Engineering Test Report No. 2401702-01		
Report Date	November 22, 2024	
Manufacturer Name	The Chamberlain Group LLC	
Manufacturer Address	300 Windsor Dr Oak Brook, IL 60523	
Test Item Name Model No.	Keypad Q348LA	
Date Received	November 11, 2024	
Test Dates	November 11 – 20, 2024	
Specifications	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		
Tested by	Javier Cardenas	Tylar Jozefczyk
Signature		
Approved by	Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894	
PO Number	4900097910	

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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 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.

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1. Report Revision History

Revision	Date	Description
–	27 NOV 2024	Initial Release of Engineering Test Report No. 2401702-01

2. Introduction

2.1. Scope of Tests

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

2.2. Purpose

The test series was performed to determine if the EUT meets the RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, §15.247 for a Digital Modulation intentional radiator operating within the 2400 – 2483.5MHz band.

The test series was also performed to determine if the EUT meets 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 Digital Modulation intentional radiator operating within the 2400 – 2483.5MHz 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	
EUT #1	
Product Description	Keypad
Model/Part No.	Q348LA / 900-15619-3/014D15619 rev C
Serial No.	Sample 5
Size of EUT	12.5cm Length x 7.2cm Width x 3cm Depth
Software/Firmware Version	0001006515 (DTM_BG22_KEYPAD) rev A.1
Device Type	Digitally Modulated Transmission Device
Band of Operation	2400 – 2483.5MHz
Modulation Type	GSFK
Antenna Type	Trace
Maximum Conducted Output Power	6.9dBm (4.9mW)
Maximum EIRP	8.6dBm (7.2mW)
6dB Bandwidth	753.8kHz
Occupied Bandwidth (99% CBW)	1.05MHz
Emission Classification	1M05F1D
FCC ID ISED Certification Number	FCC ID: HBW15619X3 IC: 2666A-15619X3
EUT #2	
Product Description	Keypad
Model/Part No.	Q348LA / 900-15619-3/014D15619 rev C
Serial No.	Sample 3
Software/Firmware Version	0001006515 (DTM_BG22_KEYPAD) rev A.1
EUT #3	
Product Description	Keypad
Model/Part No.	Q348LA / 900-15619-3/014D15619 rev C
Serial No.	Sample E4
Software/Firmware Version	126A0629 9FW,DELOREAN,KEYPAD,MAX,LATAM,BG22) rev A.1

The EUTs listed above were used throughout the test series.

3. Power Input

The EUT was powered by 9V from a battery.

4. Grounding

The EUT was not connected to ground.

5. Support Equipment

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

Description	Model #	S/N
Laptop	---	---

6. Interconnect Leads

The following interconnect cables were submitted with the test item:

Item	Description
UART Bridge	Connects laptop to EUT

7. Modifications Made to the EUT

No modifications were made to the EUT during the testing.

8. Modes of Operation

The EUT and all peripheral equipment were energized. The unit was programmed to transmit in one of the following modes:

Mode	Description
Tx	- 2402MHz, Power Setting = +8dBm - 2440MHz, Power Setting = +8dBm - 2480MHz, Power Setting = +8dBm

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 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 The 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, and ANSI C63.4-2014 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	23°C
Relative Humidity	38%
Atmospheric Pressure	1013.3mb.

13. Summary

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

Test Description	Requirements	Test Method	S/N	Results
6dB Bandwidth	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Sample 3	Conforms
Occupied Bandwidth (99%)	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Sample 3	Conforms
Maximum Peak Conducted Output Power	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Sample 3	Conforms
Effective Isotropic Radiated Power (EIRP)	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Sample 5	Conforms
Duty Cycle Factor Measurements	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Sample E4	—
Antenna Conducted Spurious Emissions	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Sample 3	Conforms
Case Spurious Radiated Emissions	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Sample 5	Conforms
Band-Edge Compliance	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Sample 5	Conforms
Power Spectral Density	FCC 15.247 ISED RSS-247	ANSI C63.10:2013	Sample 3	Conforms

14. Sample Calculations

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]

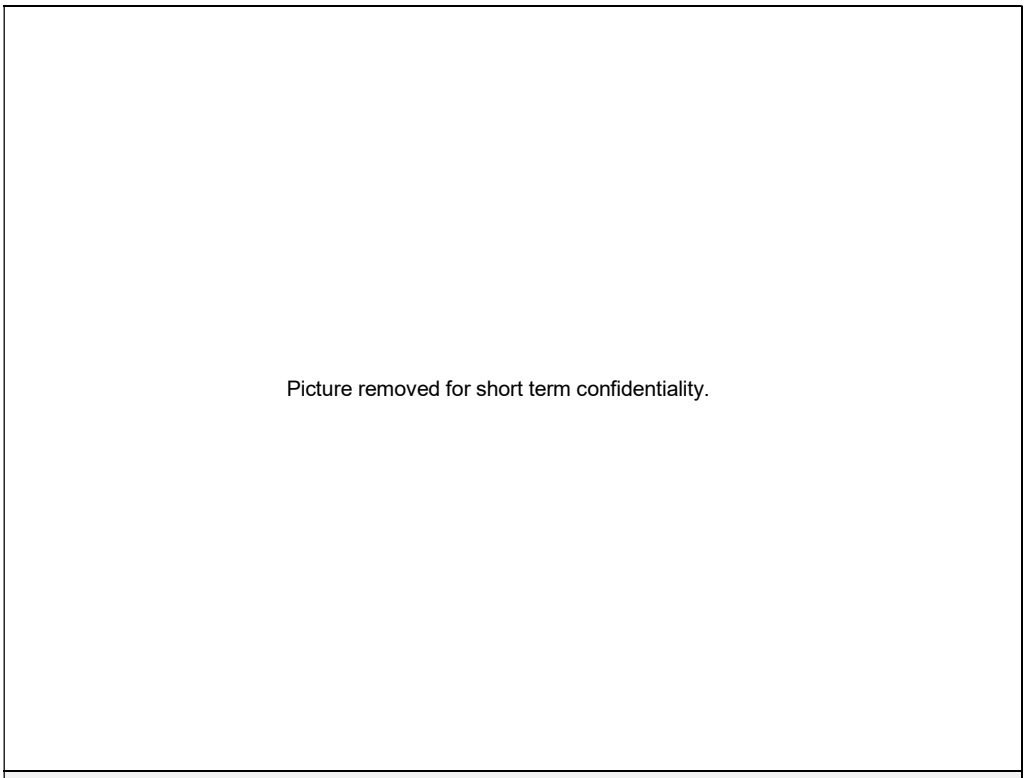
15. Statement of Conformity

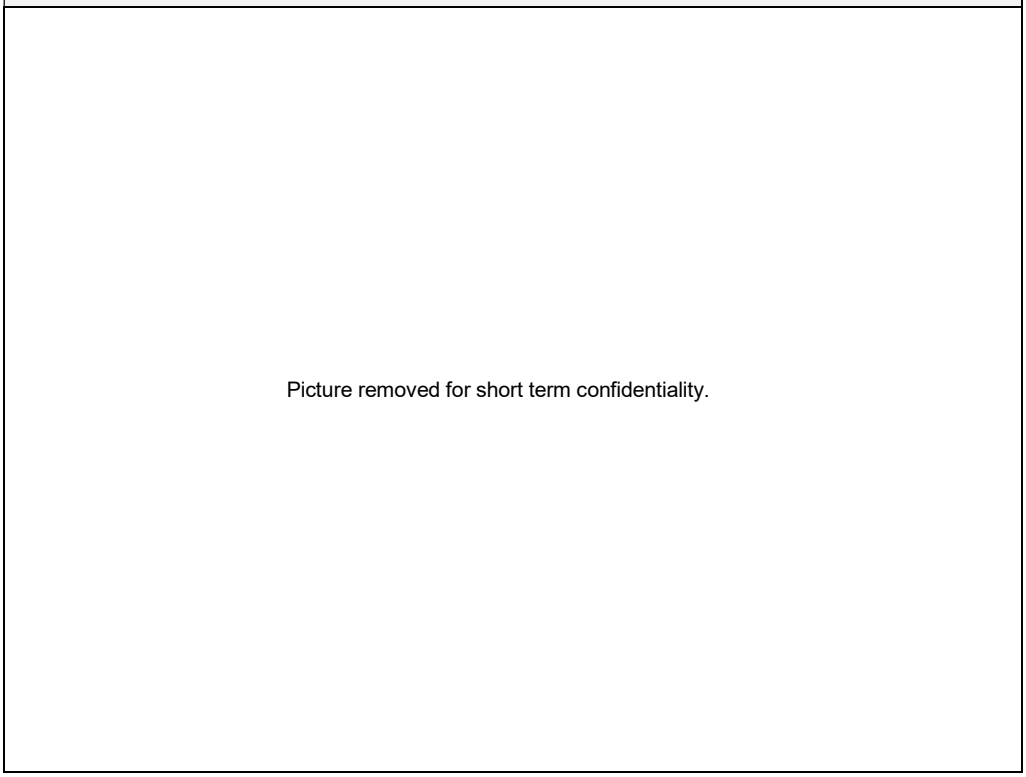
The The Chamberlain Group LLC Keypad, Model No. Q348LA, did fully conform to the selected requirements of FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 and Innovation, Science, and Economic Development Canada, RSS-247.

