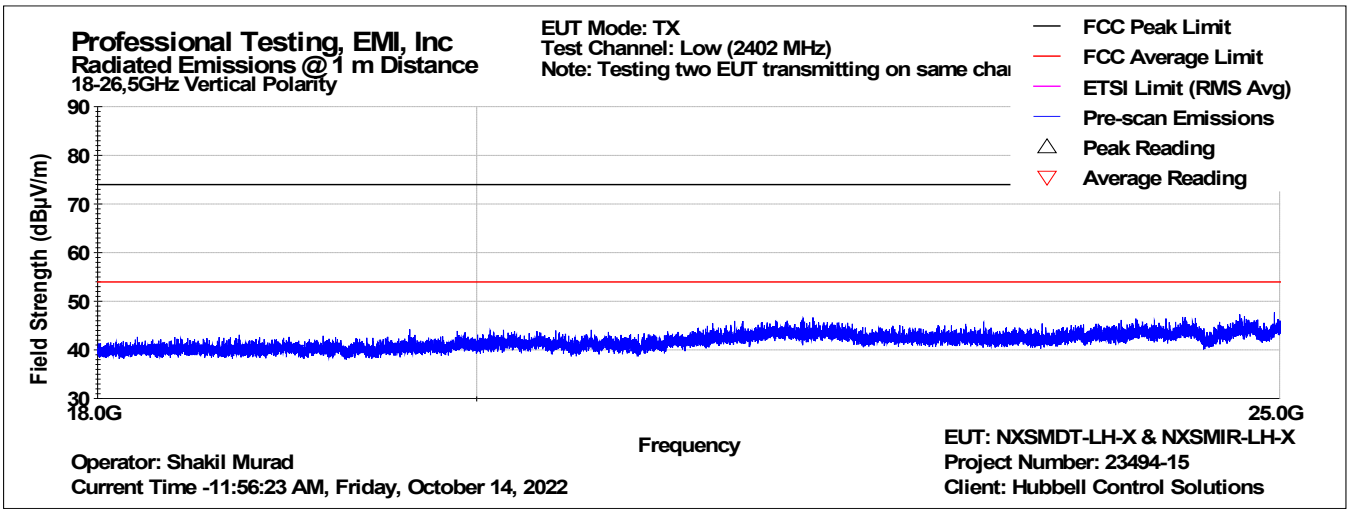
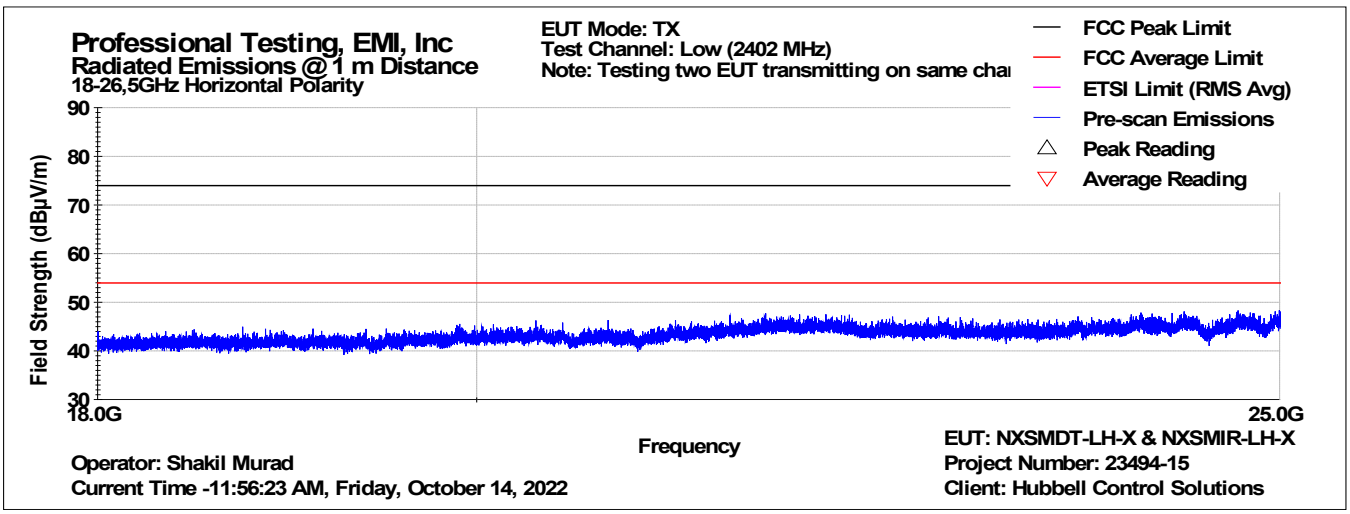
### 18GHz - 26.5GHz Vertical Polarity Emissions Data




Note: No emissions were observed.

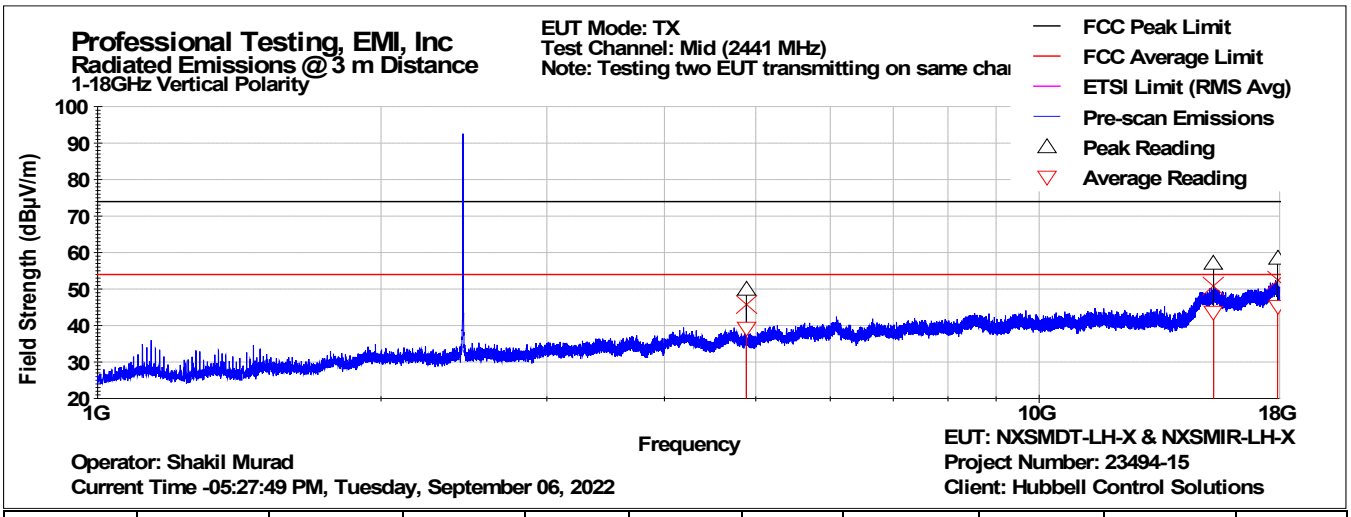
### 18GHz - 26.5GHz Horizontal Polarity Emissions Data




Note: No emissions were observed.

