| Engineering Test Report No. 2402438-03 Rev. A | | |
|---|---|---|
| Report Date | April 25, 2025 | |
| Manufacturer Name | The Chamberlain Group LLC | |
| Manufacturer Address | 300 Windsor Dr<br>Oak Brook, IL 60523 | |
| Test Item Name<br>Model No. | Vulcan – 900-15607 Rev F<br>Model No. – 900-15607-11, 2200SA, 2200M, C1000LA, 2310M | |
| Date Received | March 7, 2025 | |
| Test Dates | March 10, 2025 – July 16, 2025 | |
| Specifications | FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247<br>Innovation, Science, and Economic Development Canada, RSS-GEN<br>Innovation, Science, and Economic Development Canada, RSS-247 | |
| Test Facility | Elite Electronic Engineering, Inc.<br>1516 Centre Circle,<br>Downers Grove, IL 60515 | FCC Reg. Number: 269750<br>IC Reg. Number: 2987A<br>CAB Identifier: US0107 |
| Signature | Nathaniel Bouchie | |
| Tested by | Nathaniel Bouchie | |
| Signature | Raymond J Klouda | |
| Approved by | Raymond J. Klouda,<br>Registered Professional Engineer of Illinois – 44894 | |
| PO Number | 4900099030 | |

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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; Innovation, Science, and Economic Development Canada, RSS-GEN; and Innovation, Science, and Economic Development Canada, RSS-247 test specifications. The data presented in this test report pertains to the EUT on the test dates specified. Any electrical or mechanical modifications made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification. This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

## Table of Contents


1. Report Revision History ..... 3
2. Introduction ..... 4
2.1. Scope of Tests ..... 4
2.2. Purpose ..... 4
2.3. Identification of the EUT ..... 4
3. Power Input ..... 4
4. Grounding ..... 4
5. Support Equipment ..... 5
6. Interconnect Leads ..... 5
7. Modifications Made to the EUT ..... 5
8. Modes of Operation ..... 5
9. Test Specifications ..... 5
10. Test Plan ..... 6
11. Deviation, Additions to, or Exclusions from Test Specifications ..... 6
12. Laboratory Conditions ..... 6
13. Summary ..... 6
14. Sample Calculations ..... 6
15. Statement of Conformity ..... 7
16. Certification ..... 7
17. Photographs of EUTs ..... 8
18. Equipment List ..... 12
19. Block Diagram of Test Setup ..... 13
20. 6dB Bandwidth ..... 14
21. Occupied Bandwidth (99%) ..... 18
22. Maximum Peak Conducted Output Power ..... 22
23. Effective Isotropic Radiated Power (EIRP) ..... 26
24. Duty Cycle Factor Measurements ..... 30
25. Antenna Conducted Spurious Emissions ..... 41
26. Case Spurious Radiated Emissions ..... 45
27. Band-Edge Compliance ..... 65
28. Power Spectral Density ..... 78
29. Scope of Accreditation ..... 82


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# 1. Report Revision History

| Revision | Date | Description |
|---|---|---|
| – | 25 APR 2025 | Initial Release of Engineering Test Report No. 2402438-03 |
| A | 22 JUL 2025<br>By NDB | - Throughout report: Report number changed to 2402438-03 Rev. A.<br>- Cover Page and Section 2.3: Model No.'s 2200SA, 2200M, C1000LA, and 2310M were added.<br>- Cover Page: Added date of most recent testing.<br>- Section 15: Model No.'s 2200SA, 2200M, C1000LA, and 2310M were added to Statement of Conformity.<br>- Section 17: Added photographs of the 2200SA, 2200M, C1000LA, and 2310M EUTs.<br>- Section 18: Equipment List was updated with current calibration dates.<br>- Section 23: Added data for 2200SA, 2200M, C1000LA, and 2310M EUTs.<br>- Section 24: Added data for 2200SA, 2200M, C1000LA, and 2310M EUTs.<br>- Section 26: Added data for 2200SA, 2200M, C1000LA, and 2310M EUTs.<br>- Section 27: Added data for 2200SA, 2200M, C1000LA, and 2310M EUTs.<br>- Section 29: Updated Scope of Accreditation. |

# 2. Introduction

## 2.1. Scope of Tests

This document presents the results of a series of RF emissions tests that were performed on six (6) Vulcan – 900-15607 Rev Fs (hereinafter referred to as the Equipment Under Test (EUT)). The EUTs were 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 EUTs meet 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 EUTs meet the RF emission requirements of the Innovation, Science, and Economic Development Canada Radio Standards Specification RSS-Gen and Innovation, Science, and Economic Development Canada Radio Standards Specification RSS-247 for a 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 | |
|---|---|
| Product Description | Vulcan – 900-15607 Rev F |
| Model/Part No. | 900-15607-11<br>2200SA<br>2200M<br>C1000LA<br>2310M |
| Serial No. | Radiated Sample<br>Conducted Sample |
| Size of EUT | 13 in x 9 in x 8 in |
| Software/Firmware Version | FW Version 2.11 |
| Device Type | Digitally Modulated Transmission Device |
| Band of Operation | 2400 – 2483.5MHz |
| Antenna Type | Dipole Wire |
| Conducted Output Power | 6.1mW |
| 6dB Bandwidth | 840kHz |
| Occupied Bandwidth (99% CBW) | 1.133MHz |

The EUTs listed above were used throughout the test series.

# 3. Power Input

The EUTs were powered by 120VAC 60Hz a 1 meter, unshielded power cable.

# 4. Grounding

The EUTs were grounded only through the third wire of the input power cord.

## 5. Support Equipment

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

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

## 6. Interconnect Leads

The following interconnect cables were submitted with the test items:

| Item | Description |
|---|---|
| UART | Connects laptop to EUT |

## 7. Modifications Made to the EUT

No modifications were made to the EUTs during the testing.

## 8. Modes of Operation

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

| Mode | Description |
|---|---|
| BLE @ 2402MHz | Support software was used to configure the EUT to transmit on BLE Band 0. |
| BLE @ 2440MHz | Support software was used to configure the EUT to transmit on BLE Band 19. |
| BLE @ 2480MHz | Support software was used to configure the EUT to transmit on BLE Band 39. |

## 9. Test Specifications

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

- Federal Communications Commission "Code of Federal Regulations", Title 47, 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 3, August 2023, “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-GEN, 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 | 23.1°C |
| Relative Humidity | 19% |
| Atmospheric Pressure | 1009mb |

## 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<br>ISED RSS-247 | ANSI<br>C63.10:2013 | Conducted Sample | Conforms |
| Occupied Bandwidth (99%) | FCC 15.247<br>ISED RSS-247 | ANSI<br>C63.10:2013 | Conducted Sample | Conforms |
| Maximum Peak Conducted Output Power | FCC 15.247<br>ISED RSS-247 | ANSI<br>C63.10:2013 | Conducted Sample | Conforms |
| Effective Isotropic Radiated Power (EIRP) | FCC 15.247<br>ISED RSS-247 | ANSI<br>C63.10:2013 | Radiated Sample | Conforms |
| Duty Cycle Factor Measurements | FCC 15.247<br>ISED RSS-247 | ANSI<br>C63.10:2013 | Conducted Sample | — |
| Antenna Conducted Spurious Emissions | FCC 15.247<br>ISED RSS-247 | ANSI<br>C63.10:2013 | Conducted Sample | Conforms |
| Case Spurious Radiated Emissions | FCC 15.247<br>ISED RSS-247 | ANSI<br>C63.10:2013 | Radiated Sample | Conforms |
| Band-Edge Compliance | FCC 15.247<br>ISED RSS-247 | ANSI<br>C63.10:2013 | Radiated Sample<br>Conducted Sample | Conforms |
| Power Spectral Density | FCC 15.247<br>ISED RSS-247 | ANSI<br>C63.10:2013 | Conducted Sample | Conforms |

## 14. Sample Calculations

For Powerline Conducted Emissions:

The resultant voltage level (VL) is a summation in decibels (dB) of the receiver meter reading (MTR) and the cable loss factor (CF).

Formula 1: VL (dBµV) = MTR (dBµV) + CF (dB).

For Radiated Emissions:

The resultant field strength (FS) is a summation in decibels (dB) of the receiver meter reading (MTR), the antenna correction factor (AF), and the cable loss factor (CF). If an external preamplifier is used,

the total is reduced by its gain (-PA). If a distance correction (DC) is required, it is added to the total.

Formula 1: FS (dBµV/m) = MTR (dBµV) + AF (dB/m) + CF (dB) + (- PA (dB)) + DC (dB)

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

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

## 15. Statement of Conformity

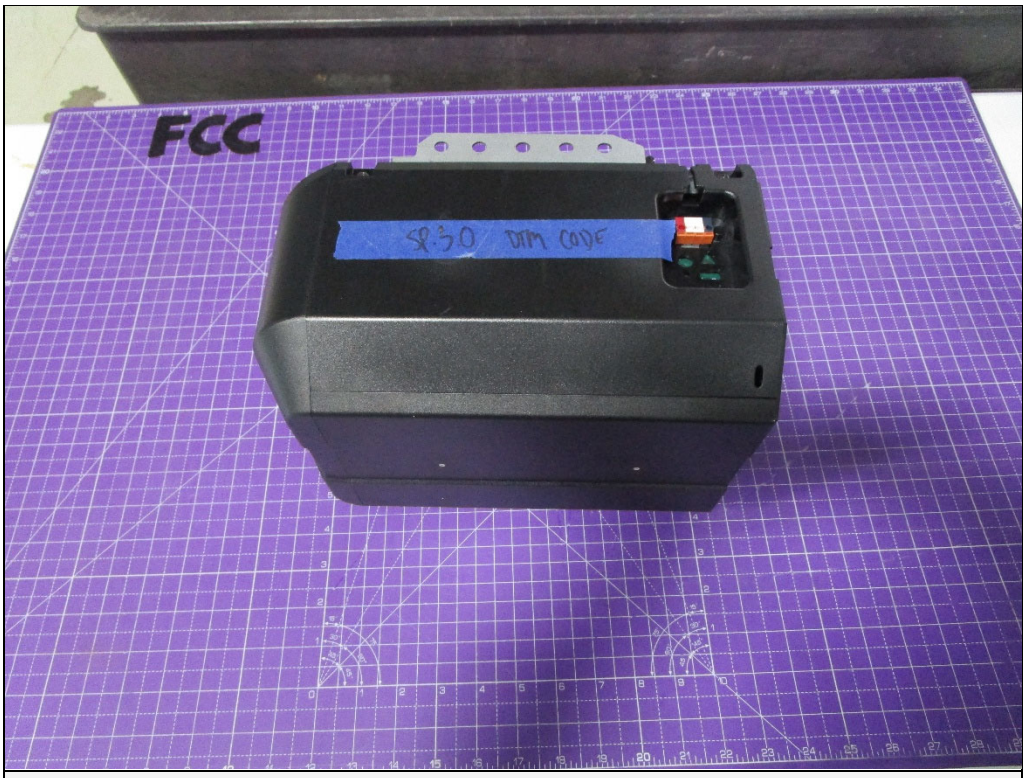
The following The Chamberlain Group LLC EUTs did fully conform to the selected requirements of FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247; Innovation, Science, and Economic Development Canada, RSS-GEN; and Innovation, Science, and Economic Development Canada, RSS-247:

| EUT | Model Number | Serial Number |
|---|---|---|
| Vulcan – 900-15607 Rev F | 900-15607-11 | Radiated Sample |
| Vulcan – 900-15607 Rev F | 900-15607-11 | Conducted Sample |
| Vulcan – 900-15607 Rev F | 2200SA | Radiated Sample |
| Vulcan – 900-15607 Rev F | 2200M | Radiated Sample |
| Vulcan – 900-15607 Rev F | C1000LA | Radiated Sample |
| Vulcan – 900-15607 Rev F | 2310M | Radiated Sample |

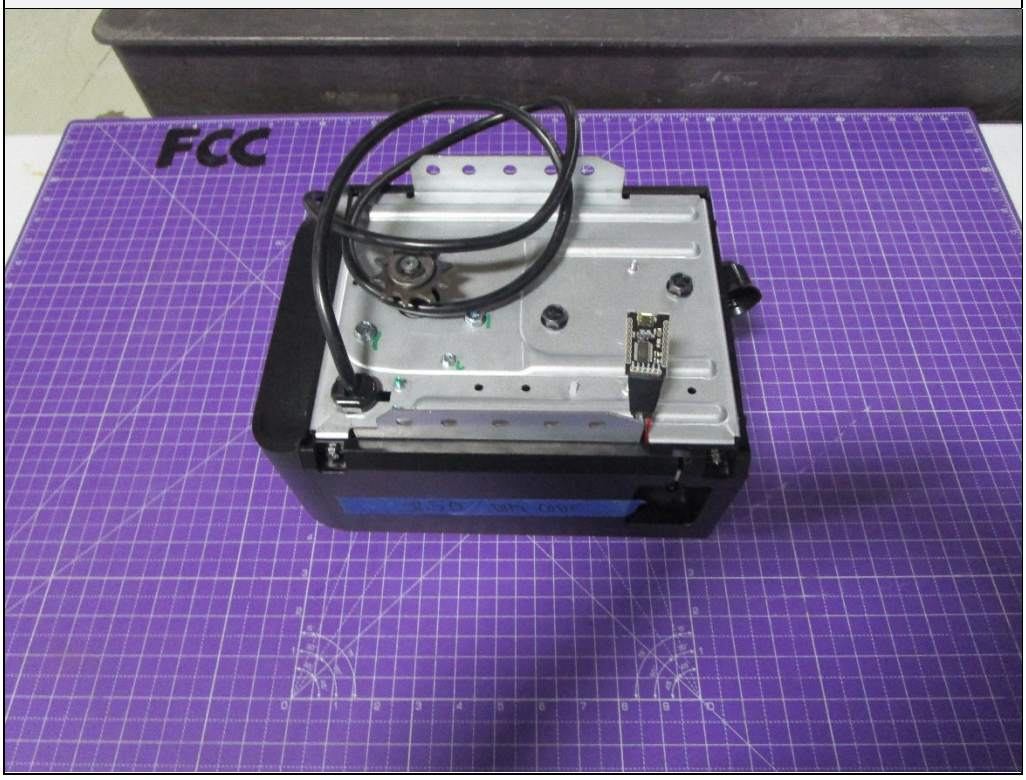
## 16. Certification

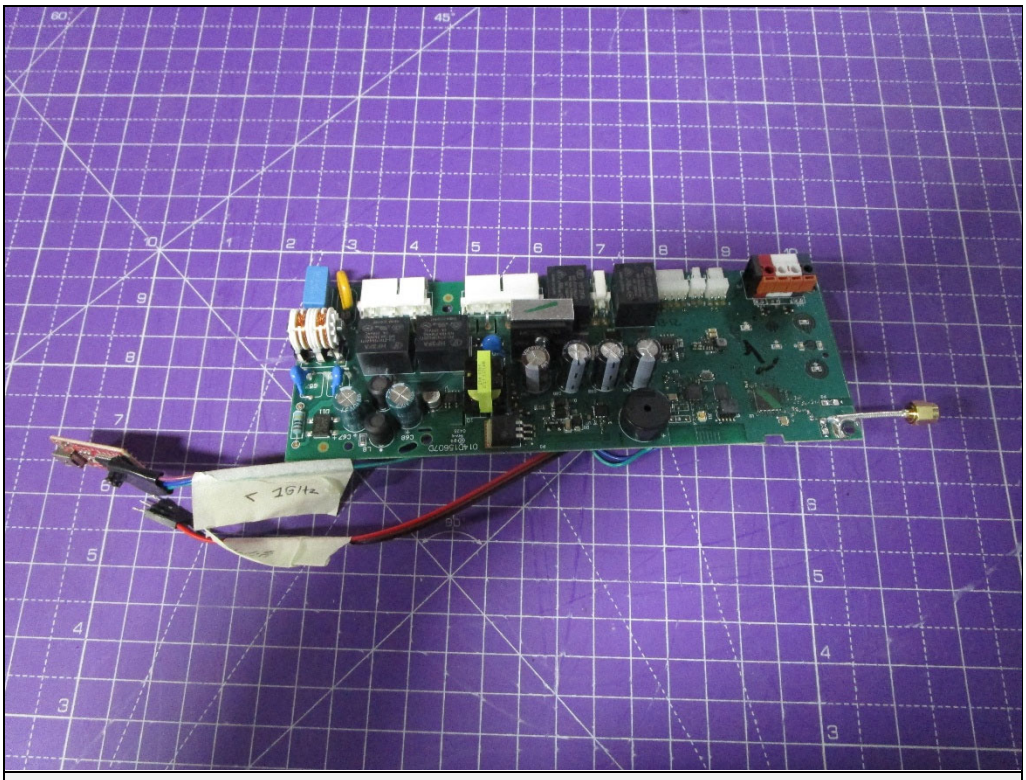
Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247; Innovation, Science, and Economic Development Canada, RSS-GEN; and Innovation, Science, and Economic Development Canada, RSS-247 test specifications. The data presented in this test report pertains to the EUTs as received by the customer on the test date specified. Any electrical or mechanical modifications made to the EUTs subsequent to the specified test date will serve to invalidate the data and void this certification.

## 17. Photographs of EUTs

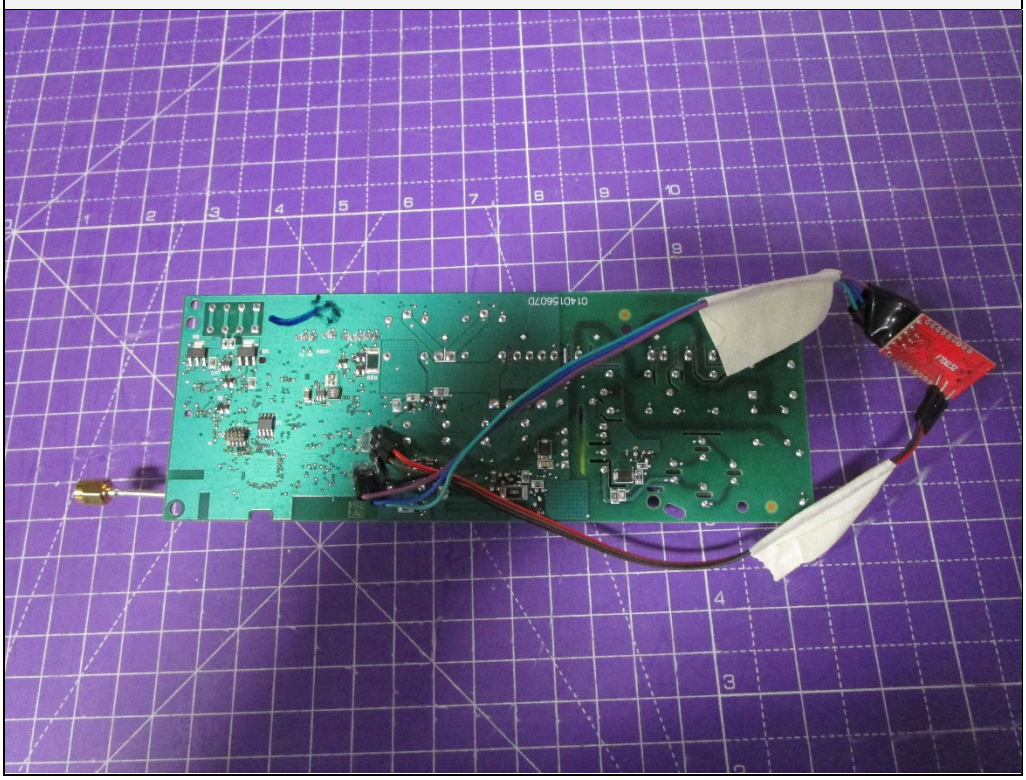



Radiated Sample





Conducted Sample



EUT 2200SA (above) and 2200M (below)

EUT C1000LA (above) and 2310M (below)

