



Engineering Test Report No. 2201231-01

| | | | | |
|--|--|--|--|--|
| Report Date | August 1, 2022 | | | |
| Manufacturer Name | Spring Window Fashions LLC | | | |
| Manufacturer Address | 7549 Graber Road Middleton, WI 53562-1096 | | | |
| Model No. | RRZB | | | |
| Date Received | April 18, 2022 | | | |
| Test Dates | April 18, 2022 – April 21, 2022 | | | |
| Specifications | FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247 FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.249 FCC "Code of Federal Regulations" Title 47 Part 15, Subpart B Innovation, Science, and Economic Development Canada, RSS-210 Innovation, Science, and Economic Development Canada, RSS-247 Innovation, Science, and Economic Development Canada, RSS-GEN | | | |
| Test Facility | Elite Electronic Engineering, Inc. 1516 Centre Circle, Downers Grove, IL 60515 | FCC Reg. Number: 269750 IC Reg. Number: 2987A CAB Identifier: US0107 | | |
| Signature | | | | |
| Tested by | Nathaniel Bouchie | | | |
| Signature | | | | |
| Approved by | Raymond J. Klouda, Registered Professional Engineer of Illinois – 44894 | | | |
| PO Number | D01-005843 | | | |
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1. Report Revision History

| Revision | Date | Description |
|----------|-------------|---|
| – | 16 AUG 2022 | Initial Release of Engineering Test Report No. 2201231-01 |
| | | |

2. Introduction

2.1. Scope of Tests

This document presents the results of a series of RF emissions tests that were performed on the Spring Window Fashions LLC Roller Window Shade (hereinafter referred to as the Equipment Under Test (EUT)). The EUT was manufactured and submitted for testing by Spring Window Fashions LLC located in Middleton, WI.

2.2. Purpose

The test series was performed to determine if the EUT meets the RF emission requirements of the FCC "Code of Federal Regulations" Title 47, Part 15, Subpart C, Section 15.249; FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.247; and FCC "Code of Federal Regulations" Title 47 Part 15, Subpart B.

The test series was also performed to determine if the EUT meets the RF emission requirements of the Industry Canada Radio Standards Specification RSS-Gen, Industry Canada Radio Standards Specification RSS-210, and Industry Canada Radio Standards Specification RSS-247 for Transmitters.

Testing was performed in accordance with ANSI C63.10-2013 and ANSI C63.4-2014.

2.3. Identification of the EUT

The EUT was identified as follows:

| EUT Identification | |
|---------------------------|---------------------------------|
| Product Description | Roller Window Shade |
| Model/Part No. | RRZB |
| S/N | Unit 1 |
| Band of Operation | 902-928 MHz and 2400-2483.5 MHz |
| Modulation Type | FSK |
| Software/Firmware Version | V1.0 |
| Rated Output Power | 0dBm |
| Antenna Type | None |
| 99% Bandwidth | 141.835kHz |
| Size of EUT | 27.5 in x 1.5 in x 1.5 in |

The EUT listed above was used throughout the test series.

3. Power Input

The EUT obtained 15VDC power through an AC power adapter. The primary of this adapter received 120V 60Hz power through lowpass powerline filters on the wall of the shielded enclosure.

4. Grounding

The EUT was not connected to ground.

5. Support Equipment

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

| Description | Model # | S/N |
|-------------|----------------------|-----|
| AC Adapter | GT-41130-2016-1.0-W2 | N/A |

6. Interconnect Leads

No interconnect leads were used during the tests.

7. Modifications Made to the EUT

No modifications were made to the EUT during the testing.

8. Modes of Operation

| Mode | Description |
|-----------------------|---|
| Tx Standby | This mode was set by applying power to the device |
| ZWave Tx @ 908.4MHz | This mode was set by applying power to the device and pressing the only accessible button 3 times |
| ZWave Tx @ 916MHz | This mode was set by applying power to the device and pressing the only accessible button 2 times |
| BLE Tx Ch0 @ 2402MHz | This mode was set by applying power to the device and connecting a Bluetooth device via the Silicon Laboratories mobile app. Commands were input have the transmitter transmit at 2402MHz |
| BLE Tx Ch19 @ 2440MHz | This mode was set by applying power to the device and connecting a Bluetooth device via the Silicon Laboratories mobile app. Commands were input have the transmitter transmit at 2440MHz |
| BLE Tx Ch39 @ 2480MHz | This mode was set by applying power to the device and connecting a Bluetooth device via the Silicon Laboratories mobile app. Commands were input have the transmitter transmit at 2480MHz |
| MultiTx | This mode included the Zwave Tx set to transmit at 908.4MHz and the BLE Tx set at 2440MHz |
| ZWave Rx @ 908MHz | This mode was set by applying power to the device and pressing the only accessible button once. The Rx operated at 908MHz. |

9. Test Specifications

The tests were performed to selected portions of, and in accordance with the Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart C, Section 247; FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.249; FCC "Code of Federal Regulations", Title 47, Part 15, Subpart B; Innovation, Science, and Economic Development Canada, RSS-210; and Innovation, Science, and Economic Development Canada, RSS-247 test specifications.

- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart B
- Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart C
- ANSI C63.4-2014, "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"
- ANSI C63.10-2013, "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices"
- RSS-210 Issue 10, December 2019, "License-Exempt Radio Apparatus: Category I Equipment"

- RSS-247 Issue 2, February 2017, "Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices"
- RSS-Gen Issue 5, March 2019, Amendment 1, Innovation, Science, and Economic Development Canada, "Spectrum Management and Telecommunications, Radio Standards Specification, General Requirements for Compliance of Radio Apparatus"

10. Test Plan

No test plan was provided. Instructions were provided by personnel from Spring Window Fashions LLC and used in conjunction with the Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart C, Section 247; FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.249; FCC "Code of Federal Regulations", Title 47, Part 15, Subpart B, Innovation, Science, and Economic Development Canada, RSS-210, Innovation, Science, and Economic Development Canada, RSS-247; ANSI C63.4-2014 and ANSI C63.10-2013 specifications.

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

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

12. Laboratory Conditions

| Ambient Parameters | Value |
|----------------------|----------|
| Temperature | 22.1°C |
| Relative Humidity | 18% |
| Atmospheric Pressure | 1018.4mb |

13. Summary

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

| Test Description | Requirements | Test Methods | S/N | Results |
|---|----------------------|-------------------|--------|----------|
| Radiated Emissions | FCC 15B | ANSI C63.4:2014 | Unit 1 | Conforms |
| Powerline Conducted Emissions (AC Mains) | FCC 15B | ANSI C63.4:2014 | Unit 1 | Conforms |
| Powerline Conducted Emissions Test (AC Mains) | FCC 15C RSS-GEN | ANSI C63.10: 2013 | Unit 1 | Conforms |
| Occupied Bandwidth | FCC 15C ISED RSS-210 | ANSI C63.10: 2013 | Unit 1 | Conforms |
| Case Spurious Radiated Emissions | FCC 15C ISED RSS-210 | ANSI C63.10: 2013 | Unit 1 | Conforms |
| Band-Edge Compliance | FCC 15C ISED RSS-210 | ANSI C63.10: 2013 | Unit 1 | Conforms |
| Module Integration | FCC 15C ISED RSS-247 | ANSI C63.10: 2013 | Unit 1 | 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: $VL (\text{dBuV}) = MTR (\text{dBuV}) + CF (\text{dB})$.

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: $FS (\text{dBuV/m}) = MTR (\text{dBuV}) + AF (\text{dB/m}) + CF (\text{dB}) + (-PA (\text{dB})) + DC (\text{dB})$

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

Formula 2: $FS (\text{uV/m}) = \text{AntiLog} [(FS (\text{dBuV/m})) / 20]$

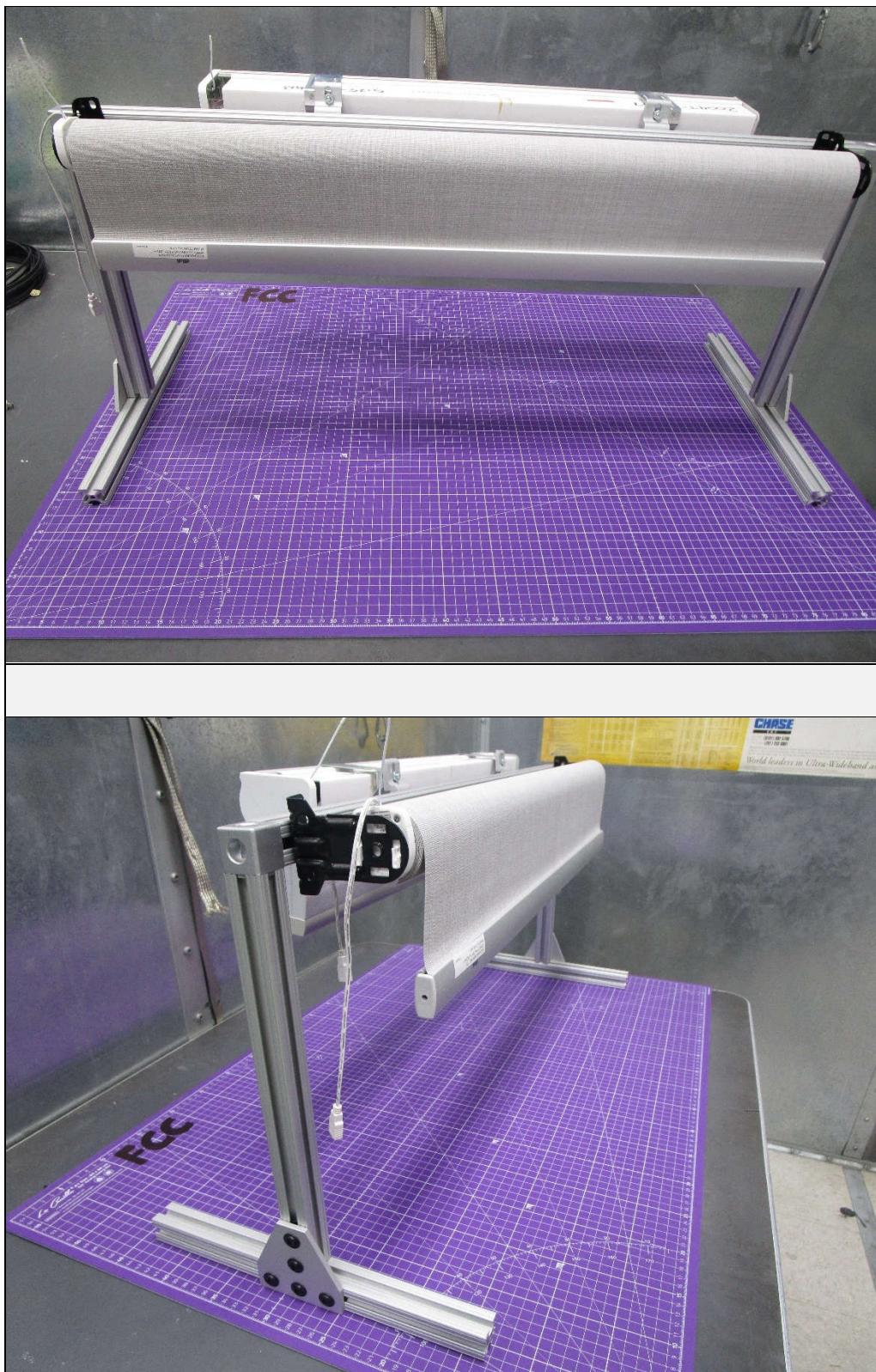
15. Statement of Conformity

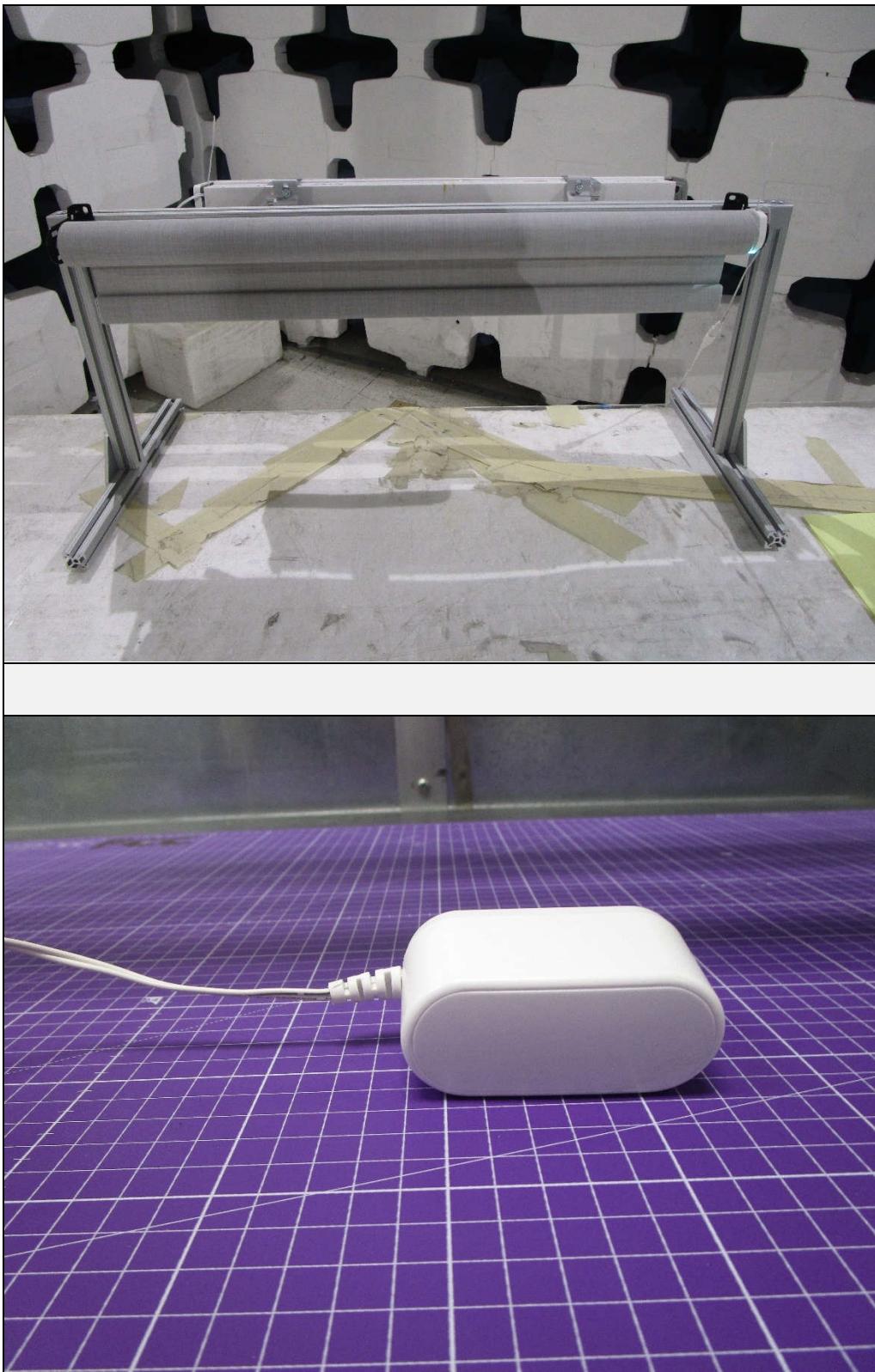
The Spring Window Fashions LLC Roller Window Shade, Model No. RRZB, Serial No. Unit 1, did fully conform to the selected requirements of Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart C, Section 247; FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.249; FCC "Code of Federal Regulations", Title 47, Part 15, Subpart B; Innovation, Science, and Economic Development Canada, RSS-210; and Innovation, Science, and Economic Development Canada, RSS-247.

16. Certification

Elite Electronic Engineering Incorporated certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the Federal Communications Commission "Code of Federal Regulations", Title 47, Part 15, Subpart C, Section 247; FCC "Code of Federal Regulations" Title 47 Part 15, Subpart C, Section 15.249; FCC "Code of Federal Regulations", Title 47, Part 15, Subpart B; Innovation, Science, and Economic Development Canada, RSS-210; 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 date specified. Any electrical or mechanical modifications made to the EUT subsequent to the specified test date will serve to invalidate the data and void this certification.

17. Photographs of EUT





18. Equipment List

| Eq ID | Equipment Description | Manufacturer | Model No. | Serial No. | Frequency Range | Cal Date | Due Date |
|-------|-----------------------------------|--------------------|--------------------------|------------|-----------------|-----------|-----------|
| APW3 | PREAMPLIFIER | PLANAR ELECTRONICS | PE2-35-120-5R0-10-12 | PL2924 | 1GHZ-20GHZ | 3/9/2022 | 3/9/2023 |
| CDZ4 | LAB WORKSTATION | ELITE | LWS-10 | | WINDOWS 10 | CNR | |
| GRB0 | 1MHZ, LISN SIGNAL CHECKER | ELITE | LISNCHKR1M | 1 | 1MHZ | 6/17/2021 | 6/17/2023 |
| MEA3 | MICRO-OHM METER | KEITHLEY | 580 | 772667 | 10UOHM-200KOHM | 6/6/2022 | 6/6/2023 |
| NSDS1 | UNIVERSAL SPHERICAL DIPOLE SOURCE | AET | USDS-H | AET-1116 | | NOTE 1 | |
| NTA4 | BILOG ANTENNA | TESEQ | 6112D | 46660 | 20-2000GHZ | 10/5/2020 | 10/5/2022 |
| NWQ1 | DOUBLE RIDGED WAVEGUIDE ANTENNA | ETS-LINDGREN | 3117 | 66655 | 1GHZ-18GHZ | 5/26/2022 | 5/26/2024 |
| PLF2 | CISPR16 50UH LISN | ELITE | CISPR16/70A | 002 | .15-30MHz | 4/5/2022 | 4/5/2023 |
| PLF4 | CISPR16 50UH LISN | ELITE | CISPR16/70A | 003 | .15-30MHz | 4/5/2022 | 4/5/2023 |
| R21F | 3M ANECHOIC CHAMBER NSA | EMC TEST SYSTEMS | 3M ANECHOIC | | 30MHZ-18GHZ | 3/30/2022 | 3/30/2023 |
| RBG3 | EMI ANALYZER | ROHDE & SCHWARZ | ESW44 | 101592 | 2HZ-44GHZ | 4/7/2022 | 4/7/2023 |
| T1ED | 10DB 25W ATTENUATOR | WEINSCHEL | 46-10-34 | BN2320 | DC-18GHZ | 1/6/2022 | 1/6/2024 |
| VBR8 | CISPR EN FCC CE VOLTAGE.exe | | | | | N/A | |
| VBV2 | CISPR EN FCC ICES RE.EXE | ELITE | CISPR EN FCC ICES RE.EXE | --- | --- | N/A | |
| WKA1 | SOFTWARE, UNIVERSAL RCV EMI | ELITE | UNIV_RCV_EMI | 1 | --- | I/O | |
| XPQ7 | HIGH PASS FILTER | K&L MICROWAVE | 4IH30-1804/T10000-0 | 5 | 1.8-10GHZ | 2/3/2021 | 2/3/2023 |