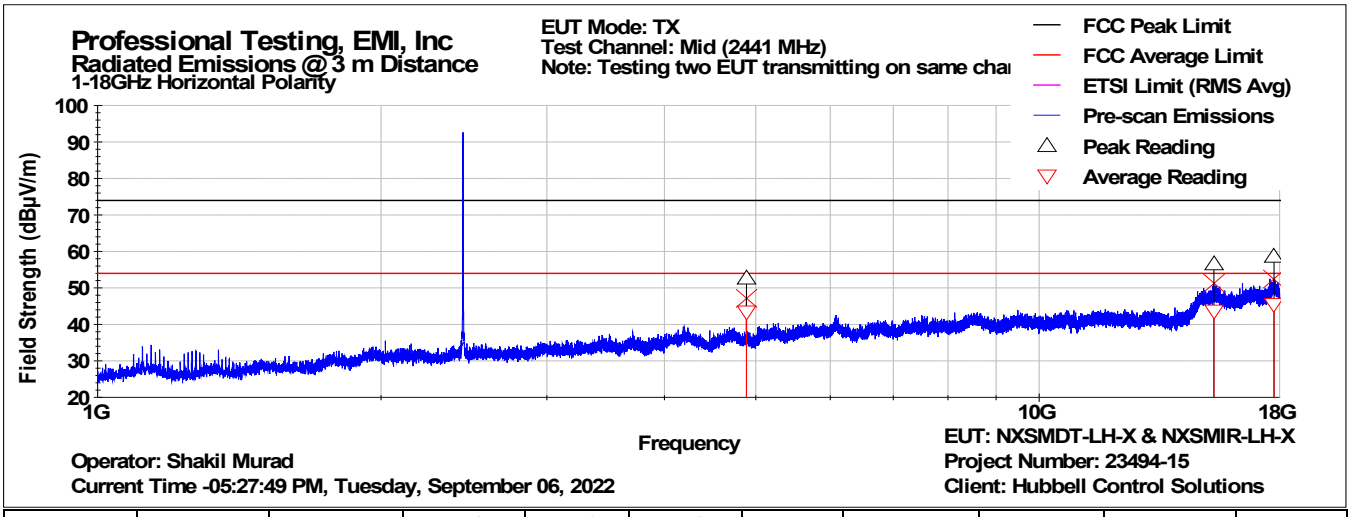
### 8.3.2 Middle Channel, 1 GHz to 26.5 GHz

**1GHz - 18GHz Vertical Polarity Emissions Data**



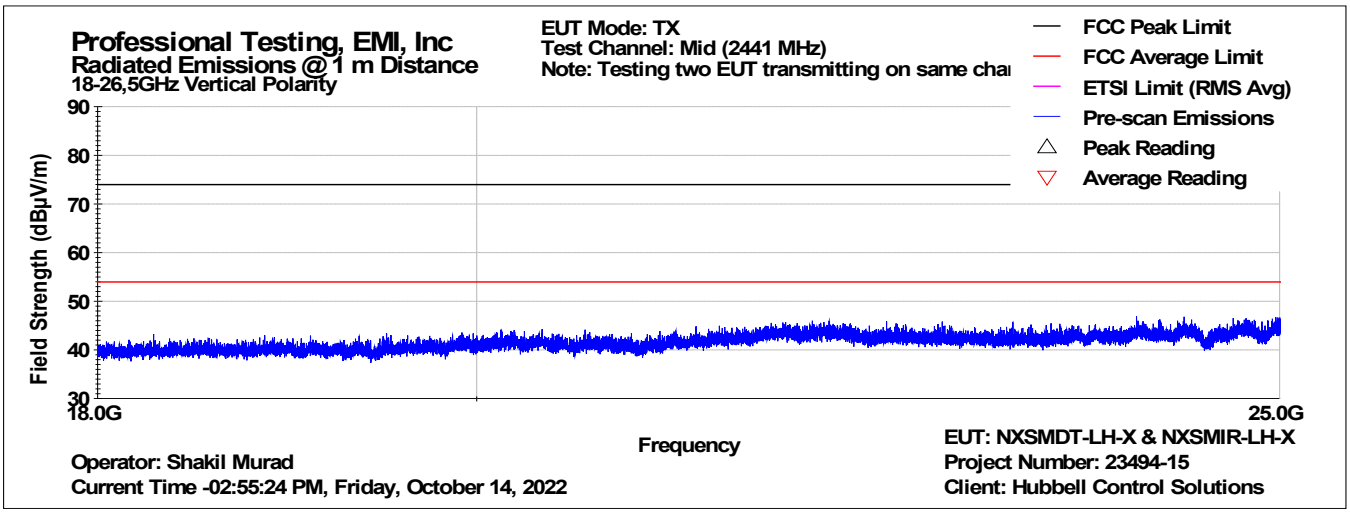

| Frequency (MHz) | EUT Direction (Degrees) | Antenna Height (cm) | Peak Reading (dBµV) | Peak Limit (dBµV) | Peak Margin (dB) | Peak Results | Average Reading (dBµV) | Average Limit (dBµV) | Average Margin (dB) | Average Results |
|---|---|---|---|---|---|---|---|---|---|---|
| 4887.28 | 6 | 156 | 49.93 | 73.96 | -24.03 | PASS | 39.29 | 53.96 | -14.67 | PASS |
| 15319.56 | 210 | 157 | 57.03 | 73.96 | -16.93 | PASS | 43.74 | 53.96 | -10.22 | PASS |
| 17910.23 | 303 | 108 | 58.34 | 73.96 | -15.62 | PASS | 45.30 | 53.96 | -8.65 | PASS |

