1	36.6	-40.2	8.3	51.6	378.2	500.0	-2.4
5413.50	V	41.3		5.1	36.6	-40.2	8.3	51.1	357.1	500.0	-2.9
8120.25	H	33.8	Ambient	6.5	38.3	-40.0	8.3	46.9	221.1	500.0	-7.1
8120.25	V	33.9	Ambient	6.5	38.3	-40.0	8.3	47.0	223.6	500.0	-7.0
9022.50	H	34.3	Ambient	6.5	38.6	-39.7	8.3	48.0	251.3	500.0	-6.0
9022.50	V	33.9	Ambient	6.5	38.6	-39.7	8.3	47.6	240.0	500.0	-6.4

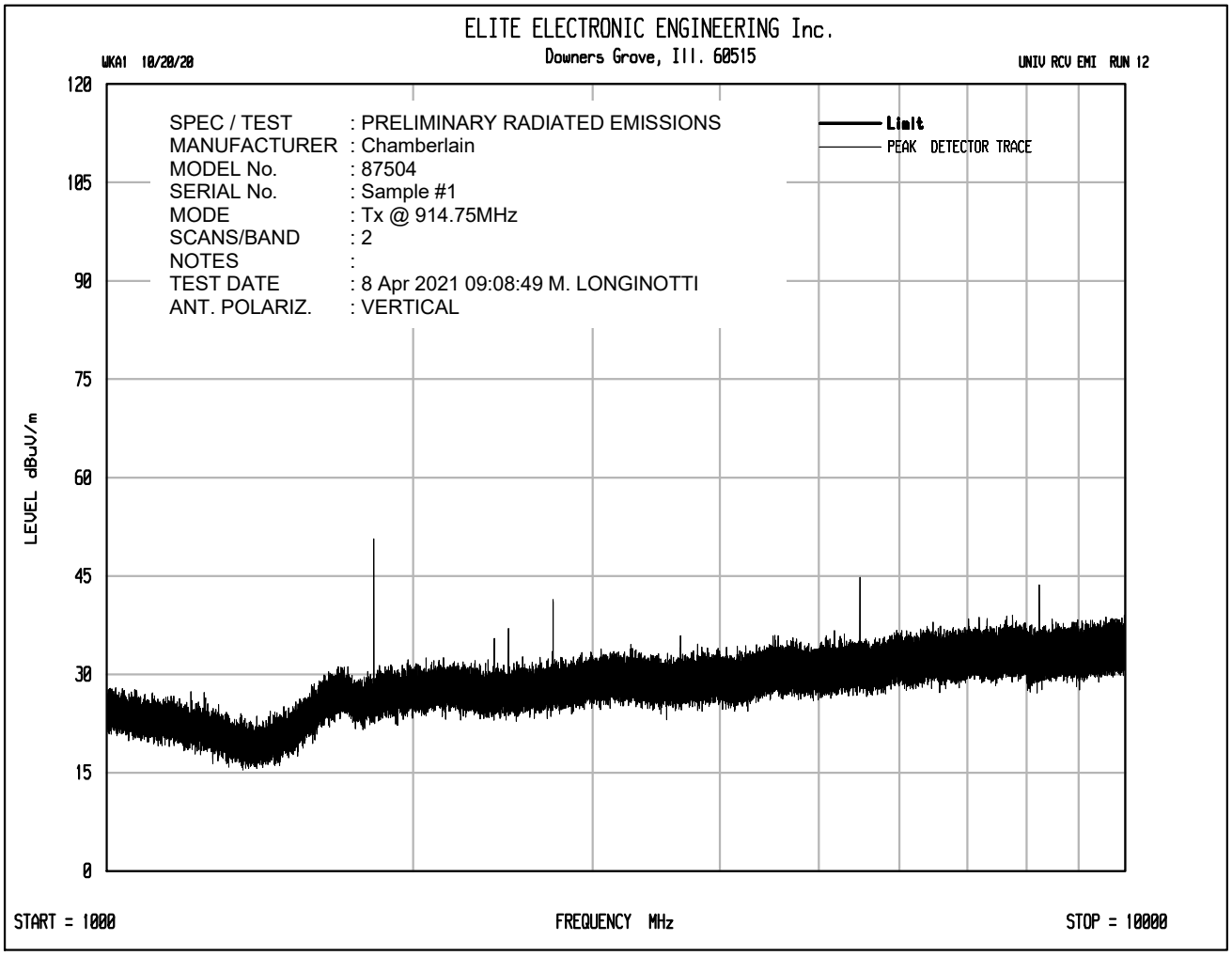
Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 902.25MHz
Parameters	Peak Measurements not in the Restricted Bands
Notes	None

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
902.25	H	81.8		2.0	26.5	0.0	110.3	327841.2		
902.25	V	72.8		2.0	26.5	0.0	101.3	116322.4		
1804.50	H	68.2		2.9	31.5	-40.9	61.7	1221.7	32784.1	-28.6
1804.50	V	62.3		2.9	31.5	-40.9	55.8	619.4	32784.1	-34.5
6315.75	H	48.9		5.6	38.1	-40.2	52.5	421.8	32784.1	-37.8
6315.75	V	46.9		5.6	38.1	-40.2	50.5	335.0	32784.1	-39.8
7218.00	H	45.8		6.1	38.4	-40.1	50.2	325.1	32784.1	-40.1
7218.00	V	42.9		6.1	38.4	-40.1	47.3	232.8	32784.1	-43.0


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 4
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Chamberlain
MODEL No. : 87504
SERIAL No. : Sample #1
MODE : Tx @ 914.75MHz
SCANS/BAND : 3
NOTES :
TEST DATE : 7 Apr 2021 10:57:35 M. LONGINOTTI
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 5
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Chamberlain
MODEL No. : 87504
SERIAL No. : Sample #1
MODE : Tx @ 914.75MHz
SCANS/BAND : 3
NOTES :
TEST DATE : 7 Apr 2021 11:04:50 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 11
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Chamberlain
MODEL No. : 87504
SERIAL No. : Sample #1
MODE : Tx @ 914.75MHz
SCANS/BAND : 2
NOTES :
TEST DATE : 8 Apr 2021 08:55:09 M. LONGINOTTI
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 12
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Chamberlain
MODEL No. : 87504
SERIAL No. : Sample #1
MODE : Tx @ 914.75MHz
SCANS/BAND : 2
NOTES :
TEST DATE : 8 Apr 2021 09:08:49 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 914.75MHz
Parameters	Peak Measurements in the Restricted Bands
Notes	None