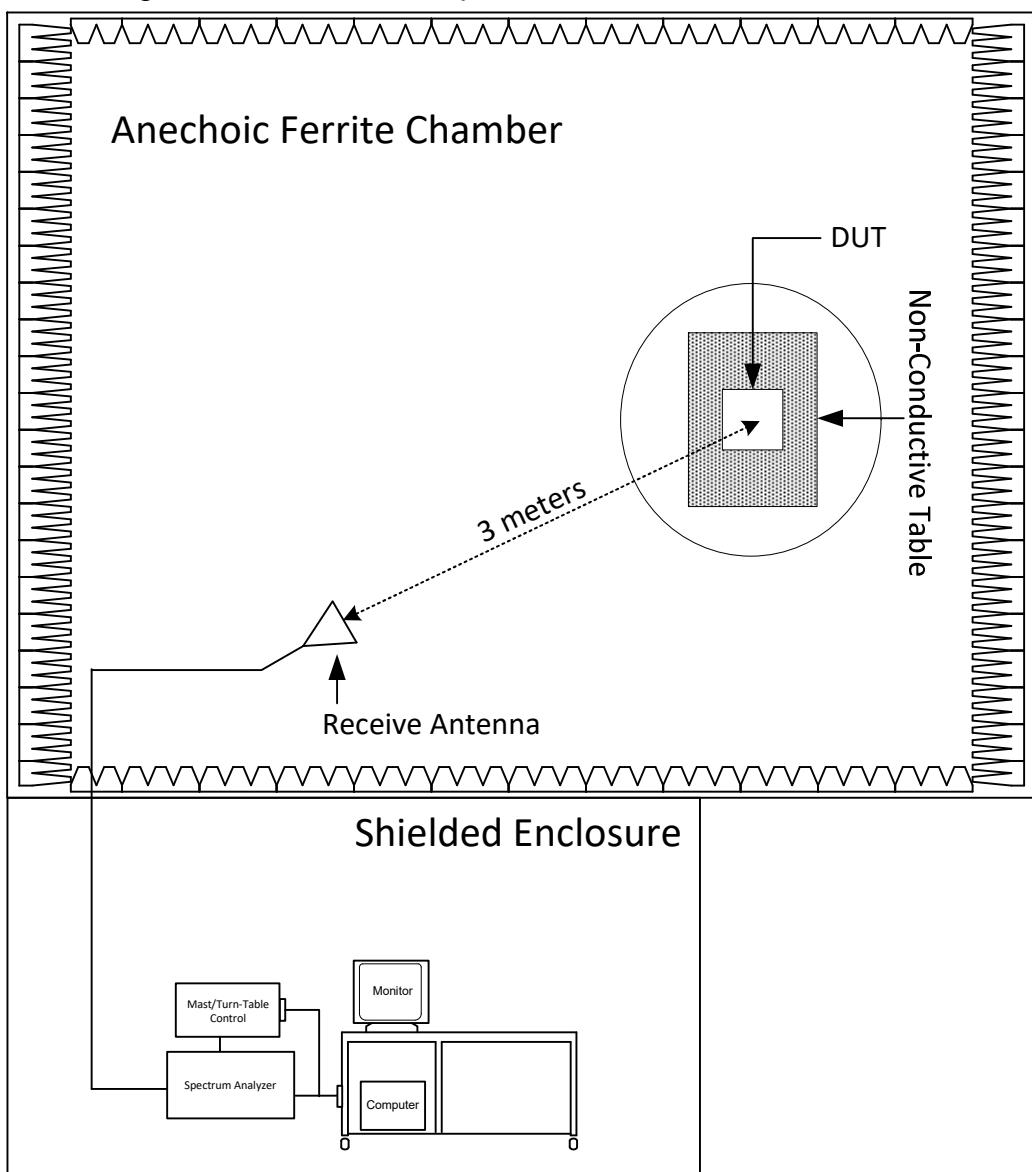
N/A: Not Applicable

I/O: Initial Only

CNR: Calibration Not Required

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

19. Block Diagram of Test Setup



Radiated Measurements Test Setup

20. Powerline Conducted Emissions Test (AC Mains)

| Test Information | |
|------------------|---|
| Manufacturer | Spring Window Fashions LLC |
| Product | Roller Window Shade |
| Model | RRZB |
| Serial No | Unit 1 |
| Modes | Tx Standby ZWave Tx @ 908.4MHz BLE Tx Ch0 @ 2402MHz |

| Test Setup Details | |
|--------------------|---------------|
| Setup Format | Tabletop |
| Height of Support | N/a |
| Type of Test Site | Semi-Anechoic |
| Test site used | Room 21 |
| Note | None |

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

| Requirements | | |
|---|-----------|----------------------------------|
| All radio frequency voltages on the power lines for any frequency or frequencies of an intentional radiator shall not exceed the limits in the following table: | | |
| Frequency of Emission (MHz) | | Conducted Limits (dB μ V) |
| Quasi-peak | | Average |
| 0.15-05 | 66 to 56* | 56-46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

Procedures

The interference on each power lead of the EUT was measured by connecting the measuring equipment to the appropriate meter terminal of the Line Impedance Stabilization Network (LISN). The meter terminal of the LISN not under test was terminated with 50 ohms.

- 1) The EUT was operated in the Tx Standby mode.
- 2) Measurements were first made on the Voltage high line.
- 3) The frequency range from 150 kHz to 30 MHz was broken up into smaller frequency sub-bands.
- 4) Conducted emissions measurements were taken on the first frequency sub-band using a peak detector.
- 5) The data thus obtained was then searched by the computer for the highest levels. Any emissions levels that were within 0dB of the average limit were then measured again using both a quasi-peak detector and an average detector. (If no peak readings were within 10dB of the average limit, quasi-peak and average readings were taken on the highest emissions levels measured during the peak detector scan.)
- 6) Steps (4) and (5) were repeated for the remainder of the frequency sub-bands until the entire frequency range from 150kHz to 30MHz was investigated. The peak trace was automatically plotted. The plot also shows quasi-peak and average readings that were taken on discrete frequencies. A table showing the quasi-peak and average readings was also generated. This tabular data compares the quasi-peak and average conducted emissions to the applicable conducted emissions limits.
- 7) Steps (3) through (6) were repeated on the Voltage return line.
- 8) Steps (2) through (7) were repeated with the EUT operated in the ZWave Tx @ 908.4MHz mode.
- 9) Steps (2) through (7) were repeated with the EUT operated in the BLE Tx Ch0 @ 2402MHz mode.



Test Setup for Powerline Conducted Emissions Test
(Roller Window Shade)



Test Setup for Powerline Conducted Emissions Test
(Roller Window Shade)



Test Setup for Powerline Conducted Emissions Test
(Roller Window Shade)



Test Setup for Powerline Conducted Emissions Test
(Roller Window Shade)

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 05/14/2020

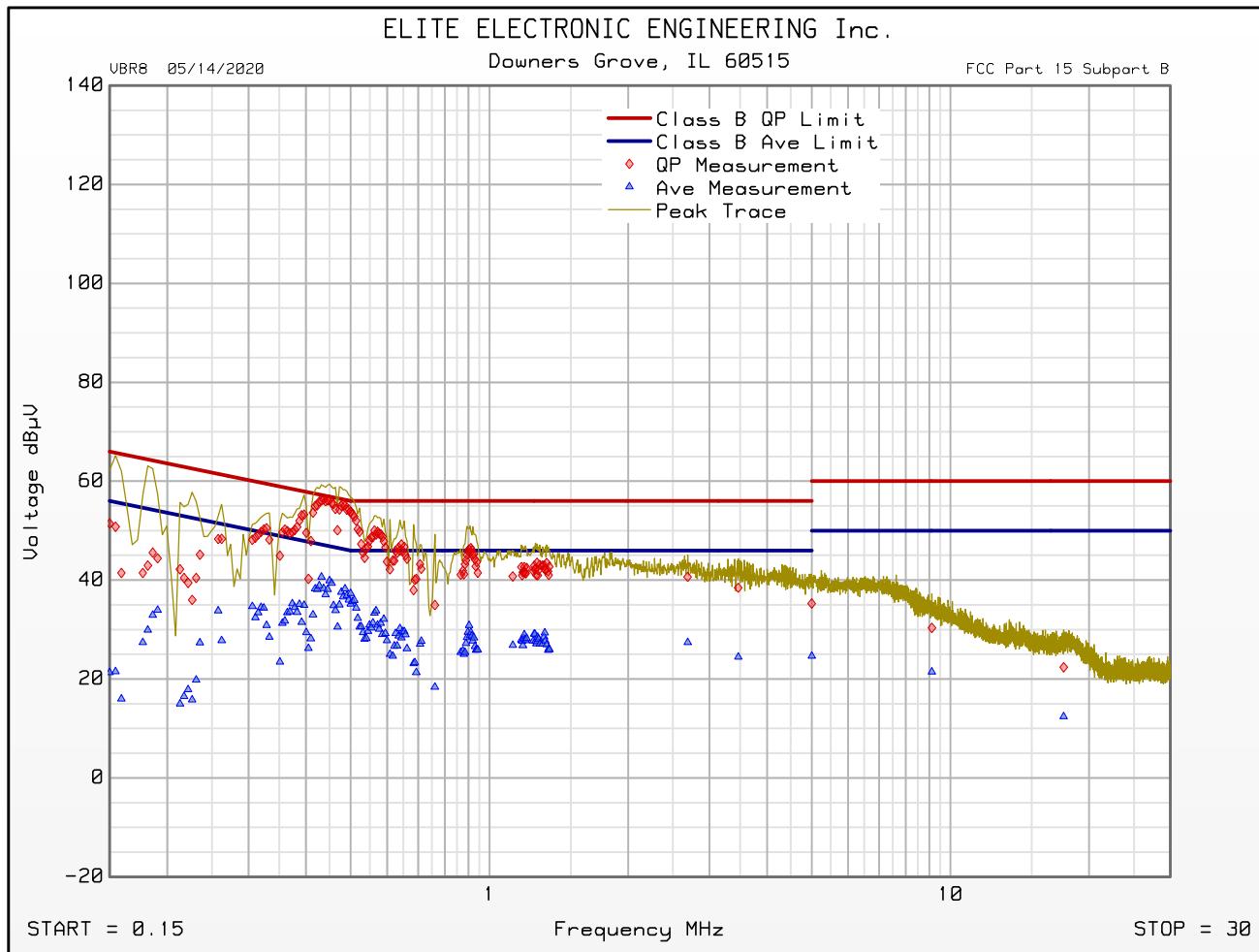
Manufacturer : Spring Window Fashions LLC
 Model : RRZB
 DUT Revision :
 Serial Number : Unit 1
 DUT Mode : Tx Standby
 Line Tested : High PLF4
 Scan Step Time [ms] : 30
 Meas. Threshold [dB] : 0
 Notes :
 Test Engineer : N. Bouchie
 Limit : Class B
 Test Date : Apr 20, 2022 02:34:50 PM
 Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold

| Freq MHz | Quasi-peak Level dB μ V | Quasi-peak Limit dB μ V | Excessive Quasi-peak Emissions | Average Level dB μ V | Average Limit dB μ V | Excessive Average Emissions |
|-------------|-----------------------------------|-----------------------------------|--------------------------------------|--------------------------------|--------------------------------|-----------------------------------|
| 0.263 | 48.3 | 61.4 | | 27.8 | 51.4 | |
| 0.450 | 56.2 | 56.9 | | 39.9 | 46.9 | |
| 0.500 | 53.8 | 56.0 | | 37.3 | 46.0 | |
| 0.912 | 46.4 | 56.0 | | 29.4 | 46.0 | |
| 1.268 | 43.5 | 56.0 | | 27.6 | 46.0 | |
| 2.691 | 40.6 | 56.0 | | 27.4 | 46.0 | |
| 3.464 | 38.4 | 56.0 | | 24.5 | 46.0 | |
| 5.000 | 35.3 | 56.0 | | 24.7 | 46.0 | |
| 9.117 | 30.3 | 60.0 | | 21.4 | 50.0 | |
| 17.609 | 22.4 | 60.0 | | 12.4 | 50.0 | |

FCC Part 15 Subpart B Conducted Emissions Test Cumulative Data

VBR8 05/14/2020

Manufacturer : Spring Window Fashions LLC
Model : RRZB
DUT Revision :
Serial Number : Unit 1
DUT Mode : Tx Standby
Line Tested : High PLF4
Scan Step Time [ms] : 30
Meas. Threshold [dB] : 0
Notes :
Test Engineer : N. Bouchie
Limit : Class B
Test Date : Apr 20, 2022 02:34:50 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart B Conducted Emissions Test

Significant Emissions Data

VBR8 05/14/2020

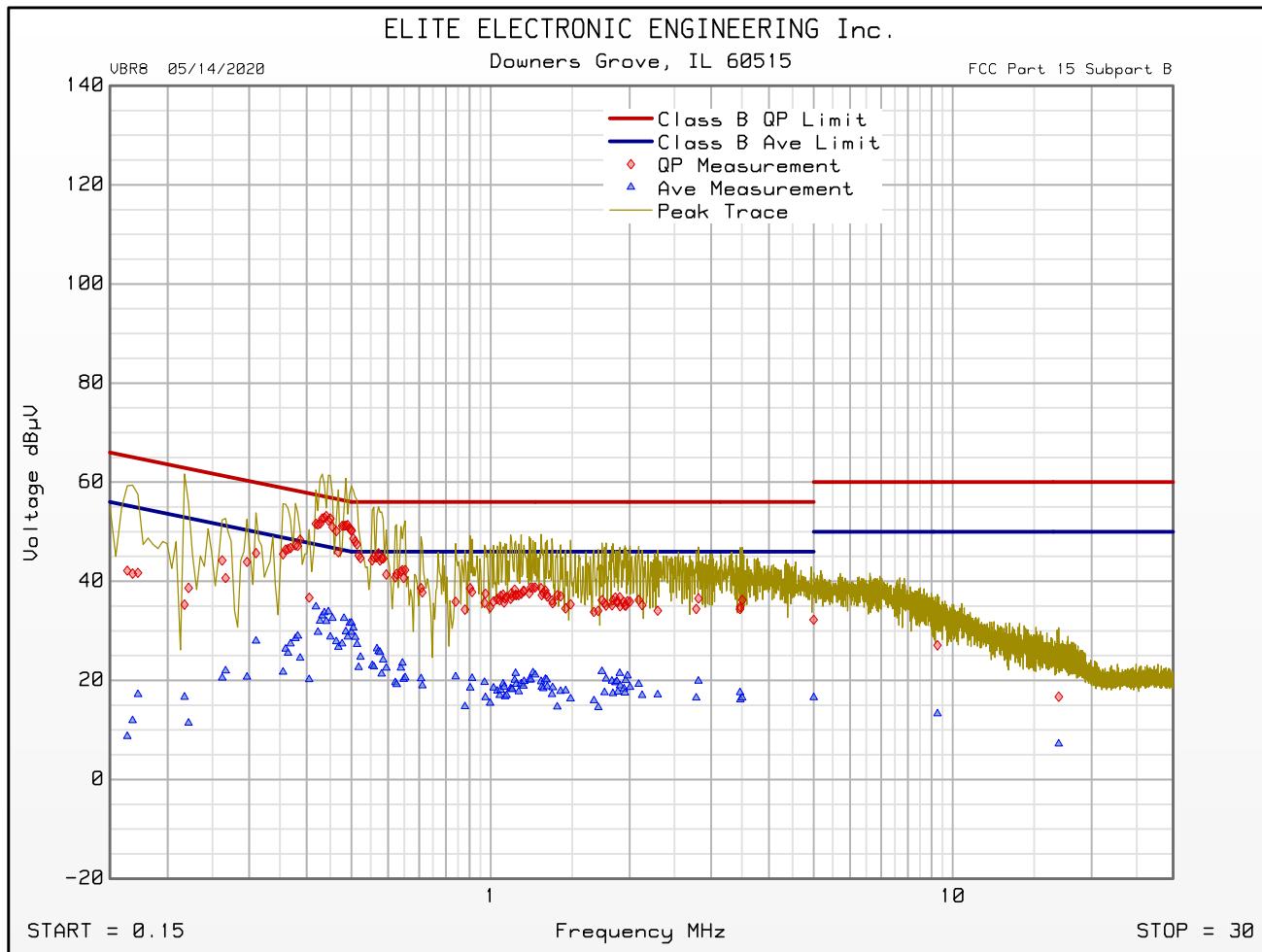
Manufacturer : Spring Window Fashions LLC
 Model : RRZB
 DUT Revision :
 Serial Number : Unit 1
 DUT Mode : Tx Standby
 Line Tested : Neutral PLF2
 Scan Step Time [ms] : 30
 Meas. Threshold [dB] : 0
 Notes :
 Test Engineer : N. Bouchie
 Limit : Class B
 Test Date : Apr 20, 2022 02:30:57 PM
 Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold

| Freq MHz | Quasi-peak Level dB μ V | Quasi-peak Limit dB μ V | Excessive Quasi-peak Emissions | Average Level dB μ V | Average Limit dB μ V | Excessive Average Emissions |
|-------------|-----------------------------------|-----------------------------------|--------------------------------------|--------------------------------|--------------------------------|-----------------------------------|
| 0.263 | 44.2 | 61.4 | | 20.5 | 51.4 | |
| 0.441 | 53.1 | 57.0 | | 31.9 | 47.0 | |
| 0.500 | 50.2 | 56.0 | | 31.6 | 46.0 | |
| 1.249 | 38.8 | 56.0 | | 21.1 | 46.0 | |
| 1.286 | 38.6 | 56.0 | | 19.8 | 46.0 | |
| 2.817 | 36.5 | 56.0 | | 19.9 | 46.0 | |
| 3.505 | 36.2 | 56.0 | | 16.5 | 46.0 | |
| 5.000 | 32.2 | 56.0 | | 16.6 | 46.0 | |
| 9.266 | 27.1 | 60.0 | | 13.3 | 50.0 | |
| 16.966 | 16.7 | 60.0 | | 7.2 | 50.0 | |

FCC Part 15 Subpart B Conducted Emissions Test Cumulative Data

VBR8 05/14/2020

Manufacturer : Spring Window Fashions LLC
 Model : RRZB
 DUT Revision :
 Serial Number : Unit 1
 DUT Mode : Tx Standby
 Line Tested : Neutral PLF2
 Scan Step Time [ms] : 30
 Meas. Threshold [dB] : 0
 Notes :
 Test Engineer : N. Bouchie
 Limit : Class B
 Test Date : Apr 20, 2022 02:30:57 PM



Emissions Meet QP Limit
 Emissions Meet Ave Limit

FCC Part 15 Subpart C Conducted Emissions Test

Significant Emissions Data

VBR8 05/14/2020

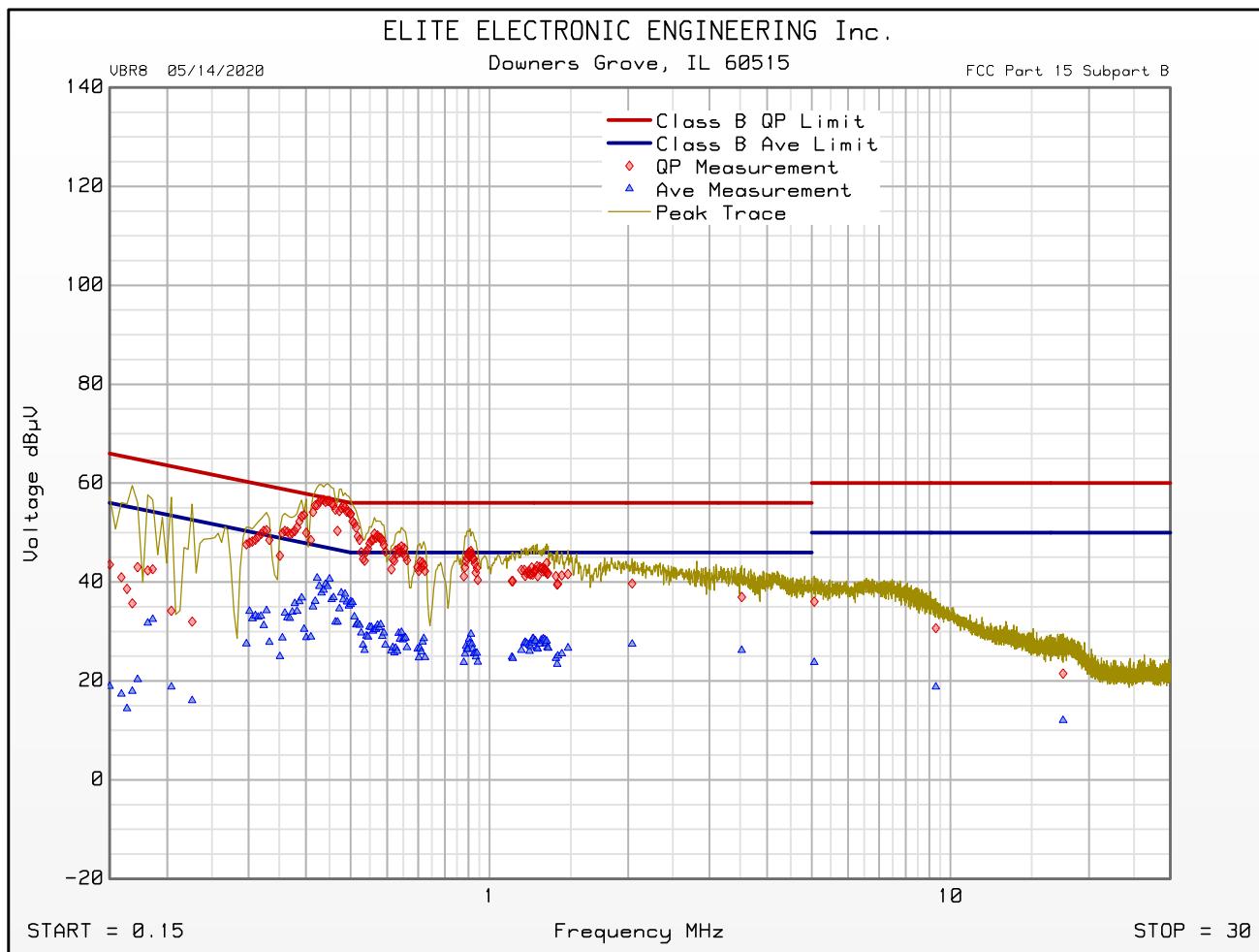
Manufacturer : Spring Window Fashions LLC
 Model : RRZB
 DUT Revision :
 Serial Number : Unit 1
 DUT Mode : ZWave Tx @ 908.4MHz
 Line Tested : High PLF4
 Scan Step Time [ms] : 30
 Meas. Threshold [dB] : 0
 Notes :
 Test Engineer : N. Bouchie
 Limit : Class B
 Test Date : Apr 20, 2022 02:43:11 PM
 Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold

| Freq MHz | Quasi-peak Level dB μ V | Quasi-peak Limit dB μ V | Excessive Quasi-peak Emissions | Average Level dB μ V | Average Limit dB μ V | Excessive Average Emissions |
|-------------|-----------------------------------|-----------------------------------|--------------------------------------|--------------------------------|--------------------------------|-----------------------------------|
| 0.186 | 42.6 | 64.2 | | 32.5 | 54.2 | |
| 0.450 | 56.4 | 56.9 | | 40.7 | 46.9 | |
| 0.500 | 53.8 | 56.0 | | 35.5 | 46.0 | |
| 0.912 | 46.2 | 56.0 | | 29.5 | 46.0 | |
| 1.331 | 43.8 | 56.0 | | 28.1 | 46.0 | |
| 2.039 | 39.7 | 56.0 | | 27.5 | 46.0 | |
| 3.527 | 37.0 | 56.0 | | 26.2 | 46.0 | |
| 5.068 | 36.0 | 60.0 | | 23.8 | 50.0 | |
| 9.297 | 30.7 | 60.0 | | 18.8 | 50.0 | |
| 17.560 | 21.5 | 60.0 | | 12.0 | 50.0 | |