## 18. Equipment List

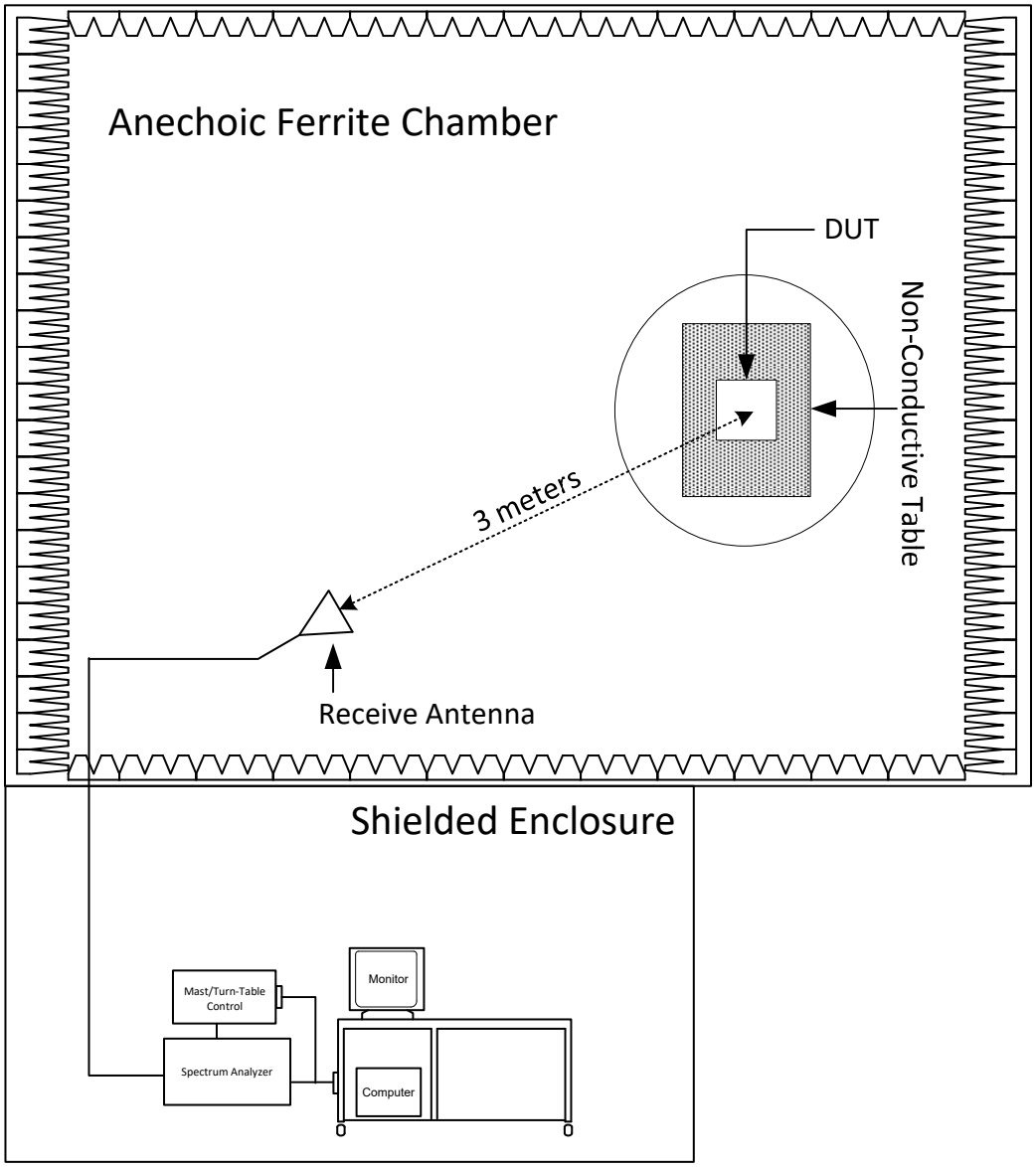
| Eq ID | Equipment Description | Manufacturer | Model No. | Serial No. | Frequency Range | Cal Date | Due Date |
|---|---|---|---|---|---|---|---|
| APW18 | PREAMPLIFER | PLANAR ELECTRONICS | PE2-30-20G20R6G-3R0-10-12-SFF | PL34312/2148 | 18-26.5GHz | 2/11/2025 | 2/11/2026 |
| APW3 | PREAMPLIFIER | PLANAR ELECTRONICS | PE2-35-120-5R0-10-12 | PL2924 | 1-20GHz | 3/24/2025 | 3/24/2026 |
| CDZ4 | LAB WORKSTATION | ELITE | LWS-10 | | WINDOWS 10 | CNR | |
| GSE3 | SIGNAL GENERATOR (40GHZ) | ROHDE & SCHWARZ | SMB100A | 183294 | 100KHZ-40GHZ | 3/23/2025 | 3/23/2027 |
| GSFB | OSP120 BASE UNIT | ROHDE & SCHWARZ | OSP120 | 101071 | --- | 3/30/2023 | 4/30/2025* |
| GSFE | OSP120 | ROHDE & SCHWARZ | OSP120 | 101288 | .01-40GHZ | 4/4/2023 | 4/30/2025* |
| NSDS1 | UNIVERSAL SPHERICAL DIPOLE SOURCE | AET | USDS-H | AET-1116 | | NOTE 1 | |
| NTA3 | BILOG ANTENNA | TESEQ | 6112D | 32853 | 25-2000MHz | 10/3/2024 | 10/3/2026 |
| NWN1 | DOUBLE RIDGED GUIDE ANTENNA | ETS LINDGREN | 3116C | 227802 | 10GHz-40GHz | 9/16/2024 | 9/16/2026 |
| NWQ2 | DOUBLE RIDGED WAVEGUIDE ANTENNA | ETS LINDGREN | 3117 | 66659 | 1GHZ-18GHZ | 4/26/2024 | 4/26/2026 |
| R21F | 3M ANECHOIC CHAMBER NSA | EMC TEST SYSTEMS | 3M ANECHOIC | | 30MHZ-18GHZ | 3/1/2025 | 3/1/2026 |
| RBG3 | EMI ANALYZER | ROHDE & SCHWARZ | ESW44 | 101592 | 2HZ-44GHZ | 5/4/2025 | 5/4/2026 |
| RBG4 | EMI ANALYZER | ROHDE & SCHWARZ | ESW44 | 103007 | 2HZ-44GHZ | 4/5/2025 | 4/5/2026 |
| SHC2 | Power Supplies | HENGFU | HF60W-SL-24 | A11372702 | 24V | NOTE 1 | |
| T2S2 | 20DB 25W ATTENUATOR | WEINSCHEL | 46-20-34 | BV3540 | DC-18GHZ | 12/19/2023 | 12/19/2025 |
| T6A3 | 6DB, 2W ATTENUATOR | KEYSIGHT TECHNOLOGIES | 8491B | MY39269623 | DC-18GHZ | 3/6/2025 | 3/6/2027 |
| WKA1 | SOFTWARE, UNIVERSAL RCV EMI | ELITE | UNIV_RCV_EMI | 1 | --- | I/O | |

N/A: Not Applicable I/O: Initial Only CNR: Calibration Not Required

NOTE 1: For the purpose of this test, the equipment was calibrated over the specified frequency range, pulse rate, or modulation prior to the test or monitored by a calibrated instrument.

Note*: The test including this equipment was run on 3/10/2025 before the calibration expired. This equipment is undergoing calibration and does not have an updated calibration date.

## 19. Block Diagram of Test Setup




Radiated Measurements Test Setup

# 20. 6dB Bandwidth

| EUT Information | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| Product | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2402MHz<br>BLE @ 2440MHz<br>BLE @ 2480MHz |

| 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 |

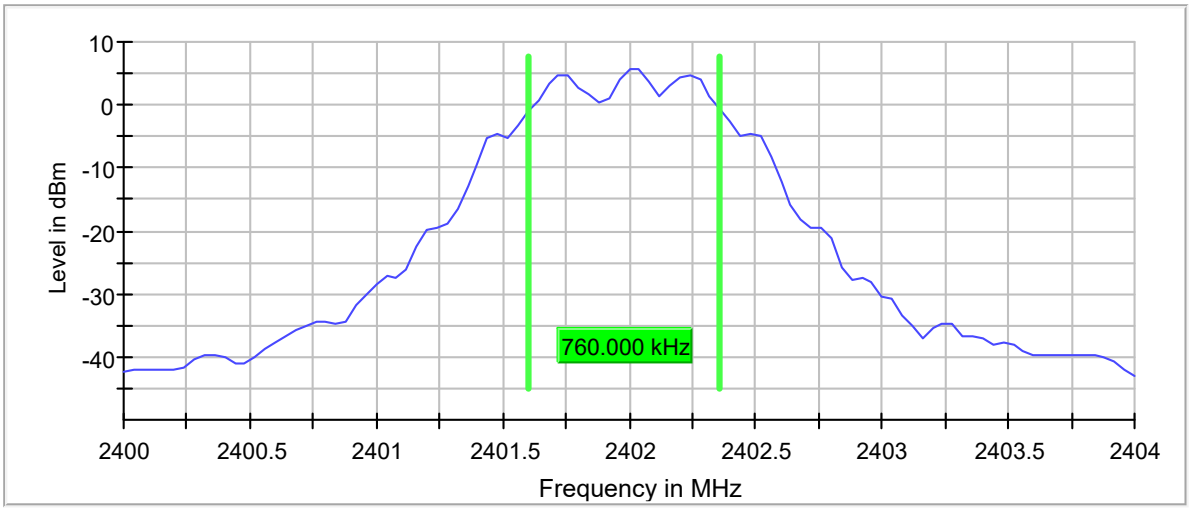
| Measurement Uncertainty | |
|---|---|
| Measurement Type | Expanded Measurement Uncertainty |
| Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz) | 4.3 |
| Radiated disturbance (electric field strength on an open area test site or 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.<br><br>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.<br><br>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. |

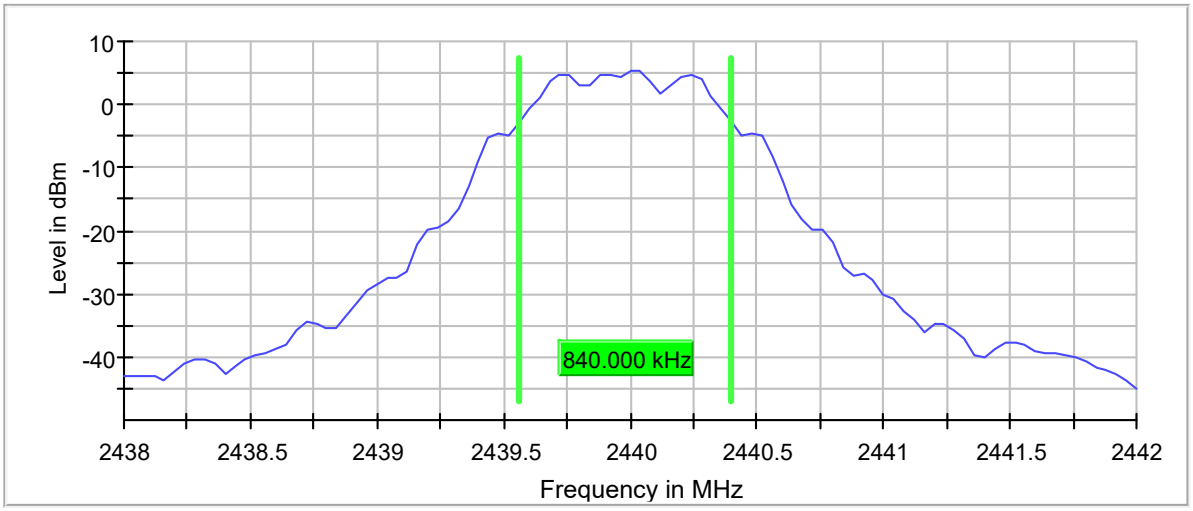
| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2402MHz |
| Frequency Tested | 2402MHz |
| Result | 6dB BW = 760kHz |
| Notes | None |

6 dB Bandwidth



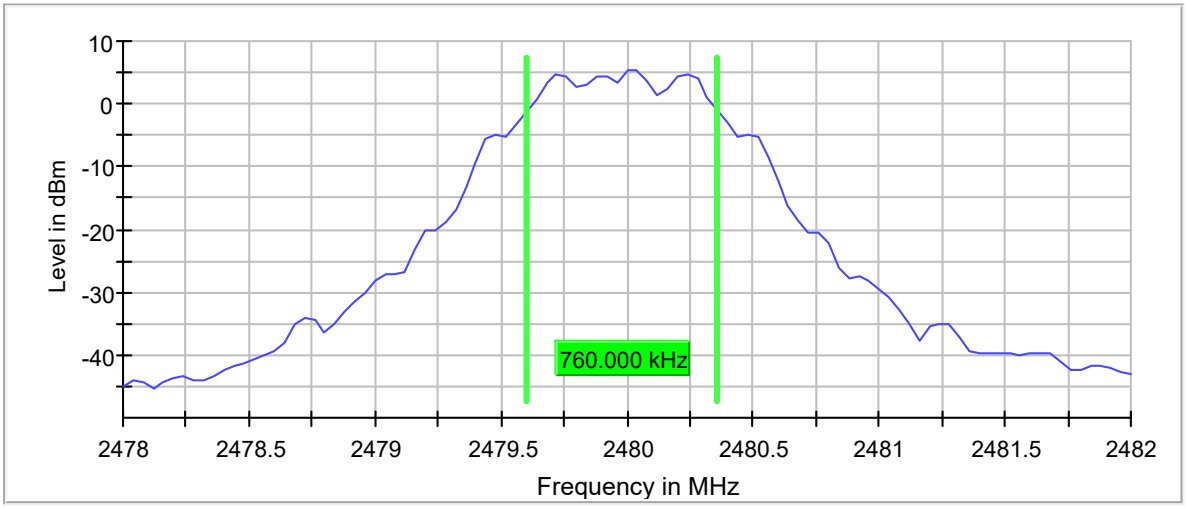
| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2440MHz |
| Frequency Tested | 2440MHz |
| Result | 6dB BW = 840kHz |
| Notes | None |

6 dB Bandwidth



| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Result | 6dB BW = 760kHz |
| Notes | None |

6 dB Bandwidth



# 21. Occupied Bandwidth (99%)

| EUT Information | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| Product | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2402MHz<br>BLE @ 2440MHz<br>BLE @ 2480MHz |

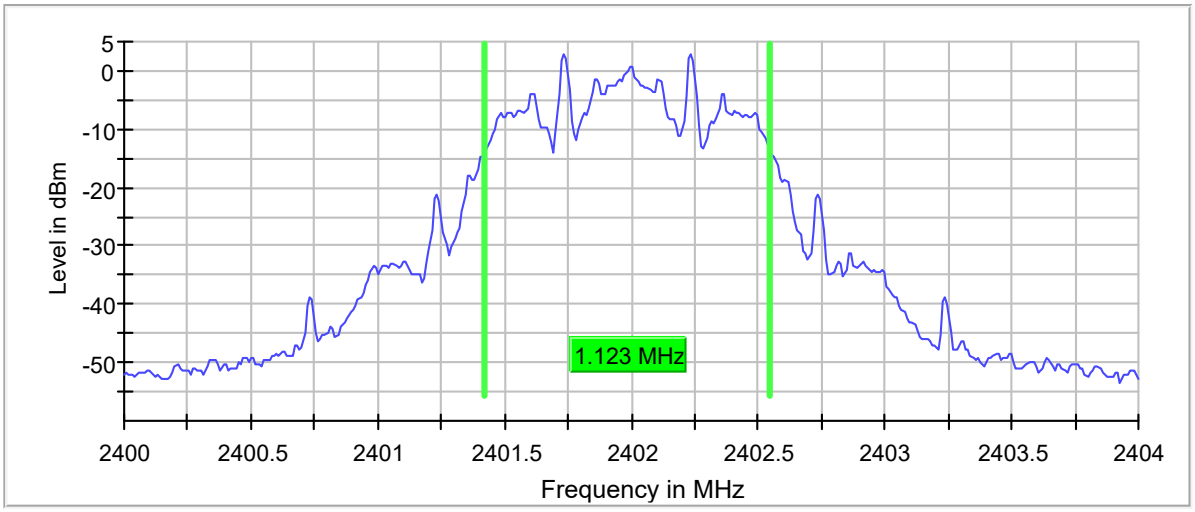
| Test Setup Details | |
|---|---|
| Setup Format | Tabletop |
| Height of Support | N/A |
| Measurement Method | Antenna Conducted |
| Type of Test Site | Tabletop |
| Test Site Used | Elite Workbench |
| Type of Antennas Used | N/a |
| Notes | None |

| 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.<br><br>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.<br><br>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. |

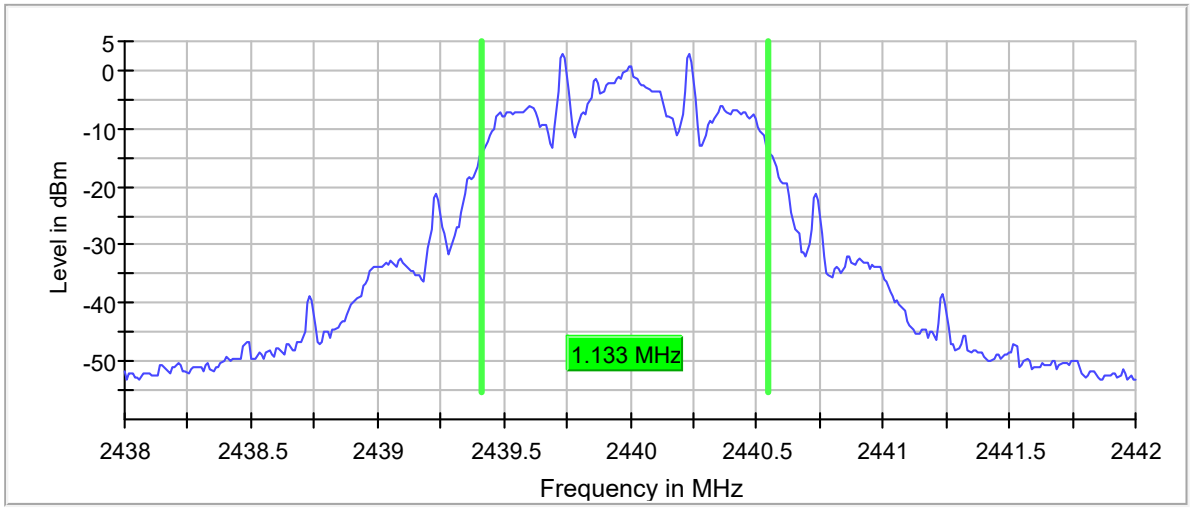
| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2402MHz |
| Frequency Tested | 2402MHz |
| Result | OBW = 1.123MHz |
| Notes | None |

99 % Bandwidth



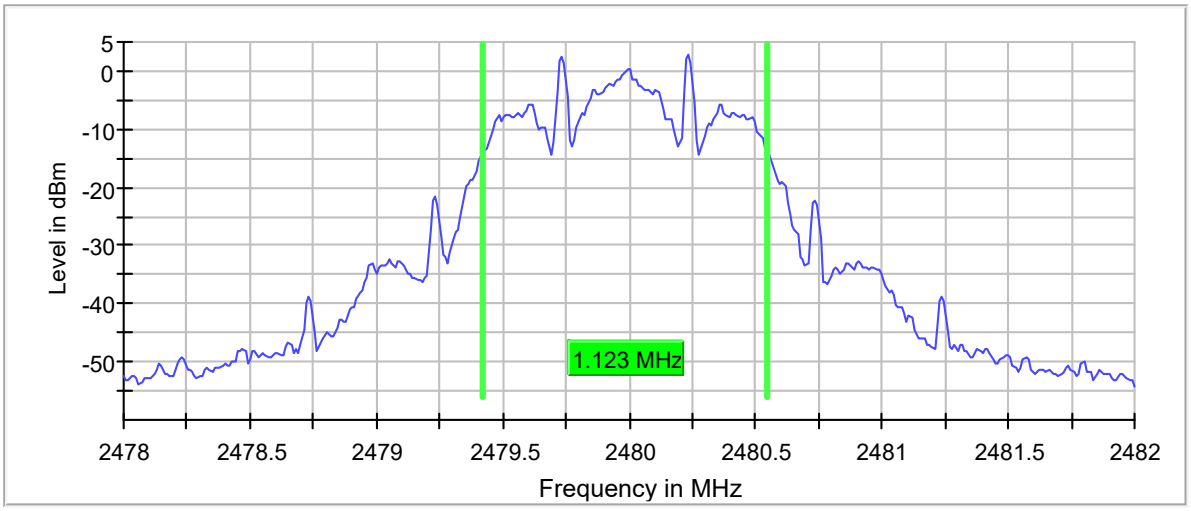
| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2440MHz |
| Frequency Tested | 2440MHz |
| Result | OBW = 1.133MHz |
| Notes | None |

99 % Bandwidth



| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Result | OBW = 1.123MHz |
| Notes | None |

99 % Bandwidth



# 22. Maximum Peak Conducted Output Power

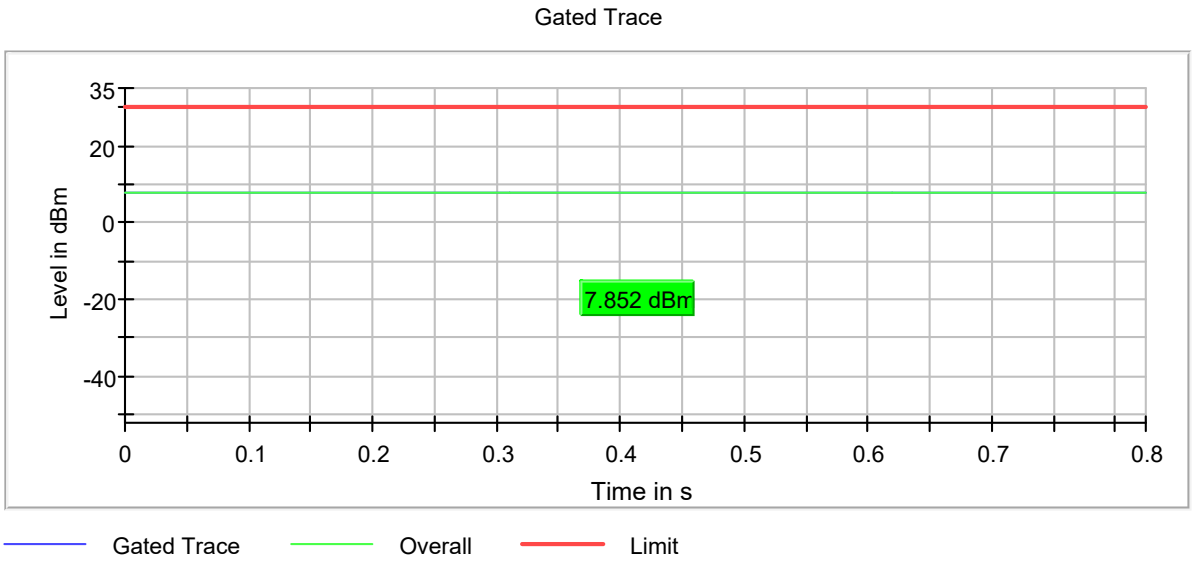
| EUT Information | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| Product | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2402MHz<br>BLE @ 2440MHz<br>BLE @ 2480MHz |

| 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 |

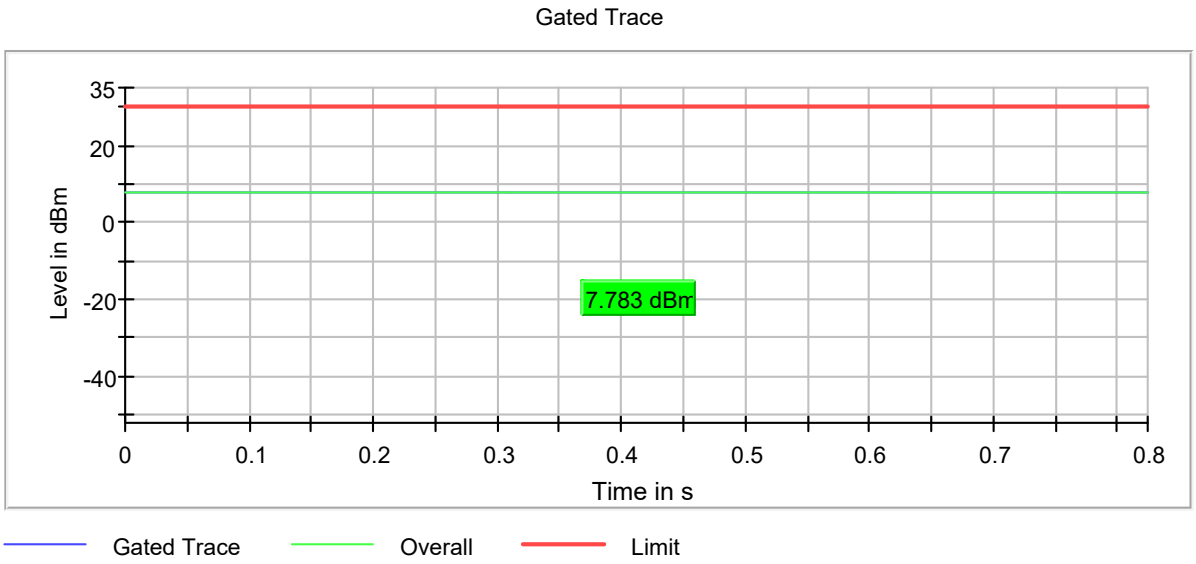
| Requirements |
|---|
| The output power shall not exceed 1W (30dBm). |

| 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. |

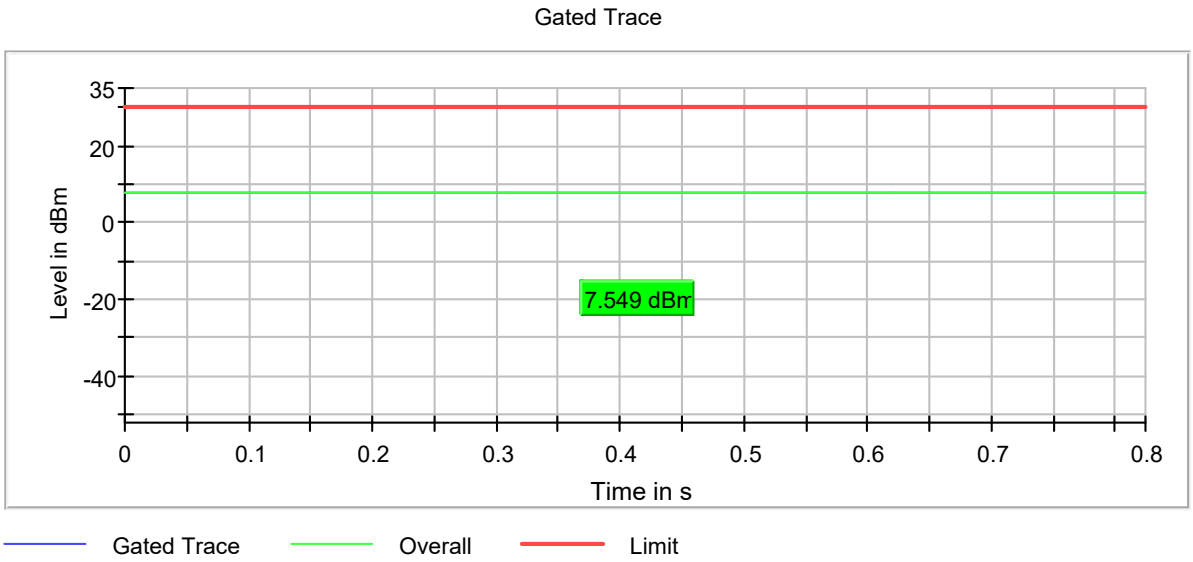
| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2402MHz |
| Frequency Tested | 2402MHz |
| Result | Output Power = 6.1mW (7.852dBm) |
| Notes | None |



| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2440MHz |
| Frequency Tested | 2440MHz |
| Result | Output Power = 6mW (7.783dBm) |
| Notes | None |



| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Result | Output Power = 5.69mW (7.549dBm) |
| Notes | None |