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 EUT as received by the customer on the test date specified. Any electrical or mechanical modifications made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification.

17. Photographs of EUT



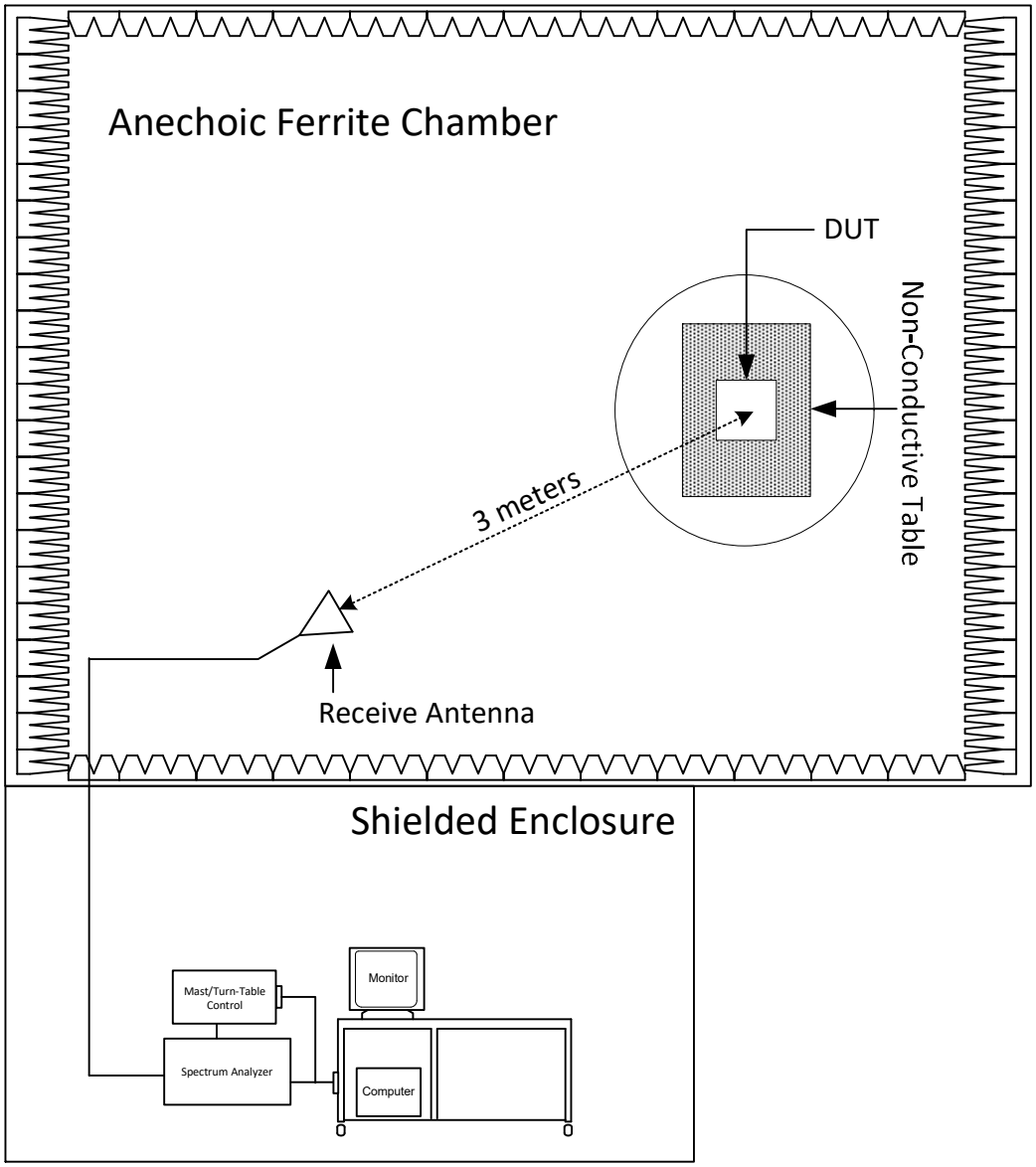


18. Equipment List

Eq ID	Equipment Description	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Date	Due Date
APW10	PREAMPLIFIER	PLANAR ELECTRONICS	PE2-35-120-5R0-10-12-SFF	PL11685/1241	1GHZ-20GHZ	3/20/2024	3/20/2025
APW18	PREAMPLIFER	PLANAR ELECTRONICS	PE2-30-20G20R6G-3R0-10-12-SFF	PL34312/2148	18-26.5GHZ	2/23/2024	2/23/2025
CDZ3	LAB WORKSTATION	ELITE	LWS-10		WINDOWS 10	CNR	
GSE3	SIGNAL GENERATOR (40GHZ)	ROHDE & SCHWARZ	SMB100A	183294	100KHZ-40GHZ	1/30/2023	1/30/2025
GSF0	VECTOR SIGNAL GENERATOR	ROHDE & SCHWARZ	SMBV100A	260452	9KHZ - 6GHZ	9/15/2024	9/15/2026
GSFB	OSP120 BASE UNIT	ROHDE & SCHWARZ	OSP120	101071	---	3/30/2023	3/30/2025
GSFE	OSP120	ROHDE & SCHWARZ	OSP120	101288	.01-40GHZ	4/4/2023	4/4/2025
NHG1	STANDARD GAIN HORN ANTENNA	NARDA	638	---	18-26.5GHZ	NOTE 1	
NTA2	BILOG ANTENNA	TESEQ	6112D	28040	25-2000MHz	6/21/2024	6/21/2026
NWQ0	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS LINDGREN	3117	66657	1GHZ-18GHZ	6/24/2024	6/24/2026
NWQ1	DOUBLE RIDGED WAVEGUIDE ANTENNA	ETS-LINDGREN	3117	66655	1GHZ-18GHZ	7/26/2024	7/26/2026
RBG2	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	101591	2HZ-44GHZ	6/16/2024	6/16/2025
RBG4	EMI ANALYZER	ROHDE & SCHWARZ	ESW44	103007	2HZ-44GHZ	3/16/2024	3/16/2025
SES0	24VDC POWER SUPPLY	P-TRANS	FS-32024-1M	001	18-27VDC	NOTE 1	
T1EG	10DB 25W ATTENUATOR	WEINSCHEL	46-10-34	CD3551	DC-18GHZ	6/27/2024	6/27/2026
WKA1	SOFTWARE, UNIVERSAL RCV EMI	ELITE	UNIV_RCV_EMI	1	---	I/O	
XPQ4	HIGH PASS FILTER	K&L MICROWAVE	11SH10-4800/X20000-O/O	1	4.8-20GHZ	9/14/2023	9/14/2025

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. 6dB Bandwidth

EUT Information	
Manufacturer	The Chamberlain Group LLC
Product	Keypad
Model No.	Q348LA
Serial No.	Sample 3
Mode	Tx

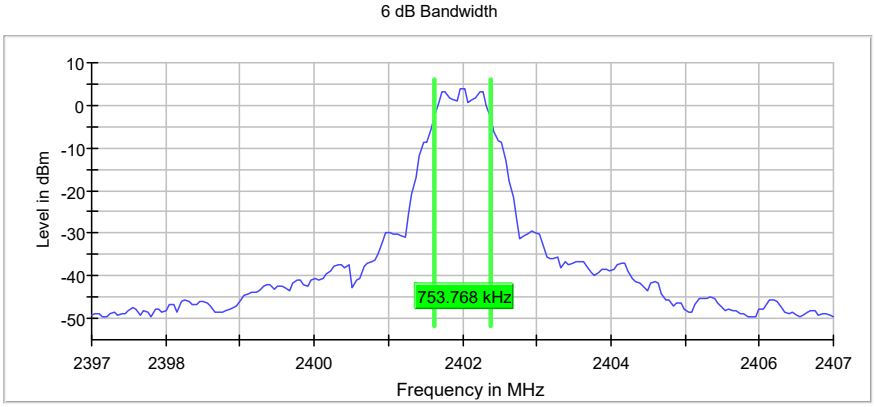
Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Antenna Conducted
Type of Test Site	Tabletop
Test Site Used	Elite Workbench
Type of Antennas Used	N/A
Notes	None