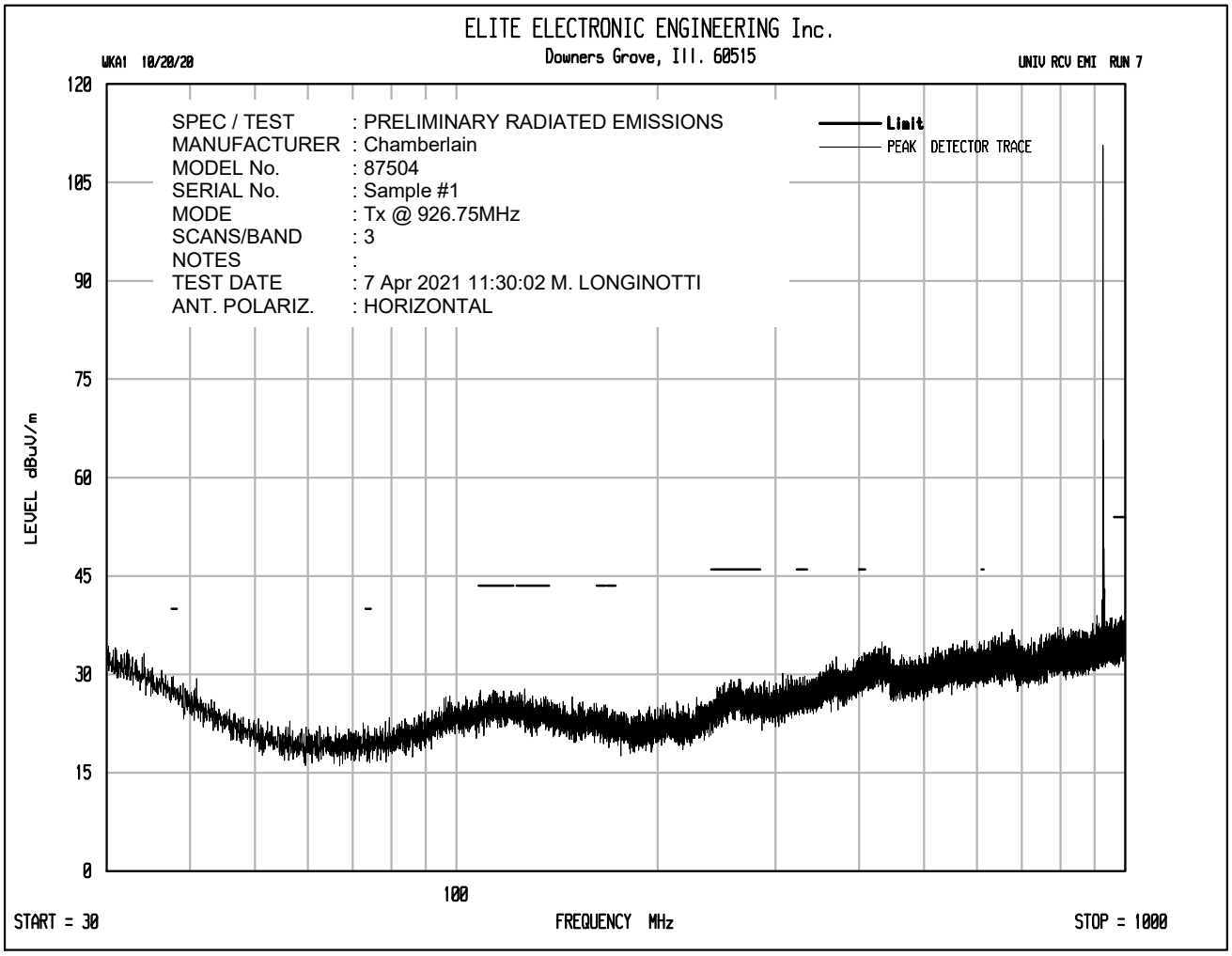
Frequency (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBµV/m at 3m	Peak Total µV/m at 3 m	Peak Limit µV/m at 3 m	Margin (dB)
2744.25	H	55.3		3.7	33.2	-40.4	51.8	389.4	5000.0	-22.2
2744.25	V	56.1		3.7	33.2	-40.4	52.6	427.0	5000.0	-21.4
3659.00	H	55.9		4.3	34.8	-40.3	54.7	544.7	5000.0	-19.3
3659.00	V	51.4	Ambient	4.3	34.8	-40.3	50.2	324.5	5000.0	-23.8
4573.75	H	50.5	Ambient	4.7	36.4	-40.1	51.5	375.8	5000.0	-22.5
4573.75	V	50.7	Ambient	4.7	36.4	-40.1	51.7	384.6	5000.0	-22.3
7318.00	H	52.6		6.2	38.2	-40.1	56.9	699.7	5000.0	-17.1
7318.00	V	50.7	Ambient	6.2	38.2	-40.1	55.0	562.2	5000.0	-19.0
8232.75	H	50.6	Ambient	6.5	38.4	-39.9	55.5	598.5	5000.0	-18.4
8232.75	V	51.6	Ambient	6.5	38.4	-39.9	56.5	671.5	5000.0	-17.4
9147.50	H	55.5		6.6	38.7	-39.7	61.1	1134.9	5000.0	-12.9
9147.50	V	53.6		6.6	38.7	-39.7	59.2	911.9	5000.0	-14.8