**1GHz - 18GHz Horizontal Polarity Emissions Data**



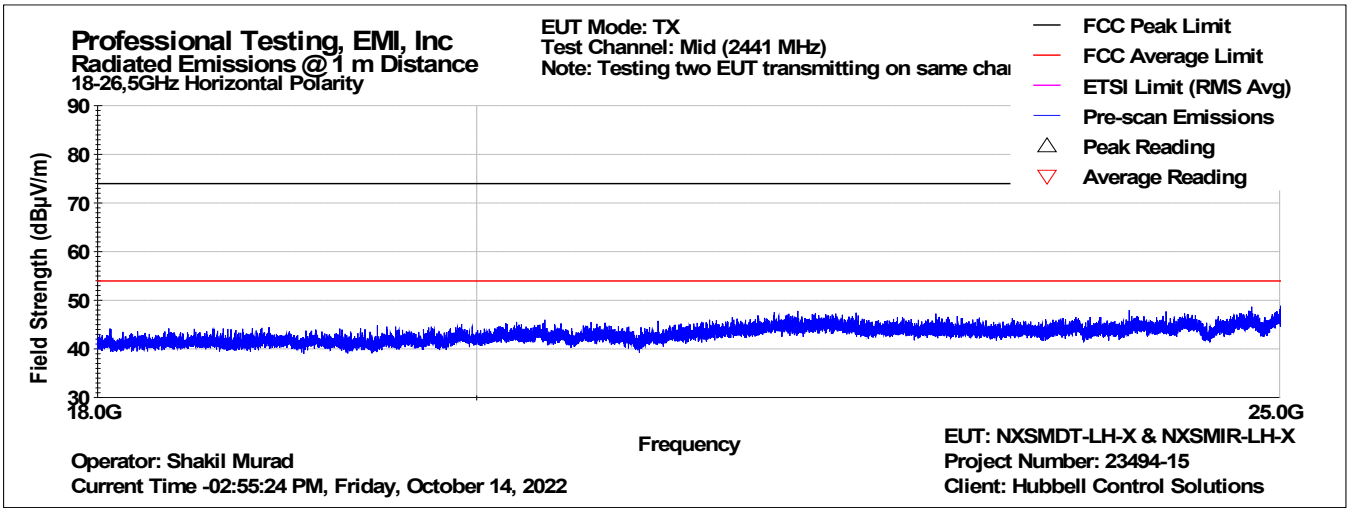

| Frequency (MHz) | EUT Direction (Degrees) | Antenna Height (cm) | Peak Reading (dBµV) | Peak Limit (dBµV) | Peak Margin (dB) | Peak Results | Average Reading (dBµV) | Average Limit (dBµV) | Average Margin (dB) | Average Results |
|---|---|---|---|---|---|---|---|---|---|---|
| 4887.78 | 40 | 182 | 52.54 | 73.96 | -21.42 | PASS | 43.37 | 53.96 | -10.59 | PASS |
| 15331.16 | 95 | 331 | 56.63 | 73.96 | -17.32 | PASS | 43.77 | 53.96 | -10.19 | PASS |
| 17757.23 | 65 | 285 | 58.62 | 73.96 | -15.34 | PASS | 45.58 | 53.96 | -8.38 | PASS |

### 18GHz - 26.5GHz Vertical Polarity Emissions Data




Note: No emissions were observed.

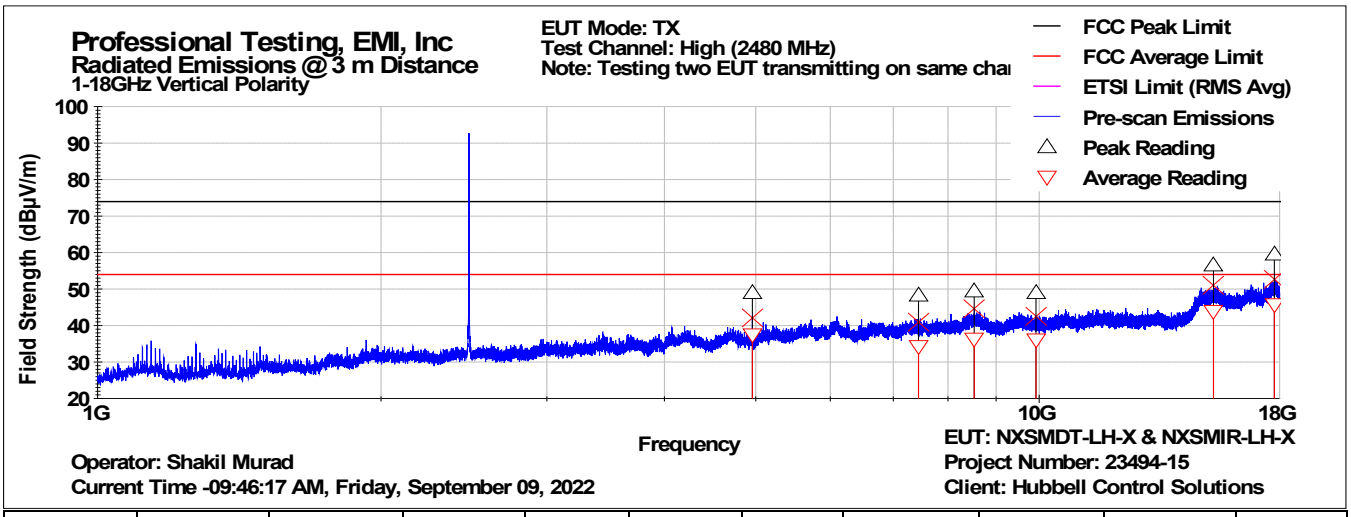
### 18GHz - 26.5GHz Horizontal Polarity Emissions Data




Note: No emissions were observed.