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

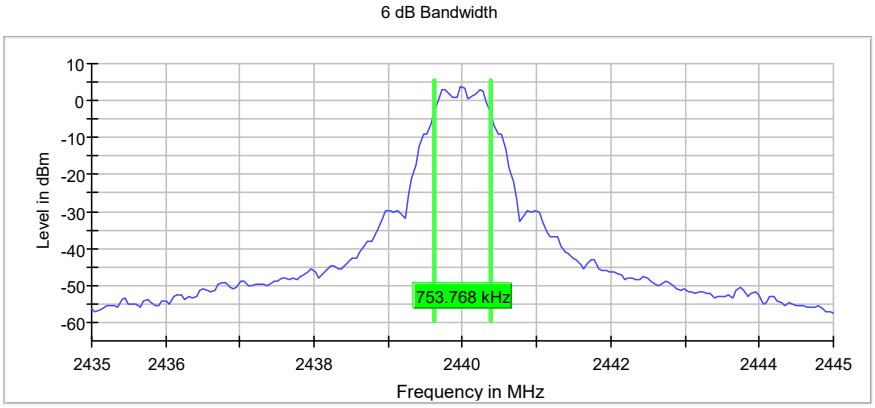
Requirements
Systems using digital modulation techniques shall have a minimum 6dB bandwidth of 500kHz

Procedure
The antenna port of the EUT was connected to the spectrum analyzer through an R&S OSP120 RF control and switch. 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 100kHz, the video bandwidth (VBW) was set to the same as or 3 times greater than the RBW, and the span was set to 3 times the RBW. 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.

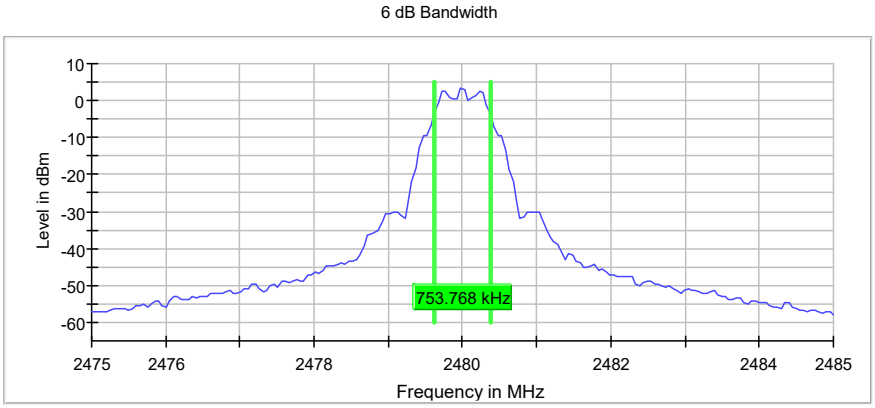
Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 3
Mode	Tx
Frequency Tested	2402MHz
Result	6dB BW = 753.8kHz
Test Date(s)	November 11, 2024
Notes	None



Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 3
Mode	Tx
Frequency Tested	2440MHz
Result	6dB BW = 753.8kHz
Test Date(s)	November 11, 2024
Notes	None



Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 3
Mode	Tx
Frequency Tested	2480MHz
Result	6dB BW = 753.8kHz
Test Date(s)	November 11, 2024
Notes	None



21. Occupied Bandwidth (99%)

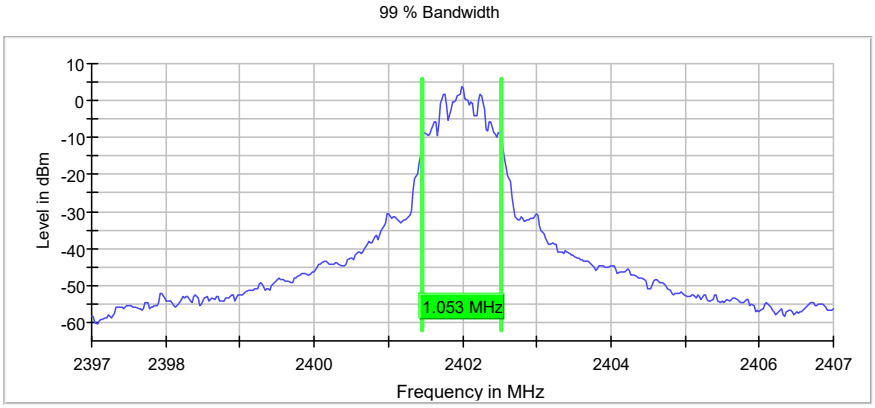
EUT Information	
Manufacturer	The Chamberlain Group LLC
Product	Keypad
Model No.	Q348LA
Serial No.	Sample 3
Mode	Tx

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Antenna Conducted
Type of Test Site	Tabletop
Test Site Used	Elite Workbench
Type of Antennas Used	N/A
Notes	None

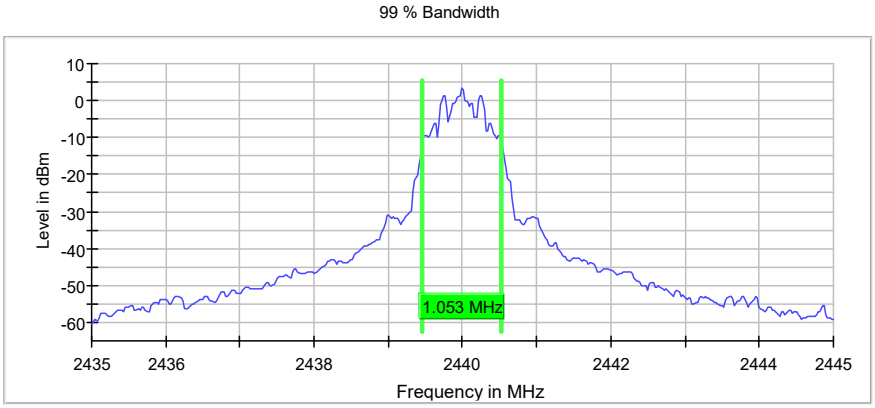
Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz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

Procedure
The antenna port of the EUT was connected to the spectrum analyzer through an R&S OSP120 RF control and switch. The EUT was allowed to transmit continuously. 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.

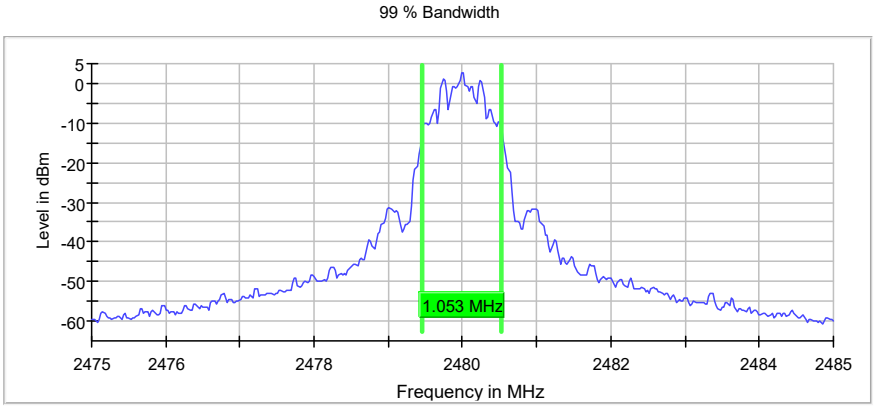
Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 3
Mode	Tx
Frequency Tested	2402MHz
Result	OBW = 1.053MHz
Test Date(s)	November 11, 2024
Notes	None



Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 3
Mode	Tx
Frequency Tested	2440MHz
Result	OBW = 1.053MHz
Test Date(s)	November 11, 2024
Notes	None



Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 3
Mode	Tx
Frequency Tested	2480MHz
Result	OBW = 1.053MHz
Test Date(s)	November 11, 2024
Notes	None



