ELEMENT WASHINGTON DC LLC
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# PART 90 MEASUREMENT REPORT

**Applicant Name:**
Applied Information, Inc.
3000 Summit Pl suite 150
Alpharetta, GA 30009
United States

**Date of Testing:**
04/22/2024 - 05/28/2024
**Test Report Issue Date:**
7/2/2024
**Test Site/Location:**
Element lab., Columbia, MD, USA
**Test Report Serial No.:**
1M2404190036-01.2BHCM

| | |
|---|---|
| **FCC ID:** | **2BHCM-500-095** |
| **APPLICANT:** | **Applied Information, Inc.** |

| | |
|---|---|
| **Application Type:** | Certification |
| **Model:** | 500-095 |
| **EUT Type:** | C-V2X Roadside Unit |
| **FCC Classification:** | Part 90M Road Side Unit (ITR) |
| **FCC Rule Part:** | §90(M) |
| **Test Procedure(s):** | ANSI C63.26-2015, KDB 511808 D01 C-V2X Waiver v01r01<br>Waivers DA 23-343 and DA 23-586 |

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

**RJ Ortanez**
**Executive Vice President**

ACCREDITED
CERT #2041.01

# TABLE OF CONTENTS

# MEASUREMENT REPORT
## FCC Part 90 Subpart M

| Mode | Bandwidth | Tx Frequency Range [MHz] | Measurement | Max. Power [W] | Max. Power [dBm] | Emission Designator |
|---|---|---|---|---|---|---|
| C-V2X | 20MHz | 5915.0 | EIRP | 0.36 | 25.51 | 18M8F1D |

# 1.0 INTRODUCTION

## 1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

## 1.2 Element Test Location

These measurement tests were conducted at the Element laboratory located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

## 1.3 Test Facility / Accreditations

**Measurements were performed at Element lab located in Columbia, MD 21046, U.S.A.**

- Element Washington DC LLC is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.

- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).

- Element Washington DC LLC facility is a registered (2451B) test laboratory with the site description on file with ISED.

- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreement.

# 2.0 PRODUCT INFORMATION

## 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Applied Information C-V2X Roadside Unit FCC ID: 2BHCM-500-095**. The test data contained in this report pertains to the emissions due to the EUT's C-V2X Roadside Unit radio transmitter that operates under the provisions of Part 90 Subpart M and KDB 511808 D01. The guidance in KDB 511808 D01 follows the guidance in the FCC waiver documentation filed under DA 23-343 and DA 23-586.

**Test Device Serial No.:** 923137153

## 2.2 Device Capabilities

This device contains the following capabilities:

C-V2X

## 2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015. See Section 6.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

The device operated in the center frequency of 5915MHz with a single 20MHz BW channel per the restrictions of the waiver.

## 2.4 Software and Firmware

Testing was performed on device(s) using software/firmware version 1.5.0 installed on the EUT.

## 2.5 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

## 2.6 Antenna Description

The manufacturer has declared that the following antenna will be used with this device:

Antenna Part No: OBM.5900.B10F21
Antenna Description: Barracuda 5.9GHz DSRC 10dBi Omnidirectional Outdoor Antenna
Antenna Type: Collinear Dipole Array
Antenna Gain: 10.2dBi

# 3.0 DESCRIPTION OF TESTS

## 3.1 Evaluation Procedure

The measurement procedures described in the "American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services" (ANSI C63.26-2015) and KDB 511808 D01 were used in the measurement of the EUT.

**Deviation from Measurement Procedure……..……..None**

## 3.2 Radiated Power and Radiated Spurious Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer.

For radiated power measurements, substitution method is used per the guidance of ANSI C63.26-2015. For emissions below 1GHz, a half-wave dipole is substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_{d\,[dBm]} = P_{g\,[dBm]} - \text{cable loss}_{\,[dB]} + \text{antenna gain}_{\,[dBd/dBi]};$$

where $P_d$ is the dipole equivalent power, $P_g$ is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_{g\,[dBm]}$ – cable loss $_{[dB]}$.

For radiated spurious emissions measurements, the field strength conversion method is used per the formulas in Section 5.2.7 of ANSI C63.26-2015. Field Strength (EIRP) is calculated using the following formulas:

$$E_{[dB\mu V/m]} = \text{Measured amplitude level}_{[dBm]} + 107 + \text{Cable Loss}_{[dB]} + \text{Antenna Factor}_{[dB/m]}$$

And

$$EIRP_{[dBm]} = E_{[dB\mu V/m]} + 20\log D - 104.8;$$ where D is the measurement distance in meters.

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 414788 D01 v01r01.

Radiated power and radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI C63.26-2015.

# 4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the $U_{CISPR}$ measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

| Contribution | Expanded Uncertainty (±dB) |
|---|---|
| Conducted Bench Top Measurements | 1.13 |
| Radiated Disturbance (<1GHz) | 4.98 |
| Radiated Disturbance (>1GHz) | 5.07 |
| Radiated Disturbance (>18GHz) | 5.09 |

# 5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

| Manufacturer | Model | Description | Cal Date | Cal Interval | Cal Due | Serial Number |
|---|---|---|---|---|---|---|
| N/A | WL40-1 | WLAN Cable Set (40GHz) | 11/15/2023 | Annual | 11/15/2024 | WL40-1 |
| N/A | MVG-001 | EMC Cable and Switch System | 4/14/2024 | Annual | 4/14/2025 | MVG-001 |
| N/A | MVG-002 | EMC Cable and Switch System | 2/14/2024 | Annual | 2/14/2025 | MVG-002 |
| Espec | SCP-220 | Temperature Chamber | 5/25/2022 | Biennial | 5/25/2024 | OCPS5H0612K05 |
| Keysight Technologies | N9030A | PXA Signal Analyzer | 2/29/2024 | Annual | 3/1/2025 | MY55410501 |
| Keysight Technologies | N9030B | PXA Signal Analyzer | 9/7/2023 | Annual | 9/7/2024 | MY57141001 |
| Rohde & Schwarz | ESU40 | EMI Test Receiver (40GHz) | 9/11/2023 | Annual | 9/11/2024 | 100348 |
| Sunol Sciences | DRH-118 | Horn (Small) | 2/21/2024 | Biennial | 2/21/2026 | A050307 |
| Sunol Sciences | JB6 | Bi-Log Antenna (30M-5GHz) | 3/2/2023 | Biennial | 3/2/2025 | A082816 |

**Table 5-1. Test Equipment**

**Notes:**

1. For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

2. Equipment with a calibration date of “N/A” shown in this list was not used to make direct calibrated measurements.

# 6.0 TEST RESULTS

## 6.1 Summary

Company Name: Applied Information, Inc.

FCC ID: 2BHCM-500-095

FCC Classification: Part 90M Road Side Unit (ITR)

| Test Condition | Test Description | FCC Part Section(s) | Test Limit | Test Result | Reference |
|---|---|---|---|---|---|
| CONDUCTED | Transmitter Conducted Output Power & Equivalent Isotropic Radiated Power | 2.1046<br>90.377<br>Waiver: DA 23-343 | < 33 dBm E.I.R.P | PASS | Section 6.2 |
| | Occupied Bandwidth | 2.1049<br>90.370<br>Waiver: DA 23-343 | N/A | PASS | Section 6.3 |
| | Out-of-Band Emissions (OOBE) | Waiver: DA 23-343 | Must meet C-V2X Out-of-Band Emissions (OOBE) Limits | PASS | Sections 6.4, 6.5 |
| | Frequency Stability | 2.1055 | **Fundamental emissions stay within authorized frequency block | PASS | Section 6.7 |
| RADIATED | Radiated Spurious Emissions | 2.1053<br>Waiver: DA 23-343 | Must meet C-V2X Out-of-Band Emissions (OOBE) Limits | PASS | Section 6.6 |

**Table 6-1. Summary of Test Results**

**Notes:**

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in Section 7.0 were taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is EMC Software Tool v1.1.