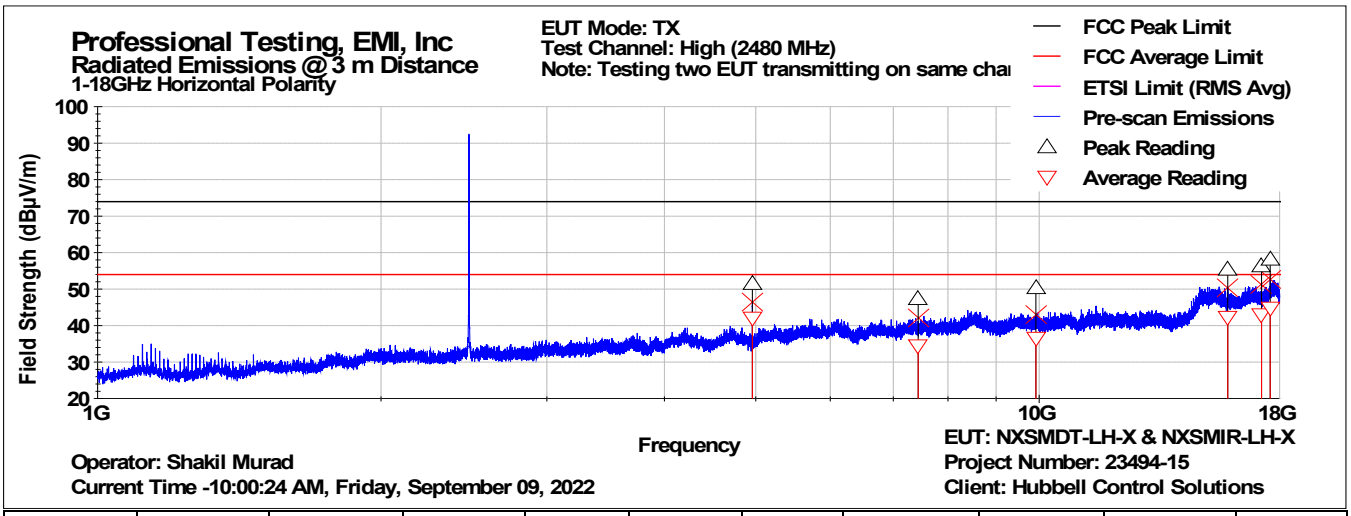
### 8.3.3 Top Channel, 1GHz to 26.5 GHz

**1GHz - 18GHz Vertical Polarity Emissions Data**



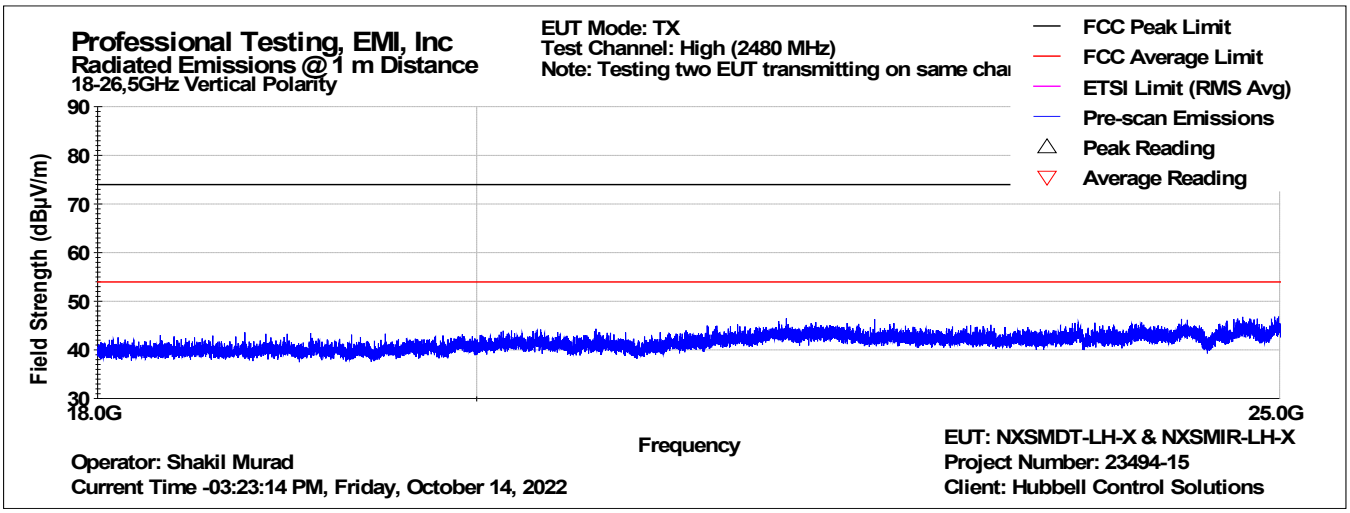

| Frequency (MHz) | EUT Direction (Degrees) | Antenna Height (cm) | Peak Reading (dBµV) | Peak Limit (dBµV) | Peak Margin (dB) | Peak Results | Average Reading (dBµV) | Average Limit (dBµV) | Average Margin (dB) | Average Results |
|---|---|---|---|---|---|---|---|---|---|---|
| 4959.34 | 245 | 107 | 48.99 | 73.96 | -24.97 | PASS | 37.52 | 53.96 | -16.44 | PASS |
| 7443.87 | 266 | 343 | 48.22 | 73.96 | -25.74 | PASS | 34.31 | 53.96 | -19.65 | PASS |
| 8530.96 | 87 | 400 | 49.38 | 73.96 | -24.57 | PASS | 36.24 | 53.96 | -17.72 | PASS |
| 9922.55 | 8 | 307 | 48.90 | 73.96 | -25.06 | PASS | 36.09 | 53.96 | -17.87 | PASS |
| 15315.99 | 329 | 163 | 56.48 | 73.96 | -17.48 | PASS | 43.92 | 53.96 | -10.04 | PASS |
| 17771.81 | 244 | 137 | 59.44 | 73.96 | -14.52 | PASS | 45.74 | 53.96 | -8.21 | PASS |

