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**16740 Peters Road**  
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## **CERTIFICATION TEST REPORT**

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**Manufacturer:** EcoTech, LLC  
2675 Commerce Center Boulevard, Suite 101  
Bethlehem, Pennsylvania 18015 USA

**Applicant:** Same as Above

**Product Name:** AI Nero 7

**Product Description:** Pump for aquariums

**Operating Voltage/Frequency:** 120V/60 Hz

**Model:** Nero 7

**FCC ID:** VKB271832

**Testing Commenced:** 2022-11-22

**Testing Ended:** 2022-11-22

**Summary of Test Results:** In Compliance

**Rules:**

- ❖ FCC Part 15 Subpart C, Section 15.247
- ❖ FCC Part 15 Subpart A, Section 15.31(e) – Measurement Standards
- ❖ ANSI C63.10:2020

**Note:** Test report reflects limited testing for PCII to add model to product family.



Order Number: F2P29090

Applicant: EcoTech, LLC  
Model: Nero 7

**Evaluation Conducted by:**

Julius Chiller, Senior Wireless Project Engineer

**Report Reviewed by:**

Ken Littell, Vice President of Operations

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## 1 ADMINISTRATIVE INFORMATION

### 1.1 Measurement Location:

F2 Labs in Middlefield, Ohio. Site description and attenuation data are on file with the FCC's Sampling and Measurement Branch at the FCC Laboratory in Columbia, MD.

### 1.2 Measurement Procedure:

All measurements were performed according to ANSI C63.10 and recommended FCC procedure of measurement under Section 15.247 and in KDB558074. A list of the measurement equipment can be found in Section 6.



### 1.3 Uncertainty Budget:

The uncertainty in EMC measurements arises from several factors which affect the results, some associated with environmental conditions in the measurement room, the test equipment being used, and the measurement techniques adopted.

The measurement uncertainty budgets detailed below are calculated from the test and calibration data and are expressed with a 95% confidence factor using a coverage factor of k=2. The Uncertainty for a laboratory is referred to as *U<sub>lab</sub>*. For Radiated and Conducted Emissions, the Expanded Uncertainty is compared to the *U<sub>cispr</sub>* values to determine if a specific margin is required to deem compliance.

*U<sub>lab</sub>*

| Measurement Range                                   | Combined Uncertainty | Expanded Uncertainty |
|---|----------------------|----------------------|
| Radiated Emissions <1 GHz @ 3m                      | 2.54                 | 5.07dB               |
| Radiated Emissions <1 GHz @ 10m                     | 2.55                 | 5.09dB               |
| Radiated Emissions 1 GHz to 2.7 GHz                 | 1.81                 | 3.62dB               |
| Radiated Emissions 2.7 GHz to 18 GHz                | 1.55                 | 3.10dB               |
| AC Power Line Conducted Emissions, 150kHz to 30 MHz | 1.38                 | 2.76dB               |
| AC Power Line Conducted Emissions, 9kHz to 150kHz   | 1.66                 | 3.32dB               |

*U<sub>cispr</sub>*

| Measurement Range                                   | Expanded Uncertainty |
|---|----------------------|
| Radiated Emissions <1 GHz @ 3m                      | 5.2dB                |
| Radiated Emissions <1 GHz @ 10m                     | 5.2dB                |
| Radiated Emissions 1 GHz to 2.7 GHz                 | Under Consideration  |
| Radiated Emissions 2.7 GHz to 18 GHz                | Under Consideration  |
| AC Power Line Conducted Emissions, 150kHz to 30 MHz | 3.6dB                |
| AC Power Line Conducted Emissions, 9kHz to 150kHz   | 4.0dB                |

If *U<sub>lab</sub>* is less than or equal to *U<sub>cispr</sub>*, then:

- compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

If *U<sub>lab</sub>* is greater than *U<sub>cispr</sub>* in table 1, then:

- compliance is deemed to occur if no measured disturbance, increased by (*U<sub>lab</sub>* – *U<sub>cispr</sub>*), exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance, increased by (*U<sub>lab</sub>* – *U<sub>cispr</sub>*), exceeds the disturbance limit.

Note: Only measurements listed in the tables above that relate to tests included in this Test Report are applicable.