FCC Part 15 Subpart C Conducted Emissions Test Cumulative Data

VBR8 05/14/2020

Manufacturer : Spring Window Fashions LLC
 Model : RRZB
 DUT Revision :
 Serial Number : Unit 1
 DUT Mode : ZWave Tx @ 908.4MHz
 Line Tested : High PLF4
 Scan Step Time [ms] : 30
 Meas. Threshold [dB] : 0
 Notes :
 Test Engineer : N. Bouchie
 Limit : Class B
 Test Date : Apr 20, 2022 02:43:11 PM



Emissions Meet QP Limit
 Emissions Meet Ave Limit

FCC Part 15 Subpart C Conducted Emissions Test

Significant Emissions Data

VBR8 05/14/2020

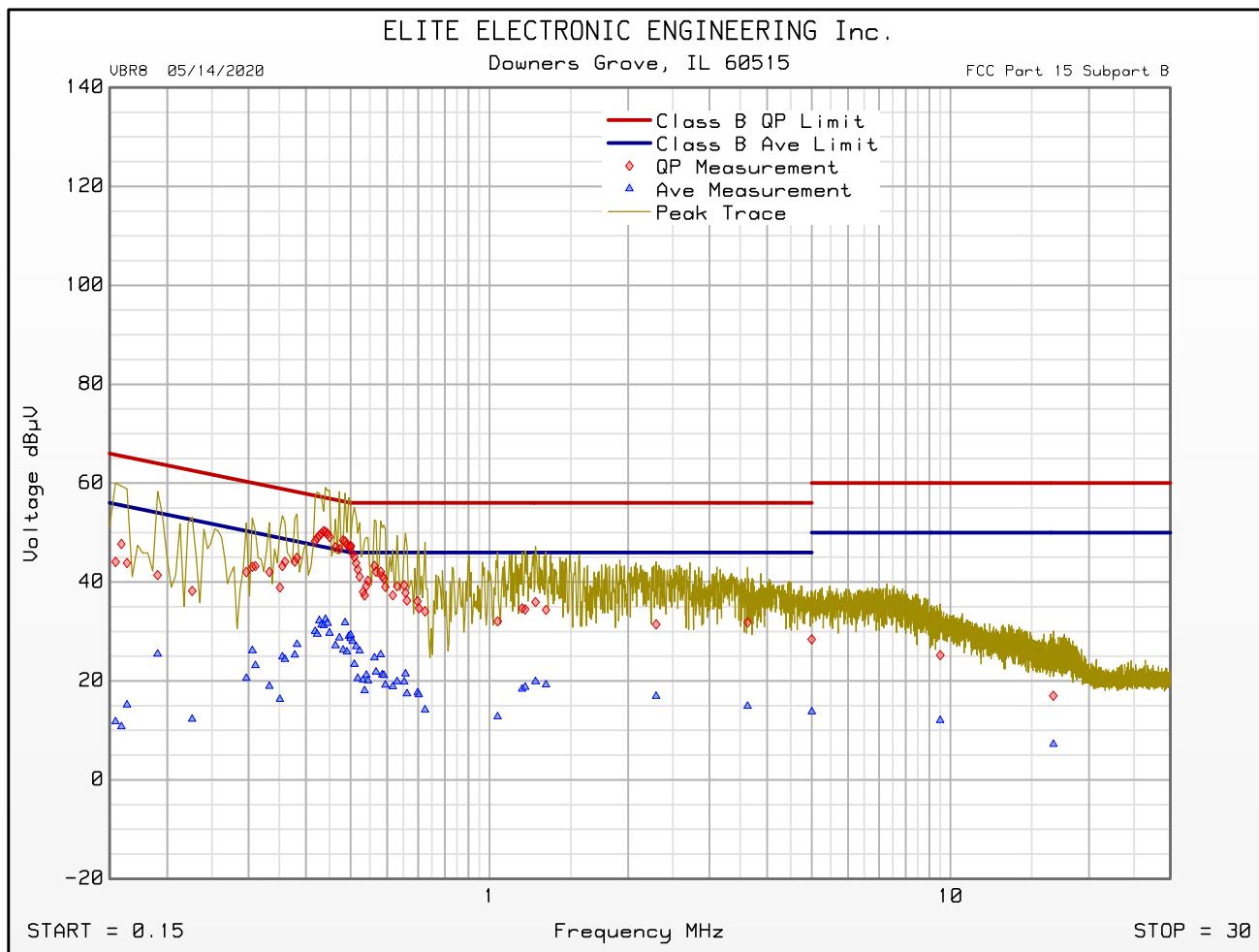
Manufacturer : Spring Window Fashions LLC
 Model : RRZB
 DUT Revision :
 Serial Number : Unit 1
 DUT Mode : ZWave Tx @ 908.4MHz
 Line Tested : Neutral PLF2
 Scan Step Time [ms] : 30
 Meas. Threshold [dB] : 0
 Notes :
 Test Engineer : N. Bouchie
 Limit : Class B
 Test Date : Apr 20, 2022 02:53:10 PM
 Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold

| Freq MHz | Quasi-peak Level dB μ V | Quasi-peak Limit dB μ V | Excessive Quasi-peak Emissions | Average Level dB μ V | Average Limit dB μ V | Excessive Average Emissions |
|-------------|-----------------------------------|-----------------------------------|--------------------------------------|--------------------------------|--------------------------------|-----------------------------------|
| 0.159 | 47.7 | 65.5 | | 10.8 | 55.5 | |
| 0.437 | 50.3 | 57.1 | | 31.2 | 47.1 | |
| 0.500 | 47.4 | 56.0 | | 29.3 | 46.0 | |
| 1.177 | 34.7 | 56.0 | | 18.3 | 46.0 | |
| 1.259 | 35.9 | 56.0 | | 19.9 | 46.0 | |
| 2.300 | 31.4 | 56.0 | | 16.9 | 46.0 | |
| 3.631 | 31.8 | 56.0 | | 14.9 | 46.0 | |
| 5.000 | 28.4 | 56.0 | | 13.8 | 46.0 | |
| 9.504 | 25.2 | 60.0 | | 12.1 | 50.0 | |
| 16.714 | 17.0 | 60.0 | | 7.2 | 50.0 | |

FCC Part 15 Subpart C Conducted Emissions Test Cumulative Data

VBR8 05/14/2020

Manufacturer : Spring Window Fashions LLC
 Model : RRZB
 DUT Revision :
 Serial Number : Unit 1
 DUT Mode : ZWave Tx @ 908.4MHz
 Line Tested : Neutral PLF2
 Scan Step Time [ms] : 30
 Meas. Threshold [dB] : 0
 Notes :
 Test Engineer : N. Bouchie
 Limit : Class B
 Test Date : Apr 20, 2022 02:53:10 PM



Emissions Meet QP Limit
 Emissions Meet Ave Limit

FCC Part 15 Subpart C Conducted Emissions Test

Significant Emissions Data

VBR8 05/14/2020

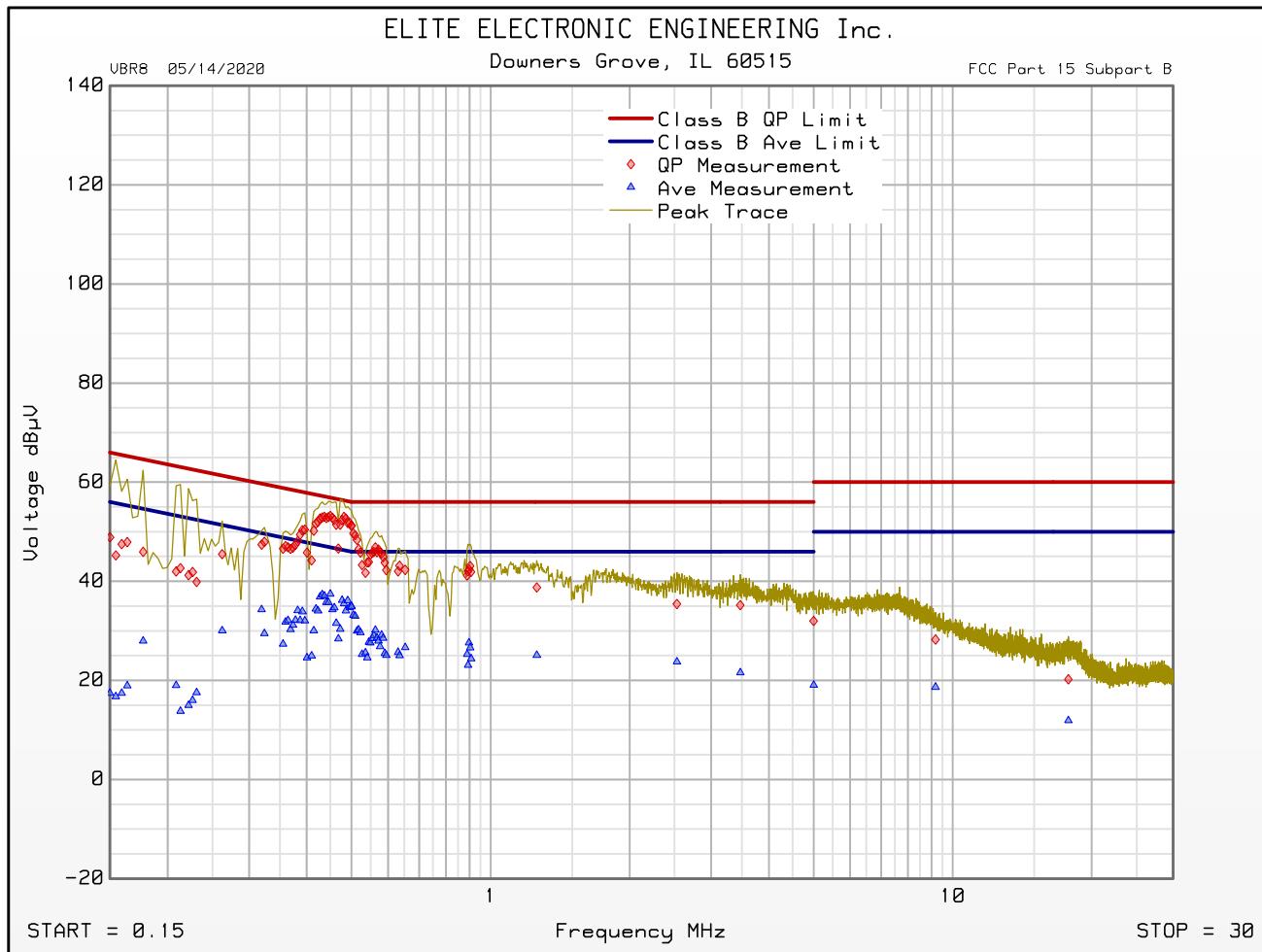
Manufacturer : Spring Window Fashions LLC
 Model : RRZB
 DUT Revision :
 Serial Number : Unit 1
 DUT Mode : BLE Tx Ch0 @ 2402MHz
 Line Tested : High PLF4
 Scan Step Time [ms] : 30
 Meas. Threshold [dB] : 0
 Notes :
 Test Engineer : N. Bouchie
 Limit : Class B
 Test Date : Apr 20, 2022 03:12:29 PM
 Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold

| Freq MHz | Quasi-peak Level dB μ V | Quasi-peak Limit dB μ V | Excessive Quasi-peak Emissions | Average Level dB μ V | Average Limit dB μ V | Excessive Average Emissions |
|-------------|-----------------------------------|-----------------------------------|--------------------------------------|--------------------------------|--------------------------------|-----------------------------------|
| 0.263 | 45.5 | 61.4 | | 30.1 | 51.4 | |
| 0.482 | 53.0 | 56.3 | | 35.5 | 46.3 | |
| 0.500 | 51.2 | 56.0 | | 34.8 | 46.0 | |
| 0.903 | 43.1 | 56.0 | | 26.6 | 46.0 | |
| 1.259 | 38.8 | 56.0 | | 25.1 | 46.0 | |
| 2.529 | 35.4 | 56.0 | | 23.8 | 46.0 | |
| 3.469 | 35.2 | 56.0 | | 21.5 | 46.0 | |
| 5.000 | 32.0 | 56.0 | | 19.1 | 46.0 | |
| 9.176 | 28.2 | 60.0 | | 18.7 | 50.0 | |
| 17.794 | 20.2 | 60.0 | | 11.9 | 50.0 | |

FCC Part 15 Subpart C Conducted Emissions Test Cumulative Data

VBR8 05/14/2020

Manufacturer : Spring Window Fashions LLC
Model : RRZB
DUT Revision :
Serial Number : Unit 1
DUT Mode : BLE Tx Ch0 @ 2402MHz
Line Tested : High PLF4
Scan Step Time [ms] : 30
Meas. Threshold [dB] : 0
Notes :
Test Engineer : N. Bouchie
Limit : Class B
Test Date : Apr 20, 2022 03:12:29 PM



Emissions Meet QP Limit
Emissions Meet Ave Limit

FCC Part 15 Subpart C Conducted Emissions Test

Significant Emissions Data

VBR8 05/14/2020

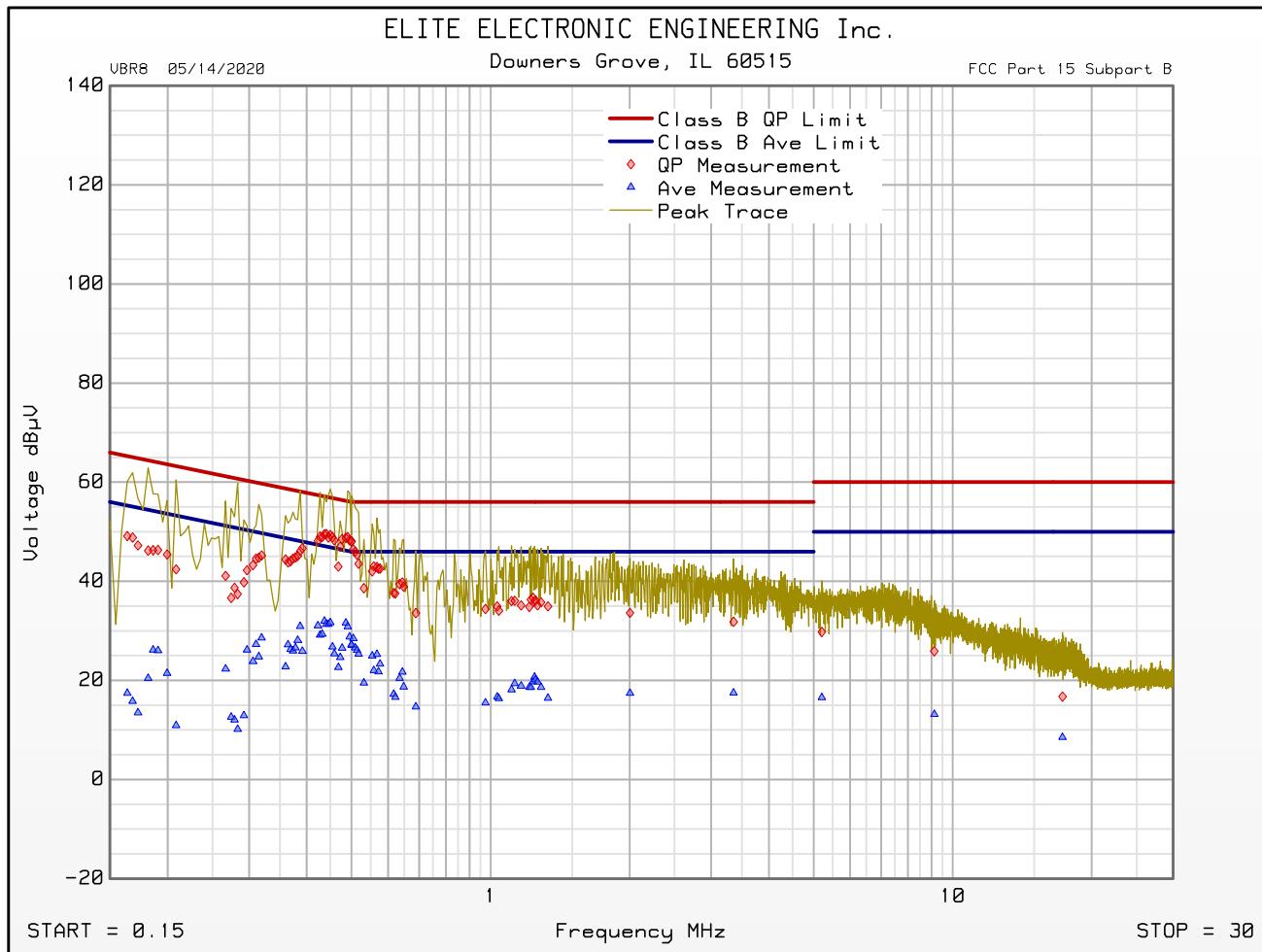
Manufacturer : Spring Window Fashions LLC
 Model : RRZB
 DUT Revision :
 Serial Number : Unit 1
 DUT Mode : BLE Tx Ch0 @ 2402MHz
 Line Tested : Neutral PLF2
 Scan Step Time [ms] : 30
 Meas. Threshold [dB] : 0
 Notes :
 Test Engineer : N. Bouchie
 Limit : Class B
 Test Date : Apr 20, 2022 03:05:37 PM
 Data Filter : Up to 80 maximum levels detected with 6 dB level excursion threshold

| Freq MHz | Quasi-peak Level dB μ V | Quasi-peak Limit dB μ V | Excessive Quasi-peak Emissions | Average Level dB μ V | Average Limit dB μ V | Excessive Average Emissions |
|-------------|-----------------------------------|-----------------------------------|--------------------------------------|--------------------------------|--------------------------------|-----------------------------------|
| 0.164 | 49.1 | 65.3 | | 17.4 | 55.3 | |
| 0.491 | 48.9 | 56.2 | | 30.8 | 46.2 | |
| 0.500 | 48.0 | 56.0 | | 27.2 | 46.0 | |
| 1.236 | 36.7 | 56.0 | | 19.7 | 46.0 | |
| 1.250 | 36.1 | 56.0 | | 20.1 | 46.0 | |
| 2.003 | 33.6 | 56.0 | | 17.4 | 46.0 | |
| 3.356 | 31.8 | 56.0 | | 17.5 | 46.0 | |
| 5.207 | 29.8 | 60.0 | | 16.5 | 50.0 | |
| 9.122 | 25.9 | 60.0 | | 13.2 | 50.0 | |
| 17.285 | 16.7 | 60.0 | | 8.5 | 50.0 | |

FCC Part 15 Subpart C Conducted Emissions Test Cumulative Data

VBR8 05/14/2020

Manufacturer : Spring Window Fashions LLC
 Model : RRZB
 DUT Revision :
 Serial Number : Unit 1
 DUT Mode : BLE Tx Ch0 @ 2402MHz
 Line Tested : Neutral PLF2
 Scan Step Time [ms] : 30
 Meas. Threshold [dB] : 0
 Notes :
 Test Engineer : N. Bouchie
 Limit : Class B
 Test Date : Apr 20, 2022 03:05:37 PM



Emissions Meet QP Limit
 Emissions Meet Ave Limit

21. RF Radiated Emissions

| EUT Information | |
|-----------------|---------------------------------|
| Manufacturer | Spring Window Fashions LLC |
| Product | Roller Window Shade |
| Model No. | RRZB |
| Serial No. | Unit 1 |
| Modes | Tx Standby ZWave Rx @ 908MHz |

| Test Site Information | |
|-------------------------------|--|
| Setup Format | Tabletop |
| Height of Support | N/a |
| Type of Test Site | Semi-Anechoic Chamber |
| Test Site Used | Room 21 |
| Type of Antennas Used | Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent) |
| Highest Internal Frequency | 916MHz |
| Highest Measurement Frequency | 13GHz |
| Notes | The cables were manually maximized during the preliminary emissions sweeps. The cable arrangement which resulted in the worst-case emissions was utilized. |

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

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

| FCC Part 15 Class B Radiated Emissions Limits (30MHz to 1GHz) | | |
|---|-----------------------|-------------------------|
| Frequency of Emission (MHz) | Field Strength (μV/m) | Field Strength (dBμV/m) |
| 30 – 88 | 100 | 40 |
| 88 – 216 | 150 | 43.5 |
| 216 – 960 | 200 | 46 |
| Above 960 | 500 | 54 |
| FCC Part 15 Class B Radiated Emissions Limits (Above 1GHz) | | |
| Frequency of Emission (MHz) | Peak Limit (dBμV/m) | Average Limit (dBμV/m) |
| Above 1000 | 74 | 54 |

Procedure

Since a quasi-peak detector and an average detector require long integration times, it is not practical to automatically sweep through the quasi-peak and average levels. Therefore, radiated emissions from the EUT were first scanned using a peak detector and automatically plotted. The frequencies where significant emission levels were noted were then remeasured using the quasi-peak detector or average detector.