## 6.2 Conducted Output Power & Equivalent Isotropic Radiated Power

**Test Overview**

All emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

**The maximum allowed EIRP for this device is 33dBm.**

**Test Procedure Used**

ANSI C63.26-2015 – Section 5.2.4.4

**Test Settings**

1. RBW = 1% to 5% of the OBW
2. VBW ≥ 3 x RBW
3. Span = 2 x OBW to 3 x OBW
4. Detector = RMS
5. Trace mode = Max Hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize
8. Spectrum analyzer's "Channel Power" function was used to compute the power by integrating the spectrum across the OBW of the signal

**Test Setup**

The EUT and measurement equipment were set up as shown in the diagram below.

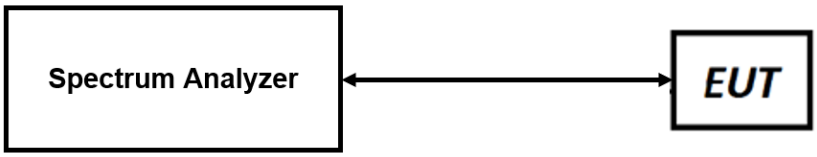


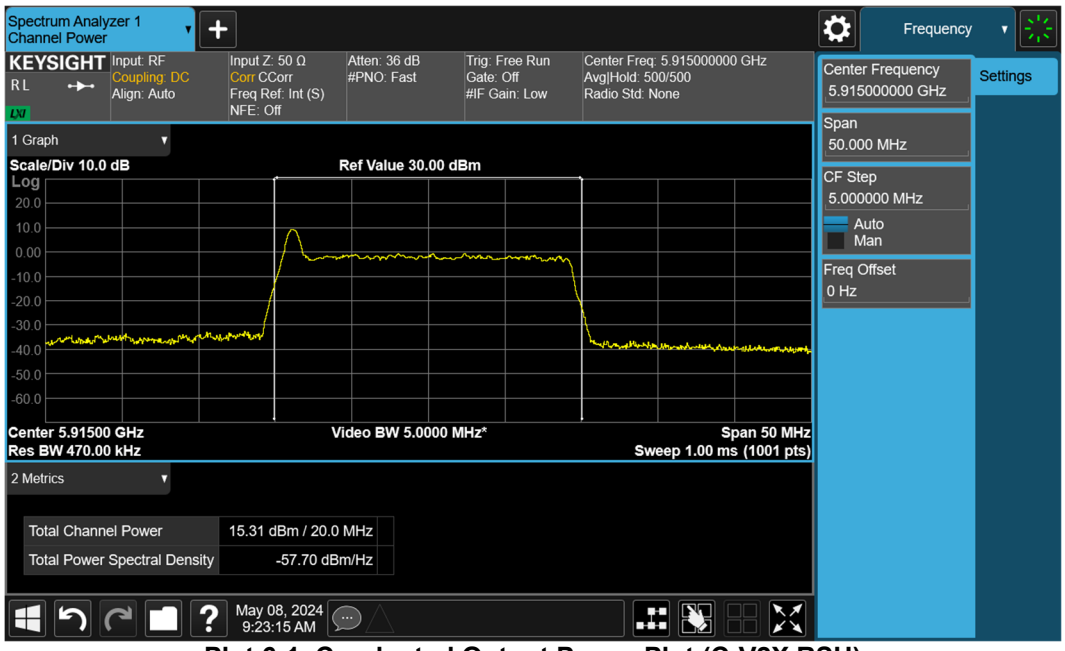

**Figure 6-1. Test Instrument & Measurement Setup**

**Test Notes**

The 10.2dBi antenna gain shown in this section is declared by the manufacturer.

| Bandwidth | Mode | Frequency [MHz] | Conducted Power [dBm] | Antenna Gain [dBi] | EIRP [dBm] | EIRP Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 20 MHz | ANT1 | 5915.0 | 15.31 | 10.2 | 25.505 | 33.00 | -7.495 |

**Table 6-2. Maximum Conducted Output Power Result**




**Plot 6-1. Conducted Output Power Plot (C-V2X RSU)**

## 6.3 Occupied Bandwidth

**Test Overview**

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

**Test Procedure Used**

ANSI C63.26-2015 – Section 5.4.4

**Test Settings**

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

**Test Setup**

The EUT and measurement equipment were set up as shown in the diagram below.

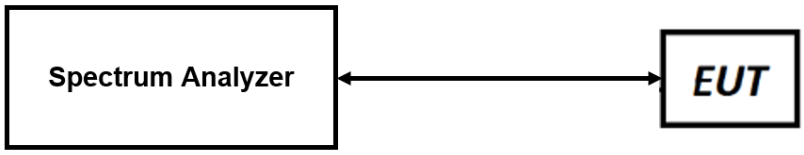
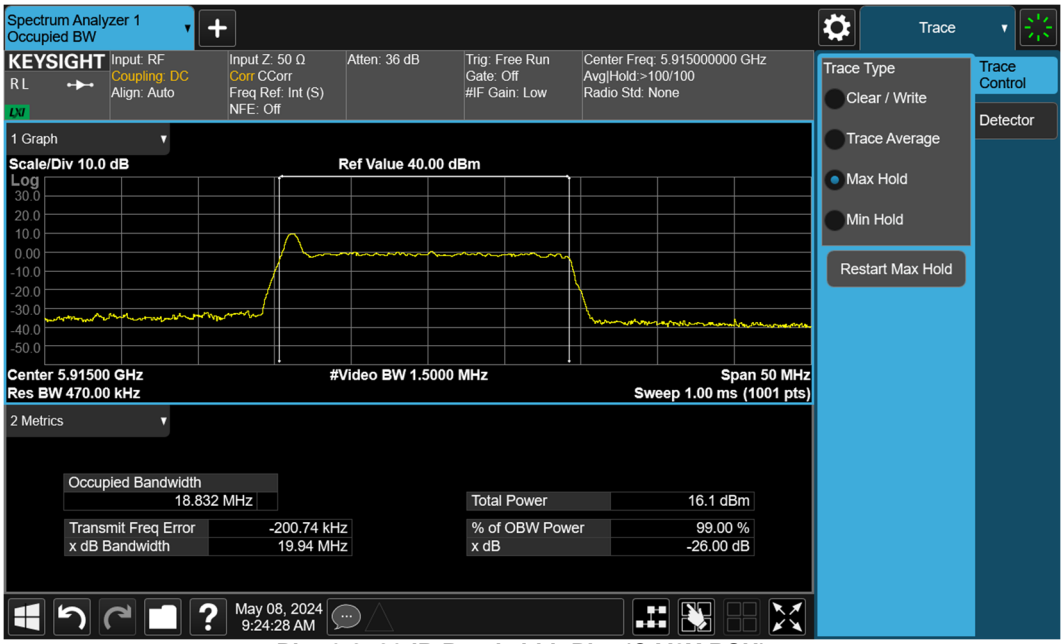



**Figure 6-2. Test Instrument & Measurement Setup**

**Test Notes**

None




**Plot 6-2. 26dB Bandwidth Plot (C-V2X RSU)**

## 6.4 Out of Band Emissions (OOBE)

**Test Overview**

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies. C-V2X RSUs must meet OOBE limits as following,

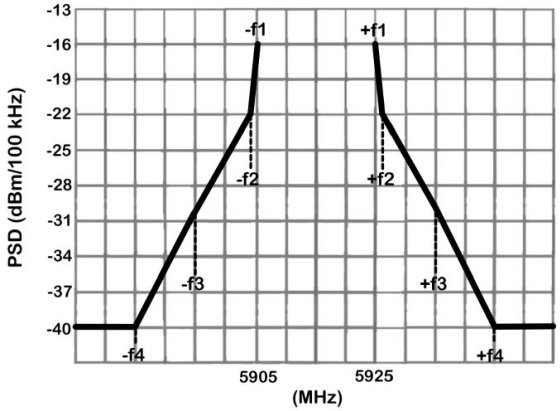



**Figure 6-3. Out of Band Emissions Mask Limit**

Out of Band Emissions Mask is based upon a absolute EIRP value in dBm/100kHz and not a relative change in amplitude(dBr). And, emissions mask for the emissions levels at the frequency offsets described below,

1. $+f_1$ and $-f_1$ is the frequencies at the channel edge with an emissions level of -16 dBm/100 kHz.
2. $+f_2$ and $-f_2$ is a frequency offset of 1 MHz from the channel edge with an emissions level of -22 dBm/100 kHz.
3. $+f_3$ and $-f_3$ is a frequency offset of 10 MHz from the channel edge with an emissions level of -30 dBm/100 kHz.
4. $+f_4$ and $-f_4$ is a frequency offset of 20 MHz from the channel edge with an emissions level of -40 dBm/100 kHz.