# 23. Effective Isotropic Radiated Power (EIRP)

| EUT Information | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| Product | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11<br>2200SA<br>2200M<br>C1000LA<br>2310M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2402MHz<br>BLE @ 2440MHz<br>BLE @ 2480MHz |

| Test Setup Details | |
|---|---|
| Setup Format | Tabletop |
| Measurement Method | Radiated |
| Type of Test Site | Semi-Anechoic Chamber |
| Test Site Used | Room 21 |
| Type of Antennas Used | Below 1GHz: Bilog (or equivalent)<br>Above 1GHz: 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.<br><br>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 | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2402MHz<br>BLE @ 2440MHz<br>BLE @ 2480MHz |
| Result | Max EIRP = 21.4mW (13.3dBm) |
| 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 | 71.1 | 9.8 | 5.3 | 2.7 | 12.3 | 36.0 | -23.7 |
| | V | 68.8 | 7.7 | 5.3 | 2.7 | 10.2 | 36.0 | -25.8 |
| 2440.00 | H | 69.5 | 8.0 | 5.2 | 2.8 | 10.4 | 36.0 | -25.6 |
| | V | 65.4 | 4.1 | 5.2 | 2.8 | 6.5 | 36.0 | -29.5 |
| 2480.00 | H | 71.8 | 10.9 | 5.2 | 2.8 | 13.3 | 36.0 | -22.7 |
| | V | 66.9 | 6.1 | 5.2 | 2.8 | 8.5 | 36.0 | -27.5 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2200SA |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Result | Max EIRP = 11.5mW (10.6dBm) |

| 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) |
|---|---|---|---|---|---|---|---|---|
| 2480.00 | H | 70.2 | 8.3 | 5.2 | 2.8 | 10.6 | 36.0 | -25.4 |
| | V | 67.9 | 6.3 | 5.2 | 2.8 | 8.7 | 36.0 | -27.3 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2200M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Result | Max EIRP = 16.2mW (12.1dBm) |

| 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) |
|---|---|---|---|---|---|---|---|---|
| 2480.00 | H | 71.7 | 9.8 | 5.2 | 2.8 | 12.1 | 36.0 | -23.9 |
| | V | 66.1 | 4.5 | 5.2 | 2.8 | 6.8 | 36.0 | -29.2 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | C1000LA |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Result | Max EIRP = 8.7mW (9.4dBm) |

| 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) |
|---|---|---|---|---|---|---|---|---|
| 2480.00 | H | 69.0 | 7.0 | 5.2 | 2.8 | 9.4 | 36.0 | -26.6 |
| | V | 65.7 | 4.2 | 5.2 | 2.8 | 6.5 | 36.0 | -29.5 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2310M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Result | Max EIRP = 14.1mW (11.5dBm) |

| 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) |
|---|---|---|---|---|---|---|---|---|
| 2480.00 | H | 71.1 | 9.1 | 5.2 | 2.8 | 11.5 | 36.0 | -24.5 |
| | V | 67.9 | 6.3 | 5.2 | 2.8 | 8.6 | 36.0 | -27.4 |

# 24. Duty Cycle Factor Measurements

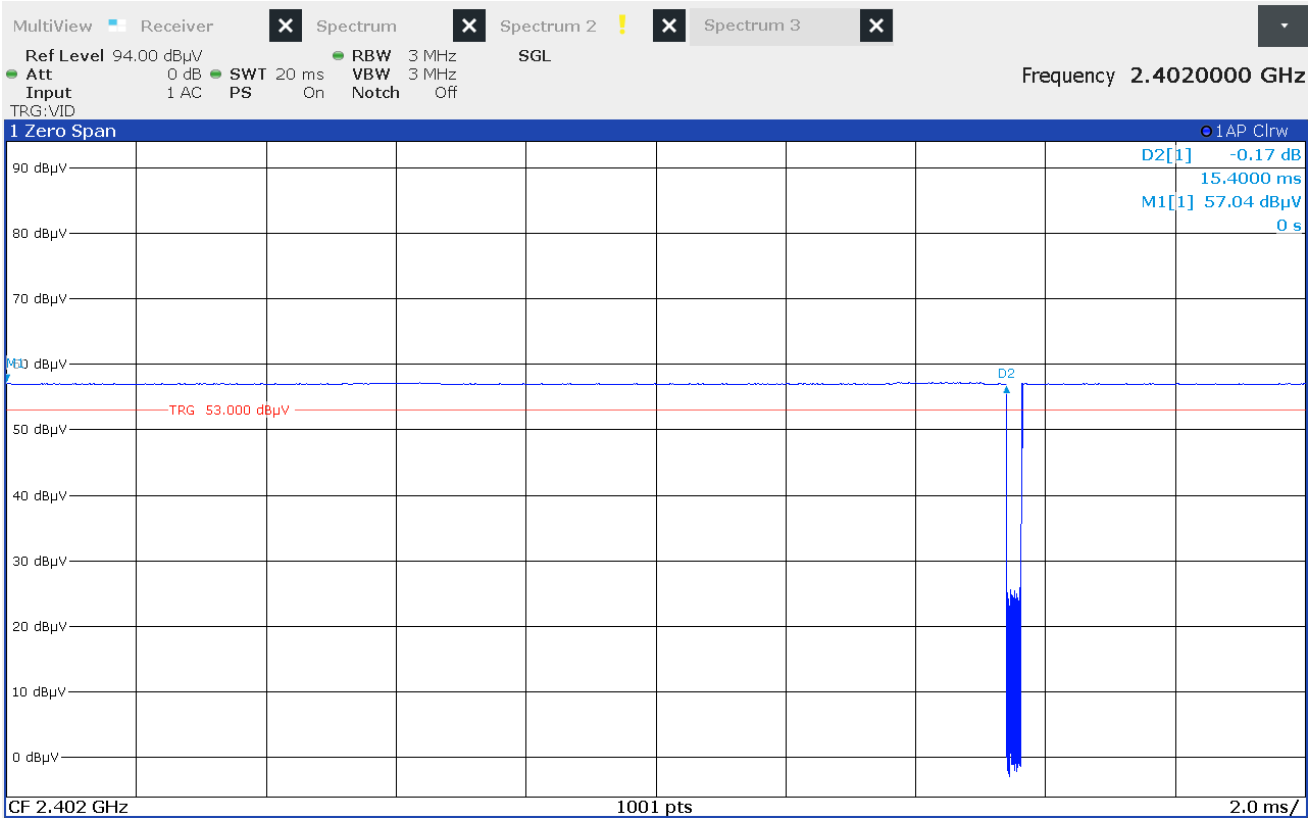
| EUT Information | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| Product | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11<br>2200SA<br>2200M<br>C1000LA<br>2310M |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2402MHz |

| Test Setup Details | |
|---|---|
| Setup Format | Tabletop |
| Measurement Method | Antenna Conducted |
| Type of Test Site | Elite Test Bench |
| Type of Antennas Used | Double-Ridged Waveguide (or equivalent) |
| Notes | None |

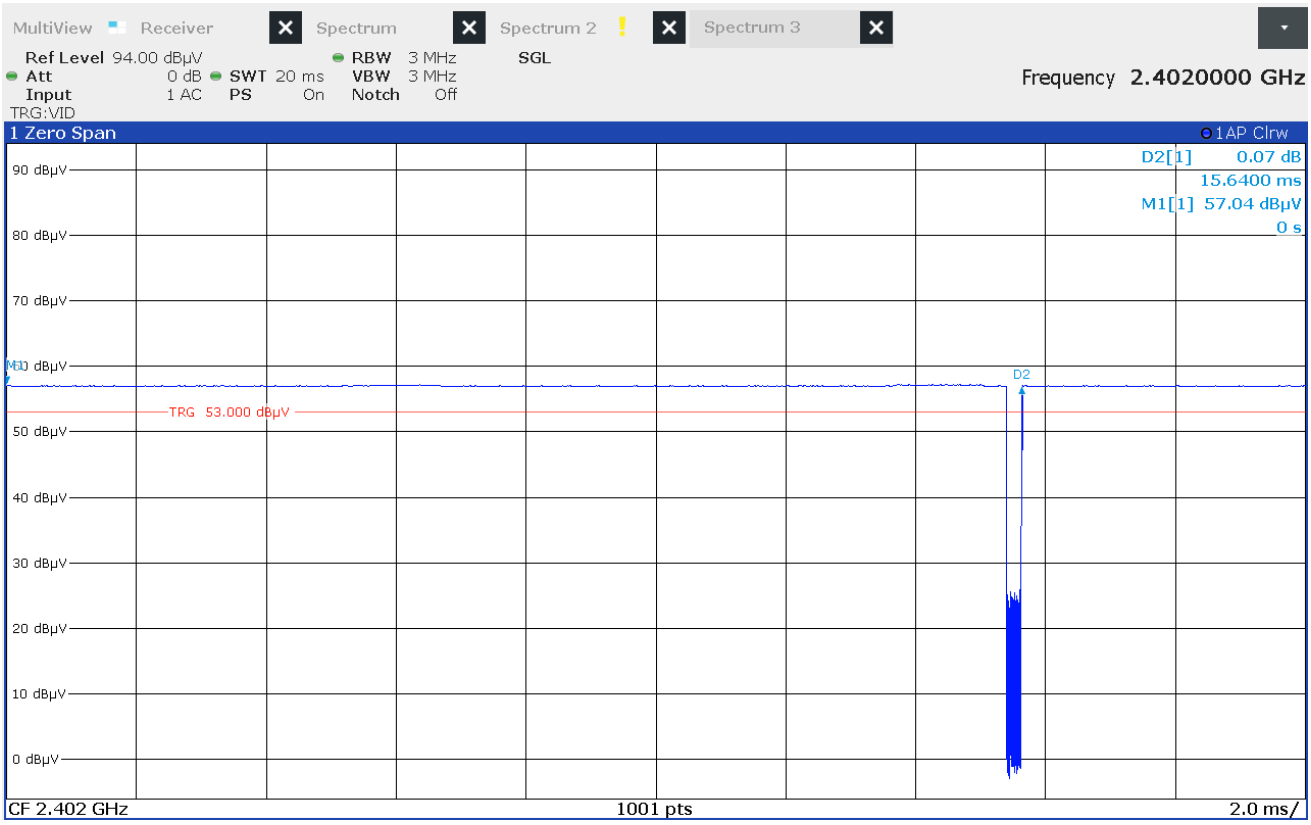
| Measurement Uncertainty | |
|---|---|
| Measurement Type | Expanded Measurement Uncertainty |
| Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz) | 4.3 |
| Radiated disturbance (electric field strength on an open area test site or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

| Procedure |
|---|
| The duty cycle factor is used to convert peak detected readings to average readings when pulsed modulation is employed. This factor is computed from the time domain trace of the pulse modulation signal.<br><br>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 2msec/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.<br><br>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.<br><br>The duty cycle is then computed as $\left(\frac{On\ Time}{Word\ Period}\right)$, where $Word\ Period\ =\ 100ms$. |

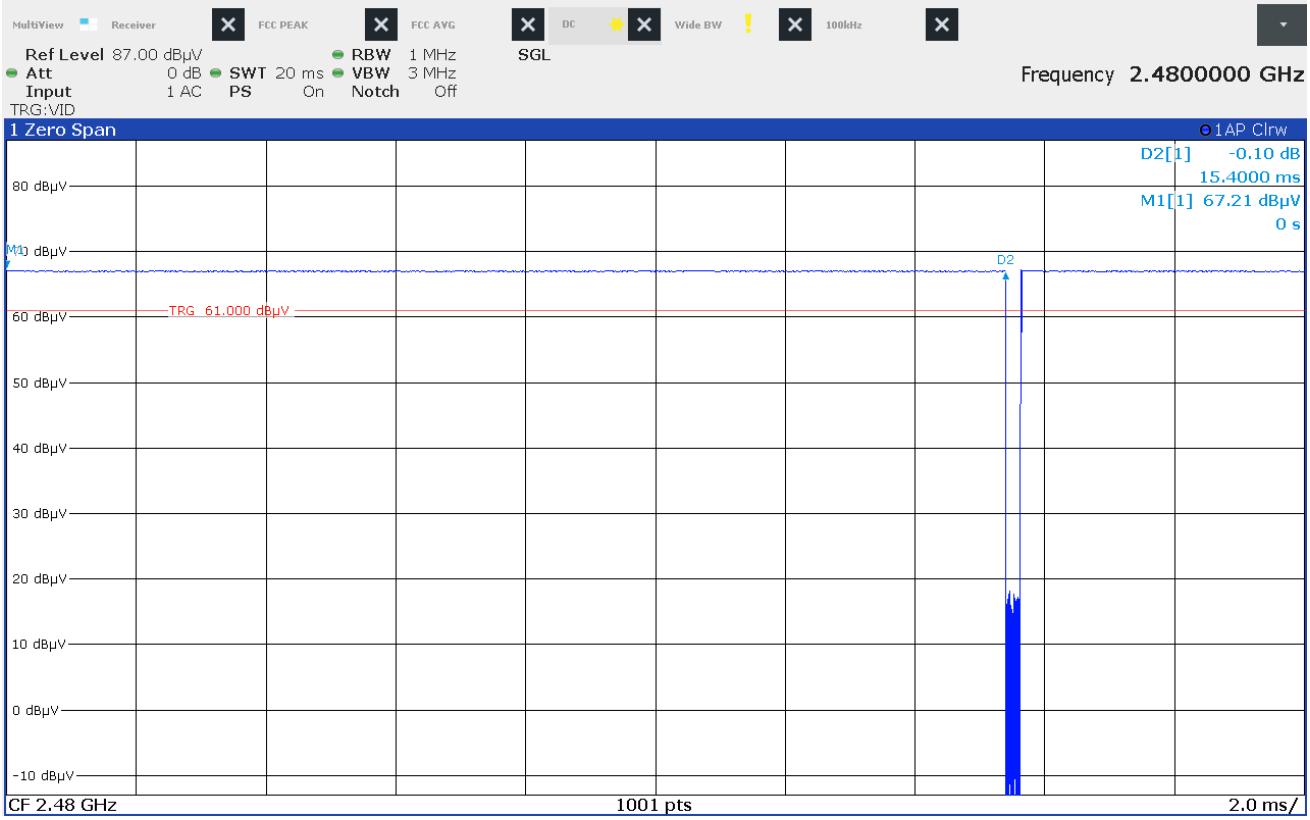
| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2402MHz |
| Frequency Tested | 2402MHz |
| Result | On Time = 15.4ms |
| Notes | None |



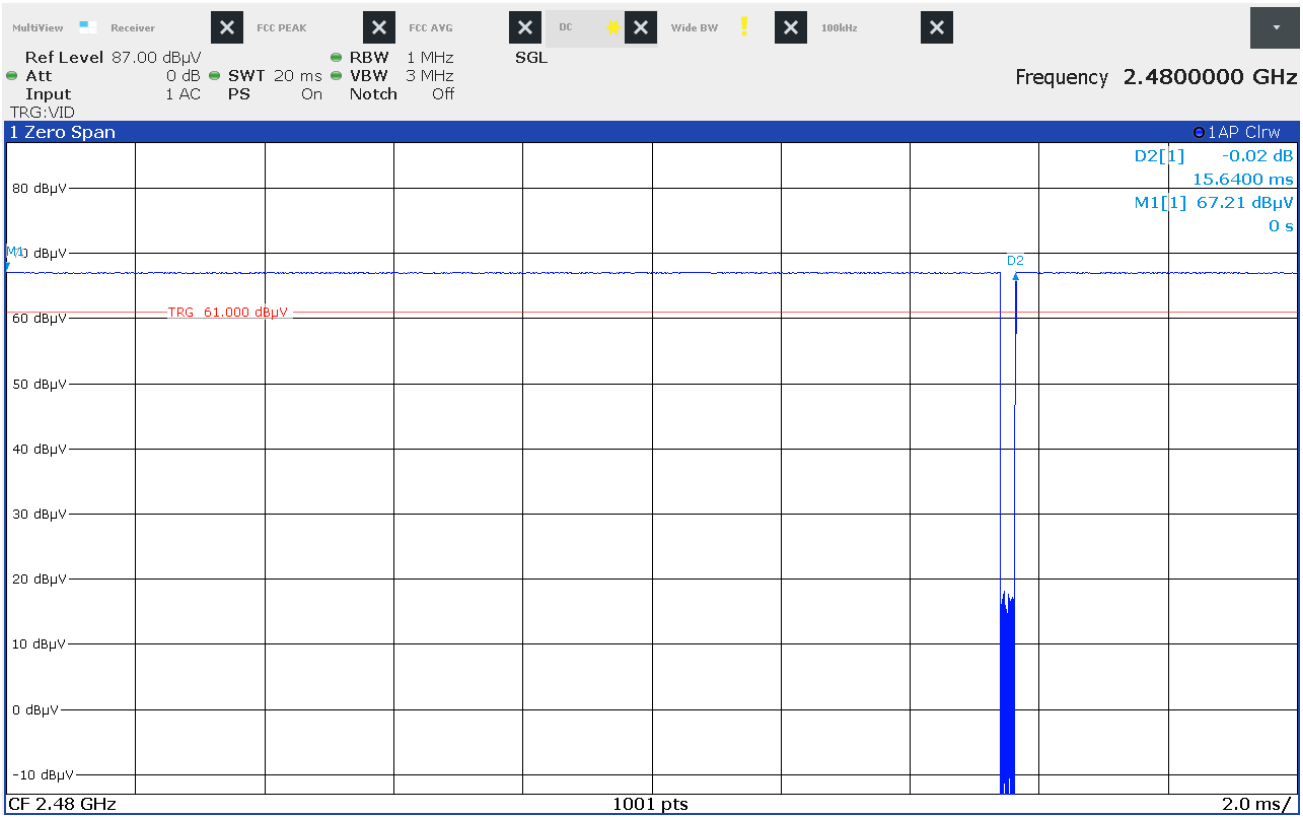
| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2402MHz |
| Frequency Tested | 2402MHz |
| Result | Word = 15.64<br>Duty Cycle Correction Factor= 0.134dB |
| Notes | Duty Cycle Factor Calculation:<br>$\text{Duty Cycle Factor} = -20\log\left(\frac{15.4\text{ms}}{15.64\text{ms}}\right) = 0.134dB$ |



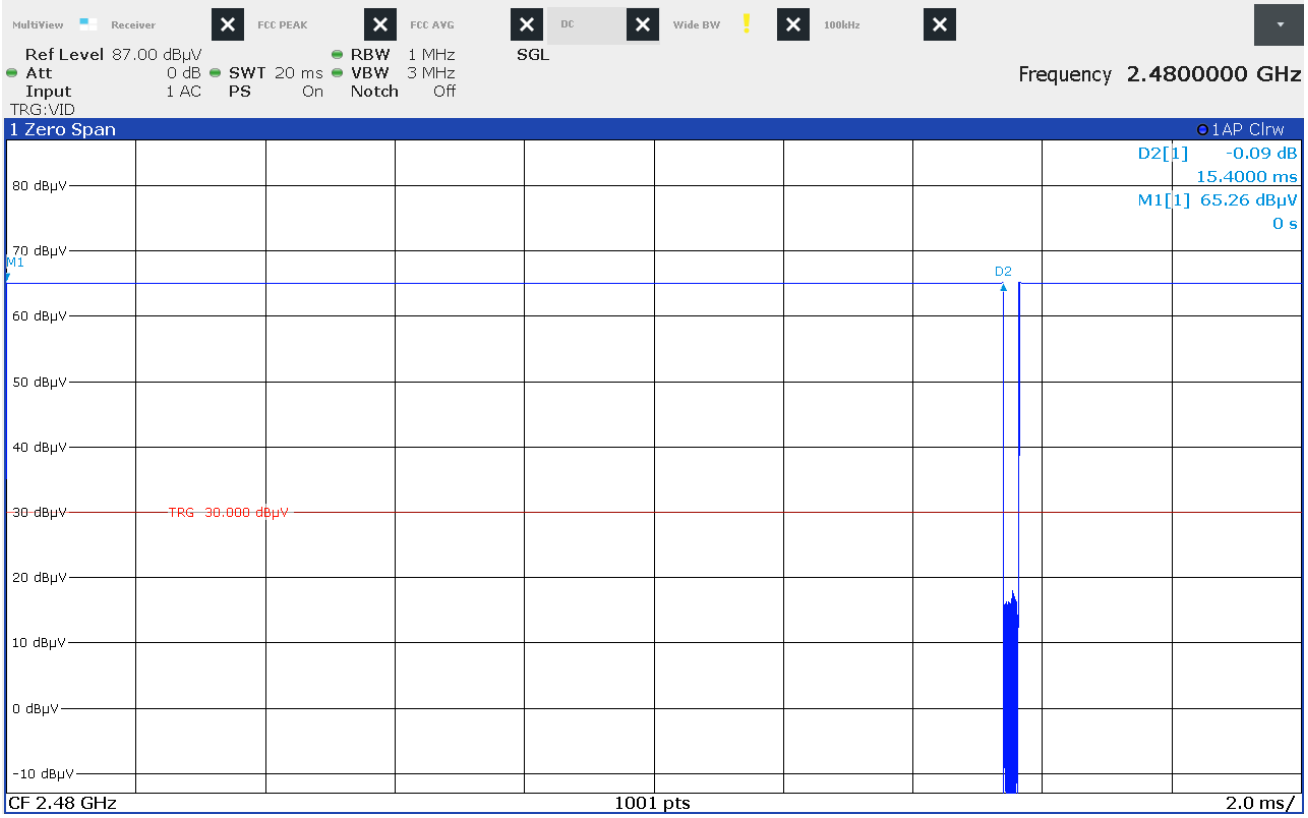
| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2200SA |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Result | On Time = 15.4us |