The EUT and all peripheral equipment were placed on an 80cm high non-conductive stand. The broadband measuring antenna was positioned at a 3-meter distance from the EUT. The frequency range from 30MHz to 1GHz was investigated using a peak detector function with the bilog antenna at several heights, horizontal and vertical polarization, and with several different orientations of the EUT with respect to the antenna. The frequency range from 1GHz to 13GHz was investigated using a peak detector function with the double ridged waveguide antenna at several heights, horizontal and vertical polarization, and with several different orientations of the EUT with respect to the antenna. The maximum levels for each antenna polarization were plotted.

Final radiated emissions were performed on all significant broadband and narrowband emissions found in the exploratory sweeps using the following methods:

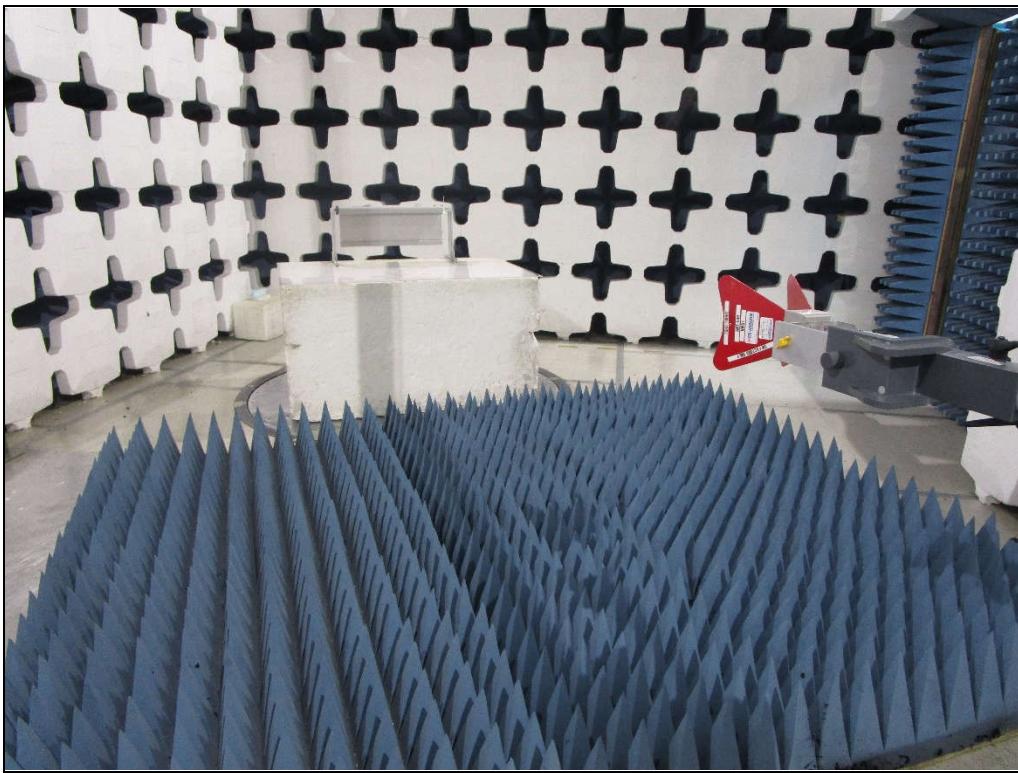
- 1) Measurements from 30MHz to 1GHz were made using a quasi-peak detector and a broadband bilog antenna. Measurements above 1GHz were made using an average detector and a broadband double ridged waveguide antenna.
- 2) To ensure that maximum or worst case, emission levels were measured, the following steps were taken:
 - a) The EUT was rotated so that all sides were exposed to the receiving antenna.
 - b) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
 - c) The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.
 - d) For hand-held or body-worn devices, the EUT was rotated through three orthogonal axes to determine which orientation produces the highest emission relative to the limit.
- 3) Steps (b) through (d) were repeated with the EUT operated in the ZWave Rx @ 908MHz mode.



Test Setup for Radiated Emissions: 30MHz to 1GHz, Horizontal Polarization
(Roller Window Shade)



Test Setup for Radiated Emissions: 30MHz to 1GHz, Vertical Polarization
(Roller Window Shade)



Test Setup for Radiated Emissions: Above 1GHz, Horizontal Polarization
(Roller Window Shade)



Test Setup for Radiated Emissions: Above 1GHz, Vertical Polarization
(Roller Window Shade)

FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 02/17/2022

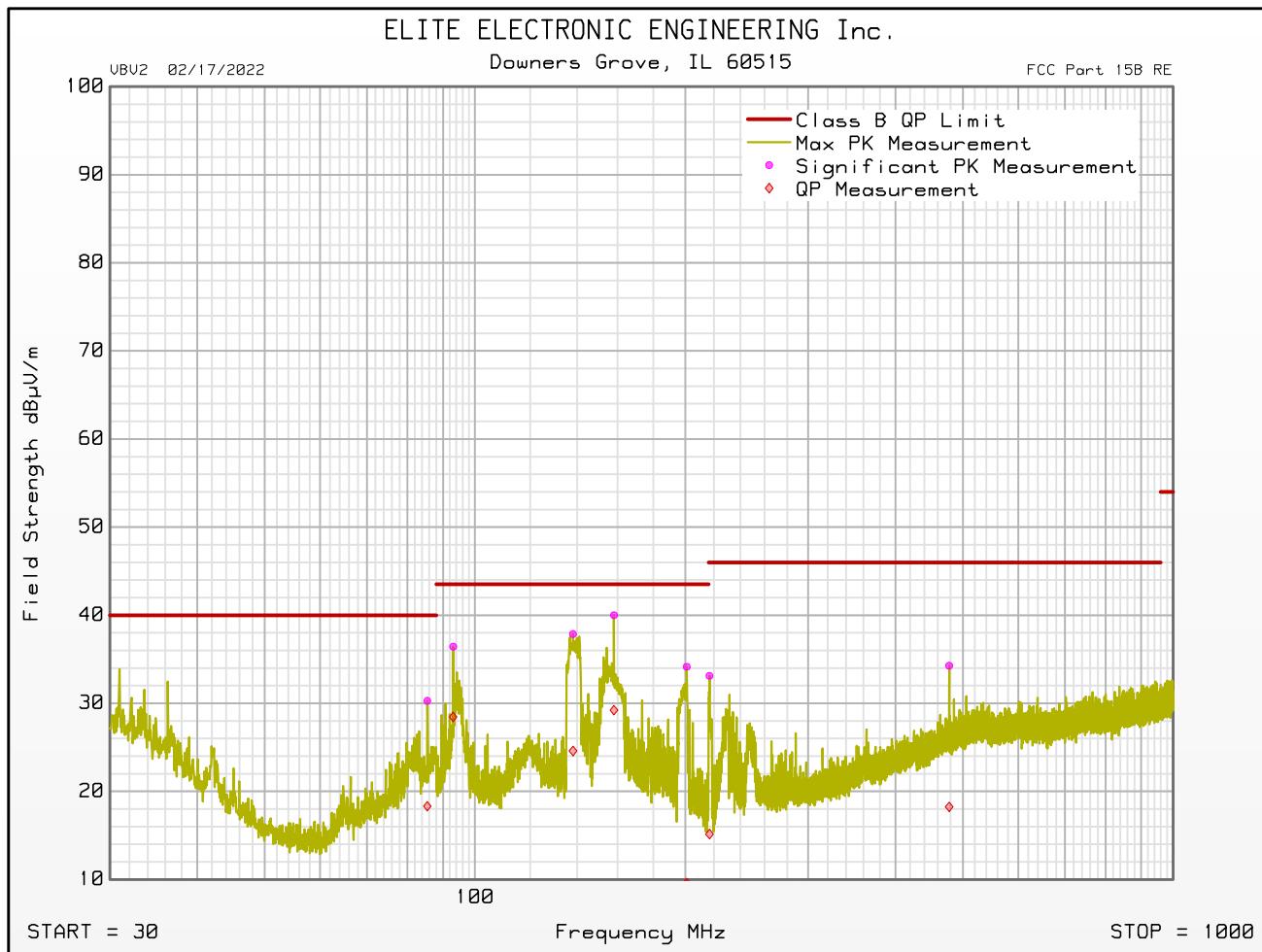
Manufacturer : Springs Windows
 Model : RRZB
 Serial Number : Unit 1
 DUT Mode : Tx Standby, Motor Cycling
 Turntable Step Angle (°) : 45
 Mast Positions (cm) : 120, 200, 340
 Scan Type : Stepped Scan
 Test RBW : 120 kHz
 Prelim Dwell Time (s) : 0.0001
 Notes :
 Test Engineer : N. Bouchie
 Test Date : Apr 18, 2022 11:01:36 AM

| Freq MHz | Peak Mtr Rdg dBuV | QP Mtr Rdg dBuV | Ant Fac dB/m | Amp Fac dB | Cbl Fac dB | Dist Corr dB | Peak Total dB μ V/m | QP Total dB μ V/m | QP Limit dB μ V/m | QP Lim Mrg dB | Ant Pol | Mast Ht cm | Azim ° | Excessive QP Level |
|-------------|----------------------------|--------------------------|--------------------|------------------|------------------|--------------------|-------------------------------|-----------------------------|-----------------------------|------------------------|------------|------------------|-----------|--------------------------|
| 34.740 | 16.3 | 5.5 | 22.2 | 0.0 | 0.5 | 0.0 | 39.0 | 28.2 | 40.0 | -11.8 | Vertical | 120 | 45 | |
| 37.140 | 18.4 | 8.1 | 20.8 | 0.0 | 0.5 | 0.0 | 39.7 | 29.5 | 40.0 | -10.5 | Vertical | 120 | 45 | |
| 37.440 | 20.4 | 10.0 | 20.7 | 0.0 | 0.5 | 0.0 | 41.5 | 31.2 | 40.0 | -8.8 | Vertical | 120 | 270 | |
| 85.440 | 15.7 | 3.8 | 14.1 | 0.0 | 0.5 | 0.0 | 30.3 | 18.3 | 40.0 | -21.7 | Horizontal | 200 | 0 | |
| 93.040 | 20.2 | 12.3 | 15.7 | 0.0 | 0.5 | 0.0 | 36.4 | 28.5 | 43.5 | -15.1 | Horizontal | 200 | 45 | |
| 95.080 | 20.1 | 10.6 | 16.1 | 0.0 | 0.5 | 0.0 | 36.7 | 27.1 | 43.5 | -16.4 | Vertical | 120 | 270 | |
| 129.340 | 19.2 | 0.7 | 17.9 | 0.0 | 0.7 | 0.0 | 37.7 | 19.3 | 43.5 | -24.2 | Vertical | 120 | 0 | |
| 138.160 | 19.8 | 6.5 | 17.3 | 0.0 | 0.7 | 0.0 | 37.9 | 24.6 | 43.5 | -18.9 | Horizontal | 200 | 180 | |
| 158.140 | 22.0 | 11.2 | 17.2 | 0.0 | 0.8 | 0.0 | 40.0 | 29.2 | 43.5 | -14.3 | Horizontal | 200 | 0 | |
| 200.980 | 17.7 | -6.8 | 15.4 | 0.0 | 1.0 | 0.0 | 34.1 | 9.6 | 43.5 | 33.9 | Horizontal | 120 | 135 | |
| 216.660 | 17.1 | -0.9 | 15.0 | 0.0 | 1.0 | 0.0 | 33.1 | 15.2 | 46.0 | -30.8 | Horizontal | 200 | 0 | |
| 244.800 | 16.2 | -7.2 | 17.8 | 0.0 | 1.0 | 0.0 | 35.1 | 11.6 | 46.0 | -34.4 | Vertical | 200 | 225 | |
| 330.060 | 5.9 | -6.2 | 19.7 | 0.0 | 1.2 | 0.0 | 26.8 | 14.7 | 46.0 | -31.3 | Vertical | 340 | 180 | |
| 348.360 | 6.8 | -4.5 | 20.2 | 0.0 | 1.3 | 0.0 | 28.3 | 16.9 | 46.0 | -29.1 | Vertical | 200 | 180 | |
| 477.660 | 8.9 | -7.1 | 23.8 | 0.0 | 1.5 | 0.0 | 34.3 | 18.3 | 46.0 | -27.7 | Horizontal | 120 | 180 | |
| 892.260 | 4.2 | -7.2 | 26.6 | 0.0 | 2.0 | 0.0 | 32.8 | 21.3 | 46.0 | -24.7 | Vertical | 340 | 45 | |

FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 02/17/2022

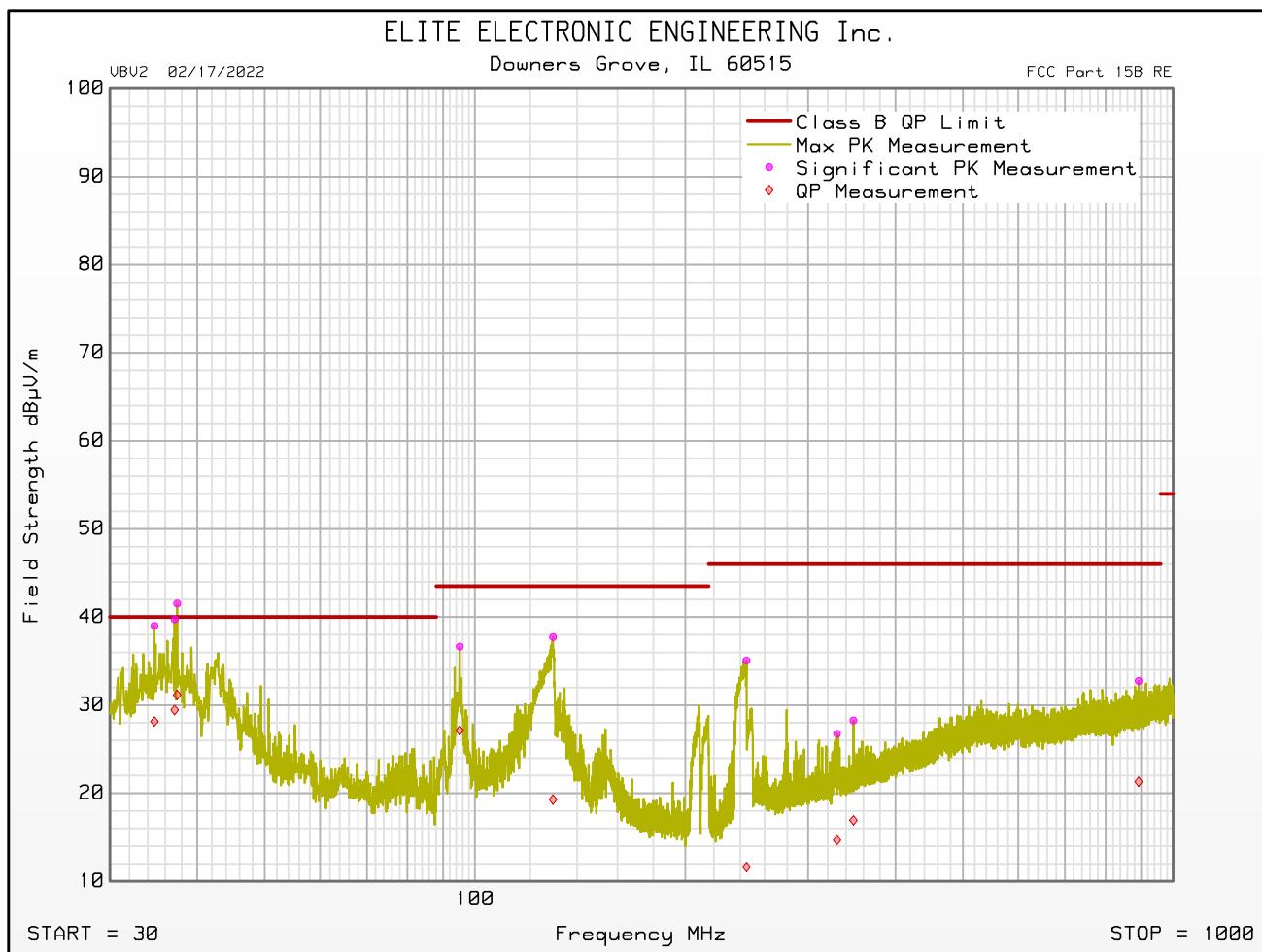
Manufacturer : Springs Windows
Model : RRZB
Serial Number : Unit 1
DUT Mode : Tx Standby, Motor Cycling
Turntable Step Angle (°) : 45
Mast Positions (cm) : 120, 200, 340
Antenna Polarization : Horizontal
Scan Type : Stepped Scan
Test RBW : 120 kHz
Prelim Dwell Time (s) : 0.0001
Notes :
Test Engineer : N. Bouchie
Test Date : Apr 18, 2022 11:01:36 AM



FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 02/17/2022

Manufacturer : Springs Windows
Model : RRZB
Serial Number : Unit 1
DUT Mode : Tx Standby, Motor Cycling
Turntable Step Angle (°) : 45
Mast Positions (cm) : 120, 200, 340
Antenna Polarization : Vertical
Scan Type : Stepped Scan
Test RBW : 120 kHz
Prelim Dwell Time (s) : 0.0001
Notes :
Test Engineer : N. Bouchie
Test Date : Apr 18, 2022 11:01:36 AM



FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 02/17/2022

Manufacturer : Springs Windows
 Model : RRZB
 Serial Number : Unit 1
 DUT Mode : Tx Standby, Motor Cycling
 Turntable Step Angle (°) : 45
 Mast Positions (cm) : 120, 200, 340
 Scan Type : Stepped Scan
 Test RBW : 1 MHz
 Prelim Dwell Time (s) : 0.0001
 Notes :
 Test Engineer : N. Bouchie
 Test Date : Apr 19, 2022 10:01:06 AM