**Test Procedure Used**

KDB 511808 D01 C-V2X Waiver v01r01 – Section 3.2.3

**Test Settings**

1. Set instrument center frequency to the frequency of channel being measured.
2. RBW = 100kHz
3. VBW ≥ 3 x RBW
4. Span ≥ 4 times the OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trace mode = max hold
8. Sweep time = auto couple
9. The trace was allowed to stabilize

**Test Setup**

The EUT and measurement equipment were set up as shown in the diagram below.

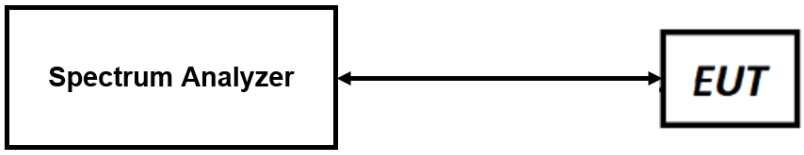


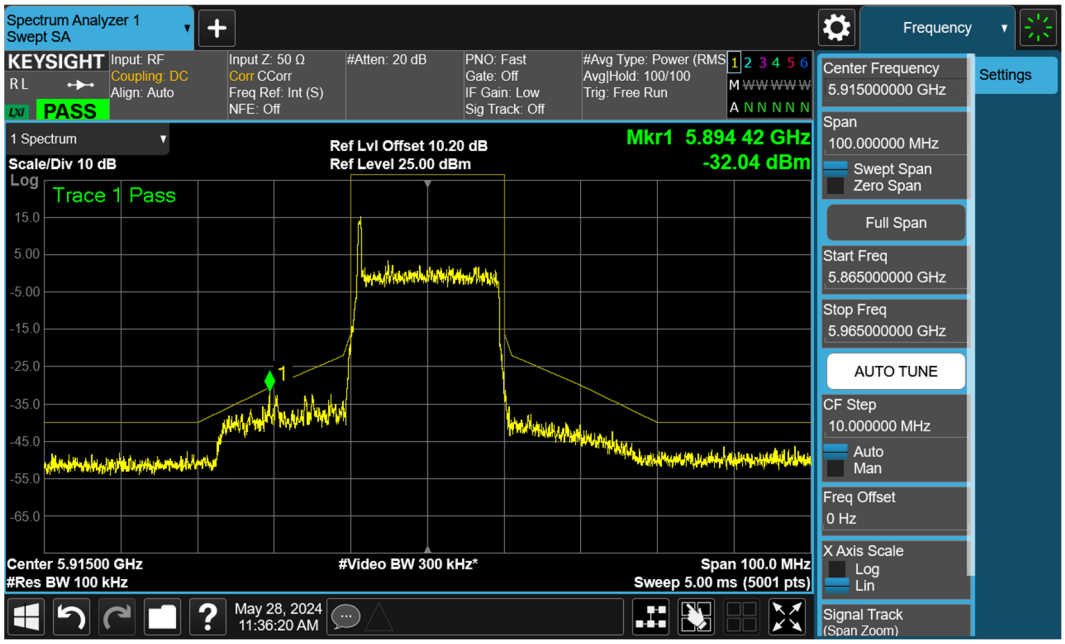

**Figure 6-4. Test Instrument & Measurement Setup**

## Test Notes

None

| Bandwidth | Test Case | Frequency [MHz] | Level [dBm] | Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|
| 20 MHz | OOBE | 5894.4 | -32.04 | -30.58 | -1.46 |

**Table 6-3. Out of Band Emissions Result**




**Plot 6-3. Out of Band Emissions Plot (C-V2X RSU)**

## 6.5 Spurious and Harmonic Emissions at Antenna Terminal

**Test Overview**

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10$^{th}$ harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies

**Test Procedure Used**

ANSI C63.26-2015 – Section 5.7.4

**Test Settings**

1. Start frequency was set to 30MHz and stop frequency was set to 40GHz (separated into at least two plots per channel)
2. RBW = 100kHz
3. VBW ≥ 3 x RBW
4. Detector = RMS
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

**Test Setup**

The EUT and measurement equipment were set up as shown in the diagram below.

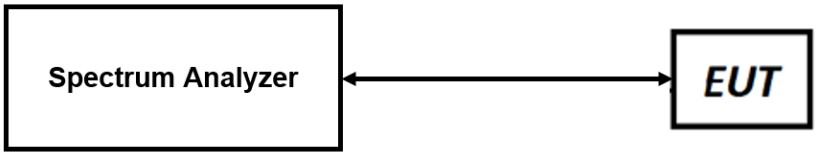
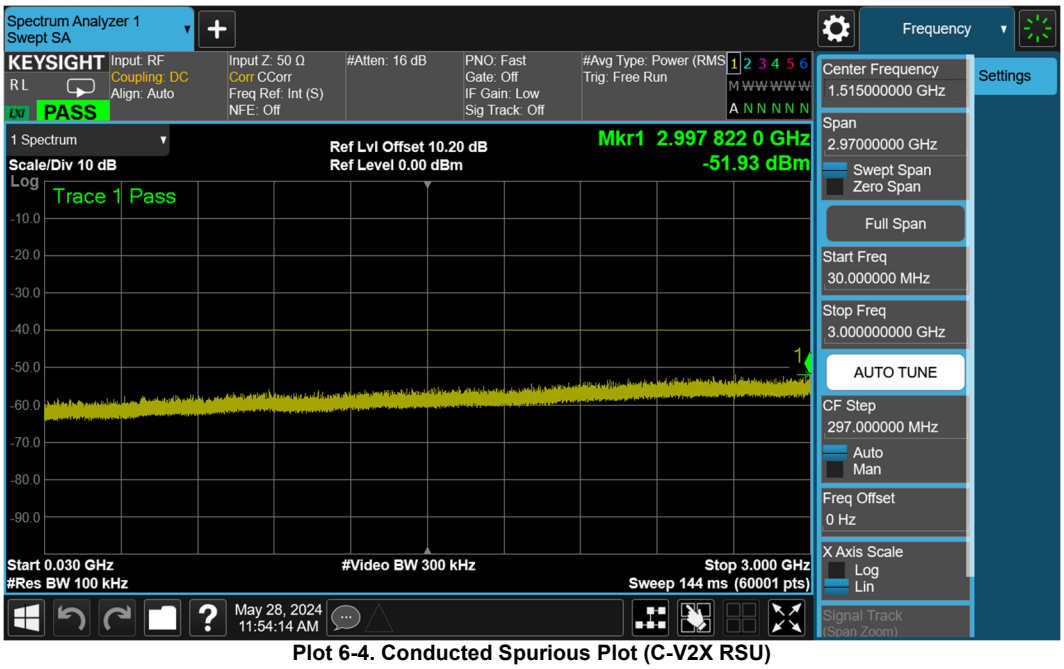