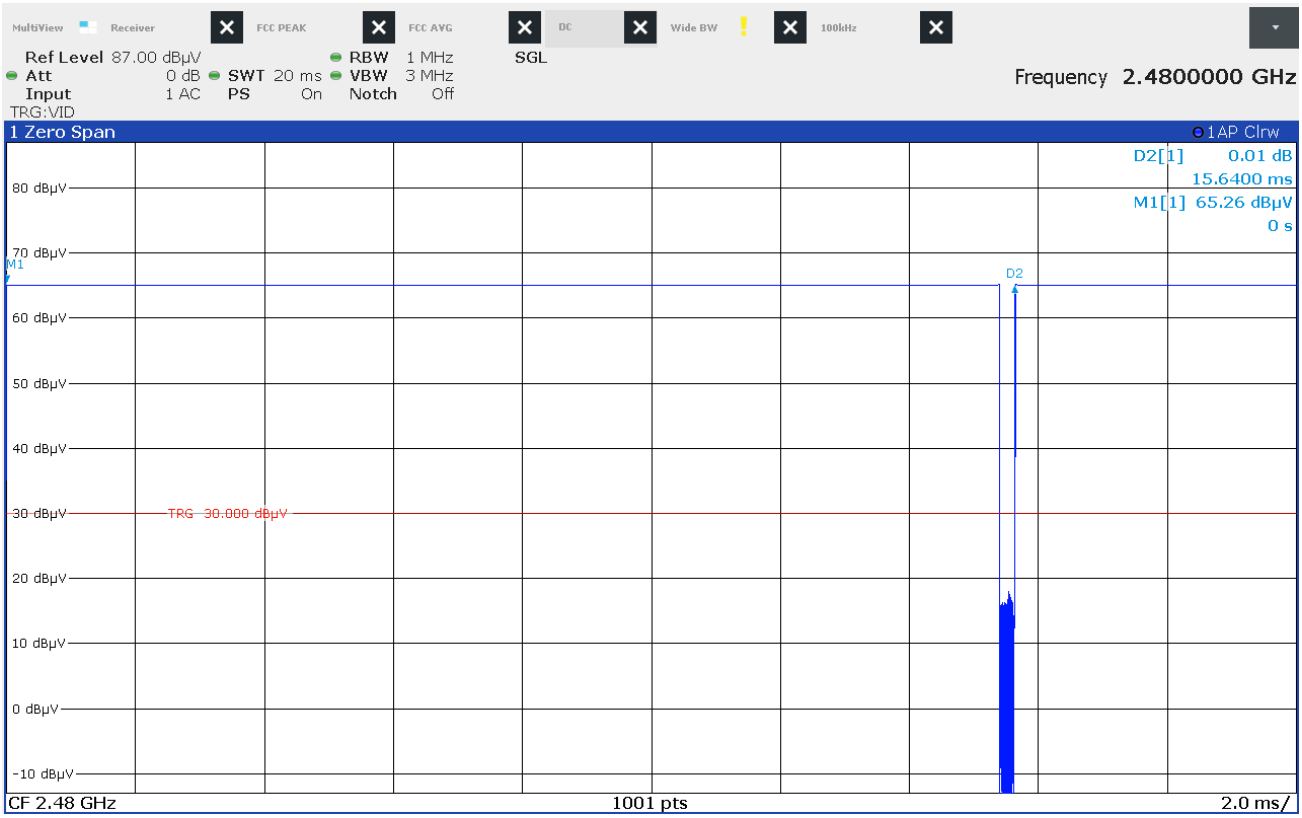
| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2200SA |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Result | Word = 15.64<br>Duty Cycle Correction Factor= 0.134dB |
| Notes | Duty Cycle Factor Calculation:<br>$\text{Duty Cycle Factor} = -20\log\left(\frac{15.4\text{ms}}{15.64\text{ms}}\right) = 0.134dB$ |



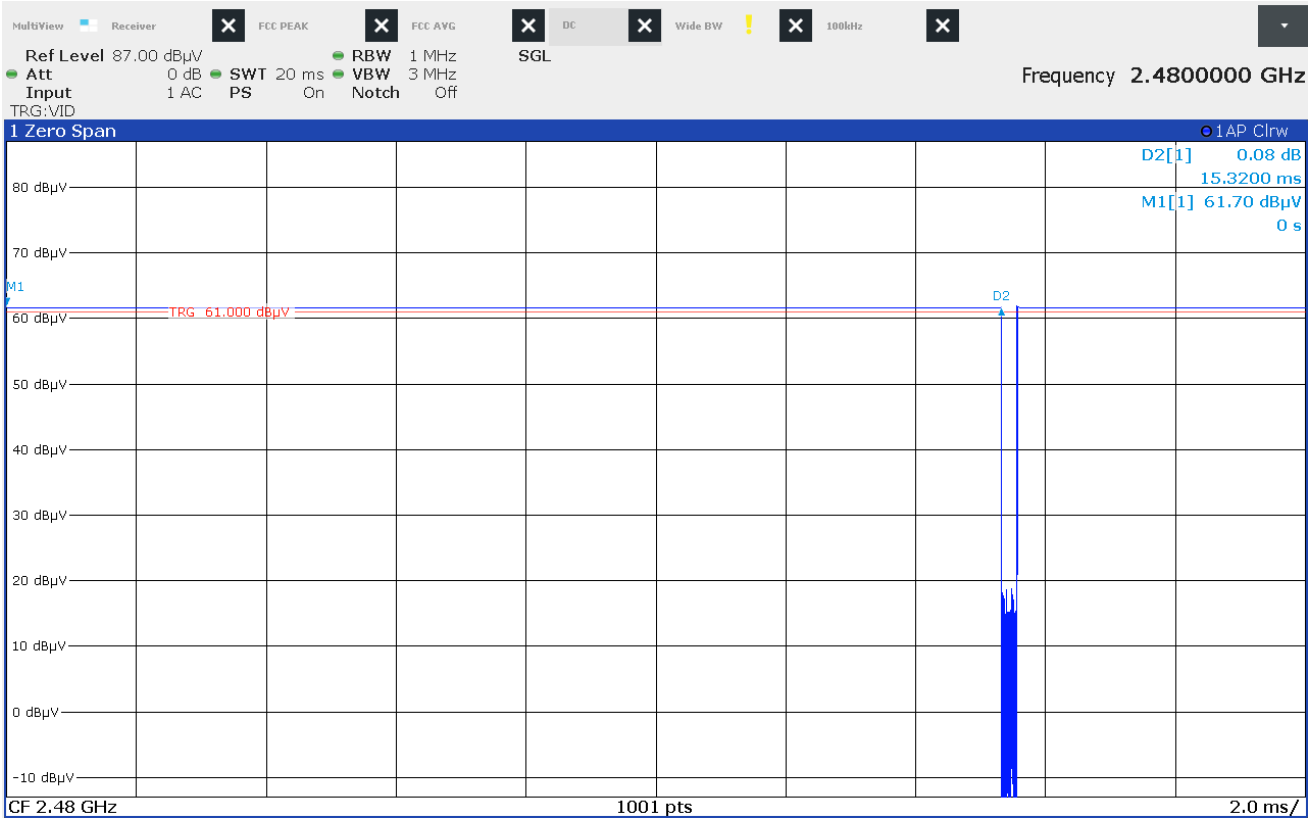
| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2200M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Result | On Time = 15.4us |



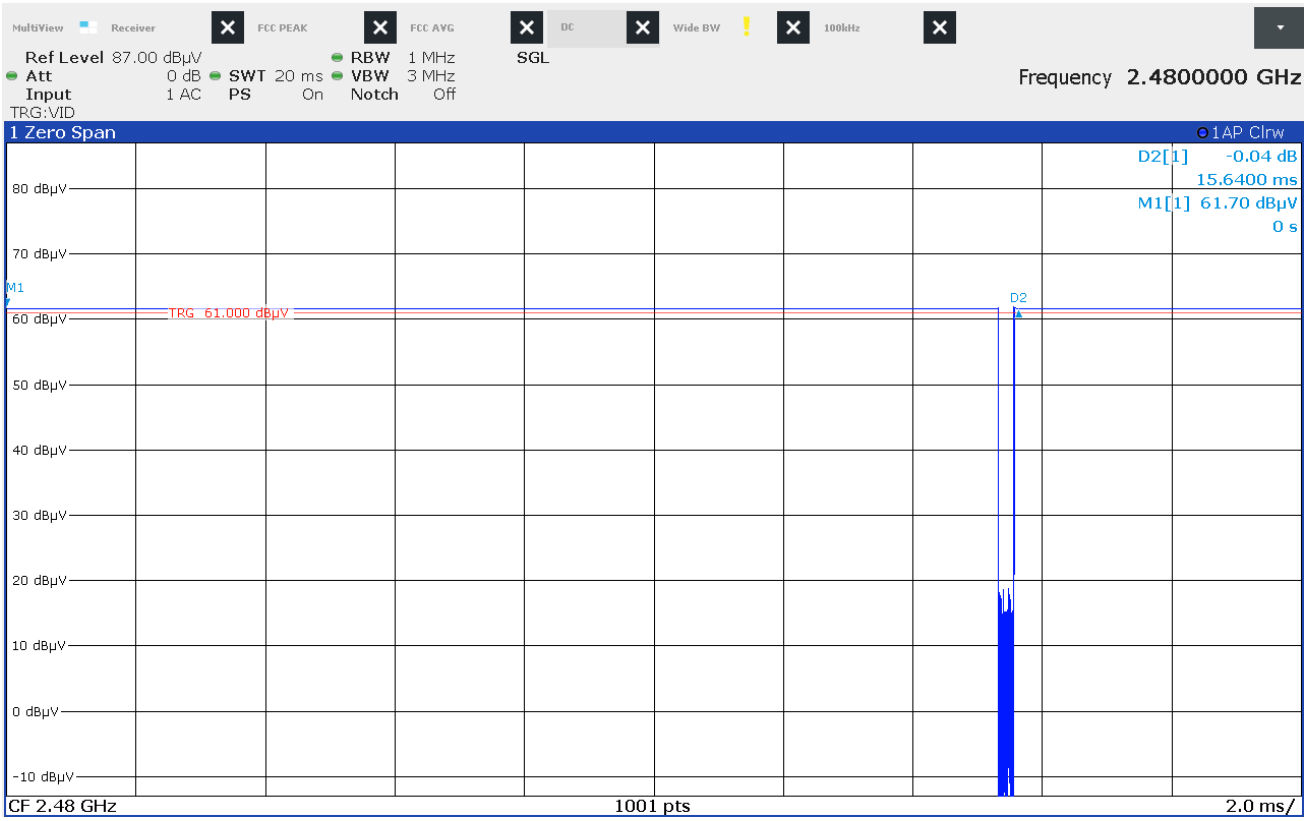
| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2200M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Result | Word = 15.64<br>Duty Cycle Correction Factor= 0.134dB |
| Notes | Duty Cycle Factor Calculation:<br>$\text{Duty Cycle Factor} = -20\log\left(\frac{15.4\text{ms}}{15.64\text{ms}}\right) = 0.134dB$ |



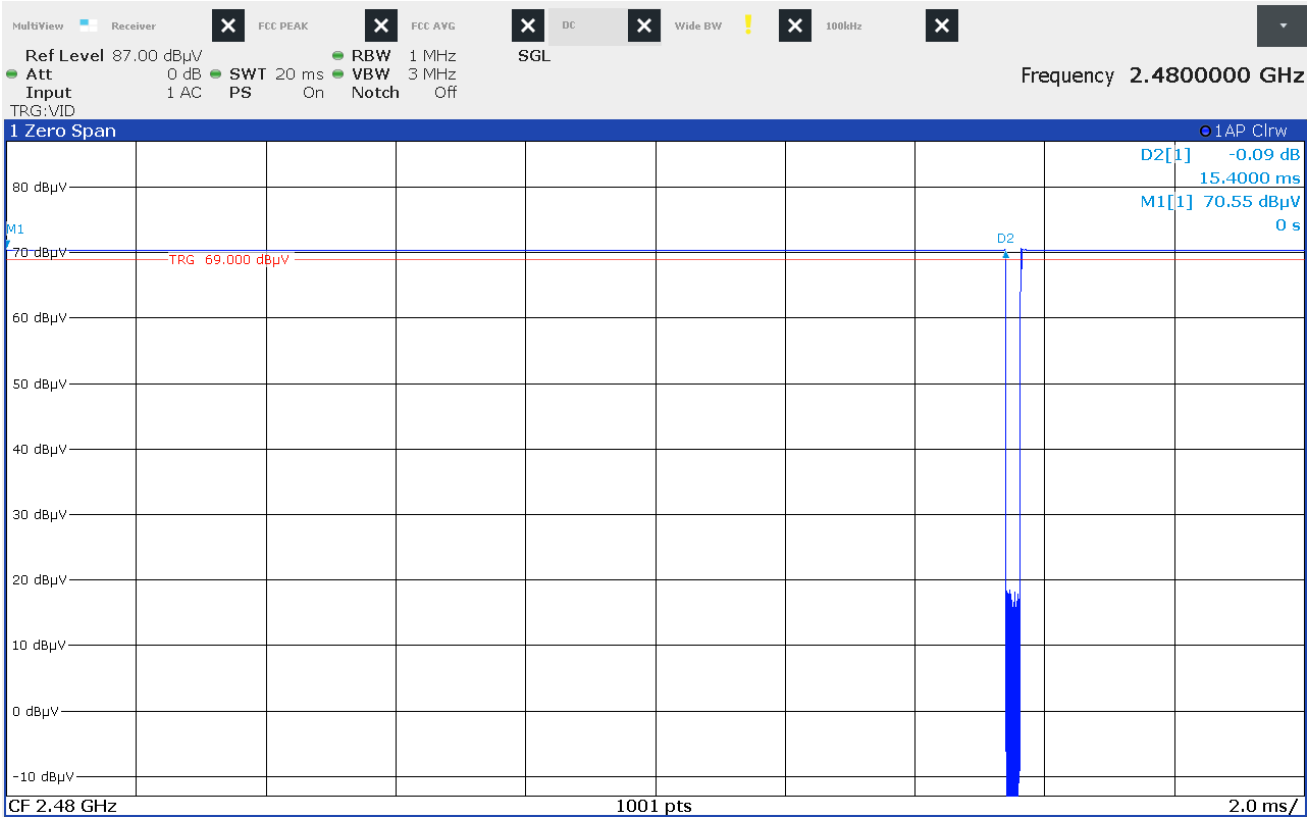
| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | C1000LA |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Result | On Time = 15.4us |



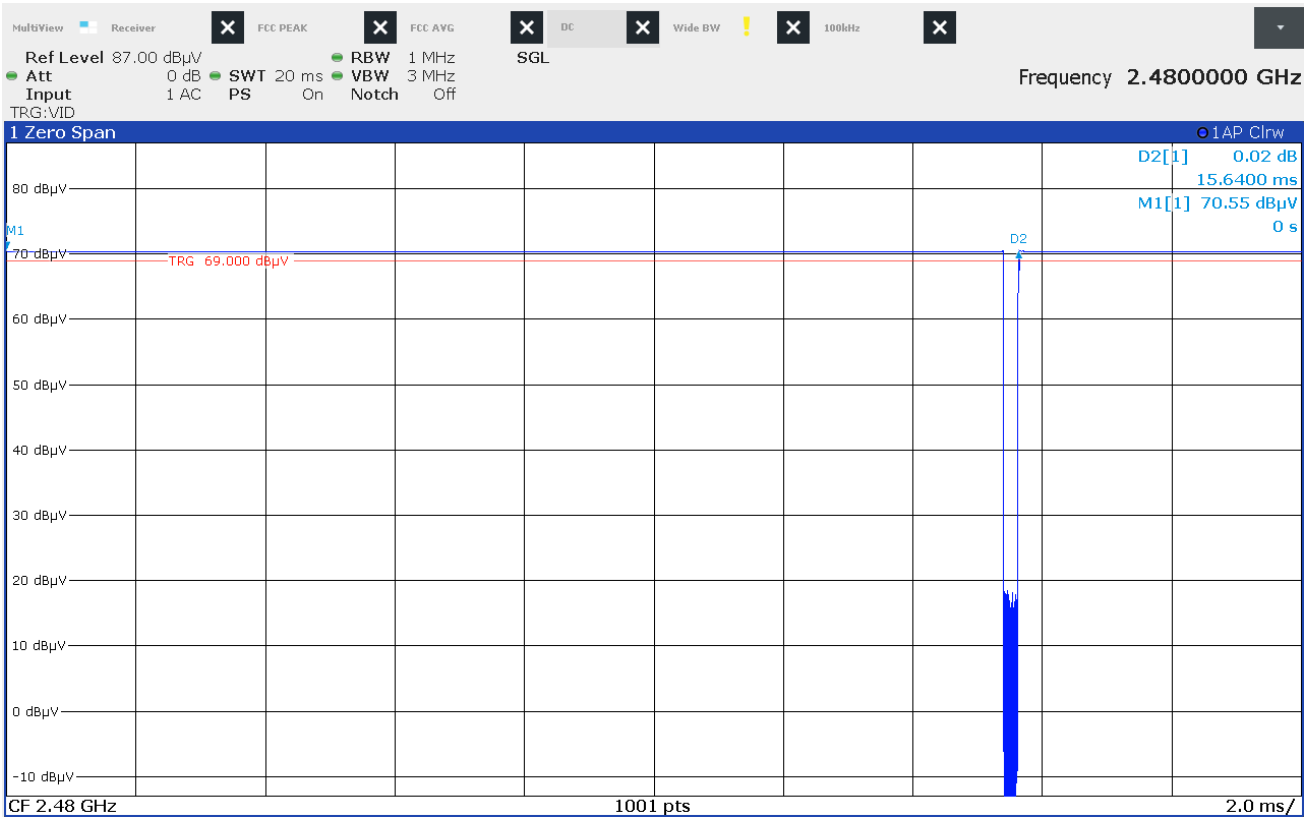
| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | C1000LA |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Result | Word = 15.64<br>Duty Cycle Correction Factor= 0.134dB |
| Notes | Duty Cycle Factor Calculation:<br>$\text{Duty Cycle Factor} = -20\log\left(\frac{15.4\text{ms}}{15.64\text{ms}}\right) = 0.134dB$ |



| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2310M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Result | On Time = 15.4us |



| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2310M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Result | Word = 15.64<br>Duty Cycle Correction Factor= 0.134dB |
| Notes | Duty Cycle Factor Calculation:<br>$\text{Duty Cycle Factor} = -20\log\left(\frac{15.4\text{ms}}{15.64\text{ms}}\right) = 0.134dB$ |



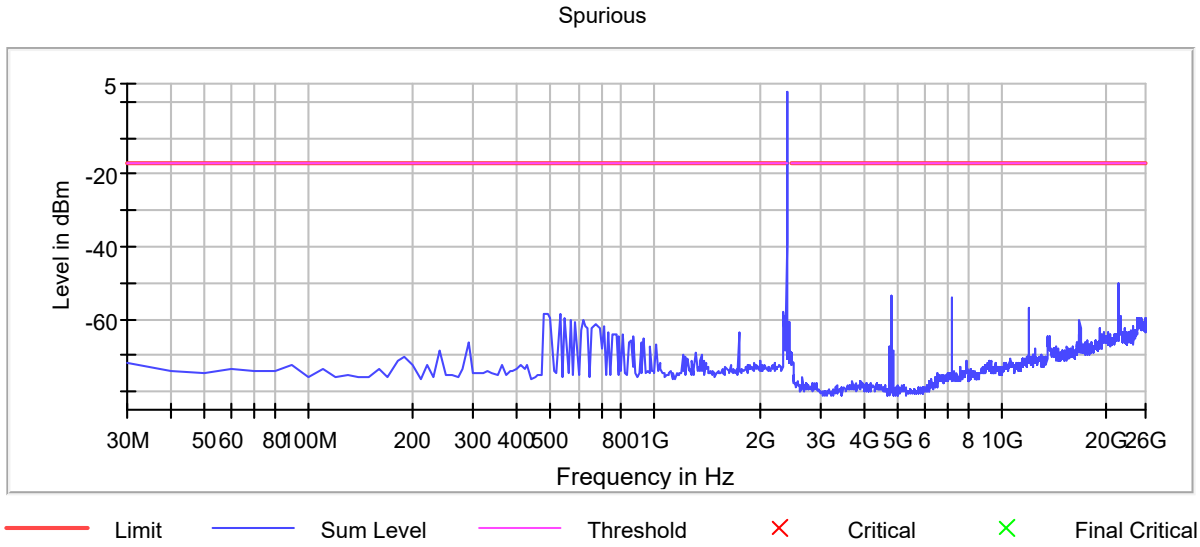
# 25. Antenna Conducted Spurious Emissions

| EUT Information | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| Product | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2402MHz<br>BLE @ 2440MHz<br>BLE @ 2480MHz |

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

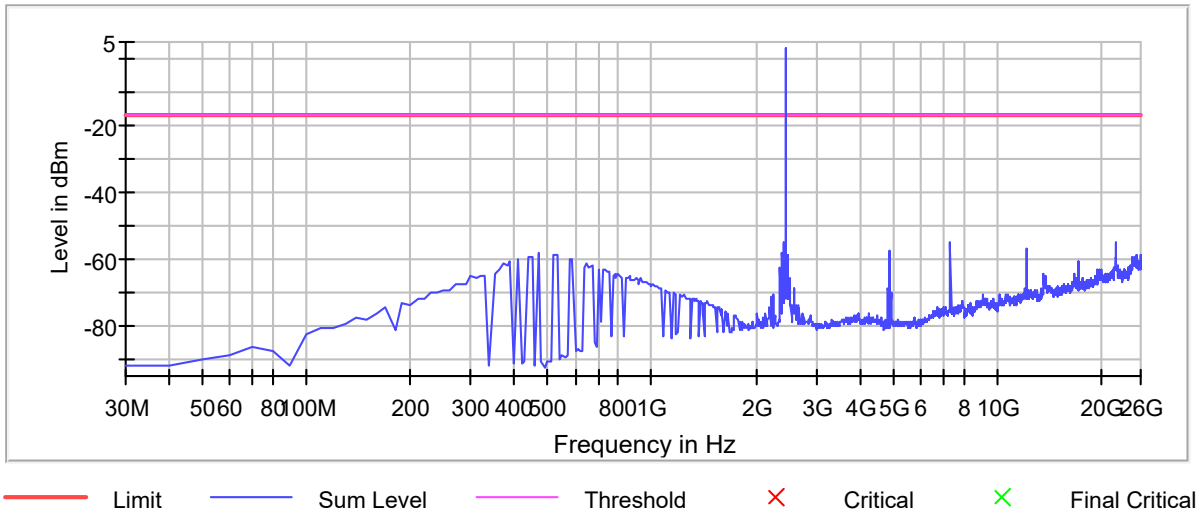
| Procedure |
|---|
| The antenna port of the EUT was connected to the spectrum analyzer through an R&S OSP120 RF control and switch. The resolution bandwidth (RBW) was set to 100kHz. The peak detector and 'Max-Hold' function were engaged. The emissions in the frequency range from 30MHz to 26GHz were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

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2402MHz |
| Frequency Tested | 2402MHz |
| Result | Compliant |
| Notes | None |