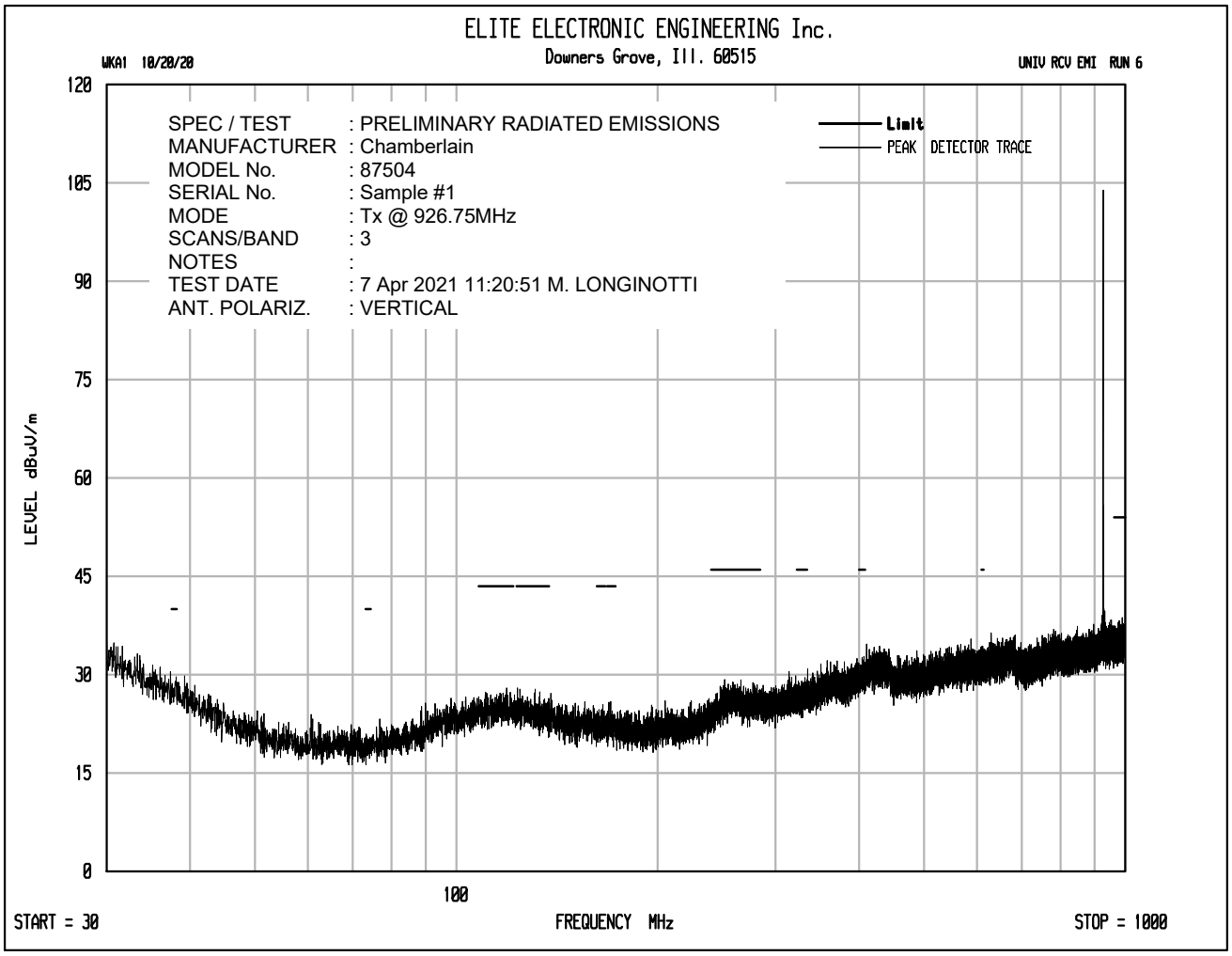
Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 914.75MHz
Parameters	Average Measurements in the Restricted Bands
Notes	None