22. Maximum Peak Conducted Output Power

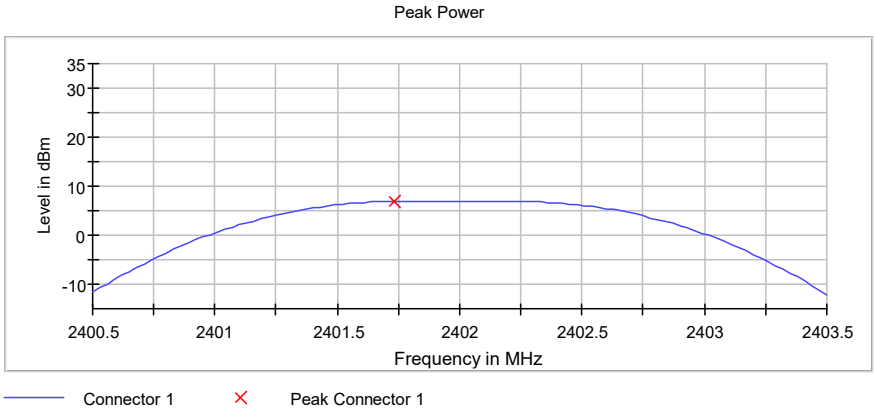
EUT Information	
Manufacturer	The Chamberlain Group LLC
Product	Keypad
Model No.	Q348LA
Serial No.	Sample 3
Mode	Tx

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Antenna Conducted
Test Site Used	Elite Workbench
Type of Antennas Used	N/A
Notes	None

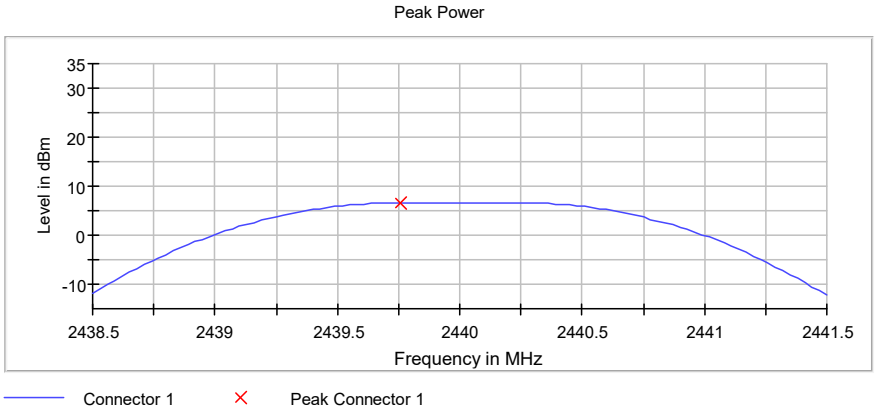
Requirements
The output power shall not exceed 1W (30dBm).

Procedure
The antenna port of the EUT was connected to the spectrum analyzer through an R&S OSP120 RF control and switch. The EUT was allowed to transmit continuously. The EUT was set to transmit separately at the low, middle, and high channels. The resolution bandwidth (RBW) was set to greater than the 6dB bandwidth. The span was set to greater than 3 times the RBW. The 'Max-Hold' function was engaged. The maximum meter reading was recorded. The peak power output was calculated for the low, middle, and high channels.

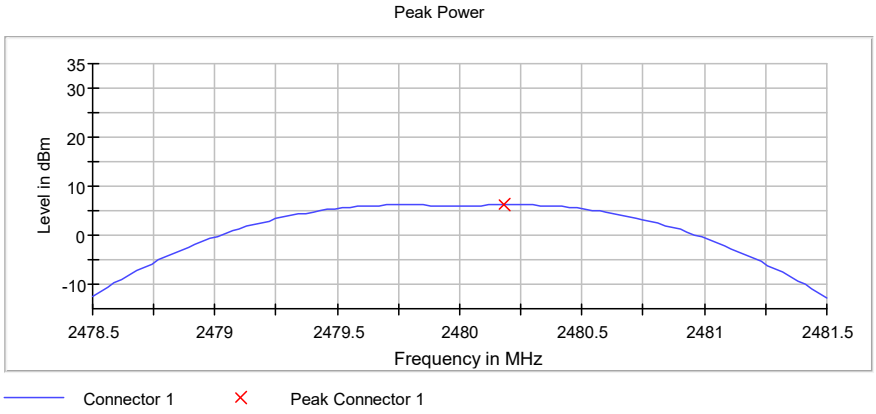
Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 3
Mode	Tx
Frequency Tested	2402MHz
Result	Output Power = 4.9mW (6.9dBm)
Test Date(s)	November 11, 2024
Notes	None



Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 3
Mode	Tx
Frequency Tested	2440MHz
Result	Output Power = 4.6mW (6.6dBm)
Test Date(s)	November 11, 2024
Notes	None



Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 3
Mode	Tx
Frequency Tested	2480MHz
Result	Output Power = 4.2mW (6.2dBm)
Test Date(s)	November 11, 2024
Notes	None



23. Effective Isotropic Radiated Power (EIRP)

EUT Information	
Manufacturer	The Chamberlain Group LLC
Product	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Radiated
Type of Test Site	Semi-Anechoic Chamber
Test Site Used	R29F
Type of Antennas Used	Double-ridged waveguide (or equivalent)
Notes	None

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

Requirements
The output power shall not exceed 4W (36dBm).

Procedure
The EUT was placed on the non-conductive stand and set to transmit. A double ridged waveguide 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 6dB 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 channels. 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	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Result	Max EIRP = 7.2mW (8.6dBm)
Test Date(s)	November 20, 2024
Notes	None

Freq (MHz)	Ant Pol	Wide BW Meter Reading (dBµV)	Matched Sig Gen Reading (dBm)	Equivalent Antenna Gain (dB)	Cable Loss (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2402.00	H	67.2	4.2	5.3	3.4	6.1	36.0	-29.9
	V	62.4	-1.0	5.3	3.4	0.9	36.0	-35.1
2440.00	H	69.3	6.9	5.2	3.5	8.6	36.0	-27.4
	V	63.9	1.7	5.2	3.5	3.4	36.0	-32.6
2480.00	H	66.7	5.1	5.2	3.5	6.7	36.0	-29.3
	V	60.8	-1.4	5.2	3.5	0.3	36.0	-35.7

24. Duty Cycle Factor Measurements

EUT Information	
Manufacturer	The Chamberlain Group LLC
Product	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Antenna Conducted
Type of Test Site	Elite Workbench
Type of Antennas Used	N/A
Notes	None

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

Procedure

Per kDB 558074 D01 Section 11 A3(a),

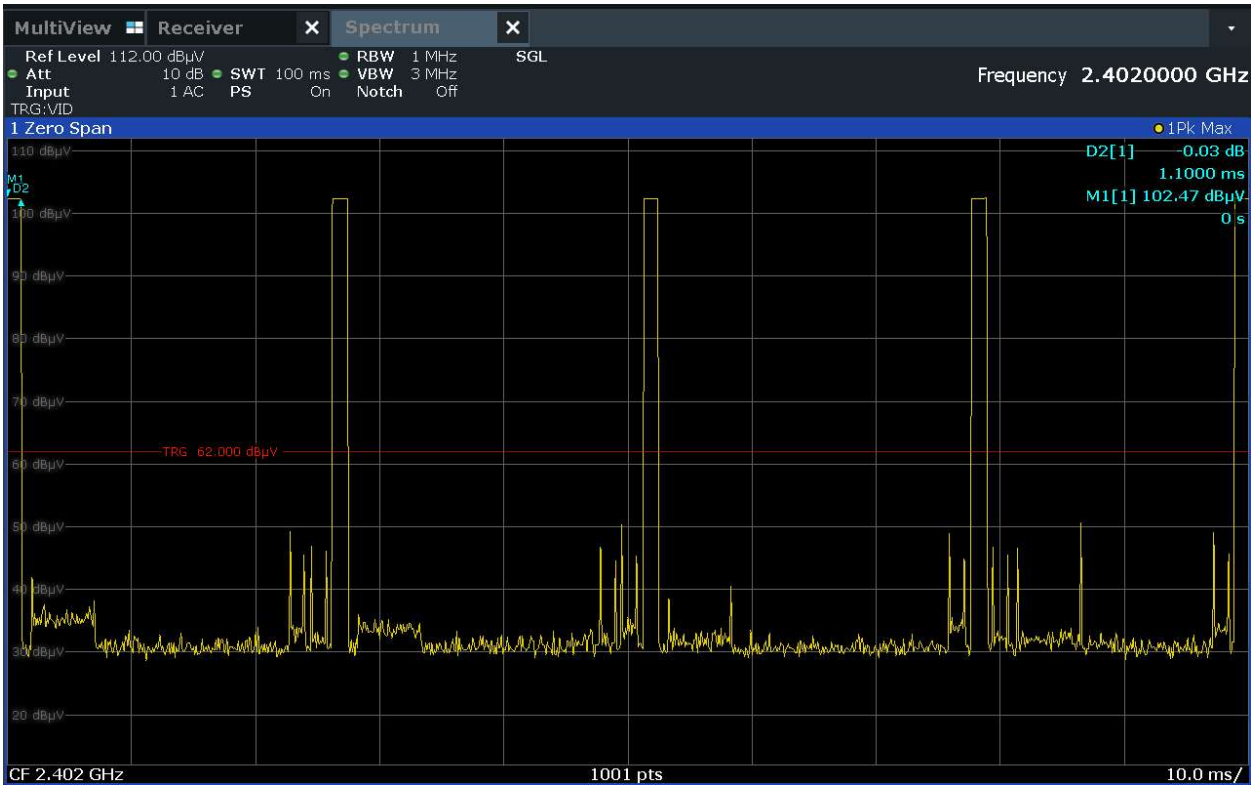
A peak measurement was made using a Peak detector. Then the operational duty cycle of the EUT was subtracted from the Peak reading to derive the RMS average value. This factor is computed from the time domain trace of the pulse modulation signal.