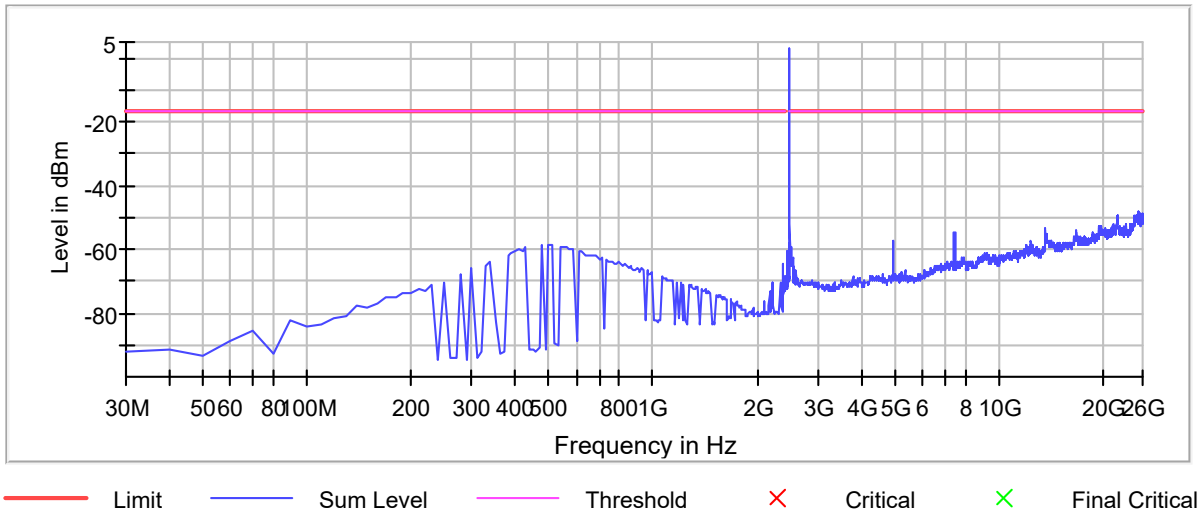
| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2440MHz |
| Frequency Tested | 2440MHz |
| Result | Compliant |
| Notes | None |

Spurious



| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Result | Compliant |
| Notes | None |

Spurious



# 26. Case Spurious Radiated Emissions

| EUT Information | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| Product | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11<br>2200SA<br>2200M<br>C1000LA<br>2310M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2402MHz<br>BLE @ 2440MHz<br>BLE @ 2480MHz |

| Test Setup Details | |
|---|---|
| Setup Format | Tabletop |
| Type of Test Site | Semi-Anechoic Chamber |
| Test Site Used | Room 21 |
| Type of Antennas Used | Below 1GHz: Bilog (or equivalent)<br>Above 1GHz: 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 |
| 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 |
|---|
| <u>Radiated Emissions in Non-Restricted Bands:</u><br><br>Per FCC 15.247, Section (d), and ISED RSS-247, Section 5.5, in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated emissions measurement. Attenuation below the general limits specified in §15.209(a) is not required.<br><br><u>Radiated Emissions in Restricted Bands:</u><br><br>Per 15.247, Section (d), radiated emissions which fall in the restricted bands, as defined in FCC 15.205, Section (a), must comply with the radiated emission limits specified in FCC 15.209, Section (a).<br><br>Per ISED RSS-247, Section 3.3, radiated emissions which fall in the restricted bands, as defined in ISED RSS-Gen, Section 8.10, must comply with the radiated emission limits specified in RSS-Gen, Section 8.9. |

| 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 power lines 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.<br><br>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 18.0GHz was investigated using a peak detector function.<br><br>The final open field emission tests were then manually performed over the frequency range of 30MHz to 18.0GHz.<br><br>1) For all harmonics not in the restricted bands, the following procedure was used:<br>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.<br>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.<br>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:<br>i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.<br>ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.<br>iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.<br>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.<br>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.<br>2) For all emissions in the restricted bands, the following procedure was used:<br>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.<br>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.<br>c) To ensure that maximum or worst case emission levels were measured, the following steps were taken when taking all measurements:<br>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.

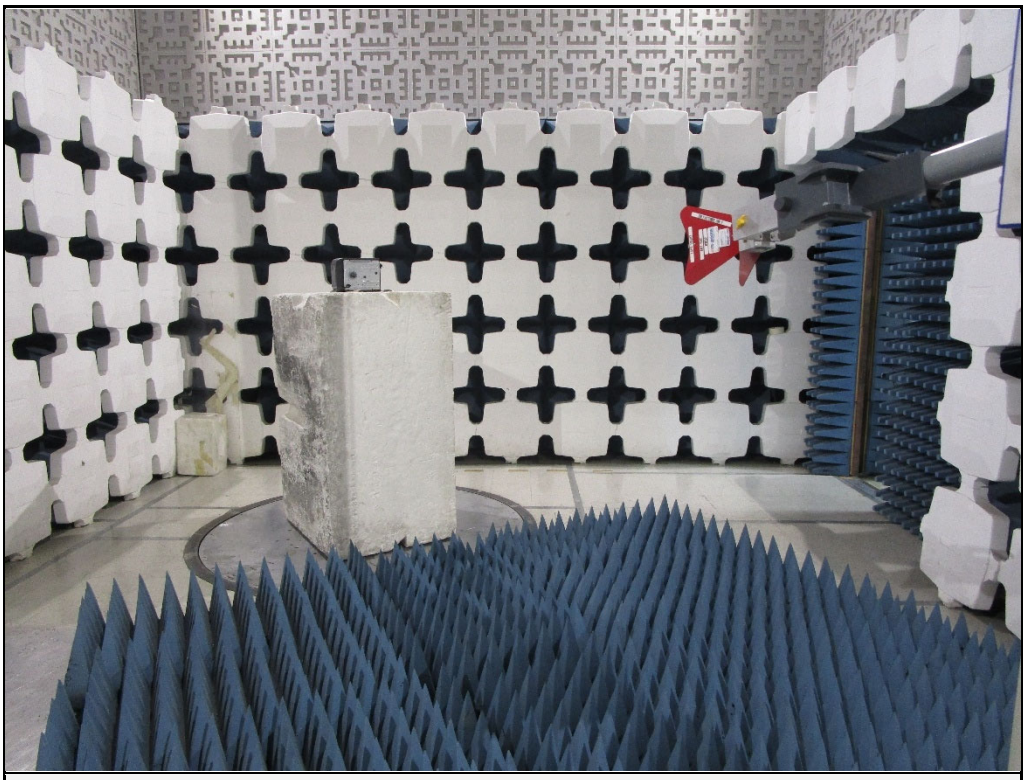
d) For all radiated emissions measurements below 1GHz, if the peak reading is below the limits listed in §15.209(a), no further measurements are required. If, however, the peak readings exceed the limits listed in §15.209(a), then the emissions are remeasured using a quasi-peak detector.

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).

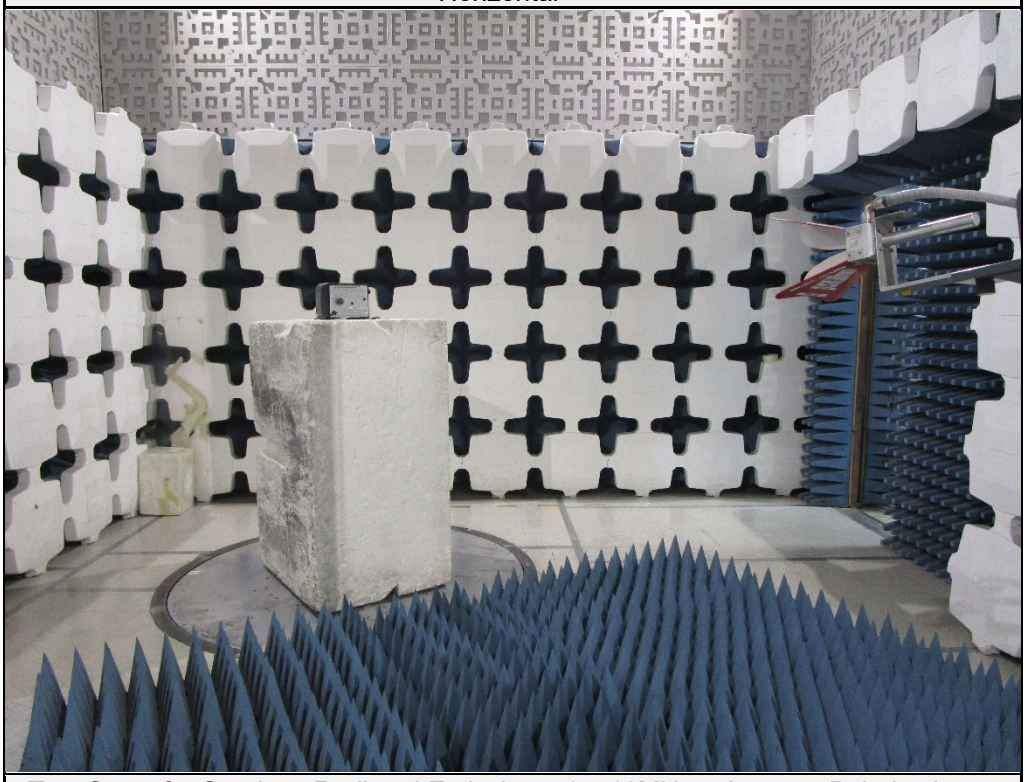
f) Next, for all radiated emissions measurements above 1GHz, the resolution bandwidth was set to 1MHz.. An average reading was taken.

Test Setup for Spurious Radiated Emissions, 30MHz – 1GHz – Antenna Polarization Horizontal

Test Setup for Spurious Radiated Emissions, 30MHz – 1GHz – Antenna Polarization Vertical



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



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

Test Setup for Spurious Radiated Emissions, 18 – 26MHz – Antenna Polarization Horizontal

Test Setup for Spurious Radiated Emissions, 18 – 26MHz – Antenna Polarization Vertical

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2402MHz |
| Frequency Tested | 2402MHz |
| 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 | 50.4 | | 4.8 | 34.3 | -39.0 | 50.6 | 339.1 | 5000.0 | -23.4 |
| | V | 50.3 | | 4.8 | 34.3 | -39.0 | 50.4 | 332.5 | 5000.0 | -23.5 |
| 12010.00 | H | 50.2 | * | 8.0 | 38.8 | -38.6 | 58.4 | 833.9 | 5000.0 | -15.6 |
| | V | 50.4 | * | 8.0 | 38.8 | -38.6 | 58.7 | 858.3 | 5000.0 | -15.3 |
| 19216.00 | H | 39.0 | * | 1.5 | 40.4 | -27.6 | 53.2 | 458.7 | 5000.0 | -20.7 |
| | V | 39.0 | * | 1.5 | 40.4 | -27.6 | 53.2 | 458.7 | 5000.0 | -20.7 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2402MHz |
| Frequency Tested | 2402MHz |
| 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 | 36.46 | | 4.8 | 34.3 | -39.0 | 0.1 | 36.8 | 68.9 | 500.0 | -17.2 |
| | V | 36.43 | | 4.8 | 34.3 | -39.0 | 0.1 | 36.7 | 68.6 | 500.0 | -17.2 |
| 12010.00 | H | 37.07 | * | 8.0 | 38.8 | -38.6 | 0.1 | 45.5 | 187.4 | 500.0 | -8.5 |
| | V | 37.12 | * | 8.0 | 38.8 | -38.6 | 0.1 | 45.5 | 188.5 | 500.0 | -8.5 |
| 19216.00 | H | 27.06 | * | 1.5 | 40.4 | -27.6 | 0.1 | 41.4 | 117.7 | 500.0 | -12.6 |
| | V | 27.00 | * | 1.5 | 40.4 | -27.6 | 0.1 | 41.4 | 116.9 | 500.0 | -12.6 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2402MHz |
| Frequency Tested | 2402MHz |
| Notes | Peak Measurements in Non-Restricted Bands |
| Limits | Peak Harmonic Limits = (Peak Fundamental Reading) – 20dB $156867.6\frac{\mu V}{m} - 20dB = \frac{156867.6}{10} = \mathbf{15686.8}\frac{\boldsymbol{\mu V}}{\boldsymbol{m}}$ |

| 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 | 67.90 | | 3.4 | 32.6 | 0.0 | 103.9 | 156867.6 | NA | NA |
| | V | 64.62 | | 3.4 | 32.6 | 0.0 | 100.6 | 107530.9 | NA | NA |
| 7206.00 | H | 39.12 | * | 6.1 | 36.3 | -39.0 | 42.5 | 133.5 | 15686.8 | -41.4 |
| | V | 39.05 | * | 6.1 | 36.3 | -39.0 | 42.4 | 132.4 | 15686.8 | -41.5 |
| 9608.00 | H | 38.97 | * | 6.8 | 37.1 | -38.8 | 44.1 | 160.3 | 15686.8 | -39.8 |
| | V | 38.76 | * | 6.8 | 37.1 | -38.8 | 43.9 | 156.5 | 15686.8 | -40.0 |
| 14412.00 | H | 39.46 | * | 8.7 | 39.4 | -37.9 | 49.7 | 306.5 | 15686.8 | -34.2 |
| | V | 38.48 | * | 8.7 | 39.4 | -37.9 | 48.7 | 273.8 | 15686.8 | -35.2 |
| 16814.00 | H | 39.32 | * | 9.4 | 42.2 | -37.3 | 53.7 | 484.9 | 15686.8 | -30.2 |
| | V | 38.35 | * | 9.4 | 42.2 | -37.3 | 52.7 | 433.7 | 15686.8 | -31.2 |
| 21618.00 | H | 27.19 | * | 1.6 | 40.6 | -25.3 | 44.1 | 160.1 | 15686.8 | -39.8 |
| | V | 26.97 | * | 1.6 | 40.6 | -25.3 | 43.9 | 156.1 | 15686.8 | -40.0 |
| 24020.00 | H | 26.96 | * | 1.7 | 40.6 | -25.2 | 44.1 | 159.7 | 15686.8 | -39.8 |
| | V | 27.28 | * | 1.7 | 40.6 | -25.2 | 44.4 | 165.7 | 15686.8 | -39.5 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2440MHz |
| Frequency Tested | 2440MHz |
| 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 | 50.6 | | 4.9 | 34.2 | -39.0 | 50.7 | 343.1 | 5000.0 | -23.3 |
| | V | 50.2 | | 4.9 | 34.2 | -39.0 | 50.2 | 324.7 | 5000.0 | -23.8 |
| 7320.00 | H | 49.4 | * | 6.2 | 36.3 | -39.0 | 52.8 | 435.5 | 5000.0 | -21.2 |
| | V | 49.3 | * | 6.2 | 36.3 | -39.0 | 52.7 | 432.0 | 5000.0 | -21.3 |
| 12200.00 | H | 49.2 | * | 8.0 | 38.9 | -38.5 | 57.5 | 751.2 | 5000.0 | -16.5 |
| | V | 49.5 | * | 8.0 | 38.9 | -38.5 | 57.9 | 782.1 | 5000.0 | -16.1 |
| 19520.00 | H | 38.1 | * | 1.5 | 40.4 | -26.7 | 53.3 | 462.8 | 5000.0 | -20.7 |
| | V | 37.2 | * | 1.5 | 40.4 | -26.7 | 52.4 | 416.7 | 5000.0 | -21.6 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2440MHz |
| Frequency Tested | 2440MHz |
| 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 | 35.17 | | 4.9 | 34.2 | -39.0 | 0.1 | 35.4 | 58.7 | 500.0 | -18.6 |
| | V | 35.37 | | 4.9 | 34.2 | -39.0 | 0.1 | 35.6 | 60.1 | 500.0 | -18.4 |
| 7320.00 | H | 34.76 | * | 6.2 | 36.3 | -39.0 | 0.1 | 38.3 | 82.4 | 500.0 | -15.7 |
| | V | 34.76 | * | 6.2 | 36.3 | -39.0 | 0.1 | 38.3 | 82.4 | 500.0 | -15.7 |
| 12200.00 | H | 34.80 | * | 8.0 | 38.9 | -38.5 | 0.1 | 43.3 | 145.5 | 500.0 | -10.7 |
| | V | 35.20 | * | 8.0 | 38.9 | -38.5 | 0.1 | 43.7 | 152.4 | 500.0 | -10.3 |
| 19520.00 | H | 25.90 | * | 1.5 | 40.4 | -26.7 | 0.1 | 41.2 | 115.1 | 500.0 | -12.8 |
| | V | 25.98 | * | 1.5 | 40.4 | -26.7 | 0.1 | 41.3 | 116.2 | 500.0 | -12.7 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2440MHz |
| Frequency Tested | 2440MHz |
| Notes | Peak Measurements in Non-Restricted Bands |
| Limits | Peak Harmonic Limits = (Peak Fundamental Reading) – 20dB $$127603.2\frac{\mu V}{m} - 20dB = \frac{127603.2}{10} = \mathbf{12760.3}\frac{\boldsymbol{\mu V}}{\boldsymbol{m}}$$ |

| 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 | 66.02 | | 3.5 | 32.6 | 0.0 | 102.1 | 127603.2 | NA | NA |
| | V | 60.56 | | 3.5 | 32.6 | 0.0 | 96.7 | 68055.2 | NA | NA |
| 9760.00 | H | 38.93 | * | 6.9 | 37.2 | -38.8 | 44.2 | 162.8 | 12760.3 | -37.9 |
| | V | 39.90 | * | 6.9 | 37.2 | -38.8 | 45.2 | 182.1 | 12760.3 | -36.9 |
| 14640.00 | H | 38.68 | * | 8.8 | 39.5 | -37.8 | 49.2 | 288.0 | 12760.3 | -32.9 |
| | V | 38.55 | * | 8.8 | 39.5 | -37.8 | 49.1 | 283.7 | 12760.3 | -33.1 |
| 17080.00 | H | 38.24 | * | 9.5 | 42.4 | -37.4 | 52.9 | 439.5 | 12760.3 | -29.3 |
| | V | 37.66 | * | 9.5 | 42.4 | -37.4 | 52.3 | 411.1 | 12760.3 | -29.8 |
| 21960.00 | H | 27.76 | * | 1.6 | 40.6 | -25.5 | 44.4 | 166.6 | 12760.3 | -37.7 |
| | V | 28.40 | * | 1.6 | 40.6 | -25.5 | 45.1 | 179.3 | 12760.3 | -37.0 |
| 24400.00 | H | 27.01 | * | 1.6 | 40.6 | -25.6 | 43.6 | 151.5 | 12760.3 | -38.5 |
| | V | 26.87 | * | 1.6 | 40.6 | -25.6 | 43.5 | 149.1 | 12760.3 | -38.6 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| 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 | 50.5 | * | 4.9 | 34.1 | -39.0 | 50.5 | 335.4 | 5000.0 | -23.5 |
| | V | 52.0 | | 4.9 | 34.1 | -39.0 | 52.0 | 399.5 | 5000.0 | -21.9 |
| 7440.00 | H | 50.2 | | 6.2 | 36.3 | -39.0 | 53.7 | 484.8 | 5000.0 | -20.3 |
| | V | 50.4 | | 6.2 | 36.3 | -39.0 | 53.9 | 496.1 | 5000.0 | -20.1 |
| 12400.00 | H | 50.9 | * | 8.0 | 38.9 | -38.5 | 59.3 | 920.8 | 5000.0 | -14.7 |
| | V | 49.4 | * | 8.0 | 38.9 | -38.5 | 57.9 | 781.0 | 5000.0 | -16.1 |
| 19840.00 | H | 37.6 | * | 1.5 | 40.4 | -26.8 | 52.7 | 432.4 | 5000.0 | -21.3 |
| | V | 37.8 | * | 1.5 | 40.4 | -26.8 | 52.9 | 440.9 | 5000.0 | -21.1 |
| 22320.00 | H | 36.8 | * | 1.4 | 40.6 | -26.0 | 52.9 | 440.8 | 5000.0 | -21.1 |
| | V | 36.7 | * | 1.4 | 40.6 | -26.0 | 52.7 | 433.8 | 5000.0 | -21.2 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| 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 | 35.01 | * | 4.9 | 34.1 | -39.0 | 0.1 | 35.2 | 57.3 | 500.0 | -18.8 |
| | V | 38.61 | | 4.9 | 34.1 | -39.0 | 0.1 | 38.8 | 86.7 | 500.0 | -15.2 |
| 7440.00 | H | 37.29 | | 6.2 | 36.3 | -39.0 | 0.1 | 41.0 | 111.6 | 500.0 | -13.0 |
| | V | 35.69 | | 6.2 | 36.3 | -39.0 | 0.1 | 39.4 | 92.8 | 500.0 | -14.6 |
| 12400.00 | H | 35.07 | * | 8.0 | 38.9 | -38.5 | 0.1 | 43.6 | 151.7 | 500.0 | -10.4 |
| | V | 35.12 | * | 8.0 | 38.9 | -38.5 | 0.1 | 43.7 | 152.5 | 500.0 | -10.3 |
| 19840.00 | H | 25.90 | * | 1.5 | 40.4 | -26.8 | 0.1 | 41.1 | 113.9 | 500.0 | -12.8 |
| | V | 25.90 | * | 1.5 | 40.4 | -26.8 | 0.1 | 41.1 | 113.9 | 500.0 | -12.8 |
| 22320.00 | H | 25.21 | * | 1.4 | 40.6 | -26.0 | 0.1 | 41.4 | 117.5 | 500.0 | -12.6 |
| | V | 25.11 | * | 1.4 | 40.6 | -26.0 | 0.1 | 41.3 | 116.1 | 500.0 | -12.7 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Notes | Peak Measurements in Non-Restricted Bands |
| Limits | Peak Harmonic Limits = (Peak Fundamental Reading) – 20dB $158638.8\frac{\mu V}{m} - 20dB = \frac{158638.8}{10} = \mathbf{15863.9}\frac{\boldsymbol{\mu V}}{\boldsymbol{m}}$ |