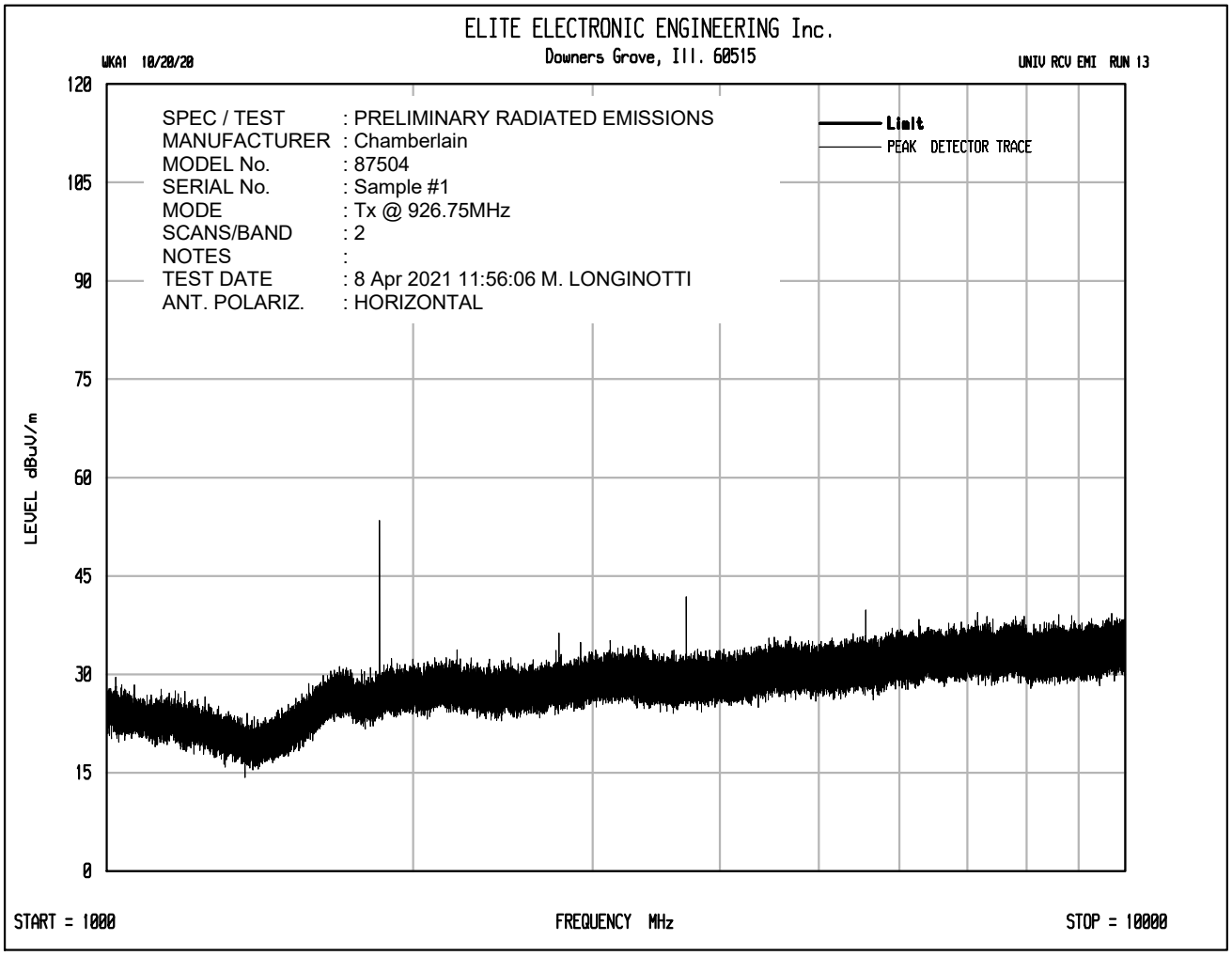
Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2744.25	H	37.20		3.7	33.2	-40.4	8.3	42.0	126.0	500.0	-12.0
2744.25	V	37.8		3.7	33.2	-40.4	8.3	42.6	135.0	500.0	-11.4
3659.00	H	35.2		4.3	34.8	-40.3	8.3	42.3	130.7	500.0	-11.7
3659.00	V	30.9	Ambient	4.3	34.8	-40.3	8.3	38.0	79.7	500.0	-16.0
4573.75	H	30.0	Ambient	4.7	36.4	-40.1	8.3	39.3	92.2	500.0	-14.7
4573.75	V	30.4	Ambient	4.7	36.4	-40.1	8.3	39.7	96.6	500.0	-14.3
7318.00	H	32.5	Ambient	6.2	38.2	-40.1	8.3	45.1	179.8	500.0	-8.9
7318.00	V	31.2	Ambient	6.2	38.2	-40.1	8.3	43.8	154.8	500.0	-10.2
8232.75	H	30.5	Ambient	6.5	38.4	-39.9	8.3	43.7	153.8	500.0	-10.2
8232.75	V	31.4	Ambient	6.5	38.4	-39.9	8.3	44.6	170.6	500.0	-9.3
9147.50	H	33.4	Ambient	6.6	38.7	-39.7	8.3	47.3	231.7	500.0	-6.7
9147.50	V	32.5	Ambient	6.6	38.7	-39.7	8.3	46.4	208.9	500.0	-7.6

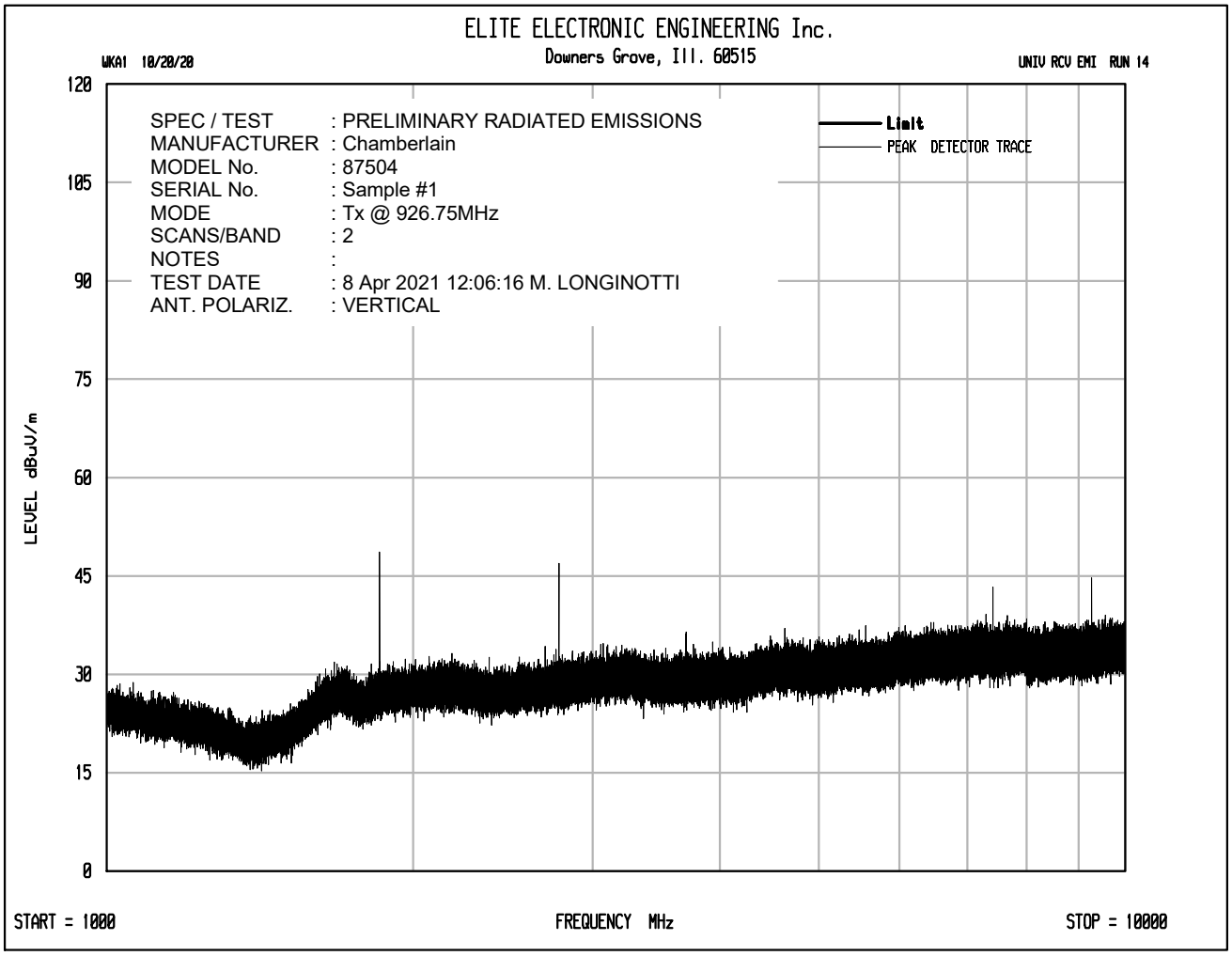
Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 914.75MHz
Parameters	Peak Measurements not in the Restricted Bands
Notes	None