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 10msec/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	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2402MHz
Result	On Time = 1.1msec x 5 = 5.5msec
Test Date(s)	November 11, 2024
Notes	None



Duty Cycle

Manufacturer : The Chamberlain Group LLC
Model Number : Q348LA
Serial Number : Sample E4
Mode : Tx
Parameters : Pulse Length = 1.1msec
Date : 11/18/2024 9:00:50 AM
Notes : BLE Sec+3.0

TRACE1 : Function plot of Max Hold Peak

$$\text{Duty Cycle Factor} = 20\log\left(\frac{5.5\text{msec}}{100\text{msec}}\right) = -25.2\text{dBdB}$$

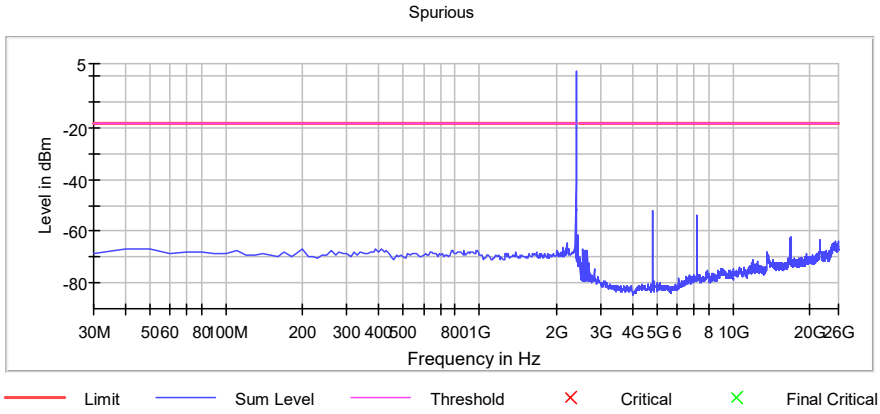
25. Antenna Conducted Spurious Emissions

EUT Information	
Manufacturer	The Chamberlain Group LLC
Product	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx

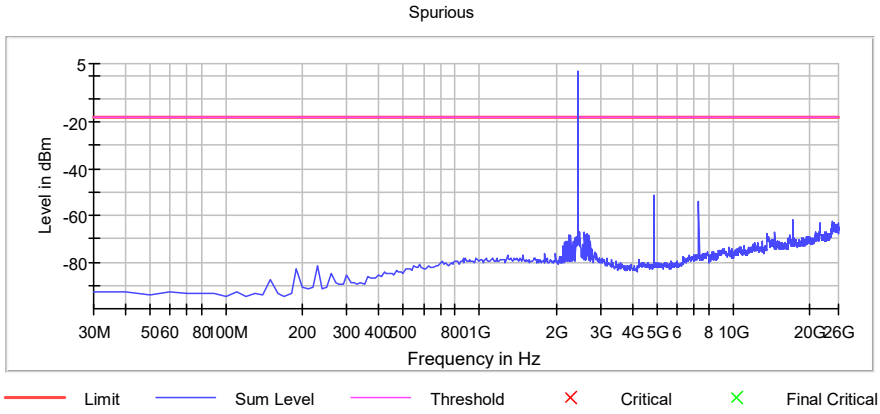
Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Antenna Conducted
Test Site Used	Elite Workbench
Notes	None

Procedure
The antenna port of the EUT was connected to the spectrum analyzer through an R&S OSP120 RF control and switch. The resolution bandwidth (RBW) was set to 100kHz. The peak detector and 'Max-Hold' function were engaged. The emissions in the frequency range from 30MHz to 26GHz were observed and plotted separately with the EUT transmitting at low, middle, and high channels.

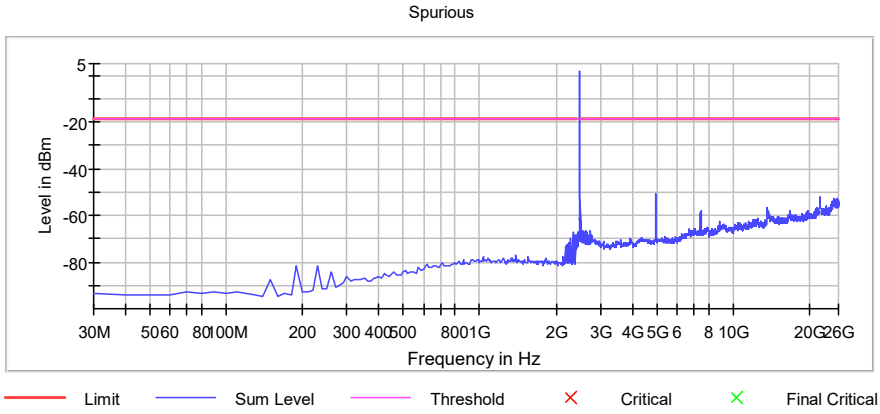
Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2402MHz
Result	Compliant
Test Date(s)	November 11, 2024
Notes	None



Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2440MHz
Result	Compliant
Test Date(s)	November 11, 2024
Notes	None



Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2480MHz
Result	Compliant
Test Date(s)	November 11, 2024
Notes	None



26. Case Spurious Radiated Emissions

EUT Information	
Manufacturer	The Chamberlain Group LLC
Product	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Type of Test Site	Semi-Anechoic Chamber
Test Site Used	R29F
Type of Antennas Used	30MHz – 1GHz: Bilog (or equivalent) 1 – 18GHz: Double-Ridged Waveguide (or equivalent) 18 – 25GHz: Horn (or equivalent)
Notes	None

Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 6 GHz)	3.1
Radiated disturbance (electric field strength on an open area test site or alternative test site) (6 GHz – 18 GHz)	3.2
Radiated disturbance (electric field strength on an open area test site or alternative test site) (18 GHz – 26.5 GHz)	3.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (26.5 GHz – 40 GHz)	3.4

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 25GHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 30MHz to 25GHz.

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 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 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) 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.

Picture removed for short term confidentiality
Test Setup for Spurious Radiated Emissions, 30MHz – 1GHz – Antenna Polarization Horizontal
Picture removed for short term confidentiality
Test Setup for Spurious Radiated Emissions, 30MHz – 1GHz – Antenna Polarization Vertical

Picture removed for short term confidentiality

Test Setup for Spurious Radiated Emissions, 1 – 18GHz – Antenna Polarization Horizontal

Picture removed for short term confidentiality

Test Setup for Spurious Radiated Emissions, 1 – 18GHz – Antenna Polarization Vertical

Picture removed for short term confidentiality
Test Setup for Spurious Radiated Emissions, Above 18GHz – Antenna Polarization Horizontal
Picture removed for short term confidentiality
Test Setup for Spurious Radiated Emissions, Above 18GHz – Antenna Polarization Vertical

Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2402MHz
Test Date(s)	November 13, 2024 through November 20, 2024
Notes	Peak Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dB)
4804.00	H	56.0		3.7	34.7	-39.3	55.1	570.3	5000.0	-18.9
	V	55.1		3.7	34.7	-39.3	54.2	512.4	5000.0	-19.8
12010.00	H	54.4		6.1	39.0	-39.2	60.3	1039.5	5000.0	-13.6
	V	53.6		6.1	39.0	-39.2	59.5	949.2	5000.0	-14.4
19216.00	H	38.5	Ambient	2.0	40.4	-27.6	53.2	455.2	5000.0	-20.8
	V	39.0	Ambient	2.0	40.4	-27.6	53.7	482.2	5000.0	-20.3

Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2402MHz
Test Date(s)	November 13, 2024 through November 20, 2024
Notes	Average Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle Factor (dB)	Average Total at 3m (dBµV/m)	Average Total at 3m (µV/m)	Average Limit at 3m (µV/m)	Margin (dB)
4804.00	H	53.07		3.7	34.7	-39.3	-25.2	27.0	22.3	500.0	-27.0
	V	52.17		3.7	34.7	-39.3	-25.2	26.1	20.1	500.0	-27.9
12010.00	H	46.35		6.1	39.0	-39.2	-25.2	27.1	22.6	500.0	-26.9
	V	44.70		6.1	39.0	-39.2	-25.2	25.4	18.7	500.0	-28.5
19216.00	H	24.10	Ambient	2.0	40.4	-27.6	-25.2	13.6	4.8	500.0	-40.4
	V	24.12	Ambient	2.0	40.4	-27.6	-25.2	13.6	4.8	500.0	-40.3

Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2402MHz
Test Date(s)	November 13, 2024 through November 20, 2024
Notes	Peak Measurements in Non-Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dB)
2402.00	H	64.67		2.6	32.6	0.0	99.8	98285.5	NA	NA
	V	59.52		2.6	32.6	0.0	94.7	54323.7	NA	NA
7206.00	H	51.59		4.6	35.7	-39.4	52.6	424.5	9828.6	-27.3
	V	45.97		4.6	35.7	-39.4	46.9	222.3	9828.6	-32.9
9608.00	H	50.78		5.2	36.7	-39.3	53.4	465.9	9828.6	-26.5
	V	51.39		5.2	36.7	-39.3	54.0	499.8	9828.6	-25.9
14412.00	H	39.28		6.6	39.9	-38.3	47.5	237.0	9828.6	-32.4
	V	39.35		6.6	39.9	-38.3	47.6	238.9	9828.6	-32.3
16814.00	H	39.82		7.2	42.7	-37.5	52.1	404.7	9828.6	-27.7
	V	41.76		7.2	42.7	-37.5	54.1	506.0	9828.6	-25.8
21618.00	H	27.64	Ambient	2.1	40.6	-25.3	45.1	179.3	9828.6	-34.8
	V	28.84	Ambient	2.1	40.6	-25.3	46.3	205.9	9828.6	-33.6
24020.00	H	27.52	Ambient	2.3	40.6	-25.2	45.2	182.0	9828.6	-34.6
	V	27.26	Ambient	2.3	40.6	-25.2	44.9	176.6	9828.6	-34.9

Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2440MHz
Test Date(s)	November 13, 2024 through November 20, 2024
Notes	Peak Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dB)
4880.00	H	55.8		3.7	34.6	-39.3	54.7	544.1	5000.0	-19.3
	V	54.4		3.7	34.6	-39.3	53.4	465.8	5000.0	-20.6
7320.00	H	56.9		4.7	35.7	-39.4	57.9	789.3	5000.0	-16.0
	V	53.0		4.7	35.7	-39.4	54.0	499.7	5000.0	-20.0
12200.00	H	51.9		6.1	39.1	-39.1	58.0	796.4	5000.0	-16.0
	V	54.2		6.1	39.1	-39.1	60.3	1030.7	5000.0	-13.7
19520.00	H	38.0	Ambient	2.1	40.4	-26.7	53.6	481.4	5000.0	-20.3
	V	39.6	Ambient	2.1	40.4	-26.7	55.2	578.7	5000.0	-18.7

Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2440MHz
Test Date(s)	November 13, 2024 through November 20, 2024
Notes	Average Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle Factor (dB)	Average Total at 3m (dBµV/m)	Average Total at 3m (µV/m)	Average Limit at 3m (µV/m)	Margin (dB)
4880.00	H	49.35		3.7	34.6	-39.3	-25.2	23.1	14.3	500.0	-30.9
	V	47.13		3.7	34.6	-39.3	-25.2	20.9	11.1	500.0	-33.1
7320.00	H	50.37		4.7	35.7	-39.4	-25.2	26.2	20.4	500.0	-27.8
	V	43.57		4.7	35.7	-39.4	-25.2	19.4	9.3	500.0	-34.6
12200.00	H	40.97		6.1	39.1	-39.1	-25.2	21.9	12.4	500.0	-32.1
	V	46.03		6.1	39.1	-39.1	-25.2	26.9	22.2	500.0	-27.1
19520.00	H	22.88	Ambient	2.1	40.4	-26.7	-25.2	13.4	4.7	500.0	-40.6
	V	23.19	Ambient	2.1	40.4	-26.7	-25.2	13.7	4.8	500.0	-40.3

Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2440MHz
Test Date(s)	November 13, 2024 through November 20, 2024
Notes	Peak Measurements in Non-Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dB)
2440.00	H	68.79		2.6	32.7	0.0	104.2	161662.5	NA	NA
	V	63.14		2.6	32.7	0.0	98.5	84354.7	NA	NA
9760.00	H	49.92		5.2	36.9	-39.3	52.8	437.5	16166.3	-31.4
	V	52.72		5.2	36.9	-39.3	55.6	603.9	16166.3	-28.6
14640.00	H	40.41		6.7	40.2	-38.2	49.1	283.9	16166.3	-35.1
	V	38.82		6.7	40.2	-38.2	47.5	236.4	16166.3	-36.7
17080.00	H	38.38		7.3	41.9	-37.6	50.0	314.5	16166.3	-34.2
	V	39.05		7.3	41.9	-37.6	50.6	339.7	16166.3	-33.6
21960.00	H	27.82	Ambient	2.1	40.6	-25.5	45.0	178.4	16166.3	-39.1
	V	27.40	Ambient	2.1	40.6	-25.5	44.6	169.9	16166.3	-39.6
24400.00	H	27.58	Ambient	2.1	40.6	-25.6	44.7	172.1	16166.3	-39.5
	V	28.07	Ambient	2.1	40.6	-25.6	45.2	182.1	16166.3	-39.0

Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2480MHz
Test Date(s)	November 13, 2024 through November 20, 2024
Notes	Peak Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dB)
4960.00	H	56.5		3.7	34.4	-39.3	55.3	583.3	5000.0	-18.7
	V	55.8		3.7	34.4	-39.3	54.6	536.9	5000.0	-19.4
7440.00	H	57.3		4.7	35.7	-39.4	58.4	828.8	5000.0	-15.6
	V	54.1		4.7	35.7	-39.4	55.1	570.1	5000.0	-18.9
12400.00	H	52.8		6.1	38.9	-39.0	58.7	861.7	5000.0	-15.3
	V	54.6		6.1	38.9	-39.0	60.5	1058.9	5000.0	-13.5
19840.00	H	37.5	Ambient	1.9	40.4	-26.8	53.0	448.5	5000.0	-20.9
	V	34.8	Ambient	1.9	40.4	-26.8	50.3	329.0	5000.0	-23.6
22320.00	H	37.7	Ambient	1.9	40.6	-26.0	54.2	515.7	5000.0	-19.7
	V	37.9	Ambient	1.9	40.6	-26.0	54.4	526.5	5000.0	-19.6

Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2480MHz
Test Date(s)	November 13, 2024 through November 20, 2024
Notes	Average Measurements in the Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle Factor (dB)	Average Total at 3m (dBµV/m)	Average Total at 3m (µV/m)	Average Limit at 3m (µV/m)	Margin (dB)
4960.00	H	50.97		3.7	34.4	-39.3	-25.2	24.6	16.9	500.0	-29.4
	V	50.46		3.7	34.4	-39.3	-25.2	24.1	16.0	500.0	-29.9
7440.00	H	51.18		4.7	35.7	-39.4	-25.2	27.0	22.4	500.0	-27.0
	V	45.25		4.7	35.7	-39.4	-25.2	21.1	11.3	500.0	-32.9
12400.00	H	43.91		6.1	38.9	-39.0	-25.2	24.7	17.1	500.0	-29.3
	V	45.96		6.1	38.9	-39.0	-25.2	26.7	21.6	500.0	-27.3
19840.00	H	22.27	Ambient	1.9	40.4	-26.8	-25.2	12.7	4.3	500.0	-41.3
	V	22.61	Ambient	1.9	40.4	-26.8	-25.2	13.0	4.5	500.0	-41.0
22320.00	H	22.58	Ambient	1.9	40.6	-26.0	-25.2	13.9	5.0	500.0	-40.1
	V	22.67	Ambient	1.9	40.6	-26.0	-25.2	14.0	5.0	500.0	-40.0

Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2480MHz
Test Date(s)	November 13, 2024 through November 20, 2024
Notes	Peak Measurements in Non-Restricted Bands