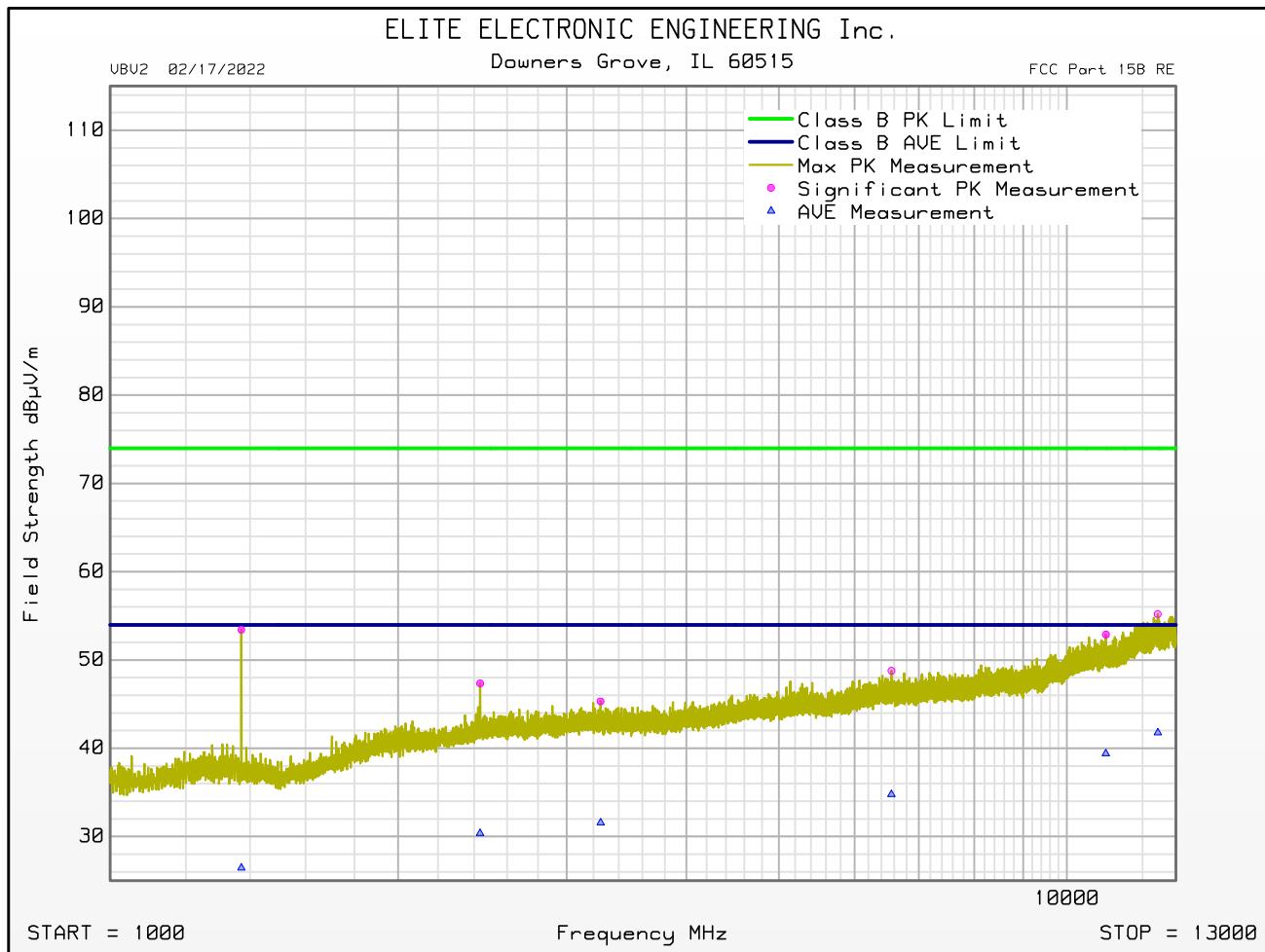
| Freq MHz | Peak Mtr Rdg dBuV | Ant Fac dB/m | Amp Fac dB | Cbl Fac dB | Dist Corr dB | Peak Total dB μ V/m | Peak Limit dB μ V/m | Peak Lim Mrg dB | Ant Pol | Mast Ht cm | Azim ° | Excessive Peak Level |
|-----------|-------------------|--------------|------------|------------|--------------|-------------------------|-------------------------|-----------------|------------|------------|--------|----------------------|
| 1371.000 | 63.7 | 28.7 | -41.5 | 2.5 | 0.0 | 53.4 | 74.0 | -20.6 | Horizontal | 120 | 270 | |
| 2435.500 | 52.7 | 32.4 | -41.1 | 3.4 | 0.0 | 47.3 | 74.0 | -26.6 | Vertical | 120 | 135 | |
| 3255.000 | 49.1 | 32.8 | -40.7 | 4.1 | 0.0 | 45.3 | 74.0 | -28.7 | Vertical | 340 | 315 | |
| 6555.000 | 47.9 | 35.6 | -40.5 | 5.8 | 0.0 | 48.8 | 74.0 | -25.2 | Horizontal | 120 | 90 | |
| 10981.500 | 48.4 | 37.5 | -40.5 | 7.5 | 0.0 | 52.9 | 74.0 | -21.1 | Vertical | 340 | 90 | |
| 12441.000 | 48.7 | 38.9 | -40.3 | 8.0 | 0.0 | 55.2 | 74.0 | -18.8 | Horizontal | 340 | 45 | |

| Freq MHz | Average Mtr Rdg dBuV | Ant Fac dB/m | Amp Fac dB | Cbl Fac dB | Dist Corr dB | Average Total dB μ V/m | Average Limit dB μ V/m | Average Lim Mrg dB | Ant Pol | Mast Ht cm | Azim ° | Excessive Average Level |
|-----------|----------------------|--------------|------------|------------|--------------|----------------------------|----------------------------|--------------------|------------|------------|--------|-------------------------|
| 1371.000 | 36.7 | 28.7 | -41.5 | 2.5 | 0.0 | 26.5 | 54.0 | -27.5 | Horizontal | 120 | 270 | |
| 2435.500 | 35.7 | 32.4 | -41.1 | 3.4 | 0.0 | 30.4 | 54.0 | -23.6 | Vertical | 120 | 135 | |
| 3255.000 | 35.4 | 32.8 | -40.7 | 4.1 | 0.0 | 31.6 | 54.0 | -22.4 | Vertical | 340 | 315 | |
| 6555.000 | 33.9 | 35.6 | -40.5 | 5.8 | 0.0 | 34.8 | 54.0 | -19.2 | Horizontal | 120 | 90 | |
| 10981.500 | 34.9 | 37.5 | -40.5 | 7.5 | 0.0 | 39.4 | 54.0 | -14.6 | Vertical | 340 | 90 | |
| 12441.000 | 35.2 | 38.9 | -40.3 | 8.0 | 0.0 | 41.7 | 54.0 | -12.2 | Horizontal | 340 | 45 | |

FCC Part 15B Class B Radiated RF Emissions Test

SW ID/Rev: VBV2 02/17/2022

Manufacturer : Springs Windows
 Model : RRZB
 Serial Number : Unit 1
 DUT Mode : Tx Standby, Motor Cycling
 Turntable Step Angle (°) : 45
 Mast Positions (cm) : 120, 200, 340
 Scan Type : Stepped Scan
 Test RBW : 1 MHz
 Prelim Dwell Time (s) : 0.0001
 Notes :
 Test Engineer : N. Bouchie
 Test Date : Apr 19, 2022 10:01:06 AM



FCC Part 15.109

Radiated RF Emissions Test

SW ID/Rev: VBV2 02/17/2022

Manufacturer : Springs Windows
 Model : RRZB
 Serial Number : Unit 1
 DUT Mode : ZWave Rx @ 908MHz
 Turntable Step Angle (°) : 45
 Mast Positions (cm) : 120, 200, 340
 Scan Type : Stepped Scan
 Test RBW : 120 kHz
 Prelim Dwell Time (s) : 0.0001
 Notes :
 Test Engineer : N. Bouchie
 Test Date : Apr 18, 2022 11:31:54 AM

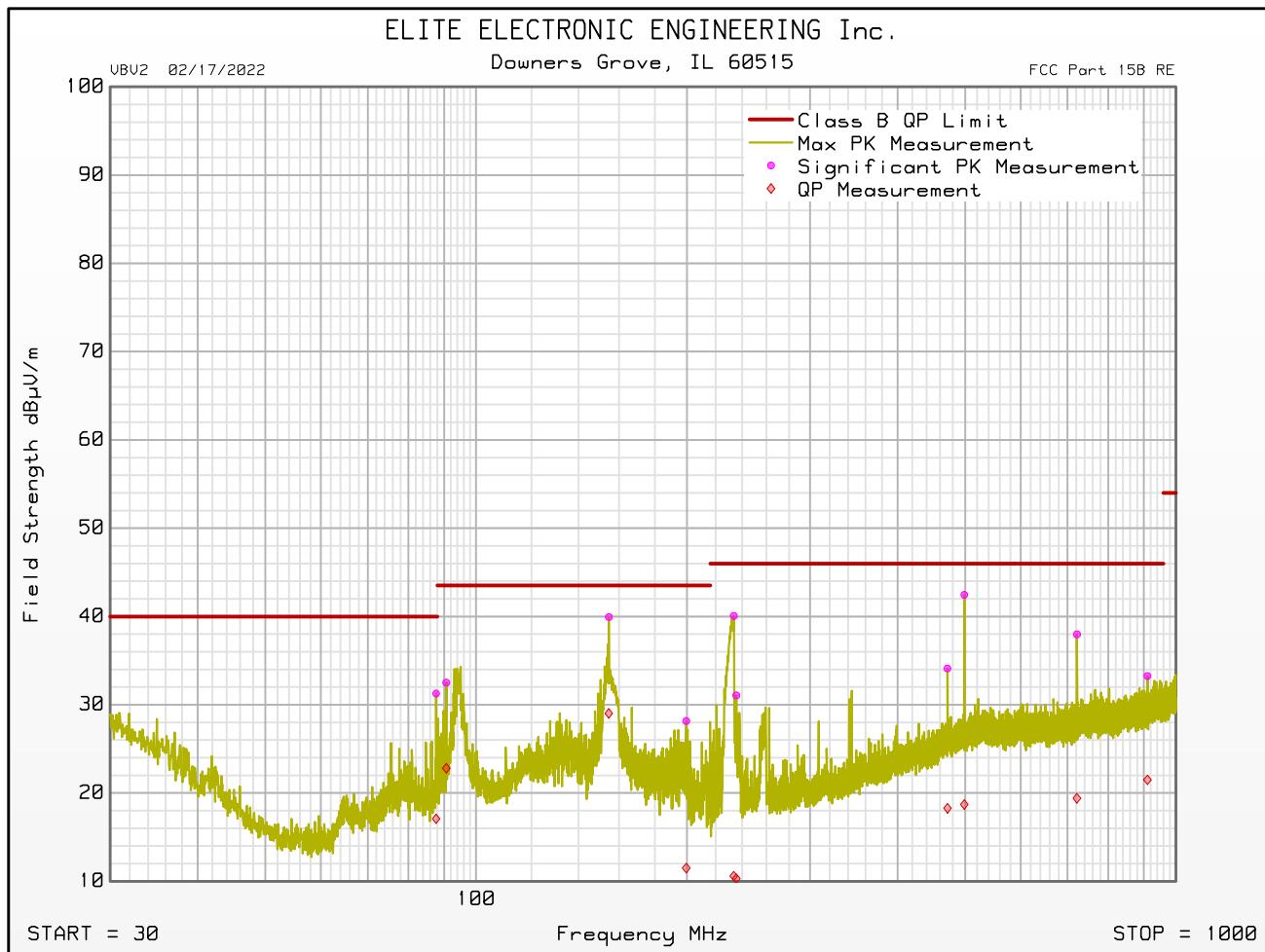
| Freq MHz | Peak Mtr Rdg dBuV | QP Mtr Rdg dBuV | Ant Fac dB/m | Amp Fac dB | Cbl Fac dB | Dist Corr dB | Peak Total dB μ V/m | QP Total dB μ V/m | QP Limit dB μ V/m | QP Lim Mrg dB | Ant Pol | Mast Ht cm | Azim ° | Excessive QP Level |
|----------|-------------------|-----------------|--------------|------------|------------|--------------|-------------------------|-----------------------|-----------------------|---------------|------------|------------|--------|--------------------|
| 35.040 | 16.8 | 5.8 | 22.0 | 0.0 | 0.5 | 0.0 | 39.3 | 28.3 | 40.0 | -11.7 | Vertical | 120 | 315 | |
| 36.540 | 19.0 | 8.8 | 21.2 | 0.0 | 0.5 | 0.0 | 40.7 | 30.4 | 40.0 | -9.6 | Vertical | 120 | 90 | |
| 42.840 | 25.9 | 11.9 | 18.0 | 0.0 | 0.5 | 0.0 | 44.4 | 30.4 | 40.0 | -9.6 | Vertical | 120 | 225 | |
| 87.660 | 16.2 | 2.1 | 14.5 | 0.0 | 0.5 | 0.0 | 31.3 | 17.1 | 40.0 | 22.9 | Horizontal | 200 | 45 | |
| 90.640 | 16.8 | 7.1 | 15.2 | 0.0 | 0.5 | 0.0 | 32.5 | 22.8 | 43.5 | -20.7 | Horizontal | 200 | 0 | |
| 94.420 | 21.3 | 8.4 | 16.0 | 0.0 | 0.5 | 0.0 | 37.7 | 24.9 | 43.5 | -18.7 | Vertical | 200 | 225 | |
| 123.940 | 17.4 | 4.6 | 18.2 | 0.0 | 0.7 | 0.0 | 36.3 | 23.5 | 43.5 | -20.0 | Vertical | 200 | 45 | |
| 128.920 | 15.7 | 4.4 | 17.9 | 0.0 | 0.7 | 0.0 | 34.3 | 23.0 | 43.5 | -20.5 | Vertical | 200 | 45 | |
| 154.720 | 22.0 | 11.0 | 17.2 | 0.0 | 0.8 | 0.0 | 39.9 | 29.0 | 43.5 | -14.5 | Horizontal | 120 | 0 | |
| 199.600 | 11.7 | -4.9 | 15.4 | 0.0 | 1.0 | 0.0 | 28.2 | 11.5 | 43.5 | 32.0 | Horizontal | 120 | 135 | |
| 233.460 | 22.5 | -7.0 | 16.6 | 0.0 | 1.0 | 0.0 | 40.1 | 10.6 | 46.0 | -35.4 | Horizontal | 340 | 180 | |
| 235.380 | 13.3 | -7.5 | 16.8 | 0.0 | 1.0 | 0.0 | 31.1 | 10.3 | 46.0 | -35.7 | Horizontal | 340 | 180 | |
| 371.100 | 11.0 | -6.9 | 20.8 | 0.0 | 1.4 | 0.0 | 33.2 | 15.3 | 46.0 | -30.7 | Vertical | 340 | 225 | |
| 471.480 | 8.9 | -6.9 | 23.7 | 0.0 | 1.5 | 0.0 | 34.1 | 18.3 | 46.0 | -27.7 | Horizontal | 340 | 225 | |
| 498.360 | 17.0 | -6.8 | 24.0 | 0.0 | 1.5 | 0.0 | 42.5 | 18.7 | 46.0 | -27.3 | Horizontal | 200 | 180 | |
| 721.980 | 10.6 | -7.9 | 25.5 | 0.0 | 1.8 | 0.0 | 38.0 | 19.4 | 46.0 | -26.6 | Horizontal | 340 | 225 | |
| 910.440 | 4.9 | -6.9 | 26.4 | 0.0 | 2.0 | 0.0 | 33.3 | 21.5 | 46.0 | -24.5 | Horizontal | 200 | 225 | |

FCC Part 15.109

Radiated RF Emissions Test

SW ID/Rev: VBV2 02/17/2022

Manufacturer : Springs Windows
Model : RRZB
Serial Number : Unit 1
DUT Mode : ZWave Rx @ 908MHz
Turntable Step Angle (°) : 45
Mast Positions (cm) : 120, 200, 340
Antenna Polarization : Horizontal
Scan Type : Stepped Scan
Test RBW : 120 kHz
Prelim Dwell Time (s) : 0.0001
Notes :
Test Engineer : N. Bouchie
Test Date : Apr 18, 2022 11:31:54 AM

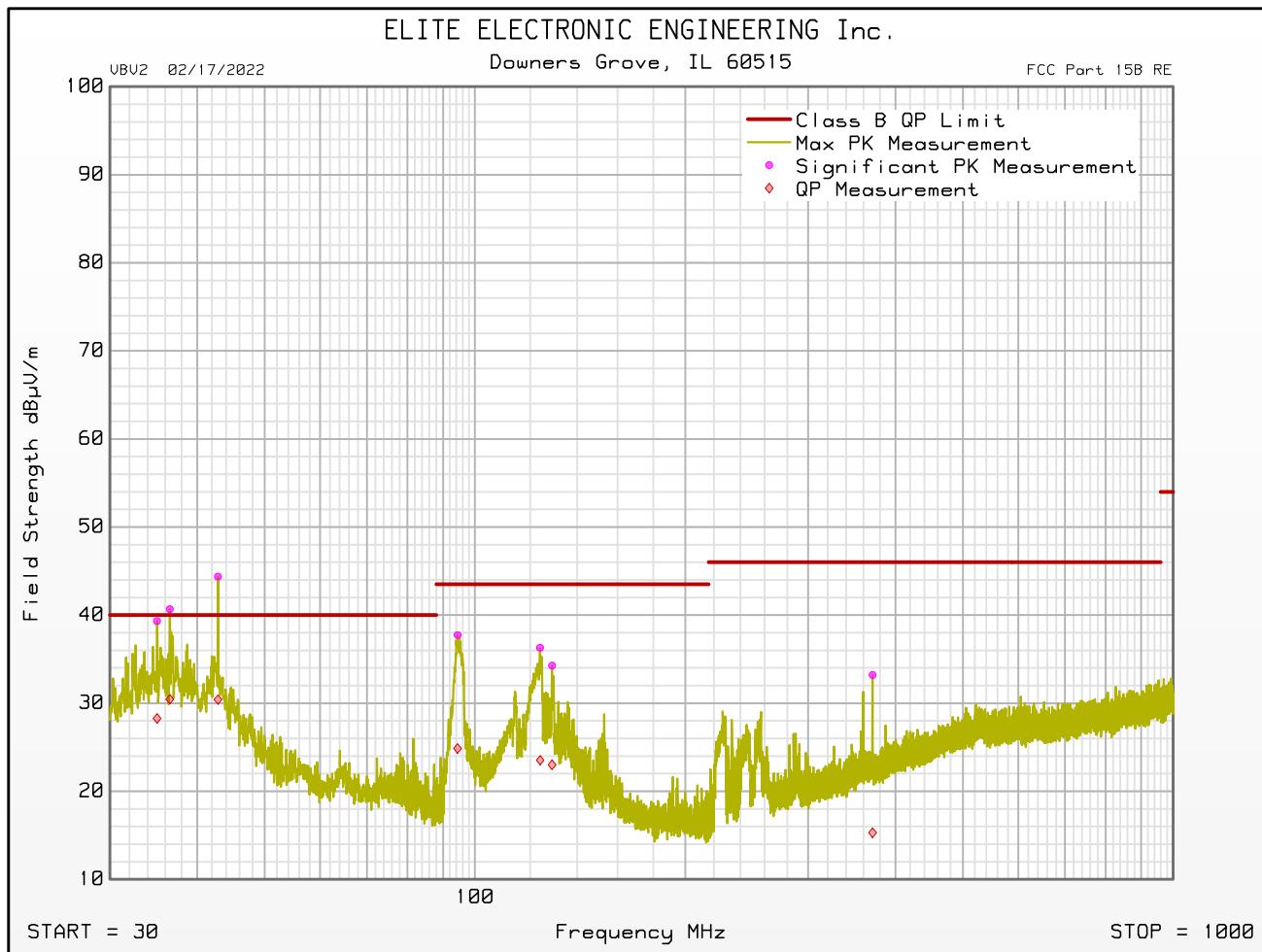


FCC Part 15.109

Radiated RF Emissions Test

SW ID/Rev: VBV2 02/17/2022

Manufacturer : Springs Windows
Model : RRZB
Serial Number : Unit 1
DUT Mode : ZWave Rx @ 908MHz
Turntable Step Angle (°) : 45
Mast Positions (cm) : 120, 200, 340
Antenna Polarization : Vertical
Scan Type : Stepped Scan
Test RBW : 120 kHz
Prelim Dwell Time (s) : 0.0001
Notes :
Test Engineer : N. Bouchie
Test Date : Apr 18, 2022 11:31:54 AM



FCC Part 15.109

Radiated RF Emissions Test

SW ID/Rev: VBV2 02/17/2022

Manufacturer : Springs Windows
 Model : RRZB
 Serial Number : Unit 1
 DUT Mode : ZWave Rx @ 908MHz
 Turntable Step Angle (°) : 45
 Mast Positions (cm) : 120, 200, 340
 Scan Type : Stepped Scan
 Test RBW : 1 MHz
 Prelim Dwell Time (s) : 0.0001
 Notes :
 Test Engineer : N. Bouchie
 Test Date : Apr 19, 2022 10:38:13 AM

| Freq MHz | Peak Mtr Rdg dBuV | Ant Fac dB/m | Amp Fac dB | Cbl Fac dB | Dist Corr dB | Peak Total dB μ V/m | Peak Limit dB μ V/m | Peak Lim Mrg dB | Ant Pol | Mast Ht cm | Azim ° | Excessive Peak Level |
|-----------|-------------------|--------------|------------|------------|--------------|-------------------------|-------------------------|-----------------|------------|------------|--------|----------------------|
| 1369.000 | 52.3 | 28.8 | -41.5 | 2.5 | 0.0 | 42.0 | 74.0 | -32.0 | Vertical | 340 | 90 | |
| 1908.500 | 57.6 | 31.2 | -40.9 | 2.9 | 0.0 | 51.0 | 74.0 | -23.0 | Vertical | 340 | 90 | |
| 2442.000 | 55.4 | 32.4 | -41.2 | 3.4 | 0.0 | 50.1 | 74.0 | -23.9 | Vertical | 340 | 45 | |
| 2463.500 | 54.7 | 32.5 | -41.2 | 3.5 | 0.0 | 49.4 | 74.0 | -24.5 | Vertical | 120 | 45 | |
| 2478.000 | 53.6 | 32.5 | -41.2 | 3.5 | 0.0 | 48.4 | 74.0 | -25.6 | Vertical | 340 | 270 | |
| 4057.500 | 48.4 | 33.4 | -40.4 | 4.5 | 0.0 | 46.0 | 74.0 | -28.0 | Horizontal | 120 | 270 | |
| 6719.500 | 47.6 | 35.6 | -40.6 | 5.9 | 0.0 | 48.4 | 74.0 | -25.6 | Vertical | 200 | 270 | |
| 10531.500 | 48.7 | 37.3 | -40.5 | 7.3 | 0.0 | 52.8 | 74.0 | -21.2 | Vertical | 200 | 45 | |
| 12410.500 | 48.7 | 38.8 | -40.3 | 8.0 | 0.0 | 55.2 | 74.0 | -18.7 | Vertical | 120 | 270 | |