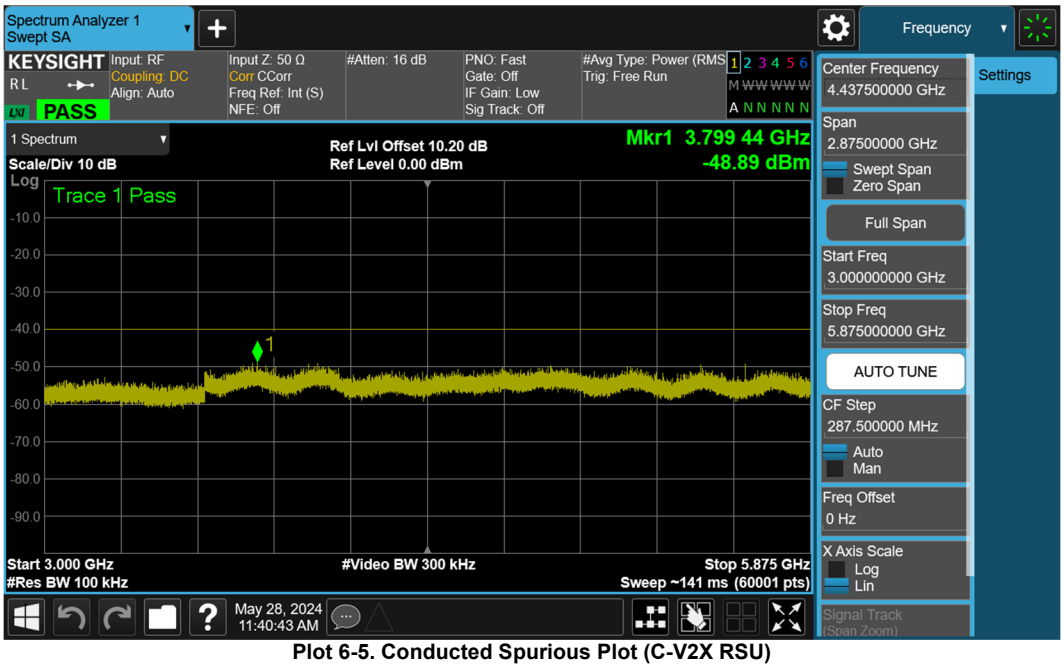

**Figure 6-5. Test Instrument & Measurement Setup**

**Test Notes**

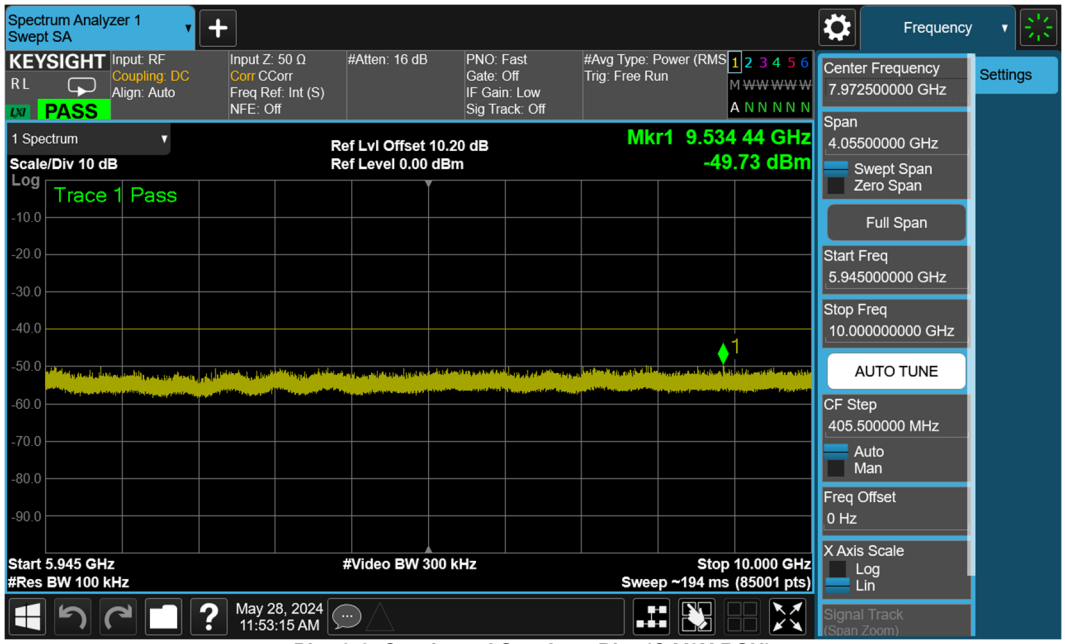
Per Part 90, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.