## 1GHz - 18GHz Horizontal Polarity Emissions Data



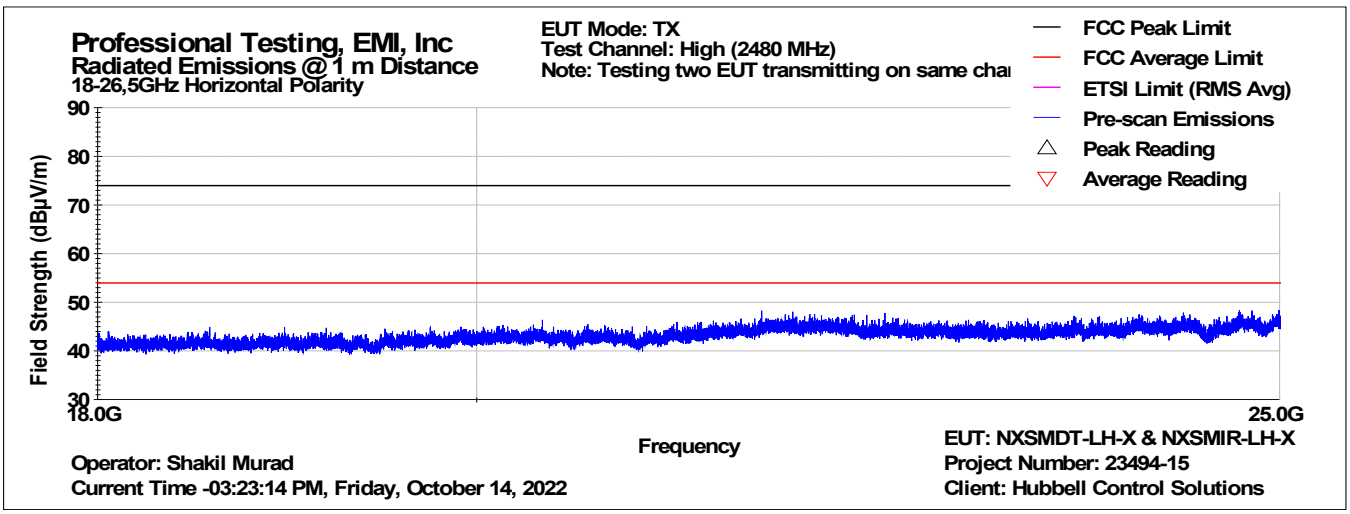

| Frequency (MHz) | EUT Direction (Degrees) | Antenna Height (cm) | Peak Reading (dBµV) | Peak Limit (dBµV) | Peak Margin (dB) | Peak Results | Average Reading (dBµV) | Average Limit (dBµV) | Average Margin (dB) | Average Results |
|---|---|---|---|---|---|---|---|---|---|---|
| 4959.19 | 40 | 210 | 51.57 | 73.96 | -22.39 | PASS | 42.15 | 53.96 | -11.81 | PASS |
| 7438.90 | 286 | 223 | 47.23 | 73.96 | -26.72 | PASS | 34.42 | 53.96 | -19.54 | PASS |
| 9920.16 | 156 | 155 | 50.34 | 73.96 | -23.62 | PASS | 36.43 | 53.96 | -17.53 | PASS |
| 15857.21 | 299 | 108 | 55.45 | 73.96 | -18.51 | PASS | 42.22 | 53.96 | -11.74 | PASS |
| 17225.50 | 242 | 351 | 56.37 | 73.96 | -17.59 | PASS | 42.89 | 53.96 | -11.07 | PASS |
| 17593.04 | 22 | 296 | 58.04 | 73.96 | -15.92 | PASS | 44.72 | 53.96 | -9.24 | PASS |

### 18GHz - 26.5GHz Vertical Polarity Emissions Data




Note: No emissions were observed.

### 18GHz - 26.5GHz Horizontal Polarity Emissions Data




Note: No emissions were observed.

# 9.0 Radiated Spurious Emissions, Receive Mode

## 9.1 Test Procedure

The EUT was in receive mode during these measurements. Both EUT models, NXSMDT-LH and NXSMIR-LH, were tested together.

**Table 9.1.1: Test Distance, Table Height, and Detection Method**

| 30 MHz to 1 GHz | 1 GHz to 18 GHz | 18 GHz to 25 GHz |
|---|---|---|
| 10 m, 80 cm | 3 m, 80 cm | 1 m, 80 cm |
| Quasi-peak | Peak & Average | Peak & Average |

## 9.2 Test Criteria

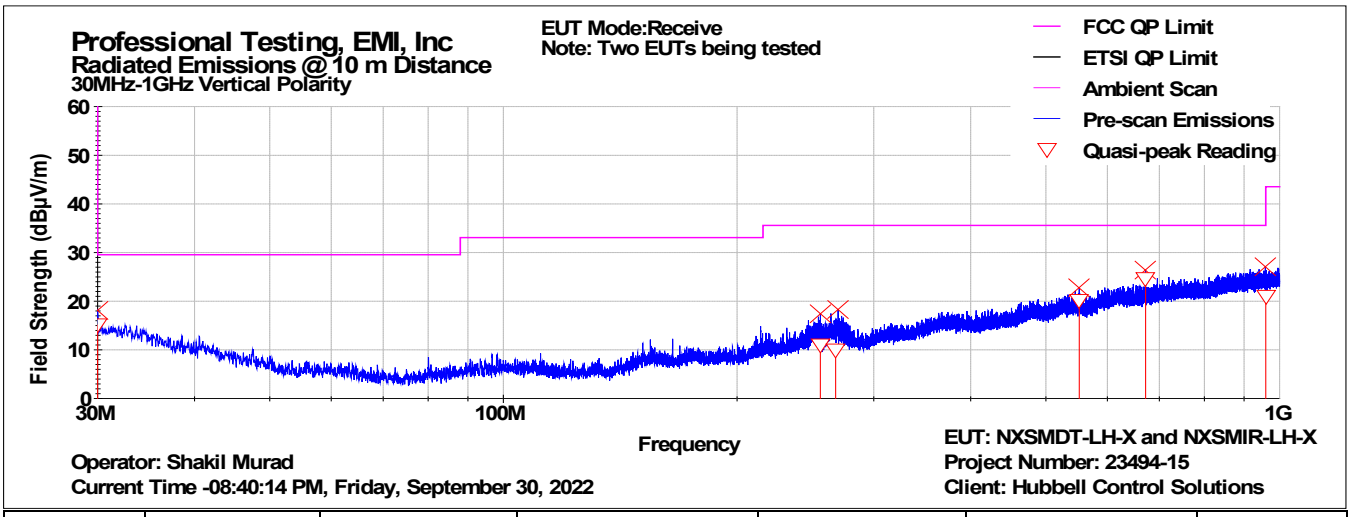
| 47 CFR (USA) // IC (Canada) | |
|---|---|
| Section Reference | Parameter |
| 15.109 // RSS-Gen 7.3 | Field Strength of Radiated Spurious/Harmonic Emissions Receive Mode |

## 9.3 Test Results

The requirement was satisfied. Graphical and tabular data appears below.

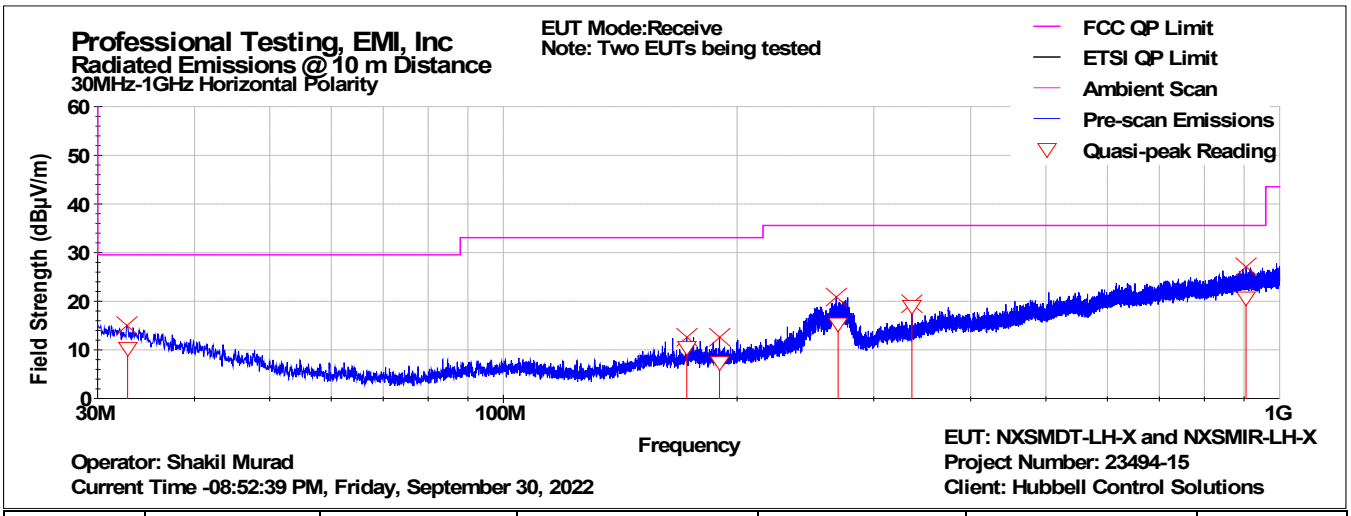
### 9.3.1 Middle Channel 30 MHz to 14 GHz