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dB)
2480.00	H	63.51		2.7	32.9	0.0	99.1	90176.4	NA	NA
	V	57.99		2.7	32.9	0.0	93.6	47763.1	NA	NA
9920.00	H	49.13		5.3	37.1	-39.2	52.2	409.1	9017.6	-26.9
	V	53.85		5.3	37.1	-39.2	57.0	704.5	9017.6	-22.1
14880.00	H	41.87		6.8	40.1	-38.2	50.6	339.0	9017.6	-28.5
	V	40.47		6.8	40.1	-38.2	49.2	288.5	9017.6	-29.9
17360.00	H	39.31		7.4	41.7	-37.7	50.6	340.7	9017.6	-28.5
	V	40.31		7.4	41.7	-37.7	51.6	382.2	9017.6	-27.5
24800.00	H	27.21	Ambient	2.3	40.6	-25.0	45.2	181.0	9017.6	-34.0
	V	26.65	Ambient	2.3	40.6	-25.0	44.6	169.7	9017.6	-34.5

27. Band-Edge Compliance

EUT Information	
Manufacturer	The Chamberlain Group LLC
Product	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx

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

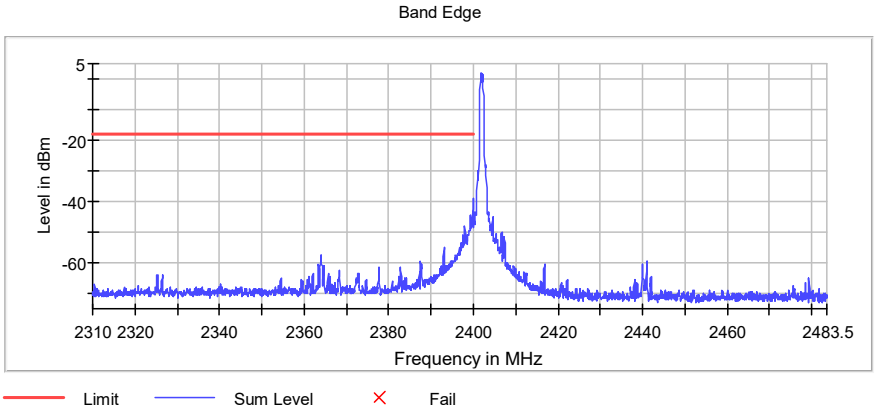
Measurement Uncertainty	
Measurement Type	Expanded Measurement Uncertainty
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.3
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz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

Procedure

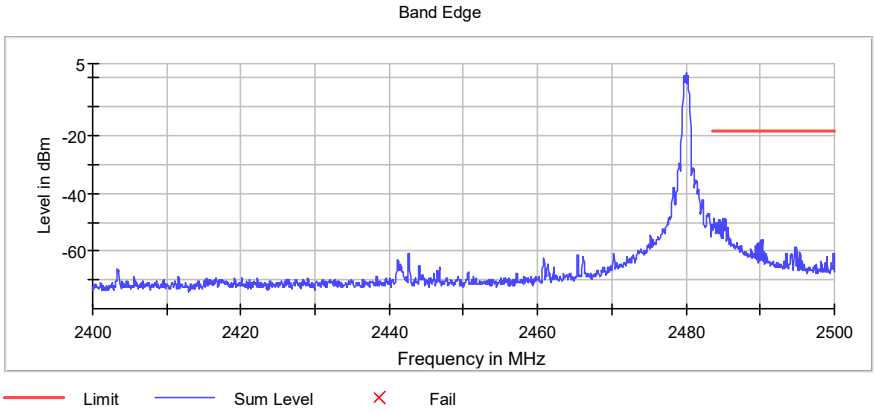
1) Low Band Edge:
   a) The antenna port of the EUT was connected to the spectrum analyzer through an R&S OSP120 RF control and switch.
   b) The EUT was set to transmit continuously at the channel closest to the low band-edge.
   c) To determine the band edge compliance, the following spectrum analyzer settings were used:
      - Center Frequency = 2400MHz (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 down 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.
2) High Band Edge:
   a) The EUT was setup inside the test chamber on a non-conductive stand and set to transmit continuously at the channel closest to the high band-edge.
   b) A broadband measuring antenna was placed at a test distance of 3 meters from the EUT. The

Procedure
antenna was connected to the input of a spectrum analyzer. c) The center frequency of the analyzer was set to the high band edge (2483.5MHz). d) The Resolution Bandwidth was set to 1MHz. e) To ensure that the maximum or worst case emission level was measured, the following steps were taken: ○ The EUT was rotated so that all of its sides were exposed to the receiving antenna. ○ Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured. ○ The EUT was rotated so that all of its sides were exposed to the receiving antenna. ○ The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings. ○ The highest measured peak reading and the highest measured average reading were recorded.

Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2402MHz
Notes	Low Band Edge



Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2480MHz
Notes	High Band Edge – Peak and Average Measurements



Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	Cable Factor (dB)	Antenna Factor (dB/m)	Pre Amp (dB)	Peak Total at 3m (dBµV/m)	Peak Total at 3m (µV/m)	Peak Limit at 3m (µV/m)	Margin (dB)
2483.50	H	38.2		2.7	32.9	0.0	73.8	4903.5	5000.0	-0.2
	V	32.1		2.7	32.9	0.0	67.7	2426.6	5000.0	-6.3

Freq (MHz)	Ant Pol	Meter Reading (dBµV)	Ambient	CBL Fac (dB)	Ant Fac (dB/m)	Pre Amp (dB)	Duty Cycle Factor (dB)	Average Total at 3m (dBµV/m)	Average Total at 3m (µV/m)	Average Limit at 3m (µV/m)	Margin (dB)
2483.50	H	16.92		2.7	32.9	0.0	-25.2	27.3	23.3	500.0	-26.6
	V	12.30		2.7	32.9	0.0	-25.2	22.7	13.7	500.0	-31.3

28. Power Spectral Density

EUT Information	
Manufacturer	The Chamberlain Group LLC
Product	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx

Test Setup Details	
Setup Format	Tabletop
Height of Support	N/A
Measurement Method	Antenna Conducted
Type of Test Site	Tabletop
Test Site Used	Elite Workbench
Type of Antennas Used	N/A
Notes	None

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

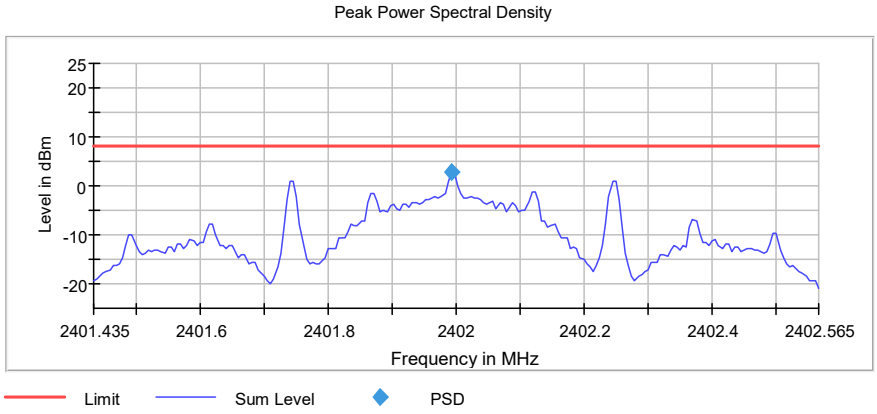
Requirement
The power spectral density from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

Procedure

1) The antenna port of the EUT was connected to the spectrum analyzer through an R&S OSP120 RF control and switch.
2) The EUT was then placed in the normal operation mode (for DTS devices).
3) To determine the power spectral density, the following spectrum analyzer settings were used:
    a) Center Frequency = Transmit Frequency
    b) Span = 1.5× the DTS (6dB) bandwidth
    c) Resolution Bandwidth (RBW) = 3kHz ≤ RBW ≤ 100kHz
    d) Sweep time = Auto
    e) Detector = Peak
    f) Trace Function = Max-Hold
4) A display line was then placed on the corresponding +8dBm level.
5) The analyzers display was then screenshot and saved.