Order Number: F2P29090

Applicant: EcoTech, LLC  
Model: Nero 7

**1.4 Document History:**

| Document Number | Description | Issue Date | Approved By |
|-----------------|-------------|------------|-------------|
| F2P29090-01E    | First Issue | 2022-12-12 | K. Littell  |



**2 SUMMARY OF TEST RESULTS**

| <b>Test Name</b>            | <b>Standard(s)</b>                              | <b>Results</b> |
|-----------------------------|---|----------------|
| Radiated Spurious Emissions | CFR 47 Part 15.247(d) / Part 15.209 / KDB558074 | Complies       |

| <b>Modifications Made to the Equipment</b> |
|--|
| No modifications were made to the EUT.     |



**Order Number: F2P29090**

**Applicant: EcoTech, LLC**

**Model: Nero 7**

### **3 ENGINEERING STATEMENT**

This report has been prepared on behalf of EcoTech, LLC to provide documentation for the testing described herein. This equipment has been tested and found to comply with Part 15.247 of the FCC Rules using ANSI C63.10 and KDB558074 standards. The test results found in this test report relate only to the items tested.



#### 4 EUT INFORMATION AND DATA

##### 4.1 Equipment Under Test:

Product: AI Nero 7

Model: Nero 7

Part No.: NX7

Serial Number: 64760069BARDC1

Firmware Version: 1.1.14-FCC

Software Version: 2.9

**FCC ID: VKB271832**

##### 4.2 Trade Name:

EcoTech, LLC

##### 4.3 Power Supply:

EA10625DR-240

##### 4.4 Applicable Rules:

CFR 47, Part 15.247, subpart C

##### 4.5 Equipment Category:

DTS

##### 4.6 Antenna:

Internal

##### 4.7 Accessories:

N/A

##### 4.8 Test Item Condition:

The equipment to be tested was received in good condition.

##### 4.9 Testing Algorithm:

EUT was set to transmit a modulated signal at low, mid and high channel in the 2.4 GHz BT band during spurious emissions testing.

**5 LIST OF MEASUREMENT INSTRUMENTATION**

| Equipment Type                  | Asset Number                     | Manufacturer       | Model                         | Serial Number  | Calibration Due Date |
|---------------------------------|----------------------------------|--------------------|-------------------------------|----------------|----------------------|
| Shielded Chamber                | CL166-E                          | Albatross Projects | B83117-DF435-T261             | US140023       | 2022-12-31           |
| Receiver                        | CL151                            | Rohde & Schwarz    | ESU40                         | 100319         | 2023-03-31           |
| Low Loss Cable Set              | --                               | Pasternack         | PE3C0666-252 / PE3C066-50CM   | None Spec.     | 2023-10-12           |
| Pre-Amplifier                   | CL250                            | Com-Power          | PAM-118A                      | 18040011       | 2023-04-11           |
| Pre-Amplifier                   | CL285                            | Com-Power          | PAM-0207                      | 322            | 2023-03-30           |
| Antenna, JB3 Combination        | CL175                            | Sunol Sciences     | JB3                           | A030315        | 2023-09-22           |
| Horn Antenna                    | CL098                            | Emco               | 3115                          | 9809-5580      | 2023-01-26           |
| Amplifier w/Monopole & 18" Loop | CL163-Loop                       | A.H. Systems, Inc. | EHA-52B                       | 100            | 2023-10-20           |
| Temp/Hum. Recorder              | CL294                            | Thermpro           | TP50                          | 2              | 2023-04-15           |
| Horn Antenna 18-26.5 GHz        | CL114                            | A.H. Systems, Inc. | SAS-572                       | 237            | 2023-07-30           |
| Pre-Amplifier                   | CL189                            | Com-Power          | PAM-840A                      | 461303         | 2023-03-30           |
| Software:                       | Tile Version 3.4.B.3             |                    | Software Verified: 2022-11-22 |                |                      |
| Software:                       | EMC 32, Version 8.53.0           |                    | Software Verified: 2022-11-22 |                |                      |
| Spectrum Analyzer               | 0204                             | Hewlett Packard    | HP8591A                       | 3149A02546     | 2023-03-29           |
| Software:                       | EMC Analyzer 85712D Rev. A.00.01 |                    |                               | Date Verified: | 2022-11-22           |
| Transient Limiter               | CL102                            | Hewlett Packard    | 11947A                        | 3107A03325     | 2023-03-29           |
| LISN                            | CL181                            | Com-Power          | LI-125A                       | 191226         | 2023-12-01           |
| LISN                            | CL182                            | Com-Power          | LI-125A                       | 191225         | 2023-12-01           |
| Temp/Hum. Recorder              | CL232                            | Extech             | 445814                        | 01             | 2023-05-19           |