| 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 | 67.80 | | 3.5 | 32.7 | 0.0 | 104.0 | 158638.8 | NA | NA |
| | V | 62.69 | | 3.5 | 32.7 | 0.0 | 98.9 | 88086.5 | NA | NA |
| 9920.00 | H | 39.12 | * | 7.0 | 37.2 | -38.8 | 44.5 | 167.1 | 15863.9 | -39.5 |
| | V | 38.26 | * | 7.0 | 37.2 | -38.8 | 43.6 | 151.4 | 15863.9 | -40.4 |
| 14880.00 | H | 38.66 | * | 8.9 | 39.9 | -37.8 | 49.7 | 305.3 | 15863.9 | -34.3 |
| | V | 38.81 | * | 8.9 | 39.9 | -37.8 | 49.8 | 310.6 | 15863.9 | -34.2 |
| 17360.00 | H | 38.69 | * | 9.7 | 42.5 | -37.5 | 53.4 | 465.2 | 15863.9 | -30.7 |
| | V | 37.65 | * | 9.7 | 42.5 | -37.5 | 52.3 | 412.7 | 15863.9 | -31.7 |
| 24800.00 | H | 28.41 | * | 1.8 | 40.6 | -25.0 | 45.8 | 194.2 | 15863.9 | -38.2 |
| | V | 25.85 | * | 1.8 | 40.6 | -25.0 | 43.2 | 144.6 | 15863.9 | -40.8 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2200SA |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| 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 | 49.9 | * | 4.9 | 34.1 | -39.0 | 49.9 | 314.1 | 5000.0 | -24.0 |
| | V | 50.1 | * | 4.9 | 34.1 | -39.0 | 50.1 | 320.6 | 5000.0 | -23.9 |
| 7440.00 | H | 48.7 | * | 6.2 | 36.3 | -39.0 | 52.2 | 406.5 | 5000.0 | -21.8 |
| | V | 48.9 | * | 6.2 | 36.3 | -39.0 | 52.4 | 417.4 | 5000.0 | -21.6 |
| 12400.00 | H | 49.4 | * | 8.0 | 38.9 | -38.5 | 57.8 | 774.8 | 5000.0 | -16.2 |
| | V | 49.4 | * | 8.0 | 38.9 | -38.5 | 57.8 | 778.3 | 5000.0 | -16.2 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2200SA |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| 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 | 37.32 | * | 4.9 | 34.1 | -39.0 | 0.1 | 37.5 | 74.8 | 500.0 | -16.5 |
| | V | 37.40 | * | 4.9 | 34.1 | -39.0 | 0.1 | 37.6 | 75.5 | 500.0 | -16.4 |
| 7440.00 | H | 36.32 | * | 6.2 | 36.3 | -39.0 | 0.1 | 40.0 | 99.8 | 500.0 | -14.0 |
| | V | 36.51 | * | 6.2 | 36.3 | -39.0 | 0.1 | 40.2 | 102.0 | 500.0 | -13.8 |
| 12400.00 | H | 36.98 | * | 8.0 | 38.9 | -38.5 | 0.1 | 45.5 | 189.0 | 500.0 | -8.5 |
| | V | 37.16 | * | 8.0 | 38.9 | -38.5 | 0.1 | 45.7 | 192.9 | 500.0 | -8.3 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2200SA |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Notes | Peak Measurements in Non-Restricted Bands |
| Limits | Peak Harmonic Limits = (Peak Fundamental Reading) – 20dB $$158456.3\frac{\mu V}{m} - 20dB = \frac{158456.3}{10} = \mathbf{15845.6}\frac{\boldsymbol{\mu V}}{\boldsymbol{m}}$$ |

| 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 | 67.79 | | 3.5 | 32.7 | 0.0 | 104.0 | 158456.3 | NA | NA |
| | V | 65.43 | | 3.5 | 32.7 | 0.0 | 101.6 | 120756.2 | NA | NA |
| 9920.00 | H | 38.88 | * | 7.0 | 37.2 | -38.8 | 44.2 | 162.6 | 15845.6 | -39.8 |
| | V | 38.72 | * | 7.0 | 37.2 | -38.8 | 44.1 | 159.6 | 15845.6 | -39.9 |
| 14880.00 | H | 38.93 | * | 8.9 | 39.9 | -37.8 | 50.0 | 314.9 | 15845.6 | -34.0 |
| | V | 39.25 | * | 8.9 | 39.9 | -37.8 | 50.3 | 326.8 | 15845.6 | -33.7 |
| 17360.00 | H | 38.96 | * | 9.7 | 42.5 | -37.5 | 53.6 | 479.9 | 15845.6 | -30.4 |
| | V | 39.14 | * | 9.7 | 42.5 | -37.5 | 53.8 | 489.9 | 15845.6 | -30.2 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2200M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| 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 | 50.0 | * | 4.9 | 34.1 | -39.0 | 50.0 | 316.2 | 5000.0 | -24.0 |
| | V | 50.0 | * | 4.9 | 34.1 | -39.0 | 50.0 | 316.6 | 5000.0 | -24.0 |
| 7440.00 | H | 48.8 | * | 6.2 | 36.3 | -39.0 | 52.3 | 413.1 | 5000.0 | -21.7 |
| | V | 48.6 | * | 6.2 | 36.3 | -39.0 | 52.2 | 406.0 | 5000.0 | -21.8 |
| 12400.00 | H | 49.8 | * | 8.0 | 38.9 | -38.5 | 58.2 | 816.9 | 5000.0 | -15.7 |
| | V | 49.9 | * | 8.0 | 38.9 | -38.5 | 58.3 | 821.6 | 5000.0 | -15.7 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2200M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| 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 | 37.42 | * | 4.9 | 34.1 | -39.0 | 0.1 | 37.6 | 75.6 | 500.0 | -16.4 |
| | V | 37.74 | * | 4.9 | 34.1 | -39.0 | 0.1 | 37.9 | 78.5 | 500.0 | -16.1 |
| 7440.00 | H | 37.12 | * | 6.2 | 36.3 | -39.0 | 0.1 | 40.8 | 109.5 | 500.0 | -13.2 |
| | V | 36.39 | * | 6.2 | 36.3 | -39.0 | 0.1 | 40.1 | 100.6 | 500.0 | -13.9 |
| 12400.00 | H | 37.20 | * | 8.0 | 38.9 | -38.5 | 0.1 | 45.7 | 193.8 | 500.0 | -8.2 |
| | V | 37.27 | * | 8.0 | 38.9 | -38.5 | 0.1 | 45.8 | 195.4 | 500.0 | -8.2 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2200M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Notes | Peak Measurements in Non-Restricted Bands |
| Limits | Peak Harmonic Limits = (Peak Fundamental Reading) – 20dB $$186814.0\frac{\mu V}{m} - 20dB = \frac{186814.0}{10} = \mathbf{18681.4}\frac{\boldsymbol{\mu V}}{\boldsymbol{m}}$$ |

| 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 | 69.22 | | 3.5 | 32.7 | 0.0 | 105.4 | 186814.0 | NA | NA |
| | V | 63.34 | | 3.5 | 32.7 | 0.0 | 99.5 | 94931.3 | NA | NA |
| 9920.00 | H | 38.96 | * | 7.0 | 37.2 | -38.8 | 44.3 | 164.1 | 18681.4 | -41.1 |
| | V | 38.51 | * | 7.0 | 37.2 | -38.8 | 43.9 | 155.8 | 18681.4 | -41.6 |
| 14880.00 | H | 38.95 | * | 8.9 | 39.9 | -37.8 | 50.0 | 315.7 | 18681.4 | -35.4 |
| | V | 38.71 | * | 8.9 | 39.9 | -37.8 | 49.7 | 307.1 | 18681.4 | -35.7 |
| 17360.00 | H | 38.41 | * | 9.7 | 42.5 | -37.5 | 53.1 | 450.4 | 18681.4 | -32.4 |
| | V | 38.84 | * | 9.7 | 42.5 | -37.5 | 53.5 | 473.3 | 18681.4 | -31.9 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | C1000LA |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| 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 | 50.5 | * | 4.9 | 34.1 | -39.0 | 50.5 | 335.4 | 5000.0 | -23.5 |
| | V | 49.9 | * | 4.9 | 34.1 | -39.0 | 49.9 | 312.2 | 5000.0 | -24.1 |
| 7440.00 | H | 50.3 | | 6.2 | 36.3 | -39.0 | 53.9 | 493.8 | 5000.0 | -20.1 |
| | V | 49.1 | * | 6.2 | 36.3 | -39.0 | 52.7 | 430.1 | 5000.0 | -21.3 |
| 12400.00 | H | 50.1 | * | 8.0 | 38.9 | -38.5 | 58.5 | 838.8 | 5000.0 | -15.5 |
| | V | 49.6 | * | 8.0 | 38.9 | -38.5 | 58.0 | 798.3 | 5000.0 | -15.9 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | C1000LA |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| 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 | 37.94 | * | 4.9 | 34.1 | -39.0 | 0.1 | 38.1 | 80.3 | 500.0 | -15.9 |
| | V | 37.45 | * | 4.9 | 34.1 | -39.0 | 0.1 | 37.6 | 75.9 | 500.0 | -16.4 |
| 7440.00 | H | 38.40 | | 6.2 | 36.3 | -39.0 | 0.1 | 42.1 | 126.8 | 500.0 | -11.9 |
| | V | 36.66 | * | 6.2 | 36.3 | -39.0 | 0.1 | 40.3 | 103.8 | 500.0 | -13.7 |
| 12400.00 | H | 36.80 | * | 8.0 | 38.9 | -38.5 | 0.1 | 45.3 | 185.1 | 500.0 | -8.6 |
| | V | 36.83 | * | 8.0 | 38.9 | -38.5 | 0.1 | 45.4 | 185.7 | 500.0 | -8.6 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | C1000LA |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Notes | Peak Measurements in Non-Restricted Bands |
| Limits | Peak Harmonic Limits = (Peak Fundamental Reading) – 20dB $$139607.7\frac{\mu V}{m} - 20dB = \frac{139607.7}{10} = \mathbf{13960.8}\frac{\boldsymbol{\mu V}}{\boldsymbol{m}}$$ |

| 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 | 66.69 | | 3.5 | 32.7 | 0.0 | 102.9 | 139607.7 | NA | NA |
| | V | 63.18 | | 3.5 | 32.7 | 0.0 | 99.4 | 93198.6 | NA | NA |
| 9920.00 | H | 38.64 | * | 7.0 | 37.2 | -38.8 | 44.0 | 158.2 | 13960.8 | -38.9 |
| | V | 38.93 | * | 7.0 | 37.2 | -38.8 | 44.3 | 163.5 | 13960.8 | -38.6 |
| 14880.00 | H | 38.84 | * | 8.9 | 39.9 | -37.8 | 49.9 | 311.7 | 13960.8 | -33.0 |
| | V | 38.92 | * | 8.9 | 39.9 | -37.8 | 50.0 | 314.6 | 13960.8 | -32.9 |
| 17360.00 | H | 39.82 | * | 9.7 | 42.5 | -37.5 | 54.5 | 529.8 | 13960.8 | -28.4 |
| | V | 39.25 | * | 9.7 | 42.5 | -37.5 | 53.9 | 496.2 | 13960.8 | -29.0 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2310M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| 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 | 50.1 | * | 4.9 | 34.1 | -39.0 | 50.1 | 320.3 | 5000.0 | -23.9 |
| | V | 50.1 | * | 4.9 | 34.1 | -39.0 | 50.1 | 321.7 | 5000.0 | -23.8 |
| 7440.00 | H | 49.8 | * | 6.2 | 36.3 | -39.0 | 53.3 | 461.9 | 5000.0 | -20.7 |
| | V | 49.2 | * | 6.2 | 36.3 | -39.0 | 52.7 | 431.1 | 5000.0 | -21.3 |
| 12400.00 | H | 50.6 | * | 8.0 | 38.9 | -38.5 | 59.0 | 890.6 | 5000.0 | -15.0 |
| | V | 50.8 | * | 8.0 | 38.9 | -38.5 | 59.2 | 912.4 | 5000.0 | -14.8 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2310M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| 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 | 37.88 | * | 4.9 | 34.1 | -39.0 | 0.1 | 38.0 | 79.7 | 500.0 | -15.9 |
| | V | 38.69 | * | 4.9 | 34.1 | -39.0 | 0.1 | 38.8 | 87.5 | 500.0 | -15.1 |
| 7440.00 | H | 36.89 | * | 6.2 | 36.3 | -39.0 | 0.1 | 40.6 | 106.6 | 500.0 | -13.4 |
| | V | 37.07 | * | 6.2 | 36.3 | -39.0 | 0.1 | 40.7 | 108.8 | 500.0 | -13.2 |
| 12400.00 | H | 37.66 | * | 8.0 | 38.9 | -38.5 | 0.1 | 46.2 | 204.4 | 500.0 | -7.8 |
| | V | 37.78 | * | 8.0 | 38.9 | -38.5 | 0.1 | 46.3 | 207.2 | 500.0 | -7.7 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2310M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Notes | Peak Measurements in Non-Restricted Bands |
| Limits | Peak Harmonic Limits = (Peak Fundamental Reading) – 20dB $$158273.9\frac{\mu V}{m} - 20dB = \frac{158273.9}{10} = \mathbf{15827.4}\frac{\boldsymbol{\mu V}}{\boldsymbol{m}}$$ |

| 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 | 67.78 | | 3.5 | 32.7 | 0.0 | 104.0 | 158273.9 | NA | NA |
| | V | 64.96 | | 3.5 | 32.7 | 0.0 | 101.2 | 114395.6 | NA | NA |
| 9920.00 | H | 39.38 | * | 7.0 | 37.2 | -38.8 | 44.7 | 172.2 | 15827.4 | -39.3 |
| | V | 38.97 | * | 7.0 | 37.2 | -38.8 | 44.3 | 164.3 | 15827.4 | -39.7 |
| 14880.00 | H | 35.15 | * | 8.9 | 39.9 | -37.8 | 46.2 | 203.8 | 15827.4 | -37.8 |
| | V | 38.70 | * | 8.9 | 39.9 | -37.8 | 49.7 | 306.7 | 15827.4 | -34.3 |
| 17360.00 | H | 39.25 | * | 9.7 | 42.5 | -37.5 | 53.9 | 496.2 | 15827.4 | -30.1 |
| | V | 38.99 | * | 9.7 | 42.5 | -37.5 | 53.7 | 481.5 | 15827.4 | -30.3 |

# 27. Band-Edge Compliance

| EUT Information | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| Product | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11<br>2200SA<br>2200M<br>C1000LA<br>2310M |
| Serial No. | Radiated Sample<br>Conducted Sample |
| Mode | BLE @ 2402MHz<br>BLE @ 2480MHz |

| 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 |

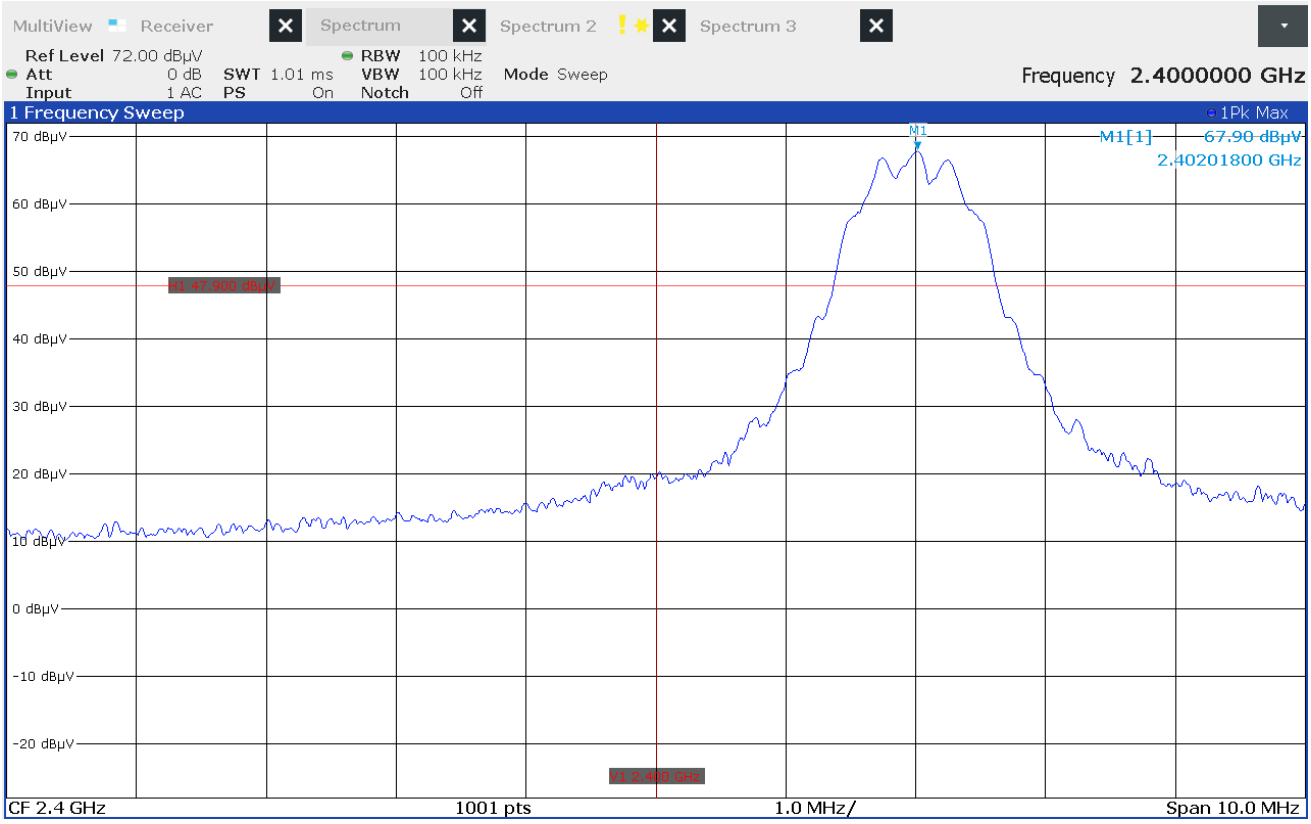
| Measurement Uncertainty | |
|---|---|
| Measurement Type | Expanded Measurement Uncertainty |
| Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz) | 4.3 |
| Radiated disturbance (electric field strength on an open area test site or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

**Procedure**

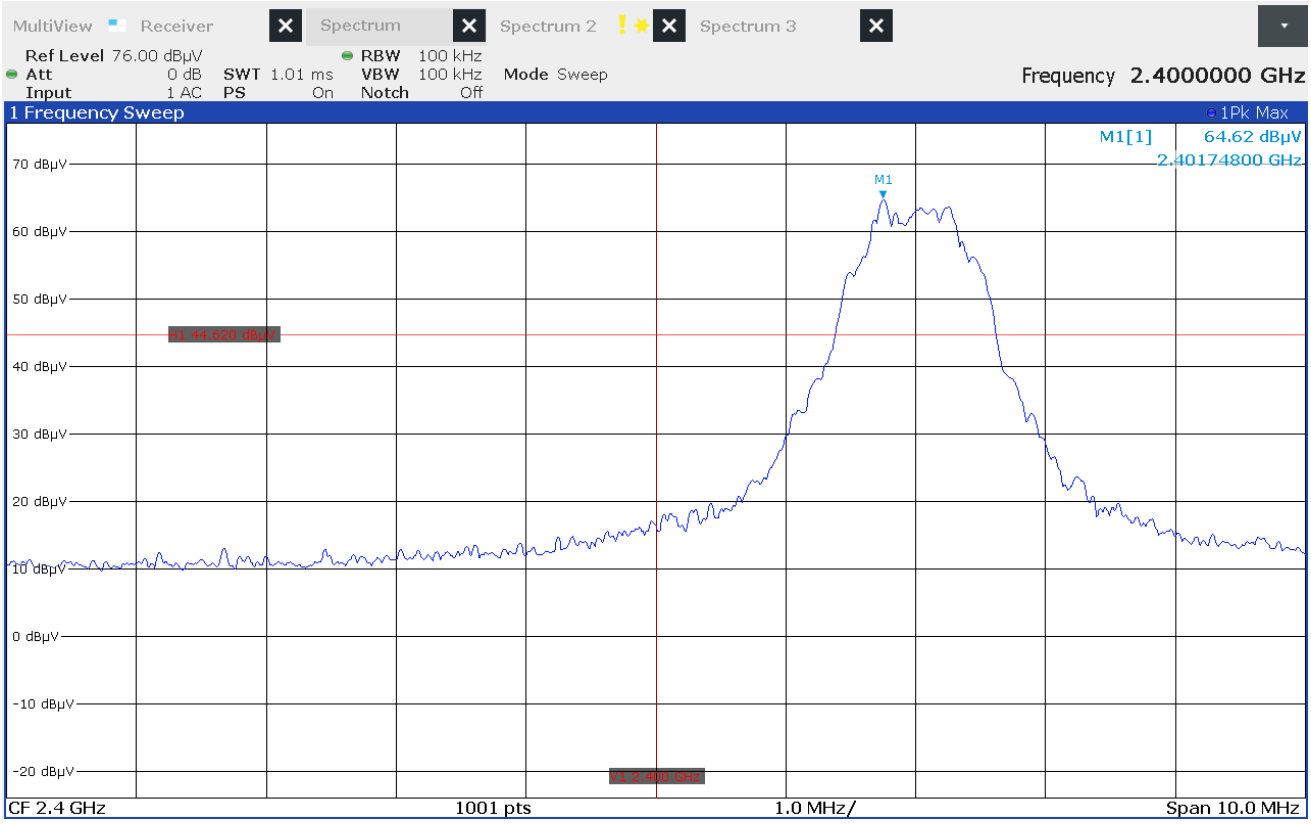
1) Low Band Edge:
   a) The antenna port of the EUT was connected to the spectrum analyzer through an R&S OSP120 RF control and switch.
   b) The EUT was set to transmit continuously at the channel closest to the low band-edge.
   c) To determine the band edge compliance, the following spectrum analyzer 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.)

| Procedure |
| --- |
| f) The analyzer's display was then screenshot and saved.<br>2) High Band Edge:<br>a) The EUT was set up inside the test chamber on a non-conductive stand and set to transmit continuously at the channel closest to the high band-edge.<br>b) A broadband measuring antenna was placed at a test distance of 3 meters from the EUT. The antenna was connected to the input of a spectrum analyzer.<br>c) The center frequency of the analyzer was set to the high band edge (2483.5MHz).<br>d) The Resolution Bandwidth was set to 1MHz.<br>e) To ensure that the maximum or worst case emission level was measured, the following steps were taken:<br>o The EUT was rotated so that all of its sides were exposed to the receiving antenna.<br>o Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.<br>o The EUT was rotated so that all of its sides were exposed to the receiving antenna.<br>o The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.<br>o The highest measured peak reading and the highest measured average reading were recorded. |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2402MHz |
| Frequency Tested | 2402MHz |
| Notes | Low Band Edge – Horizontal Orientation |

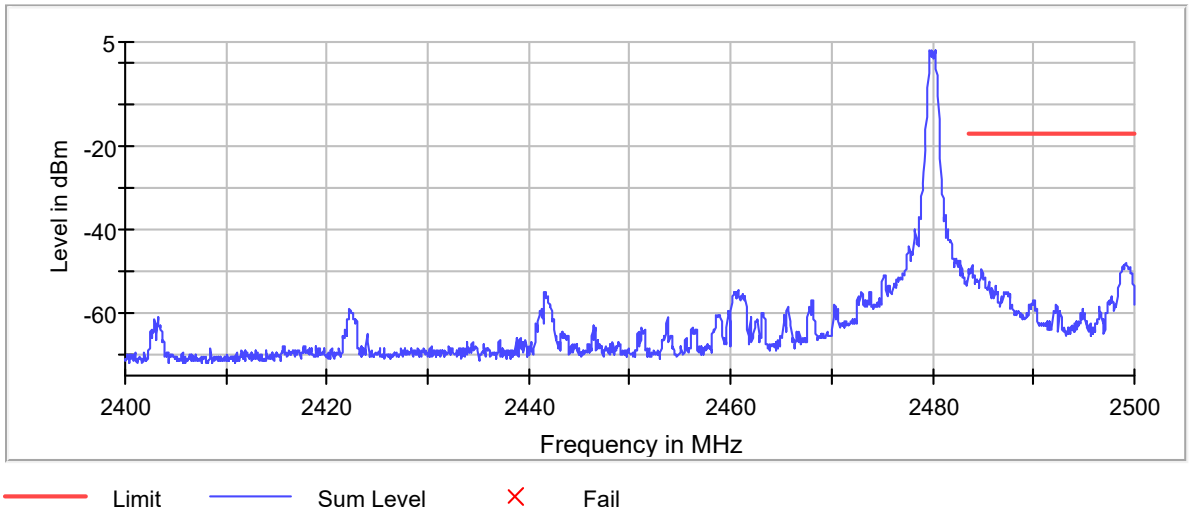


| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2402MHz |
| Frequency Tested | 2402MHz |
| Notes | Low Band Edge – Vertical Orientation |



| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Radiated Sample<br>Conducted Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Notes | High Band Edge – Peak and Average Measurements |