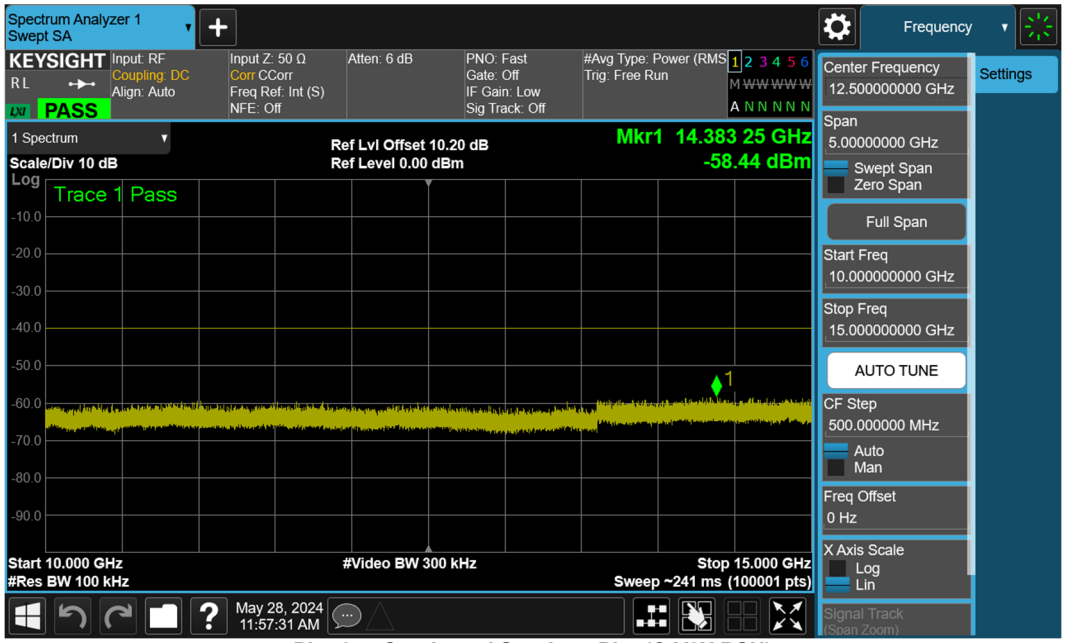

**Plot 6-4. Conducted Spurious Plot (C-V2X RSU)**



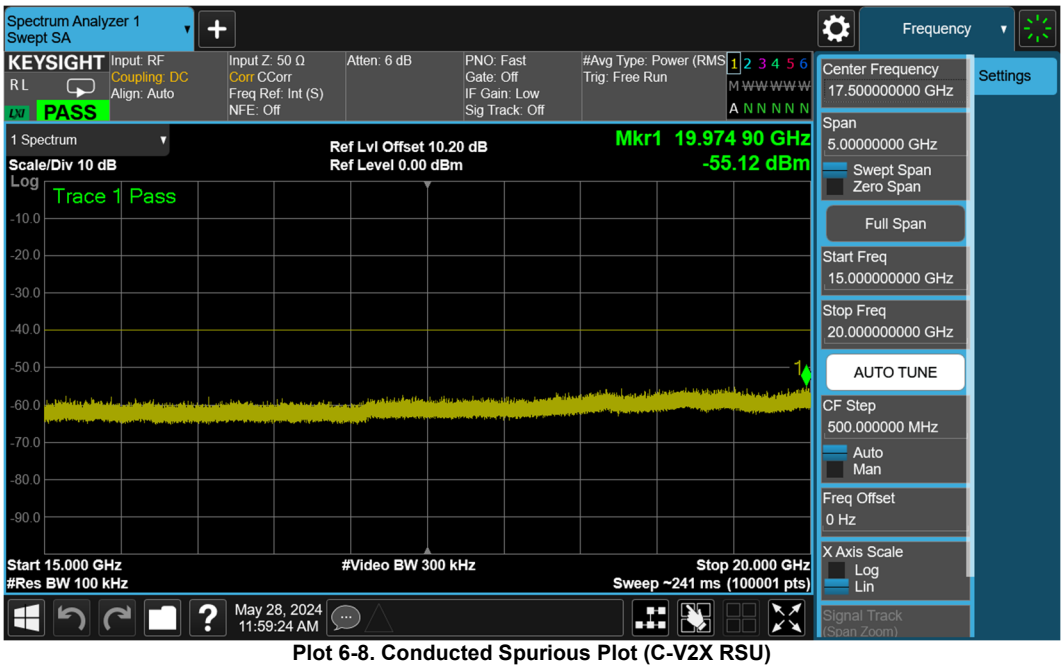

**Plot 6-5. Conducted Spurious Plot (C-V2X RSU)**



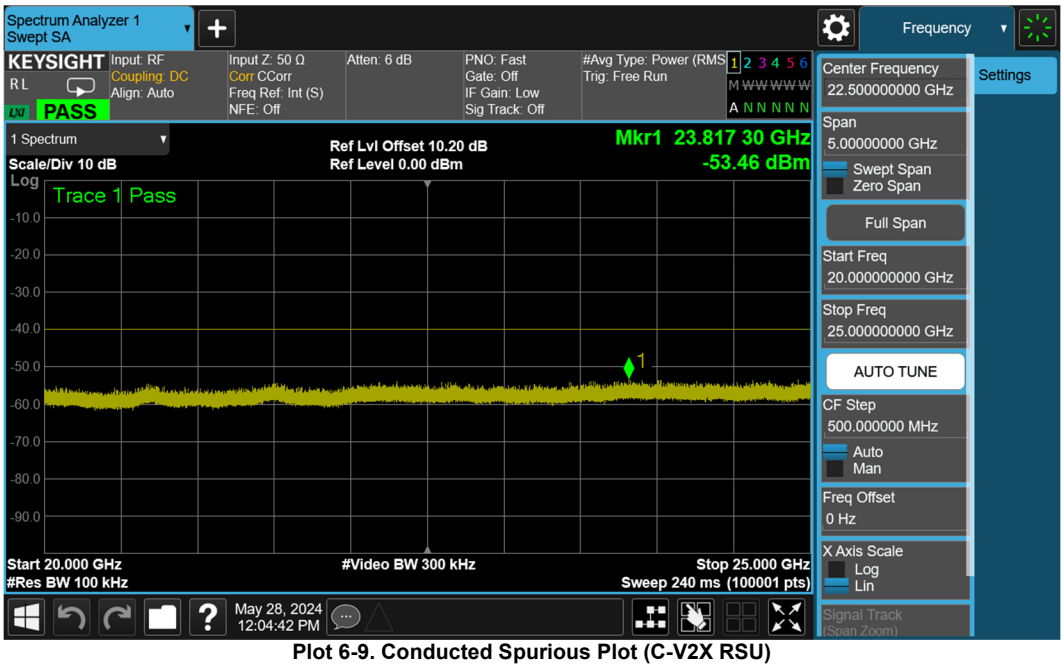

**Plot 6-6. Conducted Spurious Plot (C-V2X RSU)**



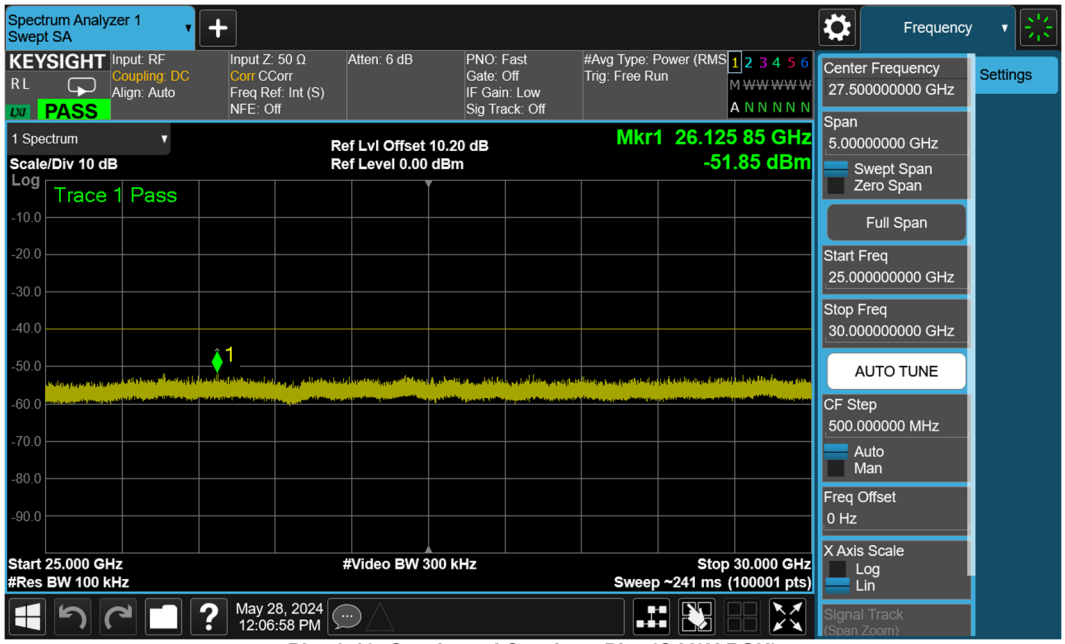

**Plot 6-7. Conducted Spurious Plot (C-V2X RSU)**



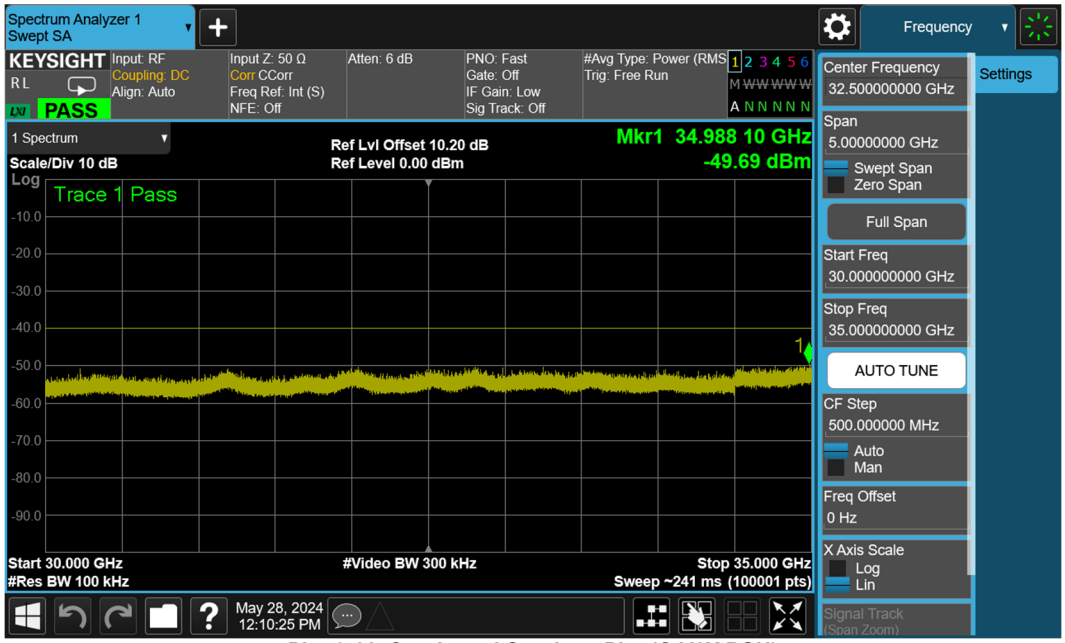

**Plot 6-8. Conducted Spurious Plot (C-V2X RSU)**



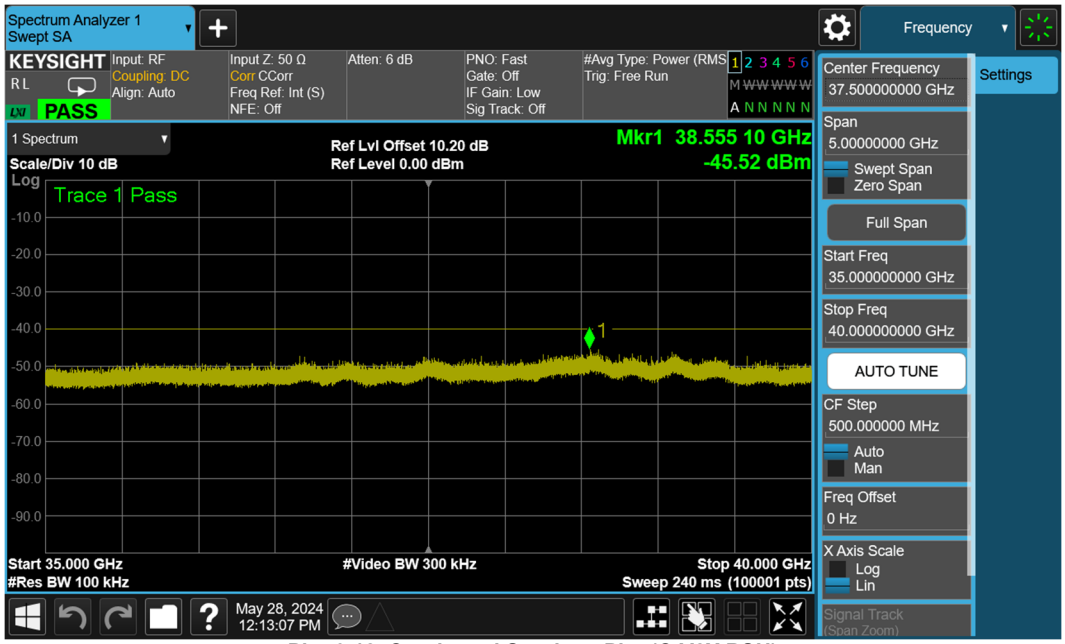

**Plot 6-9. Conducted Spurious Plot (C-V2X RSU)**




**Plot 6-10. Conducted Spurious Plot (C-V2X RSU)**




**Plot 6-11. Conducted Spurious Plot (C-V2X RSU)**




**Plot 6-12. Conducted Spurious Plot (C-V2X RSU)**

## 6.6 Radiated Spurious Emissions Measurements

**Test Overview**

Radiated spurious emissions measurements are performed using the field strength conversion method described in ANSI C63.26-2015 with the EUT transmitting in the manufacturer provided external antenna. Measurements on signals operating below 1GHz are performed using hybrid (biconical/log) antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