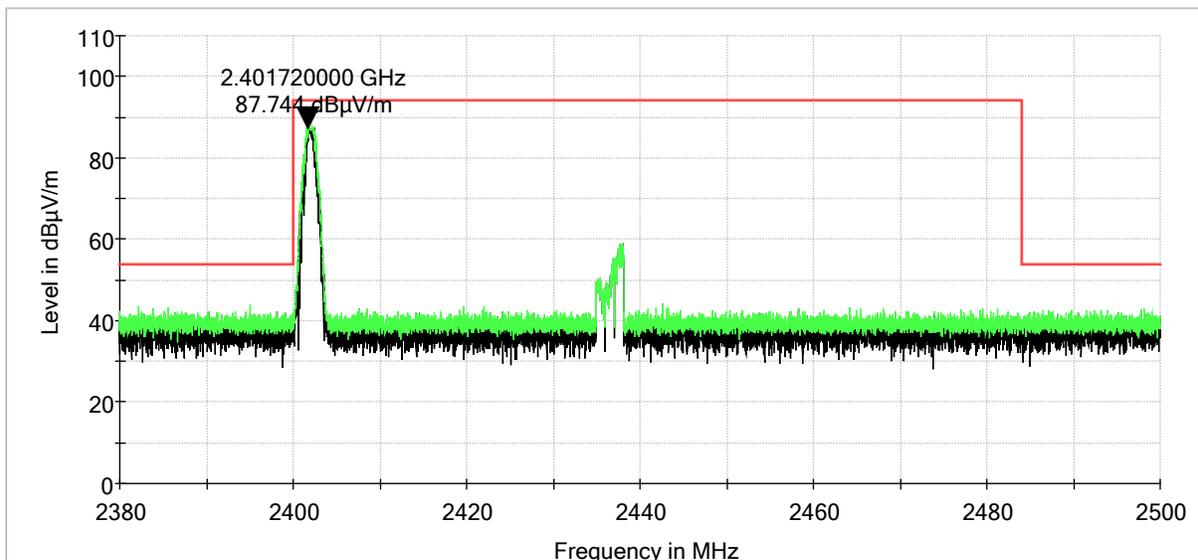


## 7 FIELD STRENGTH OF EMISSIONS FROM INTENTIONAL RADIATORS

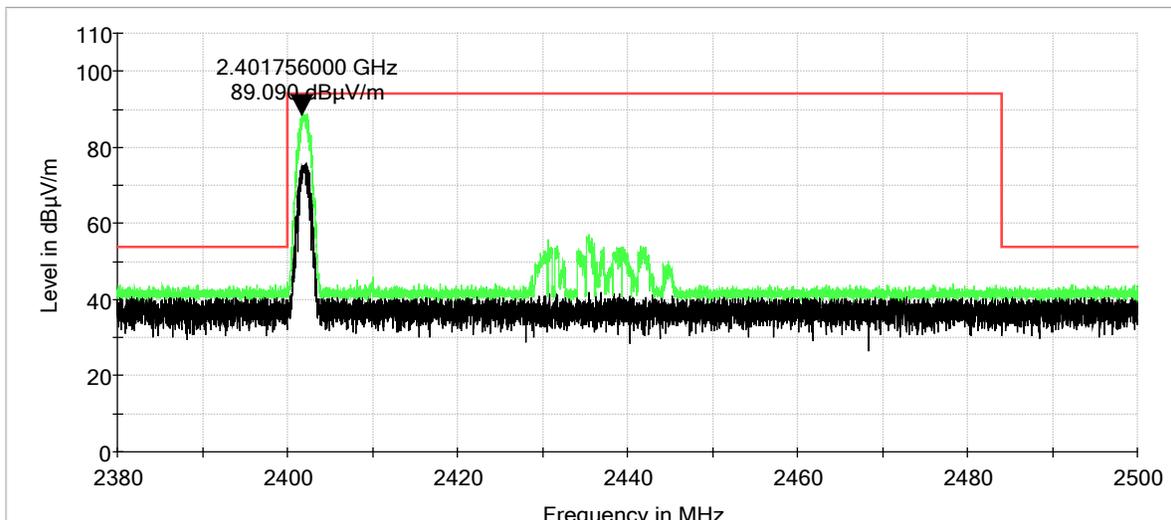
### 7.1 Test Data - Field Strength and Band Edge Measurements