**30MHz - 1GHz Vertical Polarity Emissions Data**



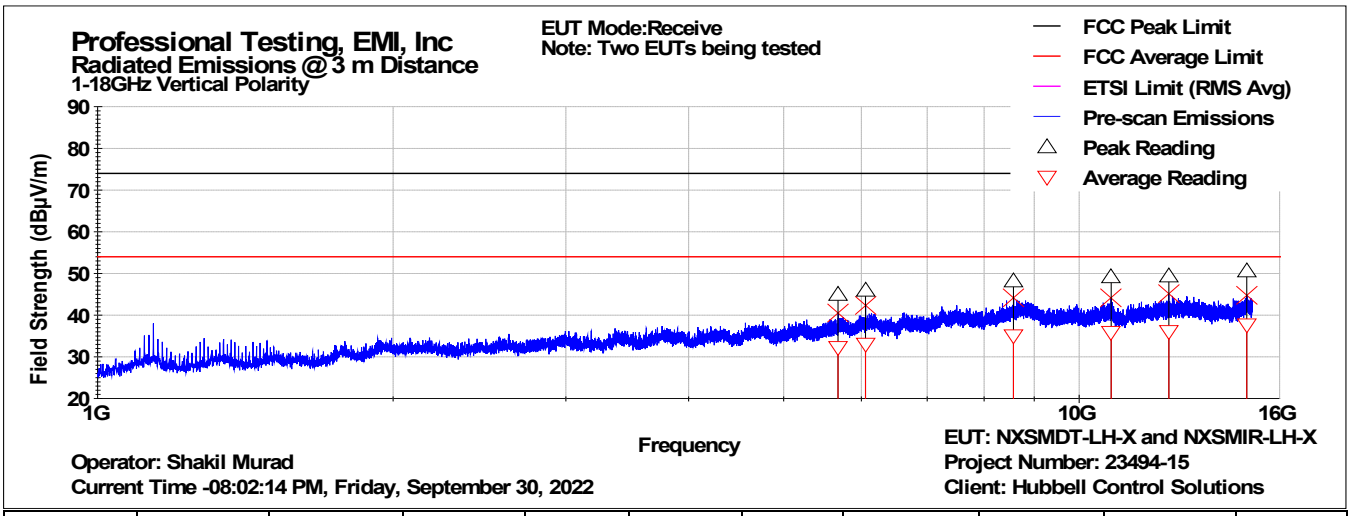

| Frequency (MHz) | EUT Direction (Degrees) | Antenna Height (cm) | Quasi-peak Reading (dBµV) | Quasi-peak Limit (dBµV) | Quasi-peak Margin (dB) | Quasi-peak Results |
|---|---|---|---|---|---|---|
| 30.001 | 299 | 135 | 15.09 | 29.54 | -14.45 | PASS |
| 256.040 | 74 | 214 | 11.07 | 35.56 | -24.49 | PASS |
| 267.984 | 112 | 308 | 10.08 | 35.56 | -25.48 | PASS |
| 552.016 | 157 | 360 | 20.11 | 35.56 | -15.45 | PASS |
| 671.982 | 102 | 256 | 24.57 | 35.56 | -10.99 | PASS |
| 959.986 | 8 | 253 | 21.05 | 35.56 | -14.51 | PASS |

## 30MHz - 1GHz Horizontal Polarity Emissions Data



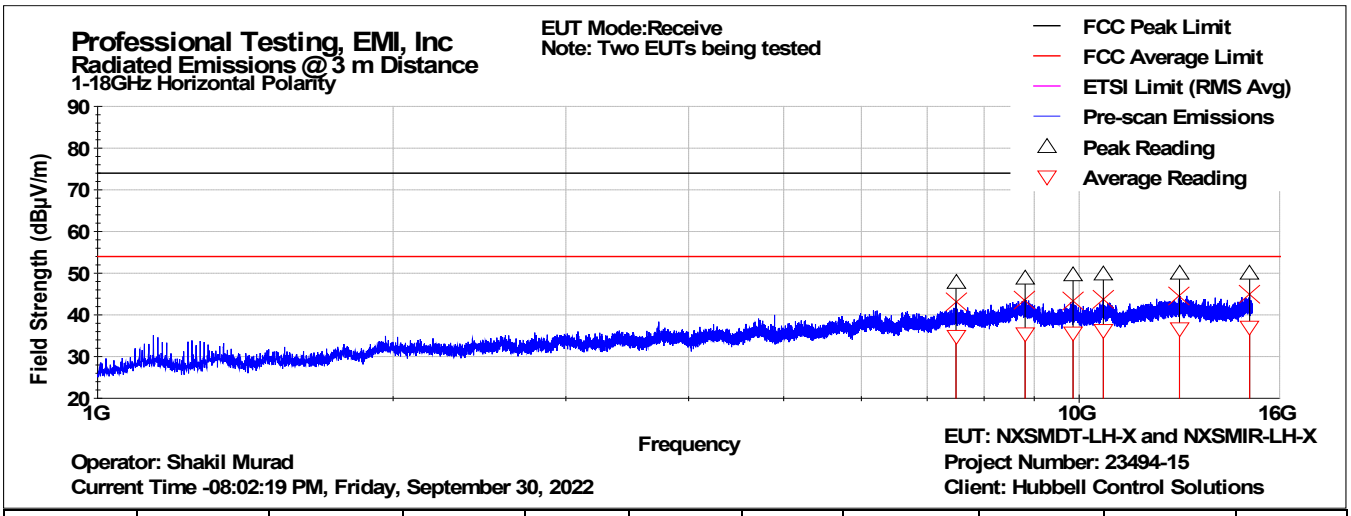

| Frequency (MHz) | EUT Direction (Degrees) | Antenna Height (cm) | Quasi-peak Reading (dBµV) | Quasi-peak Limit (dBµV) | Quasi-peak Margin (dB) | Quasi-peak Results |
|---|---|---|---|---|---|---|
| 32.793 | 7 | 387 | 10.36 | 29.54 | -19.18 | PASS |
| 172.254 | 244 | 387 | 10.53 | 33.06 | -22.53 | PASS |
| 189.834 | 86 | 345 | 7.41 | 33.06 | -25.65 | PASS |
| 269.942 | 199 | 274 | 15.38 | 35.56 | -20.18 | PASS |
| 335.997 | 85 | 188 | 18.92 | 35.56 | -16.64 | PASS |
| 905.403 | 157 | 213 | 20.64 | 35.56 | -14.92 | PASS |