**Test Procedures Used**

ANSI C63.26-2015 – Section 5.5.4

**Test Settings**

1. RBW = 100kHz for emissions <1GHz and RBW = 1MHz for emissions >1GHz
2. VBW ≥ 3 x RBW
3. Span ≥ 4 times the OBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = RMS
6. Trace mode = Max Hold
7. Sweep time = auto
8. The trace was allowed to stabilize

## Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

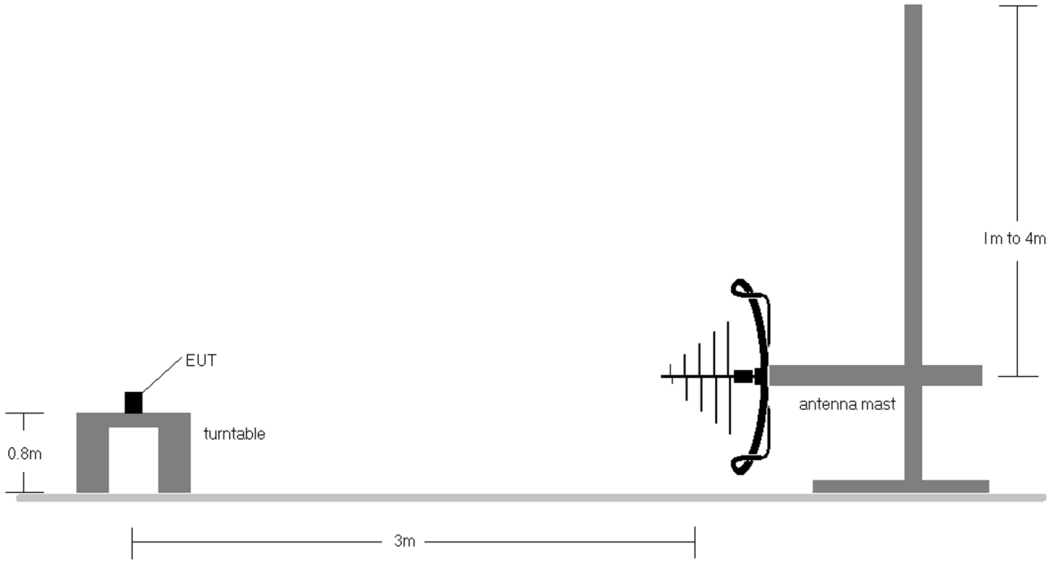



**Figure 6-6. Test Instrument & Measurement Setup < 1GHz**

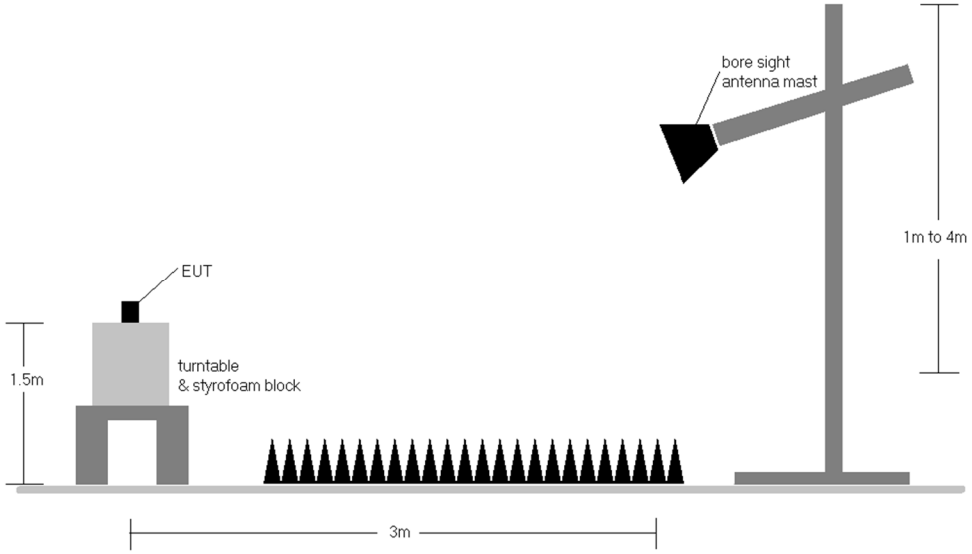



**Figure 6-7. Test Instrument & Measurement Setup >1 GHz**

## Test Notes

1) Field strengths are calculated using the Measurement quantity conversions in ANSI C63.26-2015 Section 5.2.7:
   a) E(dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m)
   b) EIRP (dBm) = E(dBµV/m) + 20logD – 104.8; where D is the measurement distance in meters.

2) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst-case emissions are reported with the EUT positioning configurations shown in the tables below.

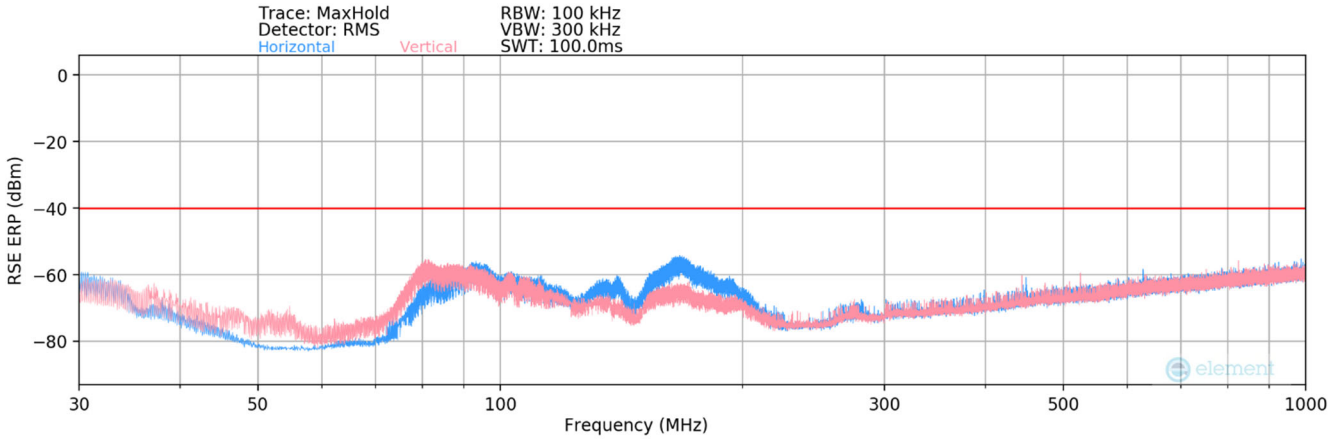
3) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

4) Emissions below 18GHz were measured at a 3-meter test distance while emissions above 18GHz were measured at a 1-meter test distance with the application of a distance correction factor.

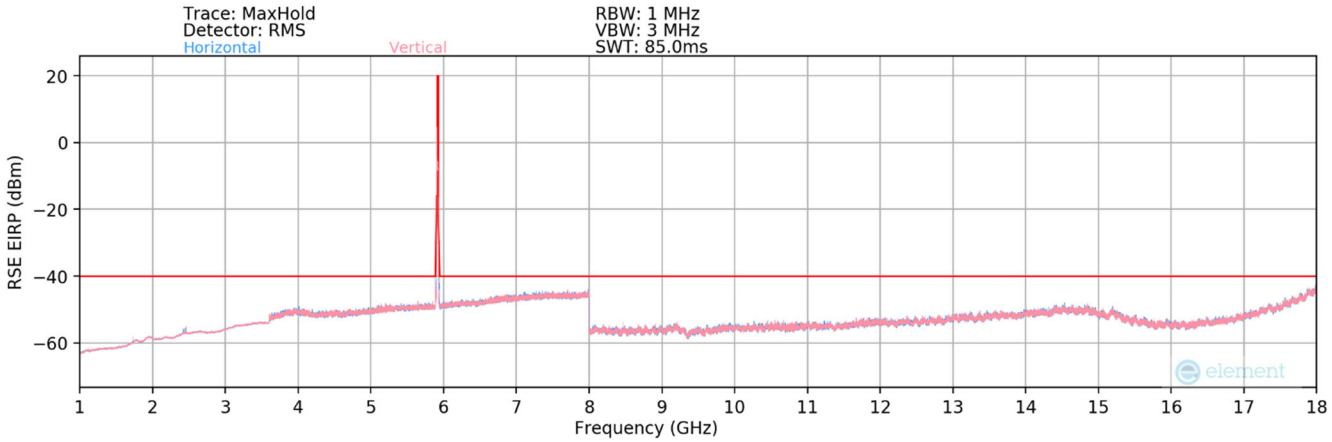
5) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

6) Prescan, above 1GHz, is taken with 1MHz RBW instead of 100kHz RBW to have enough sweep points to scan any spurious emission.