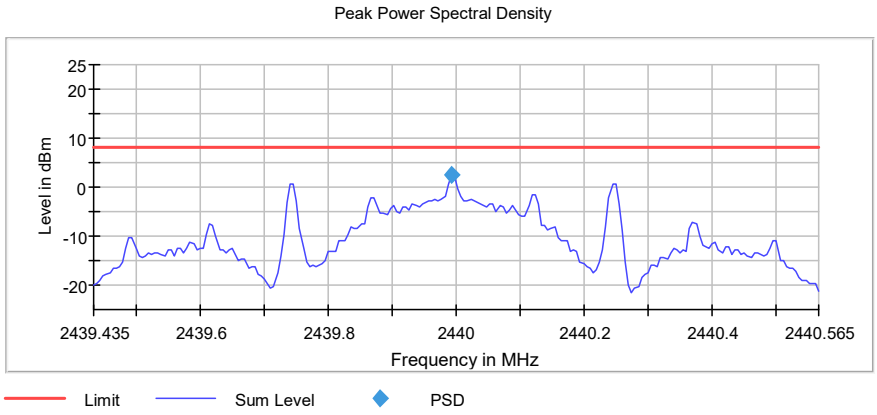
Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2402MHz
Result	PSD = 2.694dBm
Notes	None

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2402.000000	2401.992462	2.694	8.0	PASS



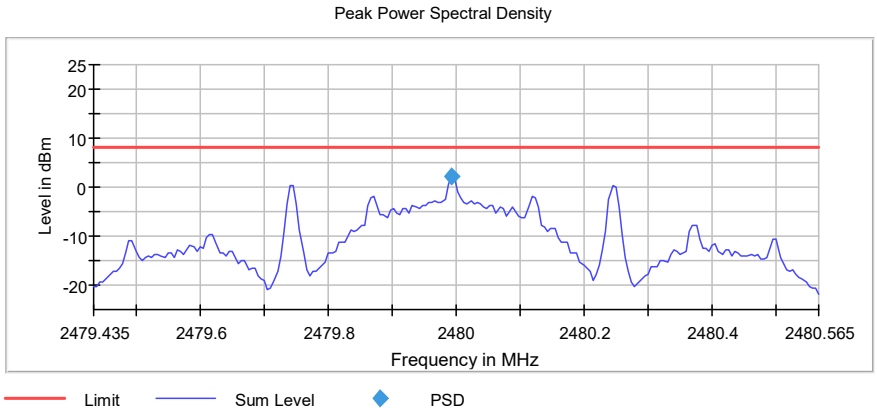
Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2440MHz
Result	PSD = 2.431dBm
Notes	None

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2440.000000	2439.992462	2.431	8.0	PASS



Test Details	
Manufacturer	The Chamberlain Group LLC
EUT	Keypad
Model No.	Q348LA
Serial No.	Sample 5
Mode	Tx
Frequency Tested	2480MHz
Result	PSD = 2.15dBm
Notes	None

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2480.000000	2479.992462	2.150	8.0	PASS



29. 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, 2025 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 *(Max Voltage 60V/Max current 100A)*	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) *(Up to +/-25kV)*	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, CE 430, CE440)

Test Technology:	Test Method(s)[1]:
Radiated Emissions Anechoic *(Up to 6GHz)*	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, RE320);
Vehicle Radiated Emissions	CISPR 12; CISPR 36; ICES-002; ECE Regulation 10.06 Annex 5
Bulk Current Injection (BCI) *(1 to 400MHz 500mA)*	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
Radiated Immunity Anechoic *(Up to 6GHz and 200V/m)* *(Including Radar Pulse 600V/m)*	ISO 11452-2; 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; FMC 1278 (RI140)
Radiated Immunity Reverb *(360MHz to 6GHz and 100V/m)*	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)* *(Up to 6GHz and 20W)*	ISO 11452-9; EMC-CS-2009.1 (RI115); FMC1278 (RI115); GMW 3097, Sec 3.4.4
Vehicle Radiated Immunity (ALSE)	ISO 11451-2; ECE Regulation 10.06 Annex 6
Vehicle Product Specific EMC Standards	EN 14982; EN ISO 13309; ISO 13766; EN 50498; EC Regulation No. 2015/208; EN 55012
Electrical Loads	ISO 16750-2
Stripline	ISO 11452-5
Transverse Electromagnetic (TEM) Cell	ISO 11452-3

Test Technology:	Test Method(s)[1]:
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; KS C 9811; CNS 13803 (1997, 2003); CISPR 14-1; EN 55014-1; AS/NZS CISPR 14.1; CISPR 16-2-1 (2008); CISPR 16-2-1; KS C 9814-1; 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; KS C 9832; KN 32; ECE Regulation 10.06 Annex 7 (Broadband); ECE Regulation 10.06 Annex 8 (Narrowband); ECE Regulation 10.06 Annex 14 (Conducted)
Cellular Radiated Spurious Emissions	ETSI TS 151 010-1 GSM; 3GPP TS 51.010-1, Sec 12; ETSI TS 134 124 UMTS; 3GPP TS 34.124; ETSI TS 136 124 LTE; E-UTRA; 3GPP TS 36.124
Current Harmonics	IEC 61000-3-2; IEC 61000-3-12; EN 61000-3-2; KN 61000-3-2; KS C 9610-3-2; ECE Regulation 10.06 Annex 11
Flicker and Fluctuations	IEC 61000-3-3; IEC 61000-3-11; EN 61000-3-3; KN 61000-3-3; KS C 9610-3-3; 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; KS C 9610-4-2; 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; KS C 9610-4-3; IEEE C37.90.2 2004

Test Technology:	Test Method(s)[1]:
Immunity (cont'd)	
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; KS C 9610-4-4; ECE Regulation 10.06 Annex 15
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; KS C 9610-4-5; 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; KS C 9610-4-6
Power Frequency Magnetic Field Immunity (*Down to 3 A/m*)	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; KS C 9610-4-8
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; KS C 9610-4-11
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

Test Technology:	Test Method(s)[1]:
Generic and Product Specific EMC Standards	IEC/EN 61000-6-1; AS/NZS 61000-6-1; KN 61000-6-1; KS C 9610-6-1; IEC/EN 61000-6-2; AS/NZS 61000-6-2; KN 61000-6-2; KS C 9610-6-2; IEC/EN 61000-6-3; AS/NZS 61000-6-3; KN 61000-6-3; KS C 9610-6-3; IEC/EN 61000-6-4; AS/NZS 61000-6-4; KN 61000-6-4; KS C 9610-6-4; EN 50130-4; EN 61326-1; EN 50121-3-2; EN 12895; EN 50270; EN 50491-1; EN 50491-2; EN 50491-3; EN 55015; EN 60730-1; EN 60945; IEC 60533; EN 61326-2-6; EN 61800-3; IEC/CISPR 14-2; EN 55014-2; AS/NZS CISPR 14.2; KN 14-2; KS C 9814-2; IEC/CISPR 24; AS/NZS CISPR 24; EN 55024; KN 24; IEC/CISPR 35; AS/NZS CISPR 35; EN 55035; KN 35; KS C 9835; 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; EN 301 489-20
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 300 220-3-1; ETSI EN 300 220-3-2; 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; 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; EN 303 340; EN 303 345-2; EN 303 345-3; EN 303 345-4
Canadian Radio Tests	RSS-102 measurement (RF Exposure Evaluation); RSS-102 measurement (Nerve Stimulation); SPR-002; 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-248; 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 (July 15, 2020)

Test Technology:	Test Method(s)[1]:
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; KS X 3124; KS X 3125; KS X 3130; KS X 3126; KS X 3129
Vietnam Radio Test Standards	QCVN 47:2015/BTTTT; QCVN 54:2020/BTTTT; QCVN 55:2011/BTTTT; QCVN 65:2013/BTTTT; QCVN 73:2013/BTTTT; QCVN 74:2020/BTTTT; QCVN 112:2017/BTTTT; QCVN 117:2020//BTTTT
Vietnam EMC Test Standards	QCVN 18:2014/BTTTT; QCVN 86:2019/BTTTT; QCVN 96:2015/BTTTT; QCVN 118:2018/BTTTT
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 (using 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 (1mV to 5kV) 60 Hz (0.1V to 250V) up to 500 MHz (1μA to 150A) 60 Hz	FAA AC 150/5345-10H; FAA AC 150/5345-43J; FAA AC 150/5345-44K; FAA AC 150/5345-46E; FAA AC 150/5345-47C;
DC Voltage / Current (1mV to 15 kV) / (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, edition, version, etc. is not identified in the scope of accreditation, laboratories may use the version that immediately precedes the current version for a period of one year from the date of publication of the standard measurement method, 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

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)
Unlicensed Personal Communication Systems Devices Part 15D	ANSI C63.17:2013	40000
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

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)
Broadcast Radio Services		
Parts 73 and 74 (below 3 GHz)	ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015	40000
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 15th day of August 2023.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1786.01
Valid to June 30, 2025

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