|                      |   |                           |            |
|----------------------|---|---------------------------|------------|
| <b>Test Date(s):</b> | 2022-11-22  | <b>Test Engineer(s):</b>  | J. Chiller |
| <b>Standards:</b>    | CFR 47 Part 15.247(d);<br>Part 15.209 / KDB558074 | <b>Air Temperature:</b>   | 22.9°C     |
|                      |   | <b>Relative Humidity:</b> | 22%        |
| <b>Results:</b>      | Complies  |                           |            |

**Band Edge, Low Channel, Vertical**

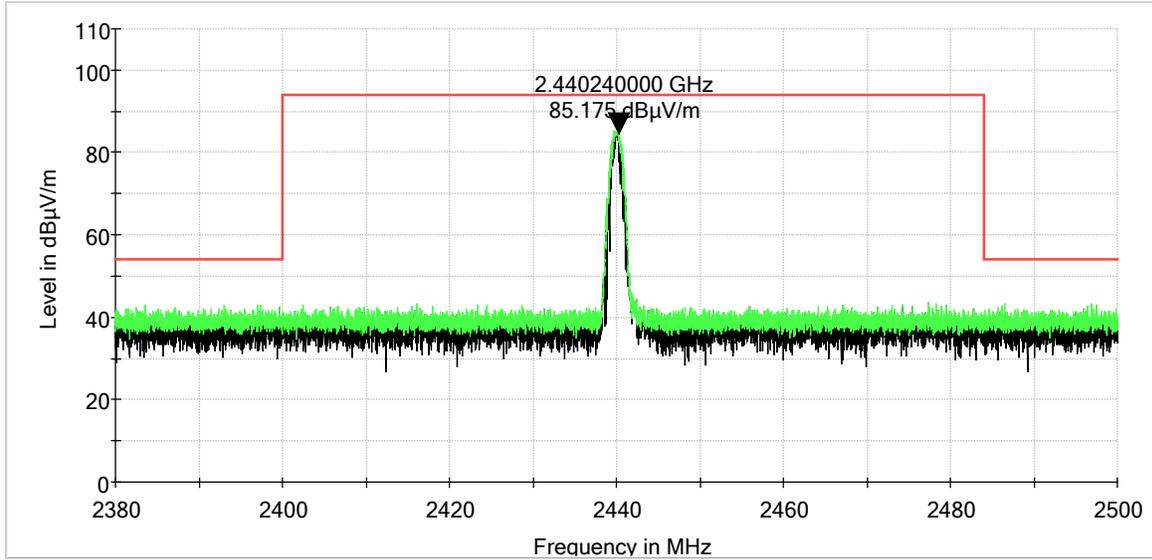


**Band Edge, Low Channel, Horizontal**

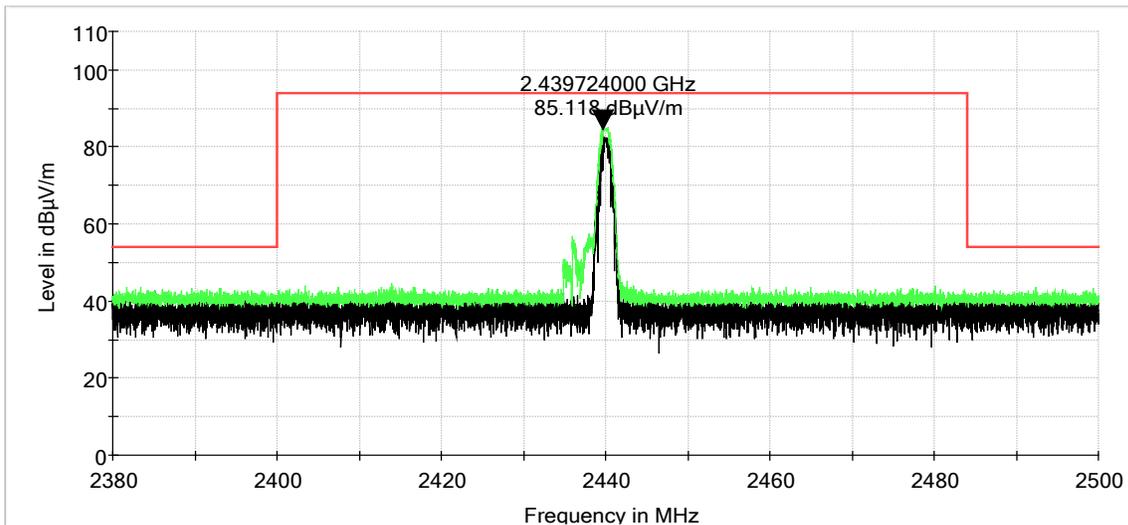




### Band Edge, Mid Channel, Vertical

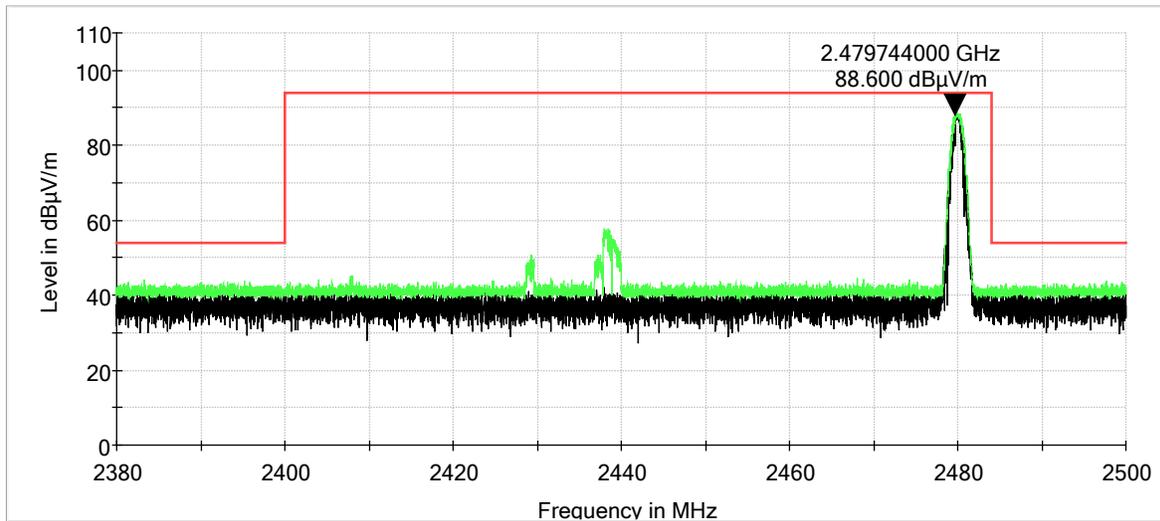


### Band Edge, Mid Channel, Horizontal

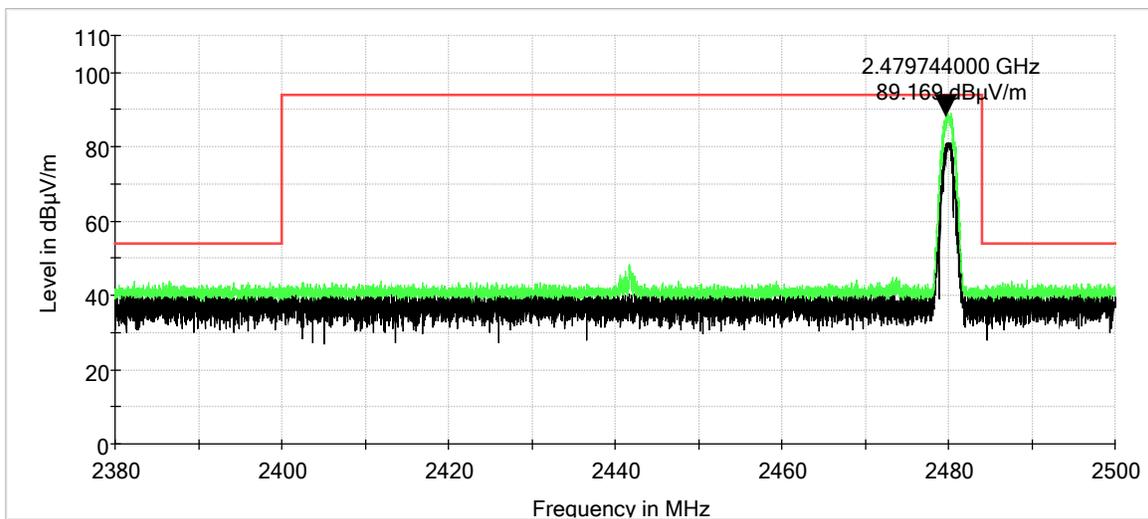




### Band Edge, High Channel, Vertical



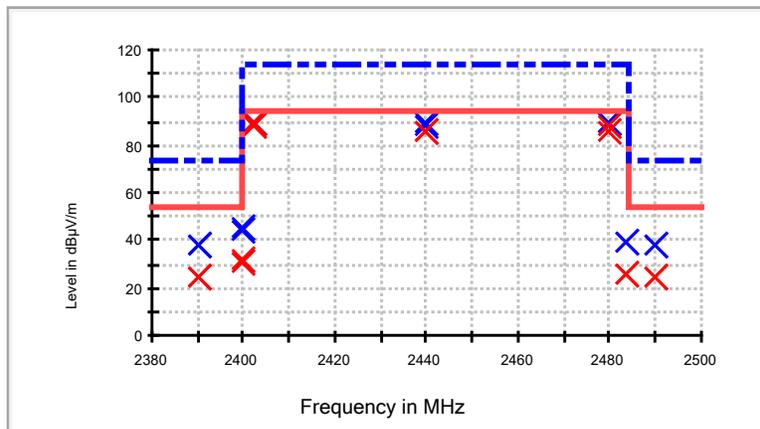
### Band Edge, High Channel, Horizontal





### Band Edge – Measurements

| Frequency (MHz) | MaxPeak (dBµV/m) | Average (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Polarization | Azimuth (deg) | Corr. (dB) | Margin - AVG (dB) | Limit - AVG (dBµV/) |
|-----------------|------------------|------------------|-----------------|-----------------|-------------|--------------|---------------|------------|-------------------|---------------------|