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
914.75	H	83.0		2.1	26.3	0.0	111.4	370030.6		
914.75	V	74.7		2.1	26.3	0.0	103.1	142310.7		
1829.50	H	58.9		2.9	31.7	-40.8	52.7	430.6	37003.1	-38.7
1829.50	V	61.7		2.9	31.7	-40.8	55.5	594.5	37003.1	-35.9
5488.50	H	51.9		5.2	36.7	-40.2	53.6	477.2	37003.1	-37.8
5488.50	V	51.7		5.2	36.7	-40.2	53.4	466.4	37003.1	-38.0
6403.25	H	40.8	Ambient	5.7	38.0	-40.1	44.3	164.1	37003.1	-47.1
6403.25	V	42.2		5.7	38.0	-40.1	45.7	192.8	37003.1	-45.7


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 7
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Chamberlain
MODEL No. : 87504
SERIAL No. : Sample #1
MODE : Tx @ 926.75MHz
SCANS/BAND : 3
NOTES :
TEST DATE : 7 Apr 2021 11:30:02 M. LONGINOTTI
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 6
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Chamberlain
MODEL No. : 87504
SERIAL No. : Sample #1
MODE : Tx @ 926.75MHz
SCANS/BAND : 3
NOTES :
TEST DATE : 7 Apr 2021 11:20:51 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
100
START = 30
FREQUENCY MHz
STOP = 1000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 13
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Chamberlain
MODEL No. : 87504
SERIAL No. : Sample #1
MODE : Tx @ 926.75MHz
SCANS/BAND : 2
NOTES :
TEST DATE : 8 Apr 2021 11:56:06 M. LONGINOTTI
ANT. POLARIZ. : HORIZONTAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000


ELITE ELECTRONIC ENGINEERING Inc.
Downers Grove, Ill. 60515
WKA1 10/20/20
UNIV RCV EMI RUN 14
SPEC / TEST : PRELIMINARY RADIATED EMISSIONS
MANUFACTURER : Chamberlain
MODEL No. : 87504
SERIAL No. : Sample #1
MODE : Tx @ 926.75MHz
SCANS/BAND : 2
NOTES :
TEST DATE : 8 Apr 2021 12:06:16 M. LONGINOTTI
ANT. POLARIZ. : VERTICAL
Limit
PEAK DETECTOR TRACE
LEVEL dBuV/m
120
105
90
75
60
45
30
15
0
START = 1000
FREQUENCY MHz
STOP = 10000

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 926.75MHz
Parameters	Peak Measurements in the Restricted Bands
Notes	None

Frequency (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBµV/m at 3m	Peak Total µV/m at 3 m	Peak Limit µV/m at 3 m	Margin (dB)
2780.25	H	58.1		3.7	32.9	-40.4	54.4	524.0	5000.0	-19.6
2780.25	V	58.2		3.7	32.9	-40.4	54.5	530.1	5000.0	-19.5
3707.00	H	53.6		4.3	34.4	-40.2	52.1	402.6	5000.0	-21.9
3707.00	V	52.5		4.3	34.4	-40.2	51.0	354.7	5000.0	-23.0
4633.75	H	50.7	Ambient	4.8	36.7	-40.2	52.0	398.6	5000.0	-22.0
4633.75	V	50.7	Ambient	4.8	36.7	-40.2	52.0	398.6	5000.0	-22.0
7414.00	H	54.9		6.2	38.0	-40.0	59.1	898.4	5000.0	-14.9
7414.00	V	50.9	Ambient	6.2	38.0	-40.0	55.1	566.8	5000.0	-18.9
8340.75	H	50.0	Ambient	6.5	38.3	-39.9	54.9	558.0	5000.0	-19.0
8340.75	V	52.0		6.5	38.3	-39.9	56.9	702.5	5000.0	-17.0

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 926.75MHz
Parameters	Average Measurements in the Restricted Bands
Notes	None

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle (dB)	Average Total dBuV/m at 3m	Average Total uV/m at 3 m	Average Limit uV/m at 3 m	Margin (dB)
2780.25	H	39.30		3.7	32.9	-40.4	8.3	43.9	156.4	500.0	-10.1
2780.25	V	39.5		3.7	32.9	-40.4	8.3	44.1	160.1	500.0	-9.9
3707.00	H	34.8		4.3	34.4	-40.2	8.3	41.6	120.2	500.0	-12.4
3707.00	V	33.6	Ambient	4.3	34.4	-40.2	8.3	40.4	104.7	500.0	-13.6
4633.75	H	29.8	Ambient	4.8	36.7	-40.2	8.3	39.4	93.4	500.0	-14.6
4633.75	V	29.9	Ambient	4.8	36.7	-40.2	8.3	39.5	94.5	500.0	-14.5
7414.00	H	33.8		6.2	38.0	-40.0	8.3	46.3	205.8	500.0	-7.7
7414.00	V	30.7	Ambient	6.2	38.0	-40.0	8.3	43.2	144.0	500.0	-10.8
8340.75	H	29.2	Ambient	6.5	38.3	-39.9	8.3	42.4	132.3	500.0	-11.5
8340.75	V	32.1	Ambient	6.5	38.3	-39.9	8.3	45.3	184.8	500.0	-8.6

Test Details	
Manufacturer	Chamberlain Group, Inc.
Model	87504
S/N	Sample #1
Mode	Transmit at 926.75MHz
Parameters	Peak Measurements not in the Restricted Bands
Notes	None