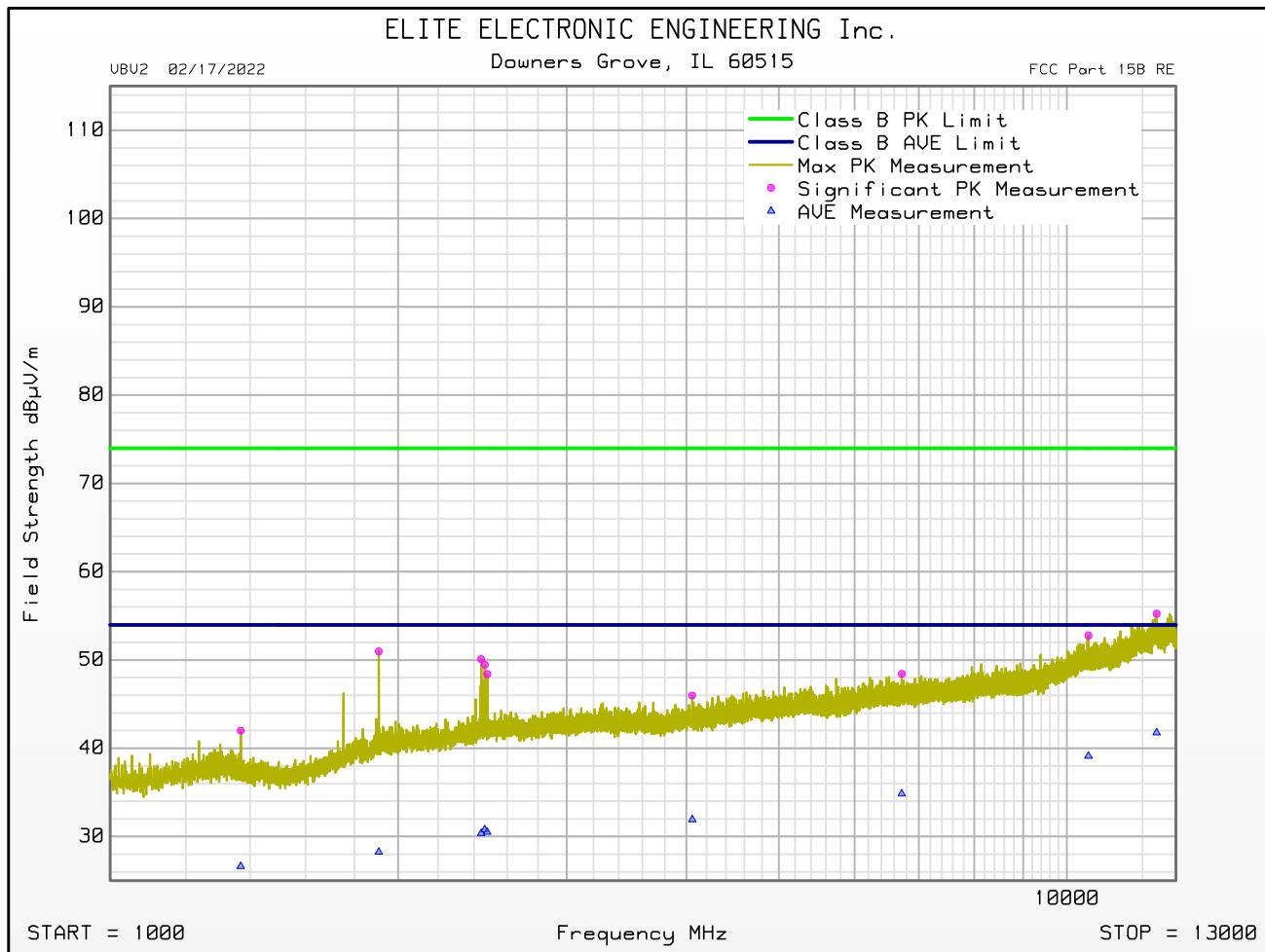
| Freq MHz | Average Mtr Rdg dBuV | Ant Fac dB/m | Amp Fac dB | Cbl Fac dB | Dist Corr dB | Average Total dB μ V/m | Average Limit dB μ V/m | Average Lim Mrg dB | Ant Pol | Mast Ht cm | Azim ° | Excessive Average Level |
|-----------|----------------------|--------------|------------|------------|--------------|----------------------------|----------------------------|--------------------|------------|------------|--------|-------------------------|
| 1369.000 | 36.9 | 28.8 | -41.5 | 2.5 | 0.0 | 26.6 | 54.0 | -27.3 | Vertical | 340 | 90 | |
| 1908.500 | 34.9 | 31.2 | -40.9 | 2.9 | 0.0 | 28.2 | 54.0 | -25.7 | Vertical | 340 | 90 | |
| 2442.000 | 35.7 | 32.4 | -41.2 | 3.4 | 0.0 | 30.4 | 54.0 | -23.6 | Vertical | 340 | 45 | |
| 2463.500 | 36.0 | 32.5 | -41.2 | 3.5 | 0.0 | 30.8 | 54.0 | -23.2 | Vertical | 120 | 45 | |
| 2478.000 | 35.7 | 32.5 | -41.2 | 3.5 | 0.0 | 30.5 | 54.0 | -23.5 | Vertical | 340 | 270 | |
| 4057.500 | 34.3 | 33.4 | -40.4 | 4.5 | 0.0 | 31.9 | 54.0 | -22.1 | Horizontal | 120 | 270 | |
| 6719.500 | 34.0 | 35.6 | -40.6 | 5.9 | 0.0 | 34.8 | 54.0 | -19.2 | Vertical | 200 | 270 | |
| 10531.500 | 35.0 | 37.3 | -40.5 | 7.3 | 0.0 | 39.1 | 54.0 | -14.9 | Vertical | 200 | 45 | |
| 12410.500 | 35.3 | 38.8 | -40.3 | 8.0 | 0.0 | 41.8 | 54.0 | -12.2 | Vertical | 120 | 270 | |

FCC Part 15.109

Radiated RF Emissions Test

SW ID/Rev: VBV2 02/17/2022

Manufacturer : Springs Windows
Model : RRZB
Serial Number : Unit 1
DUT Mode : ZWave Rx @ 908MHz
Turntable Step Angle (°) : 45
Mast Positions (cm) : 120, 200, 340
Scan Type : Stepped Scan
Test RBW : 1 MHz
Prelim Dwell Time (s) : 0.0001
Notes :
Test Engineer : N. Bouchie
Test Date : Apr 19, 2022 10:38:13 AM



22. Occupied Bandwidth Measurements

| Test Information | |
|------------------|--|
| Manufacturer | Spring Window Fashions LLC |
| Product | Roller Window Shade |
| Model | RRZB |
| Serial No | Unit 1 |
| Modes | ZWave Tx @ 908.4MHz ZWave Tx @ 916MHz |
| Test Date | April 18, 2022 |

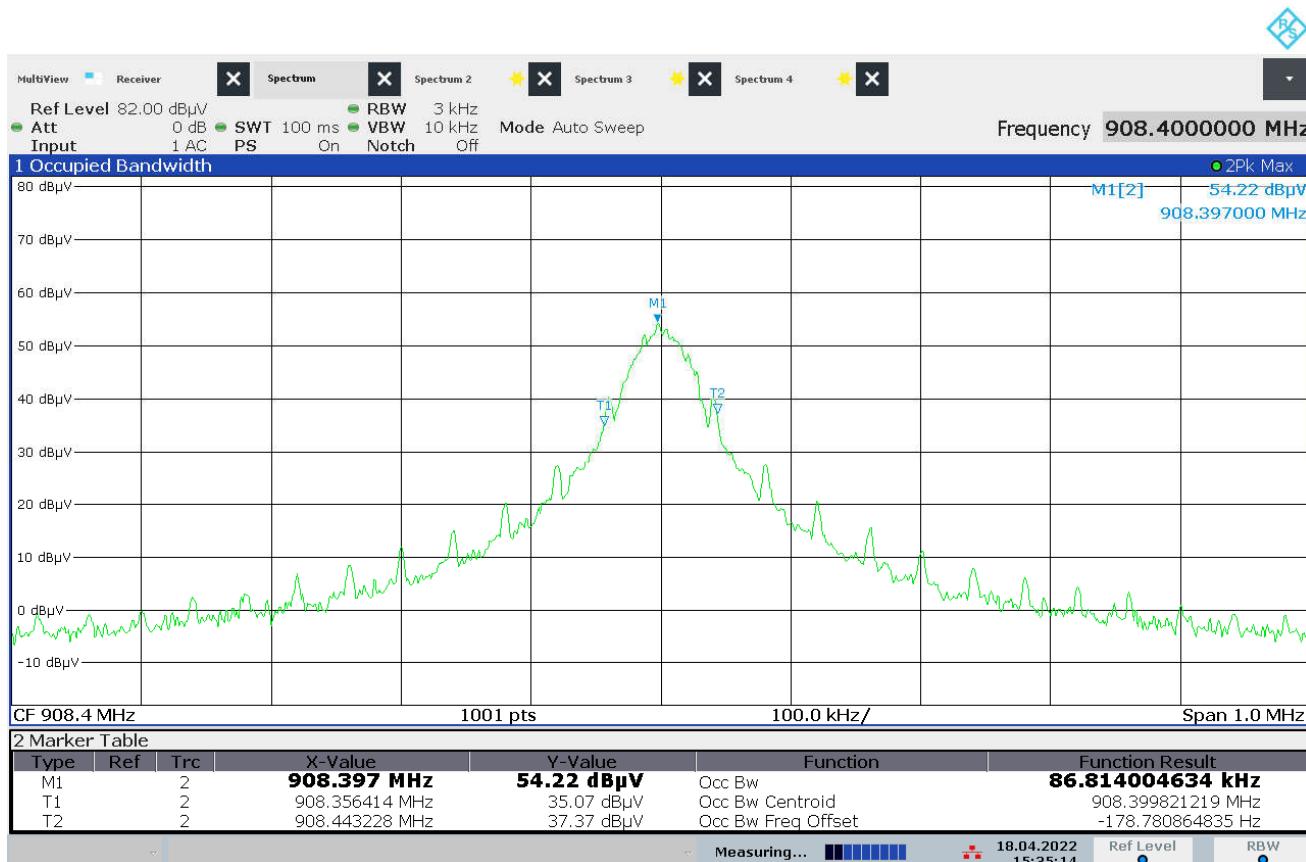
| Test Setup Details | |
|--------------------|-----------------------|
| Setup Format | Tabletop |
| Height of Support | N/a |
| Type of Test Site | Semi-Anechoic Chamber |
| Test site used | Room 21 |
| Notes | None |

| 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 |
|--|
| The occupied bandwidth (99% Bandwidth) of momentarily operated devices shall be less than or equal to 0.25% of the center frequency for devices operating between 70 MHz and 900 MHz. For devices operating above 900 MHz, the occupied bandwidth shall be less than or equal to 0.5% of the center frequency. |

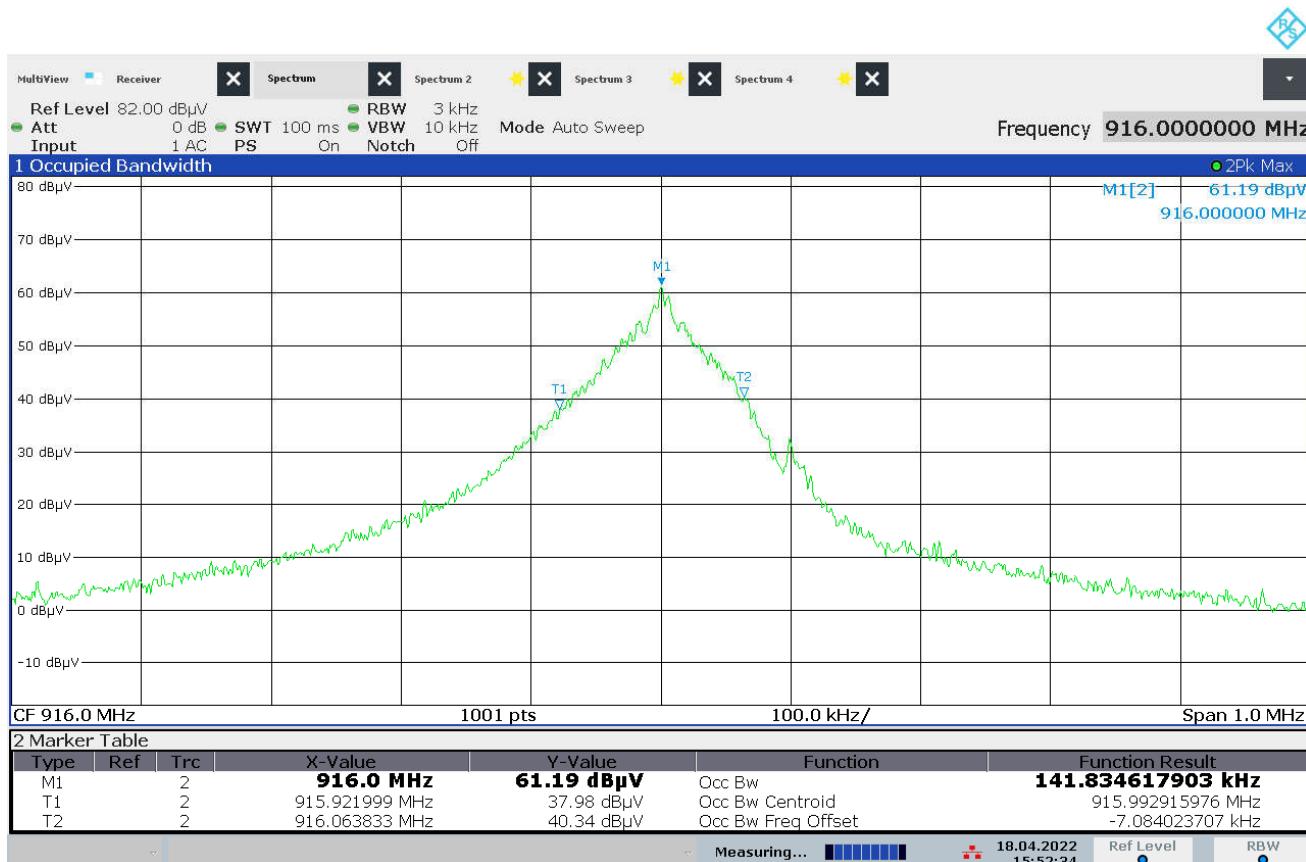
| Procedures |
|--|
| The EUT was placed on an 80cm high non-conductive stand. The unit was set to transmit continuously. With an antenna positioned nearby, occupied bandwidth emissions were displayed on the spectrum analyzer. The resolution bandwidth was set to 1% to 5% of the actual occupied bandwidth and span was set to 2MHz. The 99% Power Bandwidth function of the spectrum analyzer was enabled. A screen capture was taken of the frequency spectrum near the carrier using a screen dump function on the spectrum analyzer. |

| Test Details | |
|-------------------|--|
| Manufacturer | Spring Window Fashions LLC |
| Model | RRZB |
| S/N | Unit 1 |
| Mode | ZWave Tx @ 908.4MHz |
| Carrier Frequency | 908.4MHz |
| Parameters | Occupied Bandwidth (99% Bandwidth) = 86.814kHz |
| Notes | None |



15:35:15 18.04.2022

| Test Details | |
|-------------------|---|
| Manufacturer | Spring Window Fashions LLC |
| Model | RRZB |
| S/N | Unit 1 |
| Mode | ZWave Tx @ 916MHz |
| Carrier Frequency | 916MHz |
| Parameters | Occupied Bandwidth (99% Bandwidth) = 141.835kHz |
| Notes | None |



15:52:35 18.04.2022

23. Duty Cycle Factor Measurements

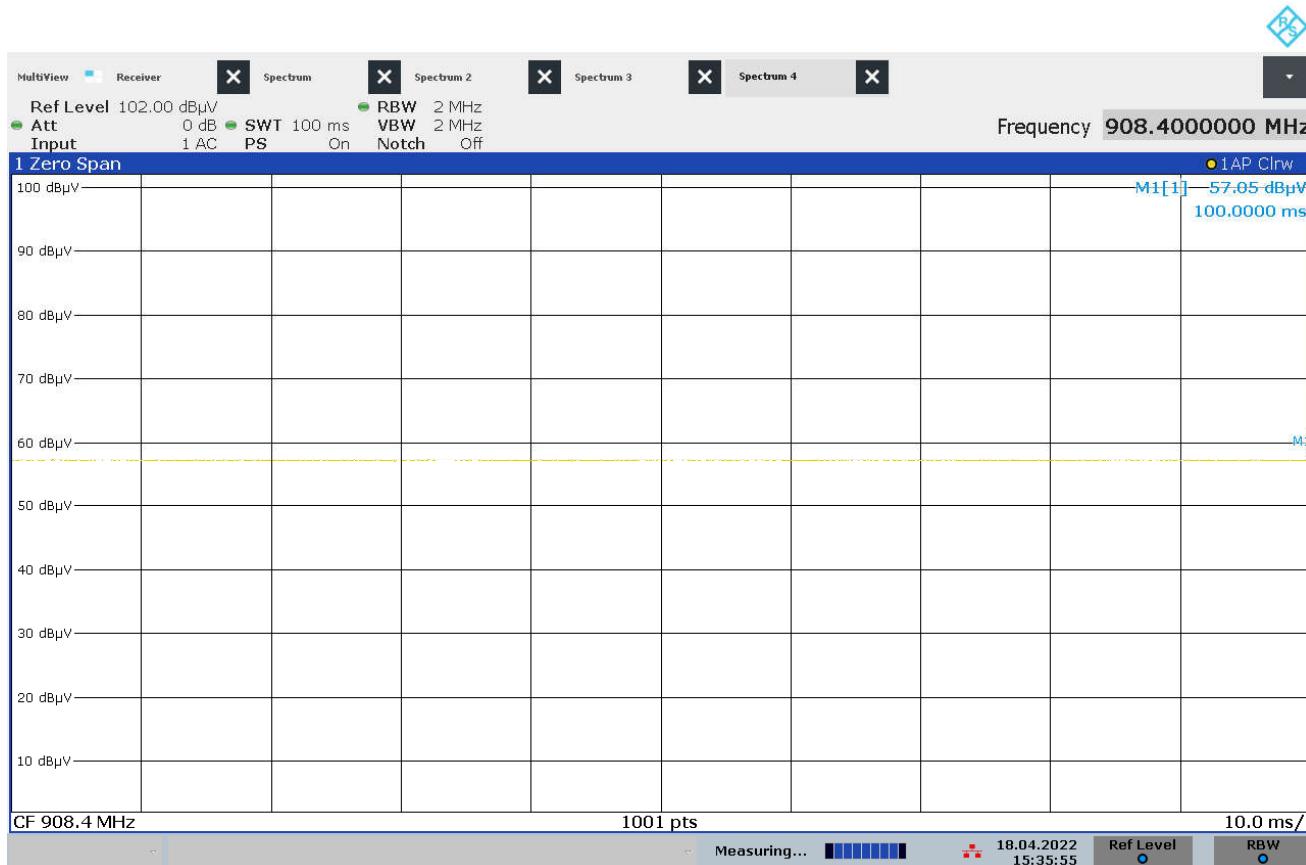
| Test Information | |
|------------------|--|
| Manufacturer | Spring Window Fashions LLC |
| Product | Roller Window Shade |
| Model | RRZB |
| Serial No | Unit 1 |
| Modes | ZWave Tx @ 908.4MHz ZWave Tx @ 916MHz |

| Test Setup Details | |
|--------------------|-----------------------|
| Setup Format | Tabletop |
| Height of Support | N/a |
| Measurement Method | Radiated |
| Type of Test Site | Semi-Anechoic Chamber |
| Test site used | Room 21 |
| Notes | None |

| Procedures |
|---|
| <p>The spectrum analyzer center frequency is set to the transmitter frequency with a zero-span width and 10msec/div. This shows if the word is longer than 100msec or shorter than 100msec. If the word period is less than 100msec, the display is set to show at least one word. The on-time and off-time are then measured. The on-time is total time signal level exceeds the 4th division. Off-time is time under for the word period. The duty cycle is then computed as the (On-time/ word period) where the word period = (On-time + Off-time).</p> |