| 2390.000000     | 37.6             | 24.7             | 1000.0          | 1000.000        | 150.0       | H            | 49.0          | -8.6       | 29.3              | 54.0                |
| 2390.000000     | 38.0             | 24.6             | 1000.0          | 1000.000        | 150.0       | V            | 167.0         | -8.6       | 29.4              | 54.0                |
| 2400.000000     | 44.8             | 31.7             | 1000.0          | 1000.000        | 150.0       | V            | 167.0         | -8.7       | 22.3              | 54.0                |
| 2400.000000     | 43.6             | 31.0             | 1000.0          | 1000.000        | 150.0       | H            | 49.0          | -8.7       | 23.0              | 54.0                |
| 2402.000000     | 89.3             | 87.8             | 1000.0          | 1000.000        | 150.0       | H            | 49.0          | -8.7       | 6.2               | 94.0                |
| 2402.000000     | 89.6             | 88.8             | 1000.0          | 1000.000        | 150.0       | V            | 167.0         | -8.7       | 5.2               | 94.0                |
| 2440.000000     | 88.3             | 86.1             | 1000.0          | 1000.000        | 150.0       | V            | 197.0         | -8.8       | 7.9               | 94.0                |
| 2440.000000     | 88.8             | 85.1             | 1000.0          | 1000.000        | 150.0       | H            | 23.0          | -8.8       | 8.9               | 94.0                |
| 2480.000000     | 89.4             | 88.1             | 1000.0          | 1000.000        | 150.0       | V            | 190.0         | -8.8       | 5.9               | 94.0                |
| 2480.000000     | 89.0             | 85.6             | 1000.0          | 1000.000        | 150.0       | H            | 82.0          | -8.8       | 8.4               | 94.0                |
| 2483.500000     | 38.7             | 25.3             | 1000.0          | 1000.000        | 150.0       | H            | 82.0          | -8.7       | 28.7              | 54.0                |
| 2483.500000     | 38.7             | 25.7             | 1000.0          | 1000.000        | 150.0       | V            | 190.0         | -8.7       | 28.4              | 54.0                |
| 2490.000000     | 37.9             | 24.9             | 1000.0          | 1000.000        | 150.0       | H            | 82.0          | -8.7       | 29.1              | 54.0                |
| 2490.000000     | 37.8             | 24.9             | 1000.0          | 1000.000        | 150.0       | V            | 190.0         | -8.7       | 29.1              | 54.0                |