Freq. MHz	Ant Pol	Meter Reading (dBuV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Peak Total dBuV/m at 3m	Peak Total uV/m at 3 m	Peak Limit uV/m at 3 m	Margin (dB)
926.75	H	82.4		2.1	26.7	0.0	111.1	359802.8		
926.75	V	75.9		2.1	26.7	0.0	104.6	170241.1		
1853.50	H	61.1		3.0	31.9	-40.8	55.1	572.0	35980.3	-36.0
1853.50	V	58.5		3.0	31.9	-40.8	52.5	424.1	35980.3	-38.6
5560.50	H	50.6		5.2	37.1	-40.2	52.7	433.0	35980.3	-38.4
5560.50	V	45.5		5.2	37.1	-40.2	47.6	240.7	35980.3	-43.5
6487.25	H	43.0		5.7	38.1	-40.1	46.7	216.8	35980.3	-44.4
6487.25	V	41.2		5.7	38.1	-40.1	44.9	176.2	35980.3	-46.2
9267.50	H	48.2		6.6	38.8	-39.7	54.0	502.2	35980.3	-37.1
9267.50	V	48.4		6.6	38.8	-39.7	54.2	513.9	35980.3	-36.9

27. Scope of Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

ELITE ELECTRONIC ENGINEERING, INC.
1516 Centre Circle
Downers Grove, IL 60515
Robert Bugielski (QA Manager) Phone: 630 495 9770 ext. 168
Email: rbugielski@elitetest.com
Craig Fanning (EMC Lab Manager) Phone: 630 495 9770 ext. 112
Email: cfanning@elitetest.com
Brandon Lugo (Automotive Team Leader) Phone: 630 495 9770 ext. 163
Email: blugo@elitetest.com
Richard King (FCC/Commercial Team Leader) Phone: 630 495 9770 ext. 123
Email: reking@elitetest.com
Website: www.elitetest.com

ELECTRICAL

Valid to: June 30, 2021 Certificate Number: 1786.01

In recognition of the successful completion of the A2LA Accreditation Program evaluation process, accreditation is granted to this laboratory to perform the following automotive electromagnetic compatibility and other electrical tests:

Test Technology:	Test Method(s) [1]:
Transient Immunity	ISO 7637-2 (including emissions); ISO 7637-3; ISO 16750-2:2012, Sections 4.6.3 and 4.6.4; CS-11979, Section 6.4; CS.00054, Section 5.9; EMC-CS-2009.1 (CI220); FMC1278 (CI220, CI221, CI222); GMW 3097, Section 3.5; SAE J1113-11; SAE J1113-12; ECE Regulation 10.06 Annex 10
Electrostatic Discharge (ESD)	ISO 10605 (2001, 2008); CS-11979 Section 7.0; CS.00054, Section 5.10; EMC-CS-2009.1 (CI 280); FMC1278 (CI280); SAE J1113-13; GMW 3097 Section 3.6
Conducted Emissions	CISPR 25 (2002, 2008), Sections 6.2 and 6.3; CISPR 25 (2016), Sections 6.3 and 6.4; CS-11979, Section 5.1; CS.00054, Sections 5.6.1 and 5.6.2; GMW 3097, Section 3.3.2; EMC-CS-2009.1 (CE 420); FMC1278 (CE420, CE421)

Test Technology:	Test Method(s) [1]:
Radiated Emissions Anechoic	CISPR 25 (2002, 2008), Section 6.4; CISPR 25 (2016), Section 6.5; CS-11979, Section 5.3; CS.00054, Section 5.6.3; GMW 3097, Section 3.3.1; EMC-CS-2009.1 (RE 310); FMC1278 (RE310); ECE Regulation 10.06 Annex 7 (Broadband) ECE Regulation 10.06 Annex 8 (Narrowband)
Vehicle Radiated Emissions	CISPR 12; ICES-002; ECE Regulation 10.06 Annex 5
Bulk Current Injection (BCI)	ISO 11452-4; CS-11979, Section 6.1; CS.00054, Section 5.8.1; GMW 3097, Section 3.4.1; SAE J1113-4; EMC-CS-2009.1 (RI112); FMC1278 (RI112); ECE Regulation 10.06 Annex 9
Bulk Current Injections (BCI) *(Closed Loop Method)*	ISO 11452-4; SAE J1113-4
Radiated Immunity Anechoic *(Including Radar Pulse)*	ISO 11452-2; ISO 11452-5; CS-11979, Section 6.2; CS.00054, Section 5.8.2; GMW 3097, Section 3.4.2; EMC-CS-2009.1 (RI114); FMC1278 (RI114); SAE J1113-21; ECE Regulation 10.06 Annex 9
Radiated Immunity Magnetic Field	ISO 11452-8
Radiated Immunity Reverb	ISO/IEC 61000-4-21; GMW 3097, Section 3.4.3; EMC-CS-2009.1 (RI114); FMC1278 (RI114); ISO 11452-11
Radiated Immunity *(Portable Transmitters)*	ISO 11452-9; EMC-CS-2009.1 (RI115); FMC1278 (RI115)
Vehicle Radiated Immunity (ALSE)	ISO 11451-2; ECE Regulation 10.06 Annex 6
Electrical Loads	ISO 16750-2, Sections 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.11, and 4.12
Dielectric Withstand Voltage	MIL-STD-202, Method 301; EIA-364-20D
Insulation Resistance	MIL-STD-202, Method 302; SAE/USCAR-2, Revision 6, Section 5.5.1; EIA-364-21D
Contact Resistance	MIL-STD-202, Method 307; SAE/USCAR-2, Revision 6, Section 5.3.1; EIA-364-23C; USCAR21-3 Section 4.5.3