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

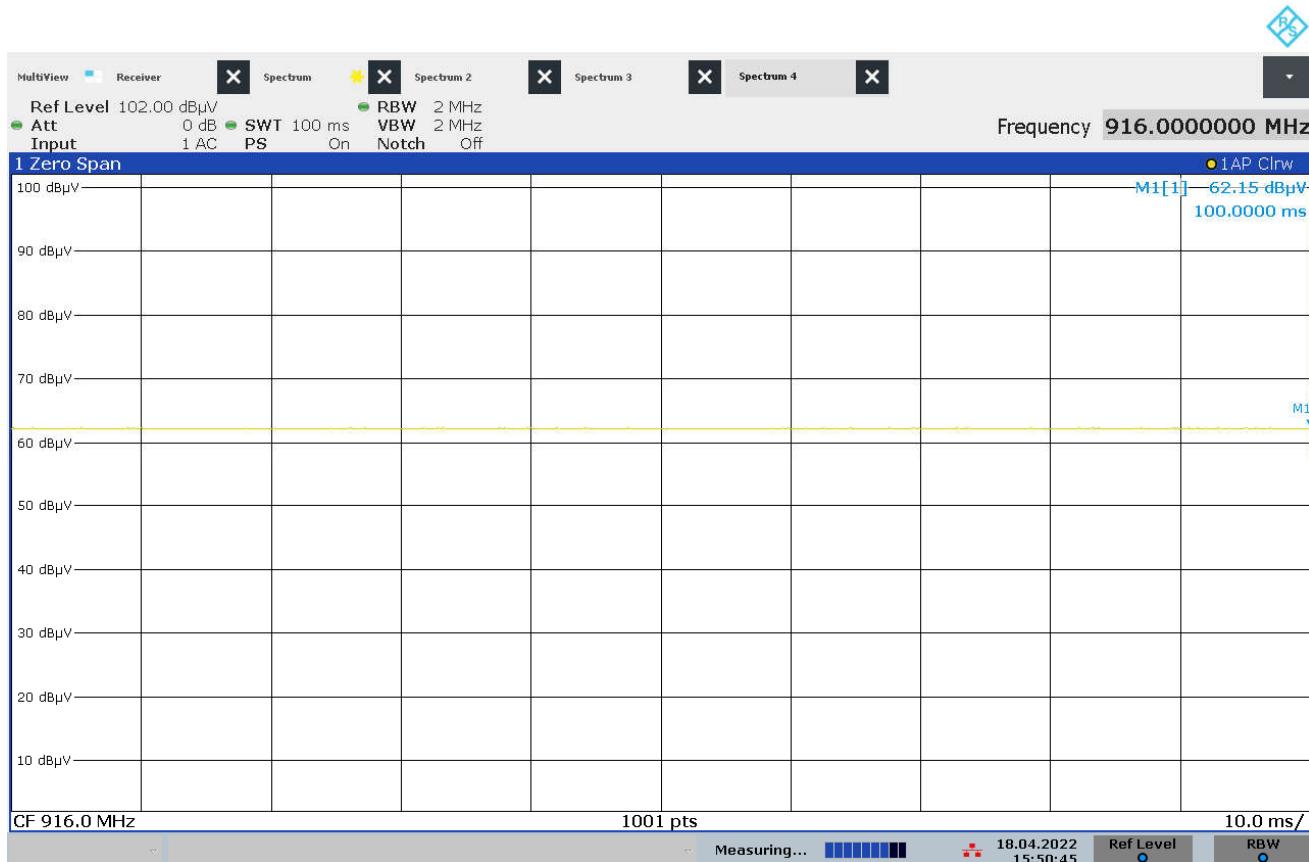
| Test Details | |
|-------------------|----------------------------|
| Manufacturer | Spring Window Fashions LLC |
| Model | RRZB |
| S/N | Unit 1 |
| Mode | ZWave Tx @ 908.4MHz |
| Carrier Frequency | 908.4MHz |
| Parameters | On time = 100ms |
| Notes | Duty Cycle Factor = 0 |



15:35:56 18.04.2022

$$\text{Duty Cycle Factor} = 20 \log \left(\frac{On - Time}{100\text{msec}} \right) = 20 \log \left(\frac{100\text{msec}}{100\text{msec}} \right) = 0$$

| Test Details | |
|-------------------|----------------------------|
| Manufacturer | Spring Window Fashions LLC |
| Model | RRZB |
| S/N | Unit 1 |
| Mode | ZWave Tx @ 916MHz |
| Carrier Frequency | 916MHz |
| Parameters | On time = 100ms |
| Notes | Duty Cycle Factor = 0 |



15:50:46 18.04.2022

$$\text{Duty Cycle Factor} = 20 \log \left(\frac{On - Time}{100\text{msec}} \right) = 20 \log \left(\frac{100\text{msec}}{100\text{msec}} \right) = 0$$

24. Case Spurious Radiated Emissions

| Test Information | |
|------------------|--|
| Manufacturer | Spring Window Fashions LLC |
| Product | Roller Window Shade |
| Model | RRZB |
| Serial No | Unit 1 |
| Modes | ZWave Tx @ 908.4MHz ZWave Tx @ 916MHz |

| Test Setup Details | |
|-----------------------|--|
| Setup Format | Tabletop |
| Height of Support | N/a |
| Measurement Method | Radiated |
| Type of Test Site | Semi-Anechoic Chamber |
| Test site used | Room 21 |
| Type of Antennas Used | Below 1GHz: Bilog (or equivalent) 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 | | |
|-----------------------|--------------------------------------|-----------------------|
| Fundamental Frequency | Field Strength of Fundamental (mV/m) | Field Strength (mV/m) |
| 902-928 MHz | 50 | 500 |
| 2400-2483.5 MHz | 50 | 500 |
| 5725-5875 MHz | 50 | 500 |
| 24.0-24.25 MHz | 250 | 2500 |

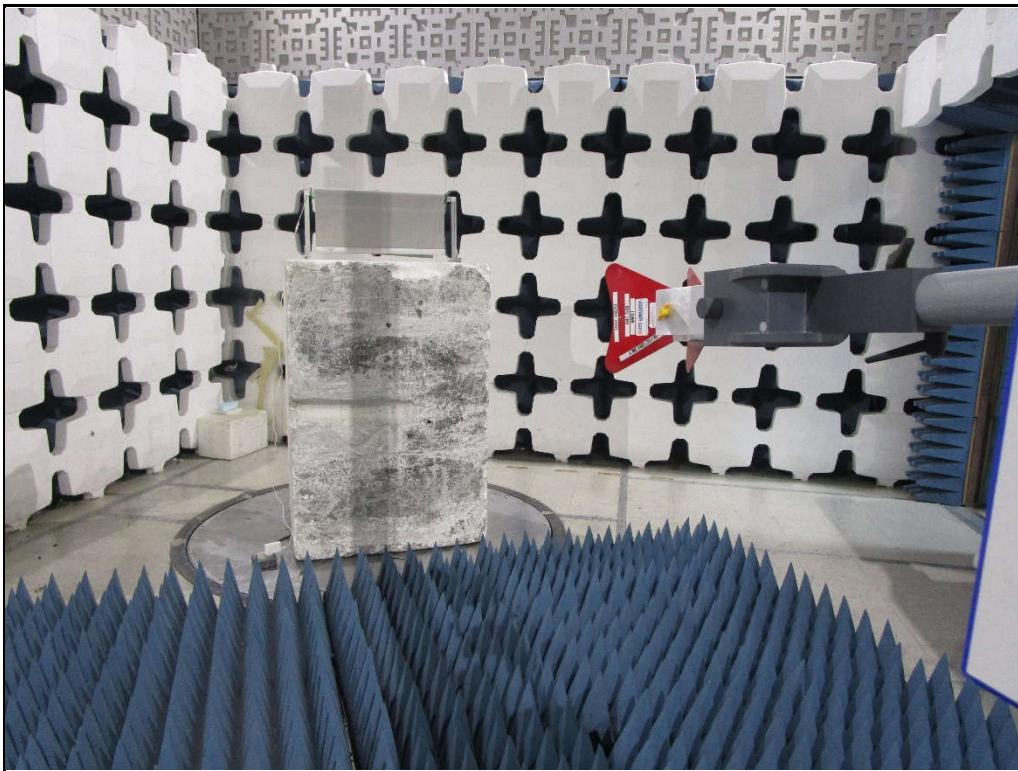
Procedures

Radiated measurements were performed in a 32ft. x 20ft. x 14ft. high shielded enclosure. The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

Preliminary radiated emissions tests were performed to determine the emission characteristics of the EUT. For the preliminary test, a broadband measuring antenna was positioned at a 3-meter distance from the EUT. The entire frequency range from 30MHz to 13.0GHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 30MHz to 13.0GHz.

- a) The field strength of the fundamental was measured using a bilog antenna. The bilog antenna was positioned at a 3-meter distance from the EUT. The EUT was placed on an 80cm high non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.
- b) The field strengths of all of the harmonics 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 100 kHz was used on the spectrum analyzer.
- c) To ensure that maximum or worst-case emission levels at the fundamental and harmonics were measured, the following steps were taken when measuring the fundamental emissions and the spurious emissions:
 - i) The EUT was rotated so that all of its sides were exposed to the receiving antenna.
 - ii) Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
 - iii) The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.
 - 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.



Test Setup for Spurious Radiated Emissions, Above 1GHz – Antenna Polarization Horizontal (Roller Window Shade)



Test Setup for Spurious Radiated Emissions, Above 1GHz – Antenna Polarization Vertical (Roller Window Shade)

| Test Details | | | | | | | | | | |
|-------------------|----------------------------|--|--|--|--|--|--|--|--|--|
| Manufacturer | Spring Window Fashions LLC | | | | | | | | | |
| Model | RRZB | | | | | | | | | |
| S/N | Unit 1 | | | | | | | | | |
| Mode | ZWave Tx @ 908.4MHz | | | | | | | | | |
| Carrier Frequency | 908.4MHz | | | | | | | | | |
| Parameters | Peak Measurements | | | | | | | | | |
| Notes | None | | | | | | | | | |

| Frequency (MHz) | Ant Pol | Meter Reading (dB μ V) | Ambient | CBL Fac (dB) | Ant Fac (dB/m) | Pre Amp (dB) | Peak Total (dB μ V/m) at 3m | Peak Total (μ V/m) at 3 m | Peak Limit (μ V/m) at 3 m | Margin (dB) |
|-----------------|---------|----------------------------|---------|--------------|----------------|--------------|---------------------------------|--------------------------------|--------------------------------|-------------|
| 908.400 | H | 57.3 | | 2.0 | 26.4 | 0.0 | 85.8 | 19450.7 | 50000.0 | -8.2 |
| 908.400 | V | 54.5 | | 2.0 | 26.4 | 0.0 | 83.0 | 14139.5 | 50000.0 | -11.0 |
| 1816.800 | H | 51.9 | * | 2.9 | 30.9 | -40.9 | 44.9 | 175.3 | 5000.0 | -29.1 |
| 1816.800 | V | 51.6 | * | 2.9 | 30.9 | -40.9 | 44.6 | 170.6 | 5000.0 | -29.3 |
| 2725.200 | H | 53.9 | | 3.7 | 32.6 | -40.4 | 49.7 | 307.2 | 5000.0 | -24.2 |
| 2725.200 | V | 55.3 | | 3.7 | 32.6 | -40.4 | 51.2 | 362.1 | 5000.0 | -22.8 |
| 3633.600 | H | 49.8 | * | 4.3 | 33.2 | -40.3 | 46.9 | 222.6 | 5000.0 | -27.0 |
| 3633.600 | V | 50.1 | * | 4.3 | 33.2 | -40.3 | 47.3 | 230.7 | 5000.0 | -26.7 |
| 4542.000 | H | 49.5 | * | 4.7 | 34.2 | -40.1 | 48.4 | 262.7 | 5000.0 | -25.6 |
| 4542.000 | V | 51.5 | | 4.7 | 34.2 | -40.1 | 50.3 | 328.8 | 5000.0 | -23.6 |
| 5450.400 | H | 49.7 | * | 5.2 | 35.0 | -40.2 | 49.6 | 301.1 | 5000.0 | -24.4 |
| 5450.400 | V | 49.9 | * | 5.2 | 35.0 | -40.2 | 49.8 | 310.6 | 5000.0 | -24.1 |
| 6358.800 | H | 50.0 | | 5.6 | 35.5 | -40.1 | 51.0 | 356.2 | 5000.0 | -22.9 |
| 6358.800 | V | 52.2 | | 5.6 | 35.5 | -40.1 | 53.2 | 457.3 | 5000.0 | -20.8 |
| 7267.200 | H | 49.3 | * | 6.1 | 35.7 | -40.1 | 51.1 | 359.0 | 5000.0 | -22.9 |
| 7267.200 | V | 48.6 | * | 6.1 | 35.7 | -40.1 | 50.4 | 330.9 | 5000.0 | -23.6 |
| 8175.600 | H | 51.4 | | 6.5 | 35.8 | -40.0 | 53.8 | 487.2 | 5000.0 | -20.2 |
| 8175.600 | V | 51.4 | | 6.5 | 35.8 | -40.0 | 53.8 | 488.9 | 5000.0 | -20.2 |
| 9084.000 | H | 49.3 | * | 6.5 | 36.3 | -39.7 | 52.4 | 416.2 | 5000.0 | -21.6 |
| 9084.000 | V | 49.4 | * | 6.5 | 36.3 | -39.7 | 52.5 | 421.5 | 5000.0 | -21.5 |

| Test Details | | | | | | | | | | | |
|-------------------|----------------------------|--|--|--|--|--|--|--|--|--|--|
| Manufacturer | Spring Window Fashions LLC | | | | | | | | | | |
| Model | RRZB | | | | | | | | | | |
| S/N | Unit 1 | | | | | | | | | | |
| Mode | ZWave Tx @ 908.4MHz | | | | | | | | | | |
| Carrier Frequency | 908.4MHz | | | | | | | | | | |
| Parameters | Average Measurements | | | | | | | | | | |
| Notes | None | | | | | | | | | | |

| Freq. (MHz) | Ant Pol | Meter Reading (dBuV) | Ambient | CBL Fac (dB) | Ant Fac (dB/m) | Pre Amp (dB) | Duty Cycle (dB) | Average Total (dBuV/m) at 3m | Average Total (uV/m) at 3 m | Average Limit (uV/m) at 3 m | Margin (dB) |
|----------------|------------|----------------------------|---------|--------------------|----------------------|--------------------|-----------------------|---------------------------------------|--------------------------------------|--------------------------------------|----------------|
| 1816.80 | H | 35.4 | * | 2.9 | 30.9 | -40.9 | 0.0 | 28.4 | 26.3 | 500.0 | -25.6 |
| 1816.80 | V | 35.4 | * | 2.9 | 30.9 | -40.9 | 0.0 | 28.4 | 26.3 | 500.0 | -25.6 |
| 2725.20 | H | 46.1 | | 3.7 | 32.6 | -40.4 | 0.0 | 42.0 | 125.4 | 500.0 | -12.0 |
| 2725.20 | V | 49.9 | | 3.7 | 32.6 | -40.4 | 0.0 | 45.8 | 194.3 | 500.0 | -8.2 |
| 3633.60 | H | 34.4 | * | 4.3 | 33.2 | -40.3 | 0.0 | 31.6 | 38.0 | 500.0 | -22.4 |
| 3633.60 | V | 34.5 | * | 4.3 | 33.2 | -40.3 | 0.0 | 31.7 | 38.4 | 500.0 | -22.3 |
| 4542.00 | H | 36 | * | 4.7 | 34.2 | -40.1 | 0.0 | 34.8 | 55.3 | 500.0 | -19.1 |
| 4542.00 | V | 37.2 | | 4.7 | 34.2 | -40.1 | 0.0 | 36.0 | 63.5 | 500.0 | -17.9 |
| 5450.40 | H | 34.2 | * | 5.2 | 35.0 | -40.2 | 0.0 | 34.1 | 50.8 | 500.0 | -19.9 |
| 5450.40 | V | 34.2 | * | 5.2 | 35.0 | -40.2 | 0.0 | 34.1 | 50.8 | 500.0 | -19.9 |
| 6358.80 | H | 39.7 | | 5.6 | 35.5 | -40.1 | 0.0 | 40.7 | 108.4 | 500.0 | -13.3 |
| 6358.80 | V | 46.7 | | 5.6 | 35.5 | -40.1 | 0.0 | 47.7 | 242.8 | 500.0 | -6.3 |
| 7267.20 | H | 34 | * | 6.1 | 35.7 | -40.1 | 0.0 | 35.8 | 61.5 | 500.0 | -18.2 |
| 7267.20 | V | 34 | * | 6.1 | 35.7 | -40.1 | 0.0 | 35.8 | 61.5 | 500.0 | -18.2 |
| 8175.60 | H | 35.6 | | 6.5 | 35.8 | -40.0 | 0.0 | 38.0 | 79.3 | 500.0 | -16.0 |
| 8175.60 | V | 42.5 | | 6.5 | 35.8 | -40.0 | 0.0 | 44.9 | 175.5 | 500.0 | -9.1 |
| 9084.00 | H | 34.3 | * | 6.5 | 36.3 | -39.7 | 0.0 | 37.4 | 74.4 | 500.0 | -16.5 |
| 9084.00 | V | 34.3 | * | 6.5 | 36.3 | -39.7 | 0.0 | 37.4 | 74.4 | 500.0 | -16.5 |

| Test Details | | | | | | | | | | |
|-------------------|----------------------------|--|--|--|--|--|--|--|--|--|
| Manufacturer | Spring Window Fashions LLC | | | | | | | | | |
| Model | RRZB | | | | | | | | | |
| S/N | Unit 1 | | | | | | | | | |
| Mode | ZWave Tx @ 916MHz | | | | | | | | | |
| Carrier Frequency | 916MHz | | | | | | | | | |
| Parameters | Peak Measurements | | | | | | | | | |
| Notes | None | | | | | | | | | |

| Frequency (MHz) | Ant Pol | Meter Reading (dB μ V) | Ambient | CBL Fac (dB) | Ant Fac (dB/m) | Pre Amp (dB) | Peak Total (dB μ V/m) at 3m | Peak Total (μ V/m) at 3 m | Peak Limit (μ V/m) at 3 m | Margin (dB) |
|-----------------|---------|----------------------------|---------|--------------|----------------|--------------|---------------------------------|--------------------------------|--------------------------------|-------------|
| 916.000 | H | 63.1 | | 2.1 | 26.4 | 0.0 | 91.6 | 37836.5 | 50000.0 | -2.4 |
| 916.000 | V | 58.7 | | 2.1 | 26.4 | 0.0 | 87.2 | 22798.8 | 50000.0 | -6.8 |
| 1832.000 | H | 51.3 | * | 2.9 | 30.9 | -40.8 | 44.3 | 164.6 | 5000.0 | -29.7 |
| 1832.000 | V | 51.0 | * | 2.9 | 30.9 | -40.8 | 44.0 | 158.8 | 5000.0 | -30.0 |
| 2748.000 | H | 53.5 | | 3.7 | 32.6 | -40.4 | 49.4 | 294.2 | 5000.0 | -24.6 |
| 2748.000 | V | 54.9 | | 3.7 | 32.6 | -40.4 | 50.8 | 347.2 | 5000.0 | -23.2 |
| 3664.000 | H | 49.4 | * | 4.3 | 33.2 | -40.3 | 46.7 | 215.3 | 5000.0 | -27.3 |
| 3664.000 | V | 50.2 | * | 4.3 | 33.2 | -40.3 | 47.4 | 234.7 | 5000.0 | -26.6 |
| 4580.000 | H | 50.7 | * | 4.7 | 34.3 | -40.1 | 49.6 | 302.2 | 5000.0 | -24.4 |
| 4580.000 | V | 50.8 | * | 4.7 | 34.3 | -40.1 | 49.7 | 305.4 | 5000.0 | -24.3 |
| 5496.000 | H | 49.7 | * | 5.2 | 35.0 | -40.2 | 49.6 | 303.0 | 5000.0 | -24.4 |
| 5496.000 | V | 50.0 | * | 5.2 | 35.0 | -40.2 | 49.9 | 312.6 | 5000.0 | -24.1 |
| 6412.000 | H | 51.1 | | 5.7 | 35.5 | -40.1 | 52.2 | 406.7 | 5000.0 | -21.8 |
| 6412.000 | V | 50.3 | * | 5.7 | 35.5 | -40.1 | 51.4 | 371.3 | 5000.0 | -22.6 |
| 7328.000 | H | 49.1 | * | 6.2 | 35.7 | -40.1 | 50.9 | 349.8 | 5000.0 | -23.1 |
| 7328.000 | V | 49.2 | * | 6.2 | 35.7 | -40.1 | 51.0 | 355.9 | 5000.0 | -23.0 |
| 8244.000 | H | 50.8 | | 6.5 | 35.9 | -39.9 | 53.3 | 462.0 | 5000.0 | -20.7 |
| 8244.000 | V | 52.0 | | 6.5 | 35.9 | -39.9 | 54.5 | 530.4 | 5000.0 | -19.5 |
| 9160.000 | H | 49.7 | * | 6.6 | 36.3 | -39.7 | 52.9 | 443.1 | 5000.0 | -21.0 |
| 9160.000 | V | 50.0 | * | 6.6 | 36.3 | -39.7 | 53.2 | 458.7 | 5000.0 | -20.7 |