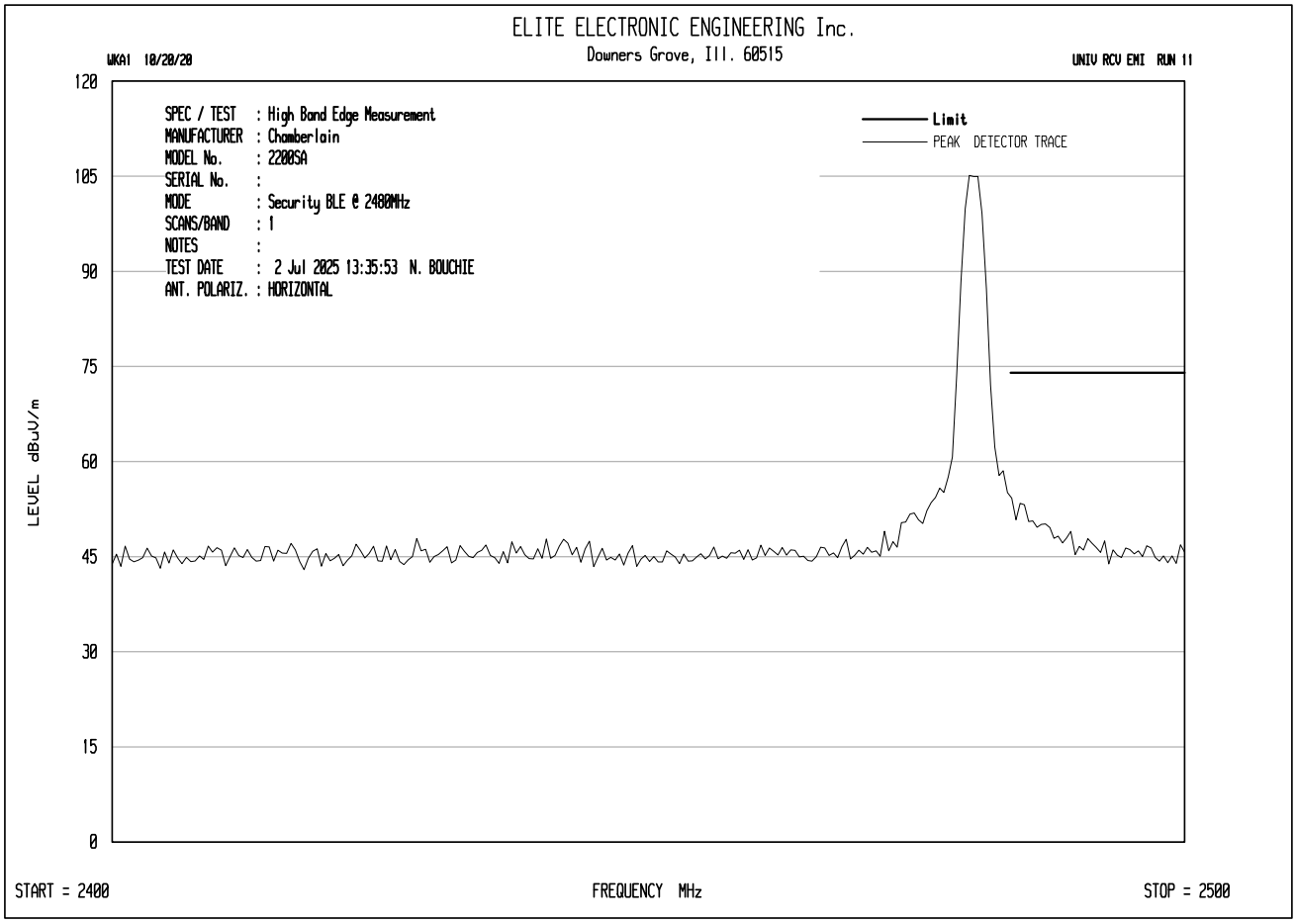
Band Edge



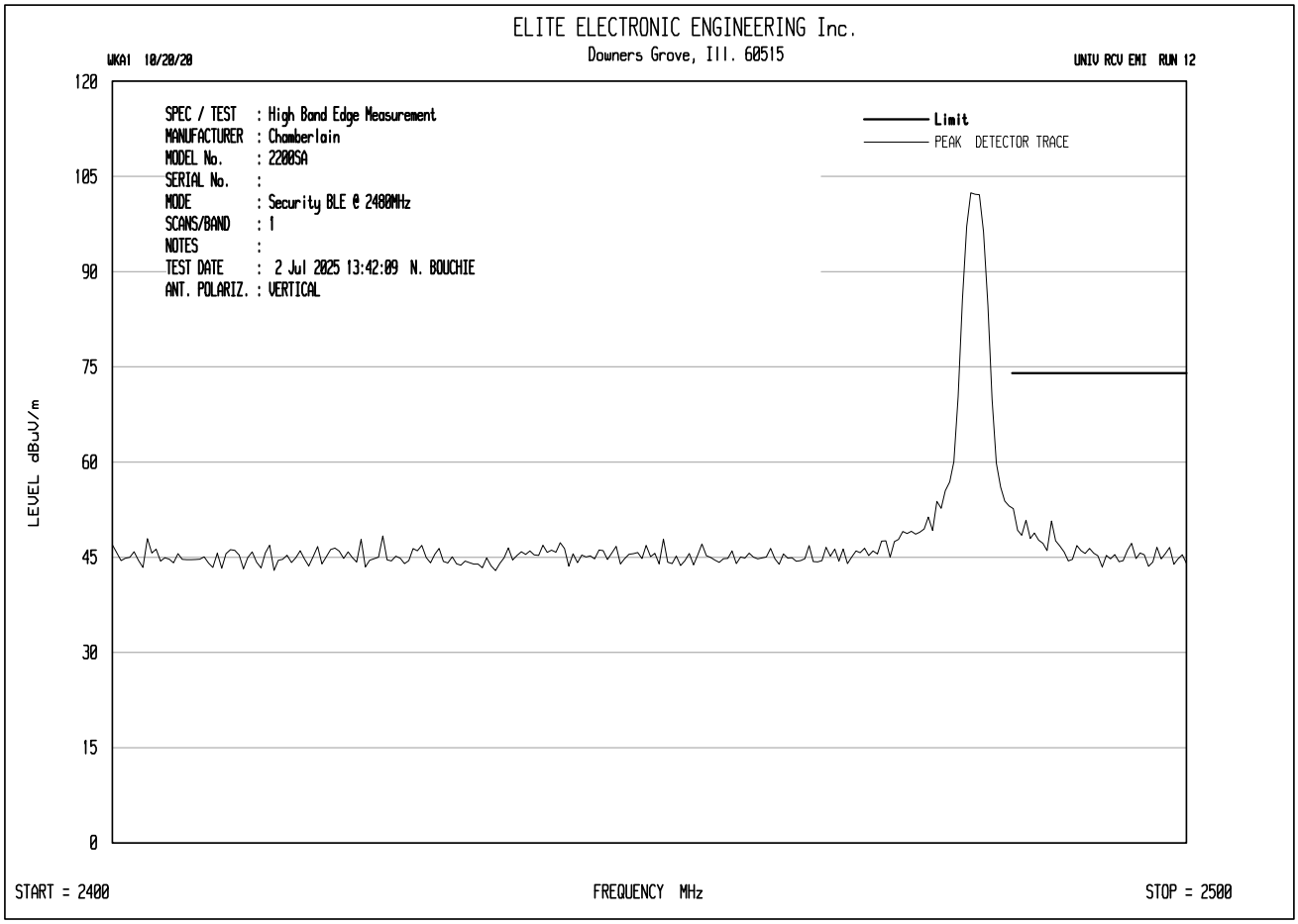

| Freq (MHz) | Ant Pol | Meter Reading (dBµV) | Ambient | Cable Factor (dB) | Antenna Factor (dB/m) | Pre Amp (dB) | Peak Total at 3m (dBµV/m) | Peak Total at 3m (µV/m) | Peak Limit at 3m (µV/m) | Margin (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2483.50 | H | 29.6 | | 3.5 | 32.7 | 0.0 | 65.8 | 1949.5 | 5000.0 | -8.2 |
| | V | 26.3 | | 3.5 | 32.7 | 0.0 | 62.5 | 1336.4 | 5000.0 | -11.5 |

| 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 | 12.15 | | 3.5 | 32.7 | 0.0 | 0.1 | 48.5 | 266.2 | 500.0 | -5.5 |
| | V | 11.11 | | 3.5 | 32.7 | 0.0 | 0.1 | 47.5 | 236.1 | 500.0 | -6.5 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2200SA |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Notes | High Band Edge – Horizontal Orientation |



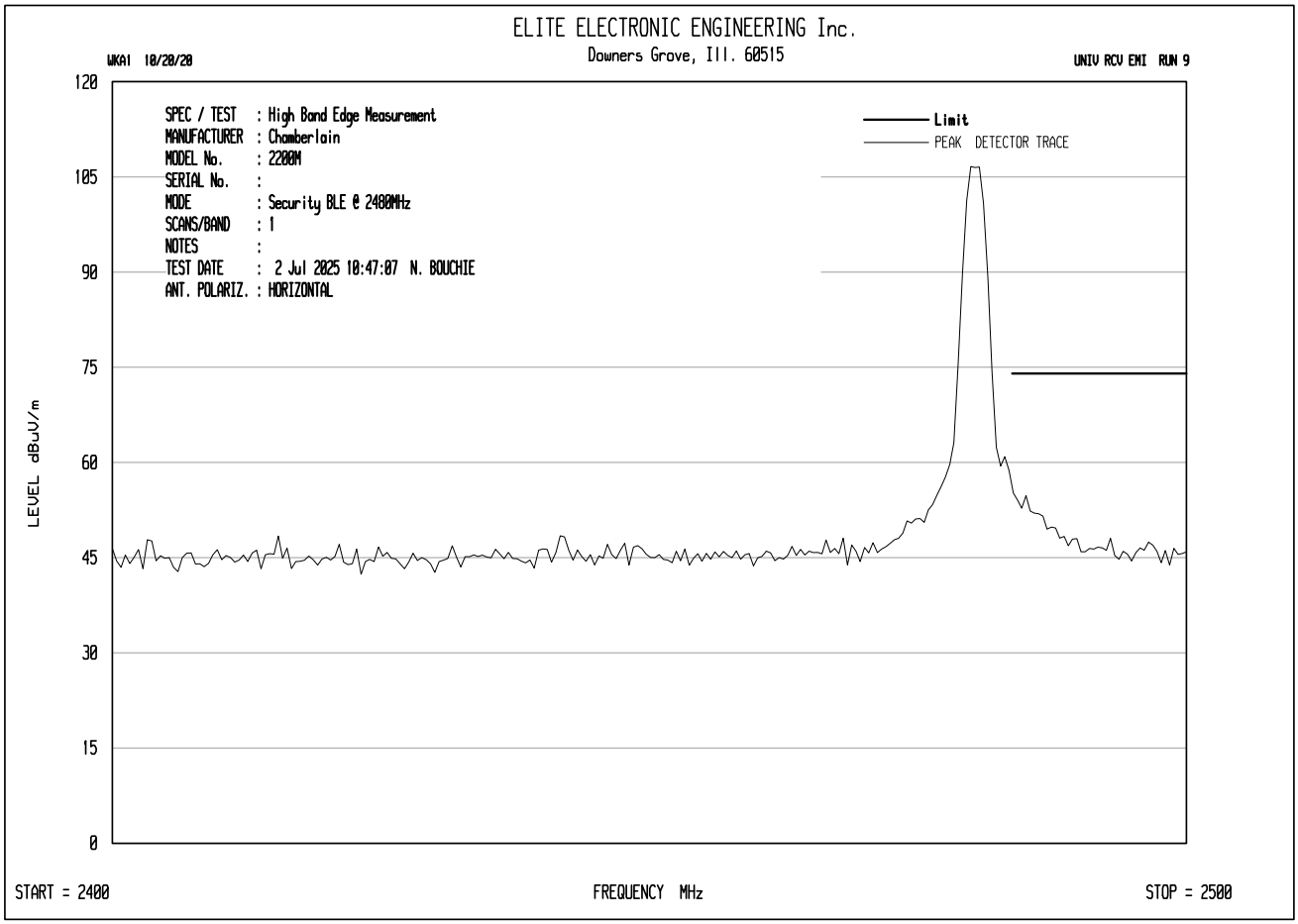
| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2200SA |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Notes | High Band Edge – Vertical Orientation |



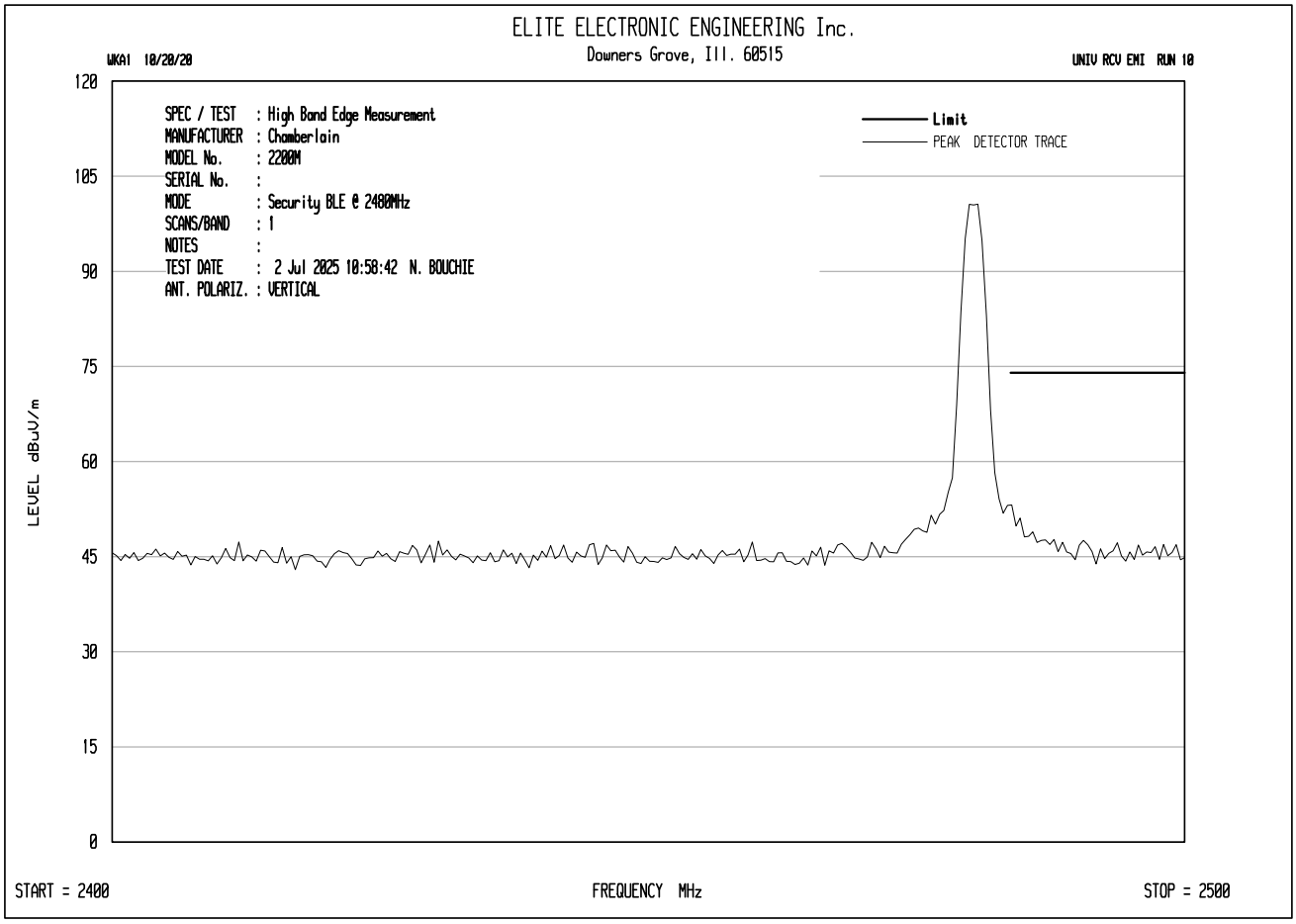

| Freq (MHz) | Ant Pol | Meter Reading (dBµV) | Ambient | Cable Factor (dB) | Antenna Factor (dB/m) | Pre Amp (dB) | Peak Total at 3m (dBµV/m) | Peak Total at 3m (µV/m) | Peak Limit at 3m (µV/m) | Margin (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2483.50 | H | 27.7 | | 3.5 | 32.7 | 0.0 | 63.9 | 1570.1 | 5000.0 | -10.1 |
| | V | 24.4 | | 3.5 | 32.7 | 0.0 | 60.6 | 1068.9 | 5000.0 | -13.4 |

| 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 | 13.91 | | 3.5 | 32.7 | 0.0 | 0.1 | 50.3 | 325.9 | 500.0 | -3.7 |
| | V | 12.33 | | 3.5 | 32.7 | 0.0 | 0.1 | 48.7 | 271.7 | 500.0 | -5.3 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2200M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Notes | High Band Edge – Horizontal Orientation |



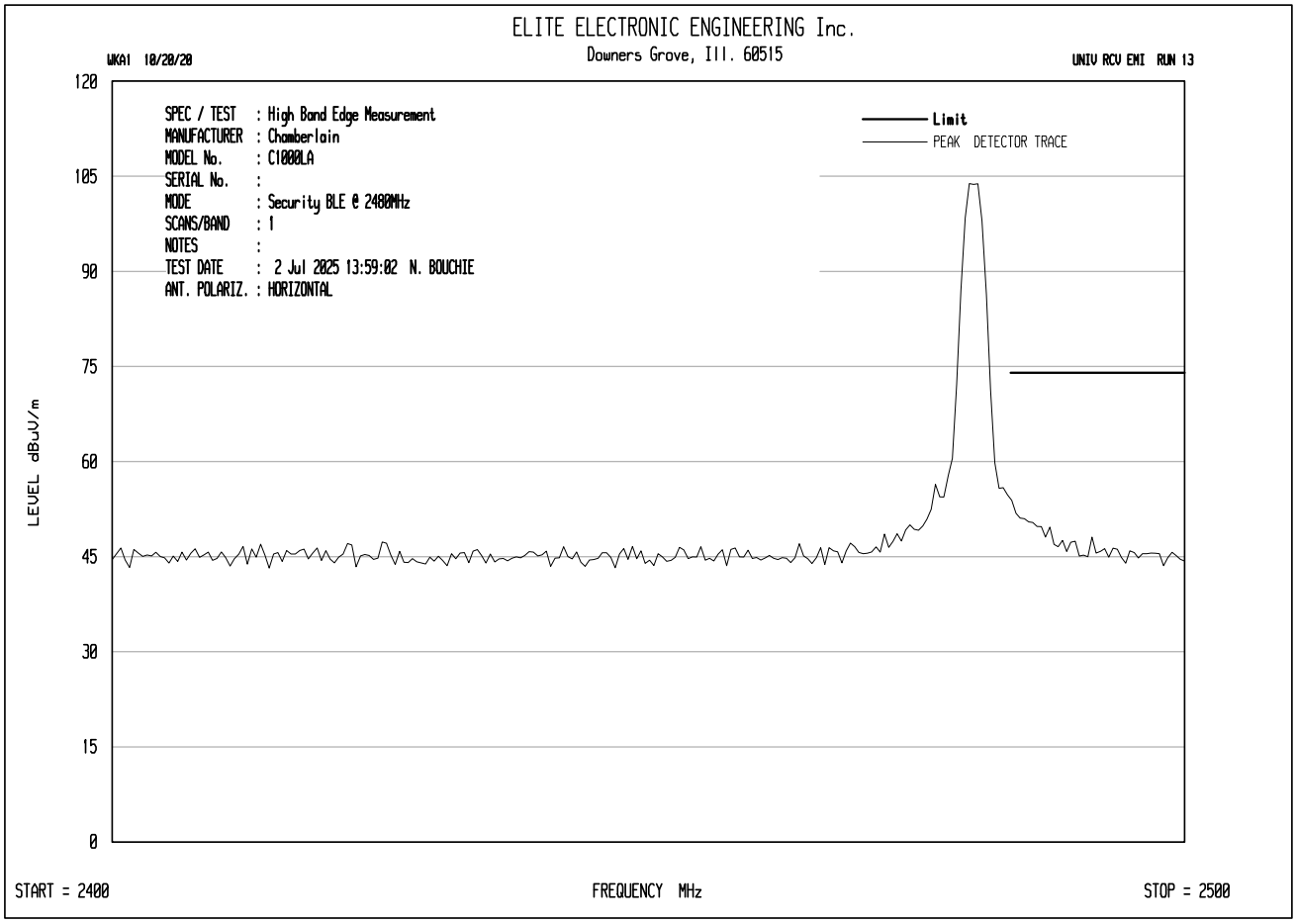
| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2200M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Notes | High Band Edge – Vertical Orientation |