Test Technology:	Test Method(s) [1]:
DC Resistance	MIL-STD-202, Method 303
Contact Chatter	MIL-STD-202, Method 310; SAE/USCAR-2, Revision 6, Section 5.1.9
Voltage Drop	SAE/USCAR-2, Revision 6, Section 5.3.2; USCAR21-3 Section 4.5.6
Emissions	
Radiated and Conducted (3m Semi-anechoic chamber, up to 40 GHz)	47 CFR, FCC Part 15 B (using ANSI C63.4:2014); 47 CFR, FCC Part 18 (using FCC MP-5:1986); ICES-001; ICES-003; ICES-005; IEC/CISPR 11, Ed. 4.1 (2004-06); AS/NZS CISPR 11 (2004); IEC/CISPR 11 Ed 5 (2009-05) + A1 (2010); KN 11 (2008-5) with RRL Notice No. 2008-3 (May 20, 2008); CISPR 11; EN 55011; KN 11; CNS 13803 (1997, 2003); CISPR 14-1; EN 55014-1; AS/NZS CISPR 14.1; KN 14-1; IEC/CISPR 22 (1997); EN 55022 (1998) + A1(2000); EN 55022 (1998) + A1(2000) + A2(2003); EN 55022 (2006); IEC/CISPR 22 (2008-09); AS/NZS CISPR 22 (2004); AS/NZS CISPR 22, 3rd Edition (2006); KN 22 (up to 6 GHz); CNS 13438 (up to 6 GHz); VCCI V-3 (up to 6 GHz); CISPR 32; EN 55032; KN 32; ECE Regulation 10.06 Annex 14
Current Harmonics	IEC 61000-3-2; EN 61000-3-2; KN 61000-3-2; ECE Regulation 10.06 Annex 11
Flicker and Fluctuations	IEC 61000-3-3; EN 61000-3-3; KN 61000-3-3; ECE Regulation 10.06 Annex 12
Immunity	
Electrostatic Discharge	IEC 61000-4-2, Ed. 1.2 (2001); IEC 61000-4-2 (1995) + A1(1998) + A2(2000); EN 61000-4-2 (1995); EN 61000-4-2 (2009-05); KN 61000-4-2 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-2; EN 61000-4-2; KN 61000-4-2; IEEE C37.90.3 2001
Radiated Immunity	IEC 61000-4-3 (1995) + A1(1998) + A2(2000); IEC 61000-4-3, Ed. 3.0 (2006-02); IEC 61000-4-3, Ed. 3.2 (2010); KN 61000-4-3 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-3; EN 61000-4-3; KN 61000-4-3; IEEE C37.90.2 2004
Electrical Fast Transient/Burst	IEC 61000-4-4, Ed. 2.0 (2004-07); IEC 61000-4-4, Ed. 2.1 (2011); IEC 61000-4-4 (1995) + A1(2000) + A2(2001); KN 61000-4-4 (2008-5); RRL Notice No. 2008-5 (May 20, 2008); IEC 61000-4-4; EN 61000-4-4; KN 61000-4-4; ECE Regulation 10.06 Annex 15

Test Technology:	Test Method(s) [1]:
Immunity (cont'd)	
Surge	IEC 61000-4-5 (1995) + A1(2000); IEC 61000-4-5, Ed 1.1 (2005-11); EN 61000-4-5 (1995) + A1(2001); KN 61000-4-5 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-5; EN 61000-4-5; KN 61000-4-5; IEEE C37.90.1 2012; IEEE STD C62.41.2 2002; ECE Regulation 10.06 Annex 16
Conducted Immunity	IEC 61000-4-6 (1996) + A1(2000); IEC 61000-4-6, Ed 2.0 (2006-05); IEC 61000-4-6 Ed. 3.0 (2008); KN 61000-4-6 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); EN 61000-4-6 (1996) + A1(2001); IEC 61000-4-6; EN 61000-4-6; KN 61000-4-6
Power Frequency Magnetic Field Immunity	IEC 61000-4-8 (1993) + A1(2000); IEC 61000-4-8 (2009); EN 61000-4-8 (1994) + A1(2000); KN 61000-4-8 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-8; EN 61000-4-8; KN 61000-4-8
Voltage Dips, Short Interrupts, and Line Voltage Variations	IEC 61000-4-11, Ed. 2 (2004-03); KN 61000-4-11 (2008-5); RRL Notice No. 2008-4 (May 20, 2008); IEC 61000-4-11; EN 61000-4-11; KN 61000-4-11
Ring Wave	IEC 61000-4-12, Ed. 2 (2006-09); EN 61000-4-12:2006; IEC 61000-4-12; EN 61000-4-12; KN 61000-4-12; IEEE STD C62.41.2 2002
Generic and Product Specific EMC Standards	IEC/EN 61000-6-1; AS/NZS 61000-6-1; KN 61000-6-1; IEC/EN 61000-6-2; AS/NZS 61000-6-2; KN 61000-6-2; IEC/EN 61000-6-3; AS/NZS 61000-6-3; KN 61000-6-3; IEC/EN 61000-6-4; AS/NZS 61000-6-4; KN 61000-6-4; EN 50130-4; EN 61326-1; IEC/CISPR 14-2; EN 55014-2; AS/NZS CISPR 14.2; KN 14-2; IEC/CISPR 24; AS/NZS CISPR 24; EN 55024; KN 24; IEC 60601-1-2; JIS T0601-1-2
TxRx EMC Requirements	EN 301 489-1; EN 301 489-3; EN 301 489-9; EN 301 489-17; EN 301 489-19
European Radio Test Standards	ETSI EN 300 086-1; ETSI EN 300 086-2; ETSI EN 300 113-1; ETSI EN 300 113-2; ETSI EN 300 220-1; ETSI EN 300 220-2; ETSI EN 300 330-1; ETSI EN 300 330-2; ETSI EN 300 440-1; ETSI EN 300 440-2; ETSI EN 300 422-1; ETSI EN 300 422-2;