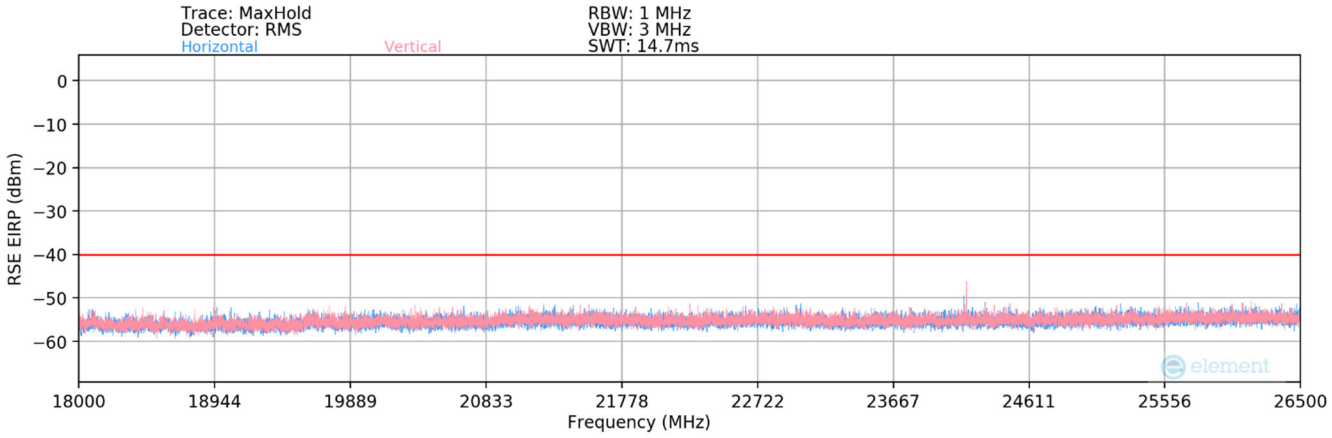
## C-V2X RSU



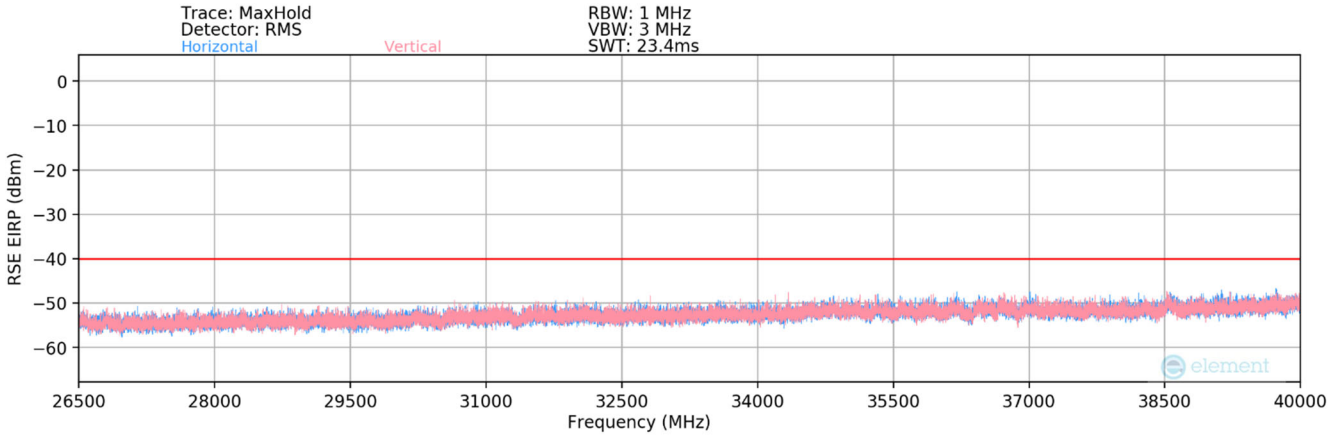

**Plot 6-13. Radiated Spurious Plot (C-V2X RSU)**




**Plot 6-14. Radiated Spurious Plot (C-V2X RSU)**




**Plot 6-15. Radiated Spurious Plot (C-V2X RSU)**




**Plot 6-16. Radiated Spurious Plot (C-V2X RSU)**

| | |
|---|---|
| **Frequency (MHz):** | 5915 |
| **Detector / Trace Mode:** | RMS / MaxHold |
| **RBW / VBW:** | 100kHz / 300kHz |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBµV/m] | ERP Spurious Emission | Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 39.03 | V | 123 | 257 | -89.92 | 20.87 | 37.95 | -59.46 | -40.00 | -19.46 |
| 80.85 | V | 135 | 15 | -76.31 | 14.02 | 44.71 | -52.69 | -40.00 | -12.69 |
| 169.40 | H | 129 | 69 | -78.54 | 19.11 | 47.57 | -49.84 | -40.00 | -9.84 |
| 475.00 | V | 114 | 244 | -94.32 | 25.25 | 37.93 | -59.48 | -40.00 | -19.48 |
| 525.00 | V | 125 | 304 | -90.48 | 24.63 | 41.15 | -56.26 | -40.00 | -16.26 |
| 825.00 | V | 113 | 259 | -92.77 | 30.06 | 44.29 | -53.12 | -40.00 | -13.12 |

**Table 6-4. Radiated Spurious Data (C-V2X RSU) Below 1GHz**

| | |
|---|---|
| **Frequency (MHz):** | 5915 |
| **Detector / Trace Mode:** | RMS / MaxHold |
| **RBW / VBW:** | 100kHz / 300kHz |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBµV/m] | EIRP Spurious Emission | Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 11830.00 | V | - | - | -78.12 | 9.15 | 38.03 | -57.23 | -40.00 | -17.23 |
| 17745.00 | V | - | - | -78.26 | 14.73 | 43.47 | -51.79 | -40.00 | -11.79 |
| 23660.00 | V | - | - | -66.35 | 3.58 | 44.23 | -60.57 | -40.00 | -20.57 |
| 29575.00 | V | - | - | -65.75 | 5.31 | 46.56 | -58.24 | -40.00 | -18.24 |
| 35490.00 | V | - | - | -69.33 | 8.14 | 45.81 | -58.99 | -40.00 | -18.99 |

**Table 6-5. Radiated Spurious Data (C-V2X RSU)**

**Note:** Leaking emissions at 24.175GHz is investigated, and confirmed it is not from EUT

## 6.7 Frequency Stability / Temperature Variation

**Test Overview and Limit**

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015. The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

***The frequency stability of the transmitter shall be maintained such that the emission remains within the band of operation.***

**Test Procedure Used**

ANSI C63.26-2015 – Section 5.6

**Test Settings**

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

**Test Setup**

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

**Test Notes**

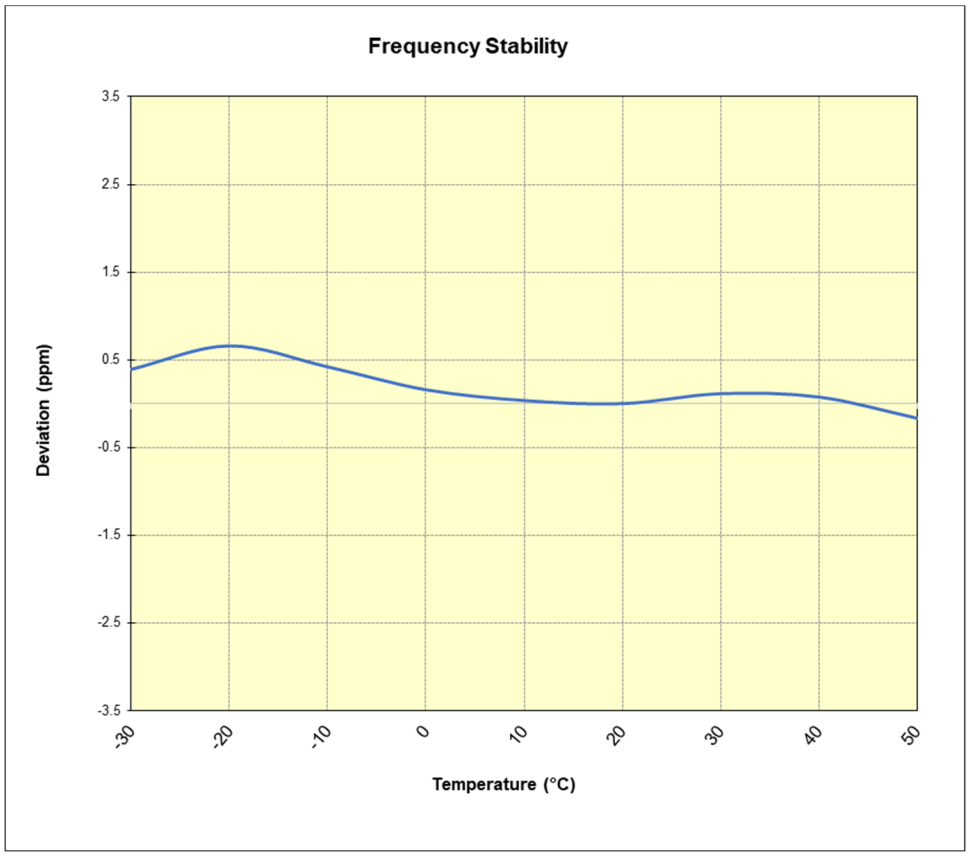
None

## C-V2X

| | |
|---|---|
| Operating Frequency (Hz): | 5,915,000,000 |
| Ref. Voltage (VDC): | 48 |

| Voltage (%) | Power (VDC) | Temp (°C) | Frequency (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 48 | - 30 | 5,915,089,209 | 2,302 | 0.0000389 |
| | | - 20 | 5,915,090,790 | 3,884 | 0.0000657 |
| | | - 10 | 5,915,089,385 | 2,478 | 0.0000419 |
| | | 0 | 5,915,087,843 | 936 | 0.0000158 |
| | | + 10 | 5,915,087,117 | 210 | 0.0000036 |
| | | + 20 (Ref) | 5,915,086,907 | 0 | 0.0000000 |
| | | + 30 | 5,915,087,578 | 672 | 0.0000114 |
| | | + 40 | 5,915,087,350 | 443 | 0.0000075 |
| | | + 50 | 5,915,085,923 | -984 | -0.0000166 |
| 85 % | 40.80 | + 20 | 5,915,086,747 | -160 | -0.0000027 |
| 115 % | 55.20 | + 20 | 5,915,088,894 | 1,988 | 0.0000336 |

**Table 6-6. Frequency Stability Data (C-V2X RSU)**




**Plot 6-17. Frequency Stability Chart (C-V2X RSU)**

# 7.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Applied Information C-V2X Roadside Unit FCC ID: 2BHCM-500-095** complies with all requirements from Waivers DA 23-343 and DA 23-586 as well as relevant sections of Part 90 Subpart M..