## 1GHz - 18GHz Vertical Polarity Emissions Data




| Frequency (MHz) | EUT Direction (Degrees) | Antenna Height (cm) | Peak Reading (dBµV) | Peak Limit (dBµV) | Peak Margin (dB) | Peak Results | Average Reading (dBµV) | Average Limit (dBµV) | Average Margin (dB) | Average Results |
|---|---|---|---|---|---|---|---|---|---|---|
| 5679.48 | 291 | 356 | 45.02 | 73.98 | -28.96 | PASS | 32.25 | 53.98 | -21.73 | PASS |
| 6057.66 | 266 | 199 | 46.02 | 73.98 | -27.96 | PASS | 33.04 | 53.98 | -20.94 | PASS |
| 8570.66 | 15 | 334 | 48.23 | 73.98 | -25.75 | PASS | 35.01 | 53.98 | -18.97 | PASS |
| 10780.04 | 296 | 108 | 49.18 | 73.98 | -24.80 | PASS | 35.85 | 53.98 | -18.13 | PASS |
| 12340.93 | 14 | 210 | 49.38 | 73.98 | -24.60 | PASS | 36.17 | 53.98 | -17.81 | PASS |
| 14813.78 | 16 | 302 | 50.49 | 73.98 | -23.49 | PASS | 37.66 | 53.98 | -16.32 | PASS |

## 1GHz - 18GHz Horizontal Polarity Emissions Data




| Frequency (MHz) | EUT Direction (Degrees) | Antenna Height (cm) | Peak Reading (dBµV) | Peak Limit (dBµV) | Peak Margin (dB) | Peak Results | Average Reading (dBµV) | Average Limit (dBµV) | Average Margin (dB) | Average Results |
|---|---|---|---|---|---|---|---|---|---|---|
| 7490.63 | 50 | 297 | 47.77 | 73.98 | -26.21 | PASS | 34.85 | 53.98 | -19.13 | PASS |
| 8809.12 | 297 | 330 | 48.68 | 73.98 | -25.30 | PASS | 35.49 | 53.98 | -18.49 | PASS |
| 9858.50 | 201 | 313 | 49.55 | 73.98 | -24.43 | PASS | 35.75 | 53.98 | -18.23 | PASS |
| 10582.99 | 313 | 202 | 49.70 | 73.98 | -24.28 | PASS | 36.25 | 53.98 | -17.73 | PASS |
| 12653.47 | 111 | 193 | 49.92 | 73.98 | -24.06 | PASS | 36.64 | 53.98 | -17.34 | PASS |
| 14916.01 | 113 | 108 | 49.93 | 73.98 | -24.05 | PASS | 37.00 | 53.98 | -16.98 | PASS |

# 10.0 Antenna Construction

## 10.1 Procedure

A direct examination of the antenna construction is performed and compared to rule criteria that prevent wireless device antennas from being modified by end users.

## 10.2 Criteria

| 47 CFR (USA) // IC (Canada) | |
|---|---|
| Section Reference | Antenna Construction |
| 15.203 // RSS-Gen 6.8 | Type of Antenna(s)<br>Type of Connector<br>Gain |

## 10.3 Results

| Table 8.3.1 Antenna Construction Details |
|---|
| **Chip Antenna** |
| Manufacturer: Pulse<br>Model/PN: W3001<br>Antenna peak gain: 1.5 dBi<br>Frequency Range: 2400-2483.5 MHz<br>Connector Type: No connector.<br>Chip is soldered to circuit board. |

User cannot substitute antenna.

Gain is under maximum limit of 6 dBi.

The requirement was satisfied. Antenna datasheet is shown below.

**Antenna Datasheet:**

W3001 Datasheet version 1.0. 2.4 GHz WiFi Antenna. (04/08).

# 2.4 GHz WiFi Antenna

10 x 3.2 x 4.0 mm Ceramic Chip Antenna (On Ground type, Top surface ground removal area 10.80 x 6.25 mm).
Pulse Part Number: W3001

## Features

- Omni directional radiation (Azimuthal plane)
- Low profile
- Compact size W x L x H (10 x 3.2 x 4 mm)
- Low weight (600 mg)
- Lead free materials
- Fully SMD compatible
- Lead free soldering compatible
- Tape and reel packing
- RoHS compliant product

## Applications

- Bluetooth
- 2.4 GHz WLAN
- 2.4 GHz ISM Band System

## Electrical specifications @ +25 °C

*Note: Electrical characteristics depend on test board (GP) size and antenna positioning on GP and Ground Clearance area size.*

## WiFi 2.4 GHz

Typical performance
(Test board size 80 x 37 mm, PWB top surface ground removal area 10.80 x 6.25 mm, position 1 on PWB)

| Frequency Range [MHz] | Max Gain [dBi] | Efficiency [%] / [dB] | Return loss min. [dB] | Impedance [Ω] | Operating Temperature [° C] |
|---|---|---|---|---|---|
| 2400 – 2483.5 | 1.5 (Peak)<br>0.5 (Band edges) | 75 /-1.25 (Peak)<br>60/-2.25 (Band edges) | -6 | 50 | -45 to +85 |

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Pulse
A TECHNITROL COMPANY

## 11.0 Measurement Bandwidths

| Radiated Emissions Spectrum Analyzer Bandwidth and Measurement Time - Peak Scan | | | | |
|---|---|---|---|---|
| **Frequency Band Start (MHz)** | **Frequency Band Stop (MHz)** | **6 dB Bandwidth (kHz)** | **Number of Ranges Used** | **Measurement Time per Range** |
| 0.009 | 0.15 | 0.3 | 2 | Multiple Sweeps |
| 0.15 | 30 | 9 | 6 | Multiple Sweeps |
| 30 | 1000 | 120 | 2 | Multiple 800 mS Sweeps |
| 1000 | 6000 | 1000 | 2 | Multiple Sweeps |
| 6000 | 18000 | 1000 | 2 | Multiple Sweeps |
| 18000 | 26500 | 1000 | 2 | Multiple Sweeps |

*Notes:
1. The settings above are specifically calculated for the E4440A series of spectrum analyzers, which have 8,000 data points per range.
2. The measurement receiver resolution bandwidth setting was 300 Hz for quasi-peak measurements from 9-150 kHz.
3. The measurement receiver resolution bandwidth setting was 9 kHz for quasi-peak measurements from 0.15-30 MHz.
4. The measurement receiver resolution bandwidth setting was 120 kHz for quasi-peak measurements from 30-1000 MHz.
5. The measurement receiver resolution bandwidth setting was 1 MHz for average measurements from 1-18 GHz.