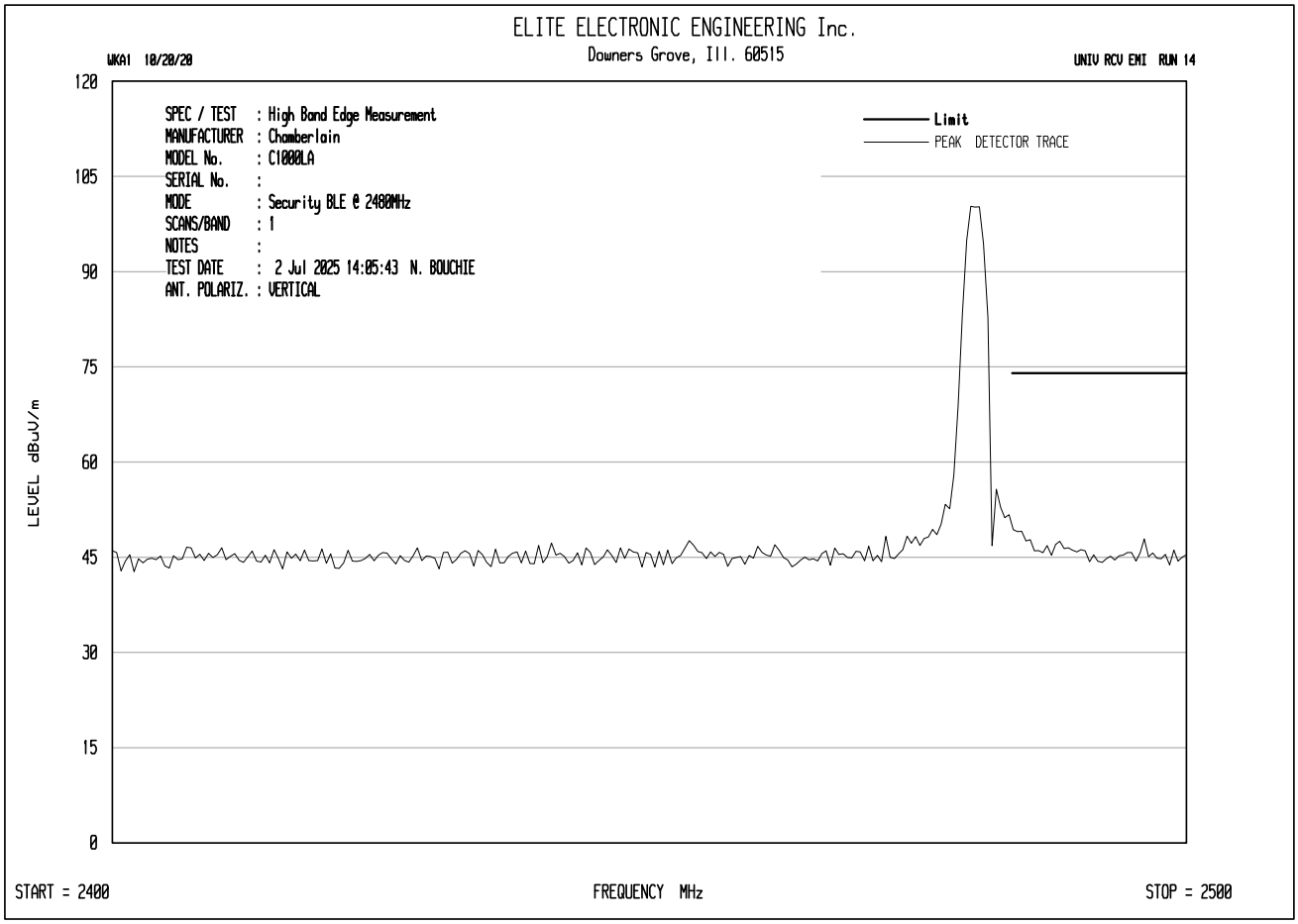

| Freq (MHz) | Ant Pol | Meter Reading (dBµV) | Ambient | Cable Factor (dB) | Antenna Factor (dB/m) | Pre Amp (dB) | Peak Total at 3m (dBµV/m) | Peak Total at 3m (µV/m) | Peak Limit at 3m (µV/m) | Margin (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2483.50 | H | 29.0 | | 3.5 | 32.7 | 0.0 | 65.2 | 1823.6 | 5000.0 | -8.8 |
| | V | 24.4 | | 3.5 | 32.7 | 0.0 | 60.6 | 1067.6 | 5000.0 | -13.4 |

| 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 | 15.07 | | 3.5 | 32.7 | 0.0 | 0.1 | 51.4 | 372.5 | 500.0 | -2.6 |
| | V | 12.18 | | 3.5 | 32.7 | 0.0 | 0.1 | 48.5 | 267.1 | 500.0 | -5.4 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | C1000LA |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Notes | High Band Edge – Horizontal Orientation |



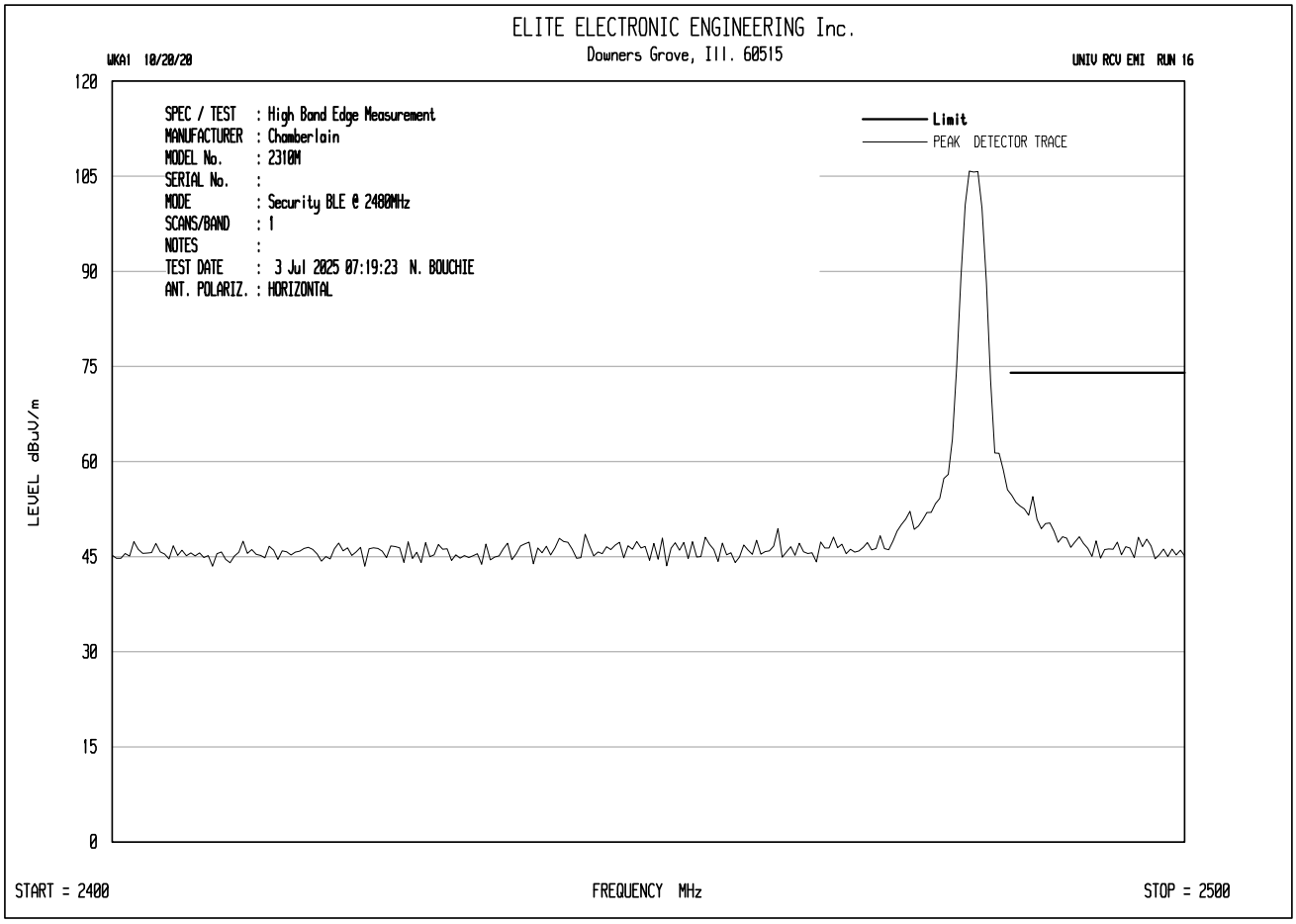
| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | C1000LA |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Notes | High Band Edge – Vertical Orientation |



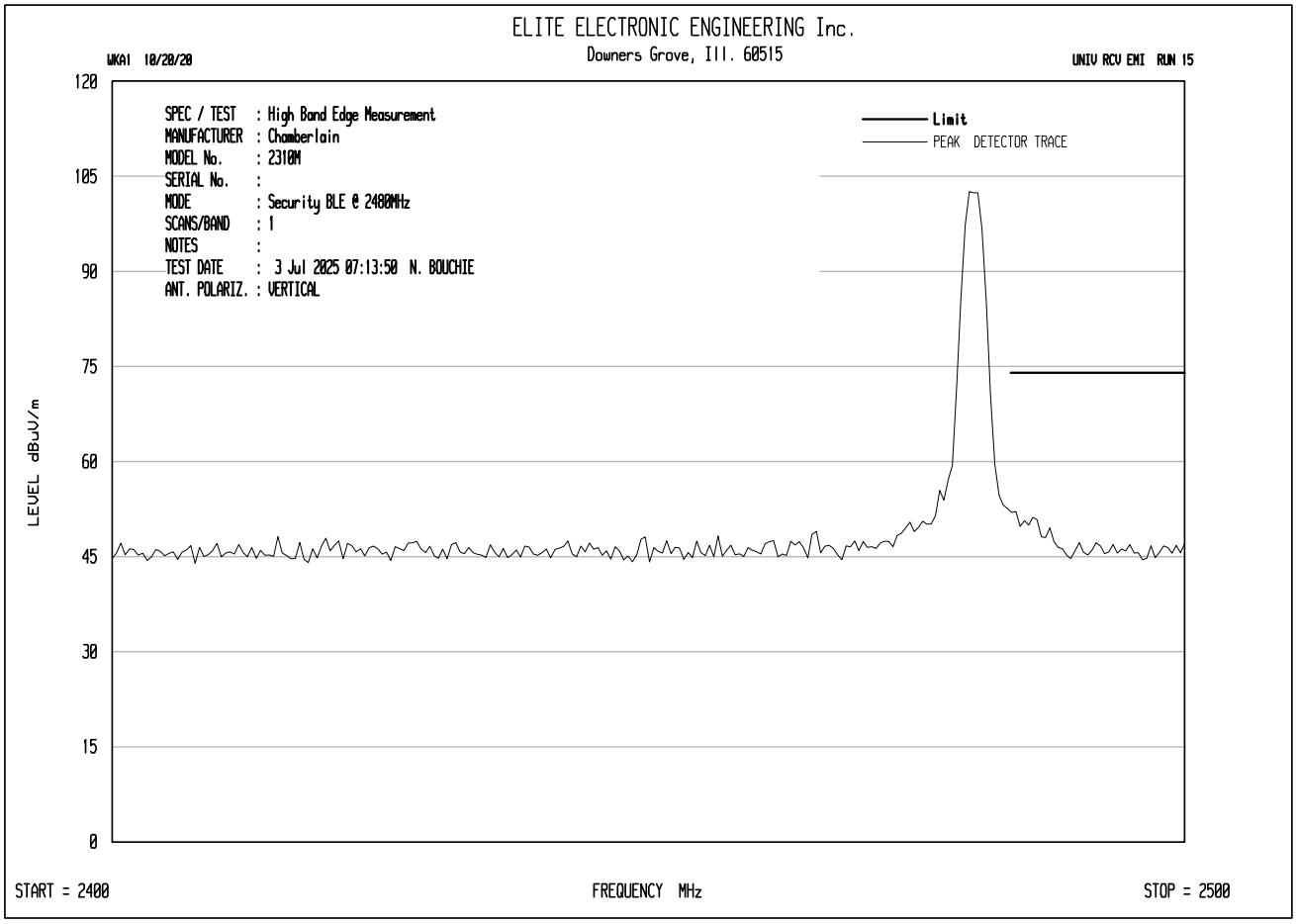

| Freq (MHz) | Ant Pol | Meter Reading (dBµV) | Ambient | Cable Factor (dB) | Antenna Factor (dB/m) | Pre Amp (dB) | Peak Total at 3m (dBµV/m) | Peak Total at 3m (µV/m) | Peak Limit at 3m (µV/m) | Margin (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2483.50 | H | 28.6 | | 3.5 | 32.7 | 0.0 | 64.8 | 1745.5 | 5000.0 | -9.1 |
| | V | 24.3 | | 3.5 | 32.7 | 0.0 | 60.5 | 1055.4 | 5000.0 | -13.5 |

| 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 | 13.38 | | 3.5 | 32.7 | 0.0 | 0.1 | 49.7 | 306.6 | 500.0 | -4.2 |
| | V | 11.44 | | 3.5 | 32.7 | 0.0 | 0.1 | 47.8 | 245.3 | 500.0 | -6.2 |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2310M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Notes | High Band Edge – Horizontal Orientation |



| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 2310M |
| Serial No. | Radiated Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Notes | High Band Edge – Vertical Orientation |




| 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 (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2483.50 | H | 27.8 | | 3.5 | 32.7 | 0.0 | 64.0 | 1579.1 | 5000.0 | -10.0 |
| | V | 26.3 | | 3.5 | 32.7 | 0.0 | 62.5 | 1328.7 | 5000.0 | -11.5 |

| 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 | 14.42 | | 3.5 | 32.7 | 0.0 | 0.1 | 50.8 | 345.7 | 500.0 | -3.2 |
| | V | 12.60 | | 3.5 | 32.7 | 0.0 | 0.1 | 49.0 | 280.3 | 500.0 | -5.0 |

# 28. Power Spectral Density

| EUT Information | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| Product | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2402MHz<br>BLE @ 2440MHz<br>BLE @ 2480MHz |

| 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 |

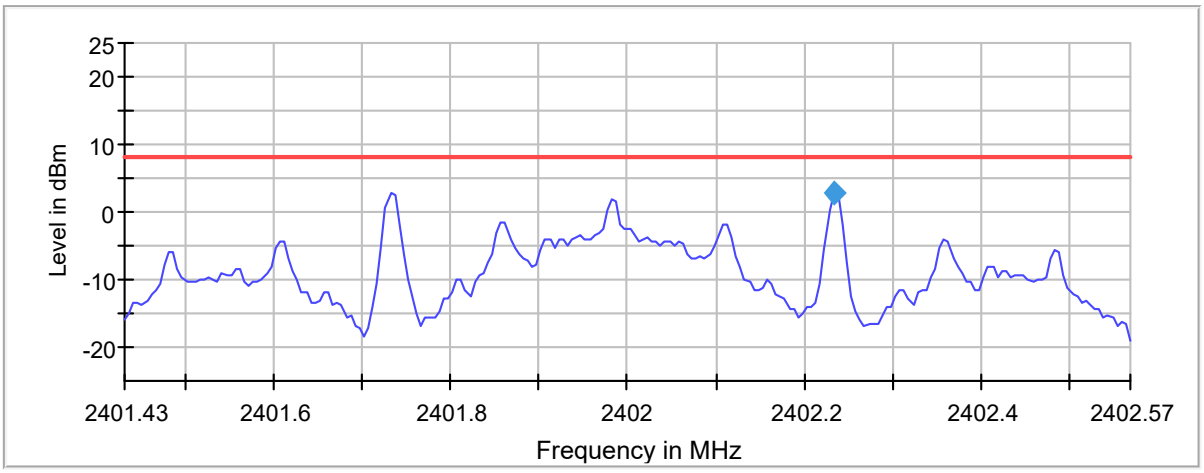
| Requirement |
|---|
| The power spectral density from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission. |

**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 | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2402MHz |
| Frequency Tested | 2402MHz |
| Result | PSD = 2.866dBm |
| Notes | None |

Peak Power Spectral Density

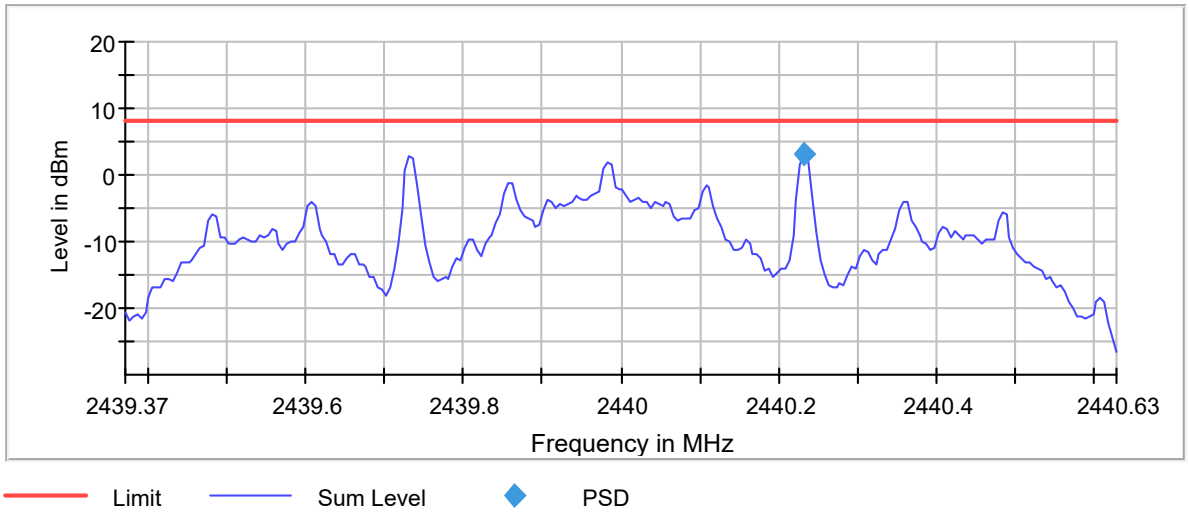



Limit Sum Level PSD

| DUT Frequency (MHz) | Frequency (MHz) | PSD (dBm) | Limit Max (dBm) | Result |
|---|---|---|---|---|
| **2402.000000** | **2402.233524** | **2.866** | **8.0** | **PASS** |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2440MHz |
| Frequency Tested | 2440MHz |
| Result | PSD = 3.019dBm |
| Notes | None |

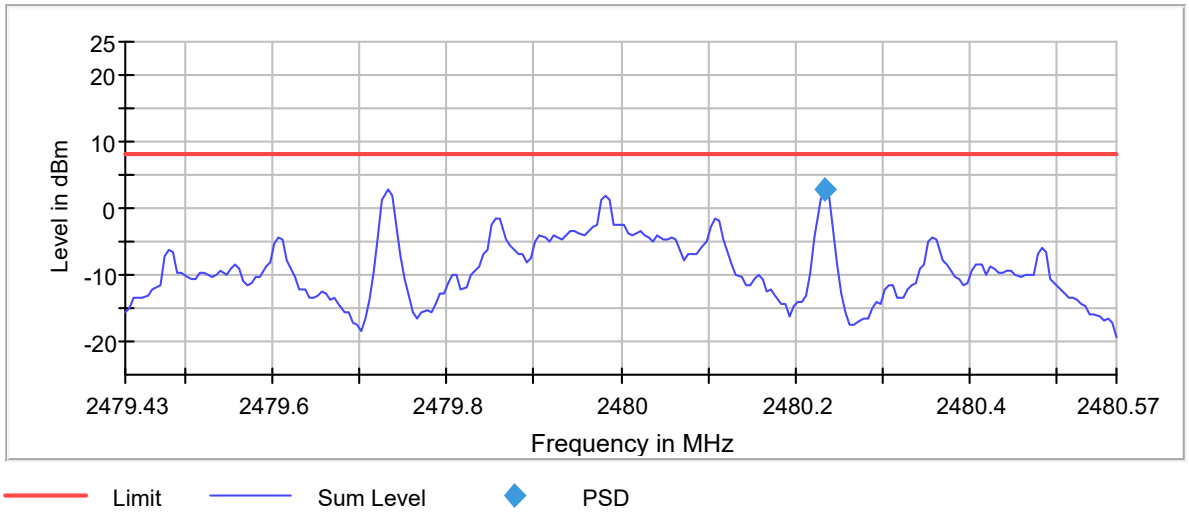
Peak Power Spectral Density




| DUT Frequency (MHz) | Frequency (MHz) | PSD (dBm) | Limit Max (dBm) | Result |
|---|---|---|---|---|
| **2440.000000** | **2440.233426** | **3.019** | **8.0** | **PASS** |

| Test Details | |
|---|---|
| Manufacturer | The Chamberlain Group LLC |
| EUT | Vulcan – 900-15607 Rev F |
| Model No. | 900-15607-11 |
| Serial No. | Conducted Sample |
| Mode | BLE @ 2480MHz |
| Frequency Tested | 2480MHz |
| Result | PSD = 2.807dBm |
| Notes | None |

Peak Power Spectral Density




| DUT Frequency (MHz) | Frequency (MHz) | PSD (dBm) | Limit Max (dBm) | Result |
|---|---|---|---|---|
| **2480.000000** | **2480.233524** | **2.807** | **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: August 31, 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***<br>*(Max Voltage 60V/Max current 100A)* | ISO 7637-2 (including emissions); ISO 7637-3;<br>ISO 16750-2:2012, Sections 4.6.3 and 4.6.4;<br>CS-11979, Section 6.4; CS.00054, Section 5.9;<br>EMC-CS-2009.1 (CI220); FMC1278 (CI220, CI221, CI222);<br>GMW 3097, Section 3.5; SAE J1113-11; SAE J1113-12;<br>ECE Regulation 10.06 Annex 10 |
| ***Electrostatic Discharge (ESD)***<br>*(Up to +/-25kV)* | ISO 10605 (2001, 2008);<br>CS-11979 Section 7.0; CS.00054, Section 5.10;<br>EMC-CS-2009.1 (CI 280); FMC1278 (CI280); SAE J1113-13;<br>GMW 3097 Section 3.6 |
| ***Conducted Emissions*** | CISPR 25 (2002, 2008), Sections 6.2 and 6.3;<br>CISPR 25 (2016), Sections 6.3 and 6.4;<br>CS-11979, Section 5.1; CS.00054, Sections 5.6.1 and 5.6.2;<br>GMW 3097, Section 3.3.2;<br>EMC-CS-2009.1 (CE 420); FMC1278 (CE420, CE421,<br>CE 430, CE440) |



5202 Presidents Court, Suite 220 | Frederick, MD 21703-8515 | Phone: 301 644 3248 | Fax: 240 454 9449 | www.A2LA.org

| Test Technology: | Test Method(s)[1]: |
|---|---|
| ***Radiated Emissions Anechoic***<br>*(Up to 6GHz)* | CISPR 25 (2002, 2008), Section 6.4;<br>CISPR 25 (2016), Section 6.5;<br>CS-11979, Section 5.3; CS.00054, Section 5.6.3;<br>GMW 3097, Section 3.3.1;<br>EMC-CS-2009.1 (RE 310); FMC1278 (RE310, RE320); |
| ***Vehicle Radiated Emissions*** | CISPR 12; CISPR 36; ICES-002;<br>ECE Regulation 10.06 Annex 4;<br>ECE Regulation 10.06 Annex 5 |
| ***Bulk Current Injection (BCI)***<br>*(1 to 400MHz 500mA)* | ISO 11452-4; CS-11979, Section 6.1; CS.00054, Section 5.8.1;<br>GMW 3097, Section 3.4.1; SAE J1113-4;<br>EMC-CS-2009.1 (RI112); FMC1278 (RI112);<br>ECE Regulation 10.06 Annex 9 |
| ***Radiated Immunity Anechoic***<br>*(Up to 6GHz and 200V/m)*<br>*(Including Radar Pulse 600V/m)* | ISO 11452-2;<br>CS-11979, Section 6.2; CS.00054, Section 5.8.2;<br>GMW 3097, Section 3.4.2;<br>EMC-CS-2009.1 (RI114); FMC1278 (RI114); SAE J1113-21;<br>ECE Regulation 10.06 Annex 9 |
| ***Radiated Immunity Magnetic Field*** | ISO 11452-8; FMC 1278 (RI140) |
| ***Radiated Immunity Reverb***<br>*(360MHz to 6GHz and 100V/m)* | ISO/IEC 61000-4-21; GMW 3097, Section 3.4.3;<br>EMC-CS-2009.1 (RI114); FMC1278 (RI114);<br>ISO 11452-11 |
| ***Radiated Immunity***<br>*(Portable Transmitters)*<br>*(Up to 6GHz and 20W)* | ISO 11452-9;<br>EMC-CS-2009.1 (RI115); FMC1278 (RI115);<br>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;<br>EC Regulation No. 2015/208; EN 55012 |
| ***Electrical Loads*** | ISO 16750-2 |
| ***Stripline*** | ISO 11452-5 |
| ***Transverse Electromagnetic (TEM) Cell*** | ISO 11452-3 |