Test Technology:	Test Method(s) [1]:
European Radio Test Standards (cont'd)	ETSI EN 300 328; ETSI EN 301 893; ETSI EN 301 511; ETSI EN 301 908-1; ETSI EN 908-2; ETSI EN 908-13; ETSI EN 303 413; ETSI EN 302 502
Canadian Radio Tests	RSS-102 (RF Exposure Evaluation only); RSS-111; RSS-112; RSS-117; RSS-119; RSS-123; RSS-125; RSS-127; RSS-130; RSS-131; RSS-132; RSS-133; RSS-134; RSS-135; RSS-137; RSS-139; RSS-140; RSS-141; RSS-142; RSS-170; RSS-181; RSS-182; RSS-191; RSS-192; RSS-194; RSS-195; RSS-196; RSS-197; RSS-199; RSS-210; RSS-211; RSS-213; RSS-215; RSS-216; RSS-220; RSS-222; RSS-236; RSS-238; RSS-243; RSS-244; RSS-247; RSS-251; RSS-252; RSS-287; RSS-288; RSS-310; RSS-GEN
Mexico Radio Tests	IFT-008-2015; NOM-208-SCFI-2016
Japan Radio Tests	Radio Law No. 131, Ordinance of MPT No. 37, 1981, MIC Notification No. 88:2004, Table No. 22-11; ARIB STD-T66, Regulation 18
Taiwan Radio Tests	LP-0002
Australia/New Zealand Radio Tests	AS/NZS 4268; Radiocommunications (Short Range Devices) Standard (2014)
Hong Kong Radio Tests	HKCA 1039 Issue 6; HKCA 1042; HKCA 1033 Issue 7; HKCA 1061; HKCA 1008; HKCA 1043; HKCA 1057; HKCA 1073
Korean Radio Test Standards	KN 301 489-1; KN 301 489-3; KN 301 489-9; KN 301 489-17; KN 301 489-52
Unlicensed Radio Frequency Devices *(3 Meter Semi-Anechoic Room)*	47 CFR FCC Part 15C, 15D, 15E, 15F, 15G, 15H (using ANSI C63.10:2013, ANSI C63.17:2013 and FCC KDB 905462 D02 (v02))
Licensed Radio Service Equipment	47 CFR FCC Parts 20, 22, 24, 25, 27, 30, 73, 74, 80, 87, 90, 95, 96, 97, 101; ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015;
OTA (Over the Air) Performance GSM, GPRS, EGPRS UMTS (W-CDMA) LTE including CAT M1 A-GPS for UMTS/GSM LTS A-GPS, A-GLONASS, SIB8/SIB16 Large Device/Laptop/Tablet Testing Integrated Device Testing WiFi 802.11 a/b/g/n/a	CTIA Test Plan for Wireless Device Over-the-Air Performance (Method for Measurement for Radiated Power and Receiver Performance) V3.8.2; CTIA Test Plan for RF Performance Evaluation of WiFi Mobile Converged Devices V2.1.0

Test Technology:	Test Method(s) [1]:
Electrical Measurements and Simulation	
AC Voltage / Current	FAA AC 150/5345-10H
(1mV to 5kV) 60 Hz	FAA AC 150/5345-43J
(0.1V to 250V) up to 500 MHz	FAA AC 150/5345-44K
(1µA to 150A) 60 Hz	FAA AC 150/5345-46E
DC Voltage / Current	FAA AC 150/5345-47C
(1mV to 15kV) / (1µA to 10A)	FAA EB 67D
Power Factor / Efficiency / Crest Factor	
(Power to 30kW)	
Resistance	
(1mΩ to 4000MΩ)	
Surge	
(Up to 10 kV / 5 kA) (Combination Wave and Ring Wave)	

On the following products and materials:
Telecommunications Terminal Equipment (TTE), Radio Equipment, Network Equipment, Information Technology Equipment (ITE), Automotive Electronic Equipment, Automotive Hybrid Electronic Devices, Maritime Navigation and Radio Communication Equipment and Systems, Vehicles, Boats and Internal Combustion Engine Driven Devices, Automotive, Aviation, and General Lighting Products, Medical Electrical Equipment, Motors, Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment, Household Appliances, Electric Tools, Low-voltage Switchgear and Control gear, Programmable Controllers, Electrical Equipment for Measurement, Control and Laboratory Use, Base Materials, Power and Data Transmission Cables and Connectors

[1] When the date, revision or edition of a test method standard is not identified on the scope of accreditation, the laboratory is expected to be using the current version within one year of the date of publication, per part C., Section 1 of A2LA *R101 - General Requirements - Accreditation of ISO-IEC 17025 Laboratories*.

Testing Activities Performed in Support of FCC Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1[2]

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
Unintentional Radiators Part 15B	ANSI C63.4:2014	40000
Industrial, Scientific, and Medical Equipment Part 18	FCC MP-5 (February 1986)	40000
Intentional Radiators Part 15C	ANSI C63.10:2013	40000
Unlicensed Personal Communication Systems Devices Part 15D	ANSI C63.17:2013	40000

Testing Activities Performed in Support of FCC Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1[2]

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
U-NII without DFS Intentional Radiators Part 15E	ANSI C63.10:2013	40000
U-NII with DFS Intentional Radiators Part 15E	FCC KDB 905462 D02 (v02)	40000
UWB Intentional Radiators Part 15F	ANSI C63.10:2013	40000
BPL Intentional Radiators Part 15G	ANSI C63.10:2013	40000
White Space Device Intentional Radiators Part 15H	ANSI C63.10:2013	40000
Commercial Mobile Services (FCC Licensed Radio Service Equipment) Parts 22 (cellular), 24, 25 (below 3 GHz), and 27	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
General Mobile Radio Services (FCC Licensed Radio Service Equipment) Parts 22 (non-cellular), 90 (below 3 GHz), 95, 97, and 101 (below 3 GHz)	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
Citizens Broadband Radio Services (FCC Licensed Radio Service Equipment) Part 96	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
Maritime and Aviation Radio Services Parts 80 and 87	ANSI/TIA-603-E; ANSI C63.26:2015	40000
Microwave and Millimeter Bands Radio Services Parts 25, 30, 74, 90 (above 3 GHz), 97 (above 3 GHz), and 101	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
Broadcast Radio Services Parts 73 and 74 (below 3 GHz)	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000

Testing Activities Performed in Support of FCC Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.1[2]

Rule Subpart/Technology	Test Method	Maximum Frequency (MHz)
Signal Boosters Part 20 (Wideband Consumer Signal Boosters, Provider-specific signal boosters, and Industrial Signal Boosters) Section 90.219	ANSI C63.26:2015	40000

[2]Accreditation does not imply acceptance to the FCC equipment authorization program. Please see the FCC website (https://apps.fcc.gov/oetcf/eas/) for a listing of FCC approved laboratories.

Accredited Laboratory

A2LA has accredited

ELITE ELECTRONIC ENGINEERING INC.

Downers Grove, IL

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories.* This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 8th day of August 2019.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1786.01
Valid to June 30, 2021

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