## 12.0 Test Equipment

### 12.1 Conducted Measurements at the Antenna Port

| Asset# | Manufacturer | Model | Equipment Nomenclature | Serial Number | Calibration Due Date |
|---|---|---|---|---|---|
| 2295 | Keysight | E4440A-AYZ | PSA Spectrum Analyzer | MY46186204 | 8/25/2023 |
| A118 | Narda | 768A-20 | 20 dB 20 W Attenuator, DC - 11GHz | 105357 | 12/10/2022 |
| 1117 | HP | 6296A | Power Supply, DC, 60V 3A | 1552A02489 | N/A |

## 12.2 Radiated Spurious Emissions

| Tile! Software Version: | | | Version: 7.1.2.17 ( Jan 08, 2016 - 02:12:48 PM ) or 4.1.A.0, April 14, 2009, 11:01:00PM | | |
|---|---|---|---|---|---|
| Test Profile: | | | 2020_RE_Unintentional_TILE7_v4 | | |
| **Asset #** | **Manufacturer** | **Model** | **Equipment Nomenclature** | **Serial Number** | **Calibration Due Date** |
| 1937 | Agilent | E4440A - AYZ | PSA , 3 Hz - 26.5 GHz, Opt. AYZ | MY44808298 | 11/12/2022 |
| 1509A | Braden | TDK 10M | TDK 10M Chamber, NSA < 1 GHz | DAC-012915-005 | 4/9/2023 |
| 1969 | HP | 11713A | Attenuator/Switch Driver | 3748A04113 | N/A |
| 942 | EMCO | 11968D | Turntable, 4ft. | 9510-1835 | N/A |
| 1326 | EMCO | 1051-12 | Controller, Antenna Mast | 9101-1564 | N/A |
| 1244 | EMCO | 1050C | Controller, Antenna Mast | 1100 | N/A |
| C027 | none | RG214 | Cable Coax, N-N, 25m, 25MHz - 1GHz | None | 9/9/2023 |
| C233 | EMCO | 3115 | Antenna, Horn, DRG, 1-18GHz | 9010-3578 | N/A |
| 1926 | ETS-Lindgren | 3142D | Antenna, Biconilog, 26 MHz - 6 GHz | 135454 | 7/15/2024 |
| 1425 | Electro-Metrics | BPA-1000 | Preamp, Broadband 10k-1GHz | 123 | 3/23/2024 |
| C289 | Pasternack | PE354-24 | Cable, N-SMA, 0.610m Blue | 1310 | 9/9/2024 |
| C030 | none | none | Cable Coax, N-N, 30m, 1 - 18GHz | None | 9/9/2023 |
| C038 | none | LMR-400 | Cable Coax, N-N, 0.15m | None | N/A |
| 1780 | ETS-Lindgren | 3117 | Antenna, Double Ridged Guide Horn, 1 - 18 GHz | 110313 | 4/16/2023 |
| 2004 | Miteq | AFS44-00101800-2S-10P-44 | Amplifier, 40dB, 100MHz-18GHz | None | 1/14/2024 |
| 745 | EMCO | 6406 | Helmholtz Coil | 1003 | N/A |
| 1326 | EMCO | 1051-12 | Controller, Antenna Mast | 9101-1564 | N/A |
| 1542 | A.H. Systems | SAS-572 | Antenna, Horn 18-26.5GHz, 20dB gain | 225 | N/A |
| 1973 | Agilent | 83017A | Amplifier, Microwave 0.5-26.5 GHz | MY39500497 | 11/10/2022 |

## Appendix: Policy, Rationale, and Evaluation of EMC Measurement Uncertainty

All uncertainty calculations, estimates and expressions thereof shall be in accordance with ANAB policy. Since Nemko USA, Inc operates in accordance with ANAB Document Number AR 2250: 2021/06/16, all instrumentation having an effect on the accuracy or validity of tests shall be periodically calibrated or verified traceable to national standards by a competent calibration laboratory. The certificates of calibration or verification on this instrumentation shall include estimates of uncertainty as required by ANAB Document Number AR 2250.

### 1. Rationale and Summary of Expanded Uncertainty.

Each piece of instrumentation at Nemko USA that is used in making measurements for determining conformance to a standard (or limit), shall be assessed to evaluate its contribution to the overall uncertainty of the measurement in which it is used. The assessment of each item will be based on either a type A evaluation or a type B evaluation. Most of the evaluations will be type B, since they will be based on the manufacturer's statements or specifications of the calibration tolerances, or uncertainty will be stated along with a brief rationale for the type of evaluation and the resulting stated uncertainties.

The individual uncertainties included in the combined standard uncertainty for a specific test result will depend on the configuration in which the item of instrumentation is used. The combination will always be based on the law of propagation of uncertainty. Any systematic effects will be accommodated by including their uncertainties, in the calculation of the combined standard uncertainty; except that if the direction and amount of the systematic effect cannot be determined and separated from its uncertainty, the whole effect will be treated as uncertainty and combined along with the other elements of the test setup.

Type A evaluations of standard uncertainty will usually be based on calculating the standard deviation of the mean of a series of independent observations, but may be based on a least-squares curve fit or the analysis of variance for unusual situations. Type B evaluations of standard uncertainty will usually be based on manufacturer's specifications, data provided in calibration reports, and experience. The type of probability distribution used (normal, rectangular, a priori, or u-shaped) will be stated for each Type B evaluation.

In the evaluation of the uncertainty of each type of measurement, the uncertainty caused by the operator will be estimated. One notable operator contribution to measurement uncertainty is the manipulation of cables to maximize the measured values of radiated emissions. The operator contribution to measurement uncertainty is evaluated by having several operators independently repeat the same test. This results in a Type A evaluation of operator-contributed measurement uncertainty.

A summary of the expanded uncertainties of Nemko USA measurements is shown as Table 1. These are the worst-case uncertainties considering all operative influence factors.

**Table 1: Summary of Measurement Uncertainties for Site 45**

| Type of Measurement | Frequency Range | Meas. Dist. | Expanded Uncertainty U, dB (k=2) |
|---|---|---|---|
| Mains Conducted Emissions | 150 kHz to 30 MHz | N/A | 2.9 |
| Telecom Conducted Emissions | 150 kHz to 30 MHz | N/A | 2.8 |
| Radiated Emissions | 30 to 1,000 MHz | 10 m | 4.8 |
| | 1 to 18 GHz | 3 m | 5.7 |

**End of Report**