| Test Details | | | | | | | | | | | |
|-------------------|----------------------------|--|--|--|--|--|--|--|--|--|--|
| Manufacturer | Spring Window Fashions LLC | | | | | | | | | | |
| Model | RRZB | | | | | | | | | | |
| S/N | Unit 1 | | | | | | | | | | |
| Mode | ZWave Tx @ 916MHz | | | | | | | | | | |
| Carrier Frequency | 916MHz | | | | | | | | | | |
| Parameters | Average Measurements | | | | | | | | | | |
| Notes | None | | | | | | | | | | |

| Freq. (MHz) | Ant Pol | Meter Reading (dBuV) | Ambient | CBL Fac (dB) | Ant Fac (dB/m) | Pre Amp (dB) | Duty Cycle (dB) | Average Total (dBuV/m) at 3m | Average Total (uV/m) at 3 m | Average Limit (uV/m) at 3 m | Margin (dB) |
|----------------|------------|----------------------------|---------|--------------------|----------------------|--------------------|-----------------------|---------------------------------------|--------------------------------------|--------------------------------------|----------------|
| 1832.00 | H | 35.8 | * | 2.9 | 30.9 | -40.8 | 0.0 | 28.8 | 27.7 | 500.0 | -25.1 |
| 1832.00 | V | 35.7 | * | 2.9 | 30.9 | -40.8 | 0.0 | 28.7 | 27.4 | 500.0 | -25.2 |
| 2748.00 | H | 44.1 | | 3.7 | 32.6 | -40.4 | 0.0 | 40.0 | 100.1 | 500.0 | -14.0 |
| 2748.00 | V | 47.5 | | 3.7 | 32.6 | -40.4 | 0.0 | 43.4 | 148.1 | 500.0 | -10.6 |
| 3664.00 | H | 34.4 | * | 4.3 | 33.2 | -40.3 | 0.0 | 31.6 | 38.1 | 500.0 | -22.4 |
| 3664.00 | V | 34.8 | * | 4.3 | 33.2 | -40.3 | 0.0 | 32.0 | 39.9 | 500.0 | -22.0 |
| 4580.00 | H | 35 | * | 4.7 | 34.3 | -40.1 | 0.0 | 33.9 | 49.8 | 500.0 | -20.0 |
| 4580.00 | V | 36.5 | * | 4.7 | 34.3 | -40.1 | 0.0 | 35.4 | 59.2 | 500.0 | -18.5 |
| 5496.00 | H | 34.2 | * | 5.2 | 35.0 | -40.2 | 0.0 | 34.1 | 50.9 | 500.0 | -19.8 |
| 5496.00 | V | 34.2 | * | 5.2 | 35.0 | -40.2 | 0.0 | 34.1 | 50.9 | 500.0 | -19.8 |
| 6412.00 | H | 40.6 | | 5.7 | 35.5 | -40.1 | 0.0 | 41.7 | 121.3 | 500.0 | -12.3 |
| 6412.00 | V | 34.7 | * | 5.7 | 35.5 | -40.1 | 0.0 | 35.8 | 61.5 | 500.0 | -18.2 |
| 7328.00 | H | 34.1 | * | 6.2 | 35.7 | -40.1 | 0.0 | 35.9 | 62.4 | 500.0 | -18.1 |
| 7328.00 | V | 34.2 | * | 6.2 | 35.7 | -40.1 | 0.0 | 36.0 | 63.1 | 500.0 | -18.0 |
| 8244.00 | H | 41.6 | | 6.5 | 35.9 | -39.9 | 0.0 | 44.1 | 159.4 | 500.0 | -9.9 |
| 8244.00 | V | 41.5 | | 6.5 | 35.9 | -39.9 | 0.0 | 44.0 | 157.6 | 500.0 | -10.0 |
| 9160.00 | H | 34.7 | * | 6.6 | 36.3 | -39.7 | 0.0 | 37.9 | 78.6 | 500.0 | -16.1 |
| 9160.00 | V | 34.7 | * | 6.6 | 36.3 | -39.7 | 0.0 | 37.9 | 78.6 | 500.0 | -16.1 |

25. Band-Edge Compliance

| Test Information | |
|------------------|--|
| Manufacturer | Spring Window Fashions LLC |
| Product | Roller Window Shade |
| Model | RRZB |
| Serial No | Unit 1 |
| Modes | ZWave Tx @ 908.4MHz ZWave Tx @ 916MHz |

| Test Setup Details | |
|--------------------|-----------------------|
| Setup Format | Tabletop |
| Height of Support | N/a |
| Measurement Method | Radiated |
| Type of Test Site | Semi-Anechoic Chamber |
| Test site used | Room 21 |
| Notes | None |

| Requirements | |
|---|--|
| Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209 and RSS-GEN, whichever is the lesser attenuation. | |

| Procedures | |
|----------------|---|
| Low Band Edge | <ol style="list-style-type: none"> 1) The EUT was setup inside the test chamber on a non-conductive stand. 2) A broadband measuring antenna was placed at a test distance of 3 meters from the EUT. 3) The EUT was set to transmit continuously at the channel closest to the low band-edge. 4) The EUT was maximized for worst case emissions at the measuring antenna. The maximum meter reading was recorded. 5) To determine the band edge compliance, the following spectrum analyzer settings were used: <ol style="list-style-type: none"> a. Center frequency = low band-edge frequency. b. 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. c. Resolution bandwidth (RBW) $\geq 1\%$ of the span. d. The 'Max-Hold' function was engaged. The analyzer was allowed to scan until the envelope of the transmitter bandwidth was defined. e. The marker was set on the peak of the in-band emissions. A display line was placed 20dB down from the peak of the in-band emissions. All emissions which fall outside of the authorized band of operation must be below the 20dB down display line. (All emissions to the left of the center frequency (band-edge) must be below the display line.) f. The analyzer's display was plotted using a 'screen dump' utility. |
| High Band Edge | <ol style="list-style-type: none"> 1) The EUT was setup inside the test chamber on a non-conductive stand. 2) A broadband measuring antenna was placed at a test distance of 3 meters from the EUT. 3) The EUT was set to transmit continuously at the channel closest to the high band-edge. |

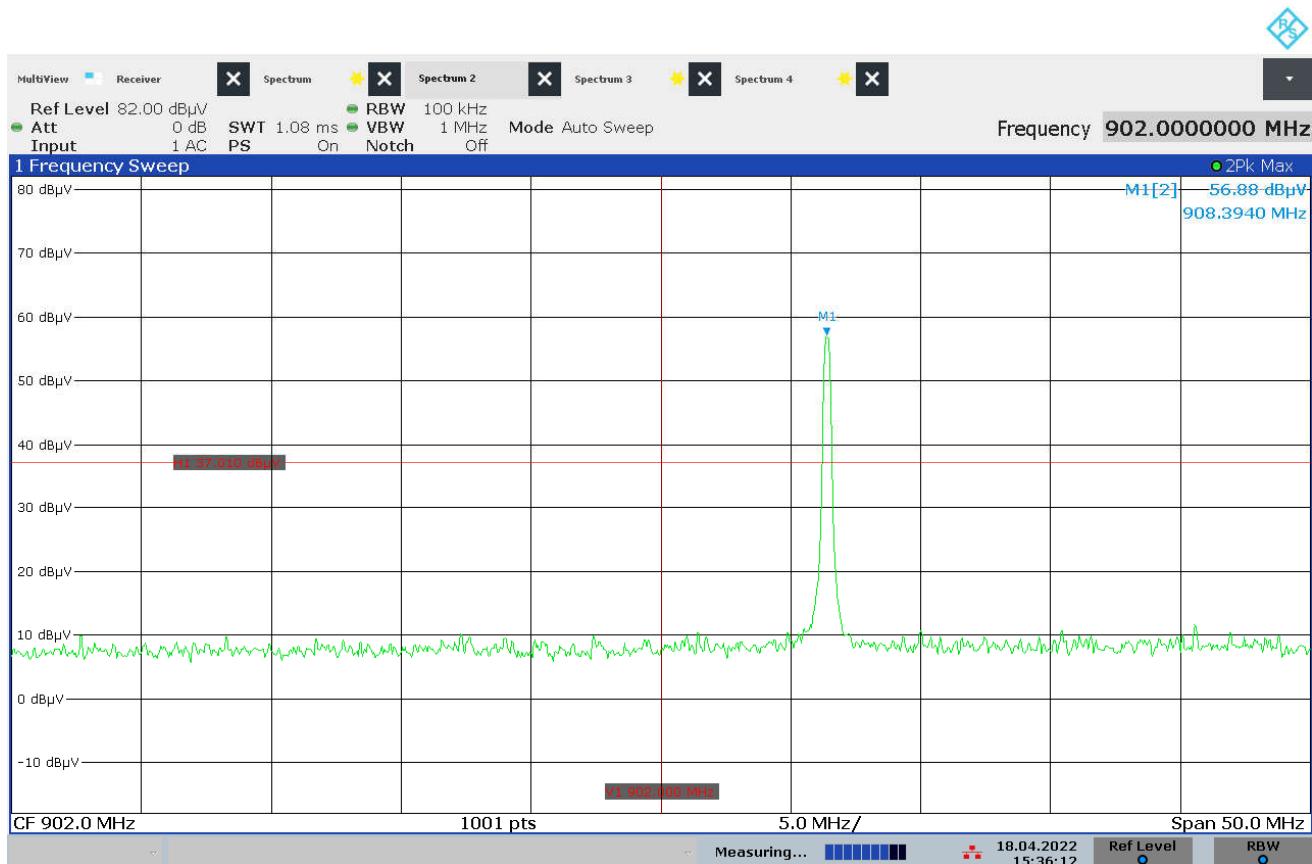
4) The EUT was maximized for worst case emissions at the measuring antenna.

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

- a. Center frequency = high band-edge frequency.
- b. 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.
- c. Resolution bandwidth (RBW) $\geq 1\%$ of the span.
- d. The 'Max-Hold' function was engaged. 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 right of the center frequency (band-edge) must be below the display line.)
- f. The analyzer's display was plotted using a 'screen dump' utility.

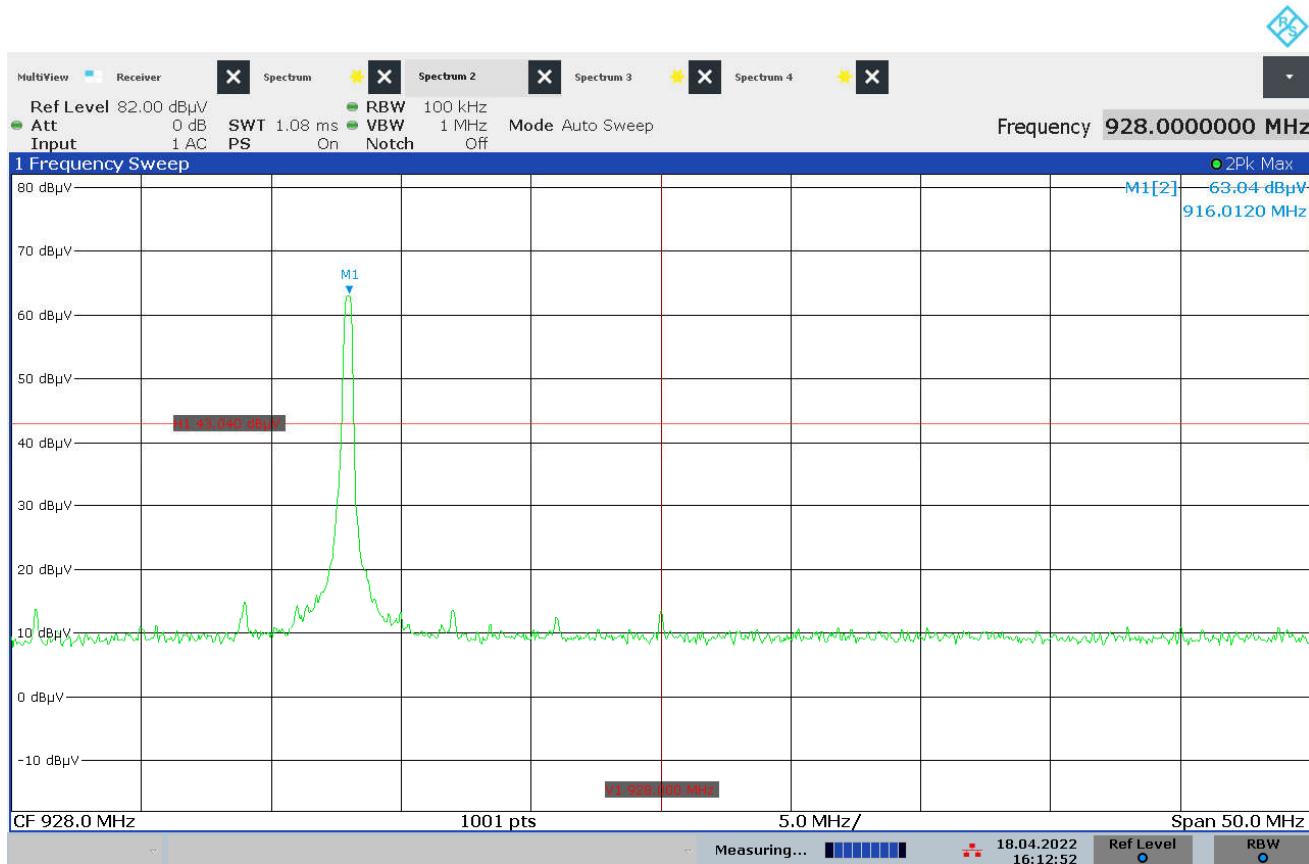
| Measurement Uncertainty | |
|---|----------------------------------|
| Measurement Type | Expanded Measurement Uncertainty |
| Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz) | 4.3 |
| Radiated disturbance (electric field strength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

| Test Details | |
|-------------------|----------------------------|
| Manufacturer | Spring Window Fashions LLC |
| Model | RRZB |
| S/N | Unit 1 |
| Mode | ZWave Tx @ 908.4MHz |
| Carrier Frequency | 908.4MHz |
| Parameters | Low Band-Edge |
| Notes | None |



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| Test Details | |
|-------------------|----------------------------|
| Manufacturer | Spring Window Fashions LLC |
| Model | RRZB |
| S/N | Unit 1 |
| Mode | ZWave Tx @ 916MHz |
| Carrier Frequency | 916MHz |
| Parameters | High Band-Edge |
| Notes | None |



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26. Module Integration – Emissions Test

| EUT Information | |
|-----------------|---|
| Manufacturer | Spring Window Fashions LLC |
| Product | Roller Window Shade |
| Model No. | RRZB |
| Serial No. | Unit 1 |
| Modes | BLE Tx Ch0 @ 2402MHz BLE Tx Ch19 @ 2440MHz BLE Tx Ch39 @ 2480MHz MultiTx |

| Test Site Information | |
|-----------------------|--|
| Setup Format | Tabletop |
| Height of Support | N/a |
| Type of Test Site | Semi-Anechoic Chamber |
| Test Site Used | Room 21 |
| Type of Antennas Used | Below 1GHz: Bilog (or equivalent) Above 1GHz: Double-ridged waveguide (or equivalent) |
| Notes | The cables were manually maximized during the preliminary emissions sweeps. The cable arrangement which resulted in the worst-case emissions was utilized. |

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

Requirements

Per 996369 D04 Module Integration Guide v01:

Testing of the host product with all the transmitters installed is recommended, to verify that the host product meets all the applicable FCC rules. The radio spectrum is to be investigated with all the transmitters in the final host product functioning to determine that no emissions exceed the highest limit permitted for any one individual transmitter as required by Section 2.947(f).

The testing shall also check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (enclosure). This investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand-alone configuration. No emissions exceed the highest limit permitted for any one individual transmitter as required by Section 2.947(f).

FCC 15.247:

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 measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30dB instead of 20dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Procedures

Radiated measurements were performed in a 32ft. x 20ft. x 18ft. hybrid ferrite-tile/anechoic absorber lined test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles and anechoic absorber material is installed over the ferrite tiles. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4-2014 for site attenuation.

The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All powerlines and signal lines entering the enclosure pass through filters on the enclosure wall. The powerline filters prevent extraneous signals from entering the enclosure on these leads.

Preliminary radiated emissions tests were performed to determine the emission characteristics of the EUT. For the preliminary test, a broadband measuring antenna was positioned at a 3-meter distance from the EUT. The entire frequency range from 30MHz to 18.0GHz was investigated using a peak detector function.

The final open field emission tests were then manually performed over the frequency range of 30MHz to 18.0GHz.

- 1) For all harmonics not in the restricted bands, the following procedure was used:
 - a) The field strength of the fundamental was measured using a double ridged waveguide antenna. The waveguide antenna was positioned at a 3-meter distance from the EUT. The EUT was placed on a 1.5-meter-high non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.
 - b) The field strengths of all of the harmonics not in the restricted band were then measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3-meter distance from the EUT. The EUT was placed on a non-conductive stand. A peak detector with a resolution bandwidth of 100 kHz was used on the spectrum analyzer.
 - c) To ensure that maximum or worst-case emission levels at the fundamental and harmonics were measured, the following steps were taken when measuring the fundamental emissions and the spurious emissions:
 - i. The EUT was rotated so that all of its sides were exposed to the receiving antenna.
 - ii. Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
 - iii. The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.
 - iv. In instances where it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer, the measuring antenna was not raised or lowered to ensure maximized readings. Instead, the EUT was rotated through all axis to ensure the maximum readings were recorded for the EUT.
 - d) All harmonics not in the restricted bands must be at least 20dB below levels measured at the fundamental. However, attenuation below the general limits specified in §15.209(a) is not required.
- 2) For all emissions in the restricted bands, the following procedure was used:
 - a) The field strengths of all emissions below 1GHz were measured using a bi-log antenna. The bi-log antenna was positioned at a 3-meter distance from the EUT. The EUT was placed on an 80cm high non-conductive stand. A peak detector with a resolution bandwidth of 100kHz was used on the spectrum analyzer.
 - b) The field strengths of all emissions above 1GHz were measured using a double-ridged waveguide antenna. The waveguide antenna was positioned at a 3-meter distance from the EUT. The EUT was placed on a 1.5-meter-high non-conductive stand. A peak detector with a resolution bandwidth of 1MHz was used on the spectrum analyzer.

- c) To ensure that maximum (or worst case) emission levels were measured, the following steps were taken when taking all measurements:
 - i. The EUT was rotated so that all of its sides were exposed to the receiving antenna.
 - ii. Since the measuring antenna is linearly polarized, both horizontal and vertical field components were measured.
 - iii. The measuring antenna was raised and lowered for each antenna polarization to maximize the readings.
 - iv. In instances where it was necessary to use a shortened cable between the measuring antenna and the spectrum analyzer, the measuring antenna was not raised or lowered to ensure maximized readings. Instead, the EUT was rotated through all axis to ensure the maximum readings were recorded.
- d) For all radiated emissions measurements below 1GHz, if the peak reading is below the limits listed in §15.209(a), no further measurements are required. If, however, the peak readings exceed the limits listed in 15.209(a), then the emissions are remeasured using a quasi-peak detector.
- e) For all radiated emissions measurements above 1GHz, the peak readings must comply with the §15.35(b) limits. §15.35(b) states that when average radiated emissions measurements are specified, there also is a limit on the peak level of the radiated emissions. The limit on the peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. Therefore, all peak readings above 1GHz must be no greater than 20dB above the limits specified in §15.209(a).
- f) Next, for all radiated emissions measurements above 1GHz, the resolution bandwidth was set to 1MHz. The analyzer was set to linear mode with a 10Hz video bandwidth in order to simulate an average detector and an average reading was taken.