## 7.2 Test Data – Spurious Emissions

Notes: Plots are peak, max hold pre-scan data included only to determine what frequencies to investigate and measure. During the pre-scan evaluation, the EUT was rotated in all possible directions and three orthogonal positions to find the maximum emissions. The orthogonal position that showed the highest emissions was used. At some frequencies, no emissions from the EUT were measurable over the ambient noise floor. The readings did not change with EUT on and EUT off.

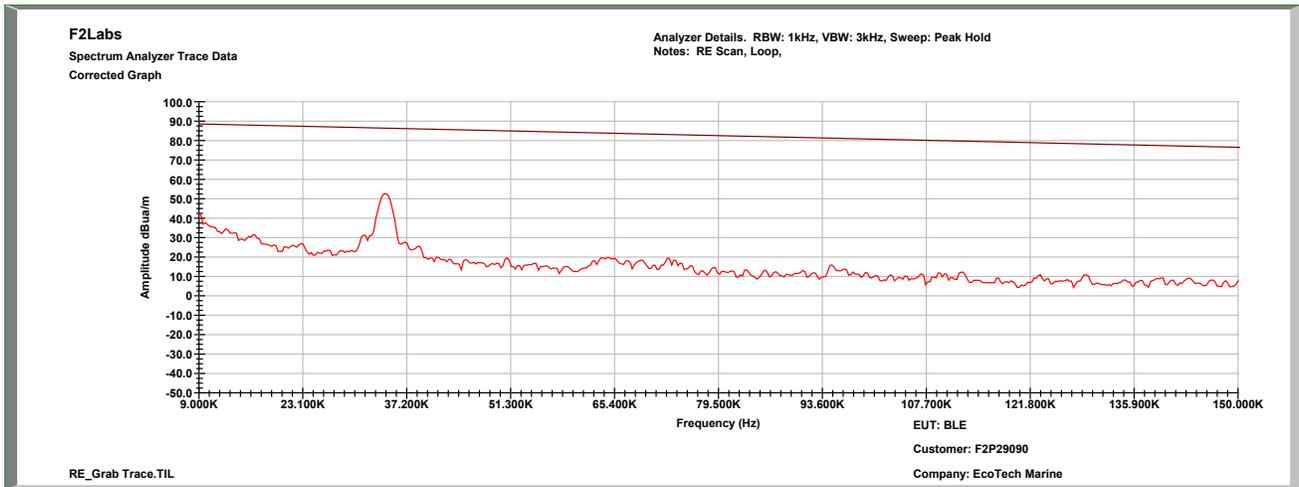
At least 6 of the highest frequencies were measured per ANSI 63.4 in a 3-meter anechoic chamber. Frequencies below 1GHz were measured using a quasi-peak detector. The antenna was raised between 1 and 4 meters and the EUT turntable was rotated 360 degrees to maximize the emissions. Some of the frequencies did not change with the EUT on or off. At those frequencies, the test distance was shortened to 1 meter and still no emissions from the EUT were visible or over the ambient or limit. Frequencies were scanned from 9kHz to 1000 MHz and the highest emissions are presented.

In the following plots, the red line indicates the measurement with the EUT on. Emissions to be found by the EUT were measured and listed in tables below.

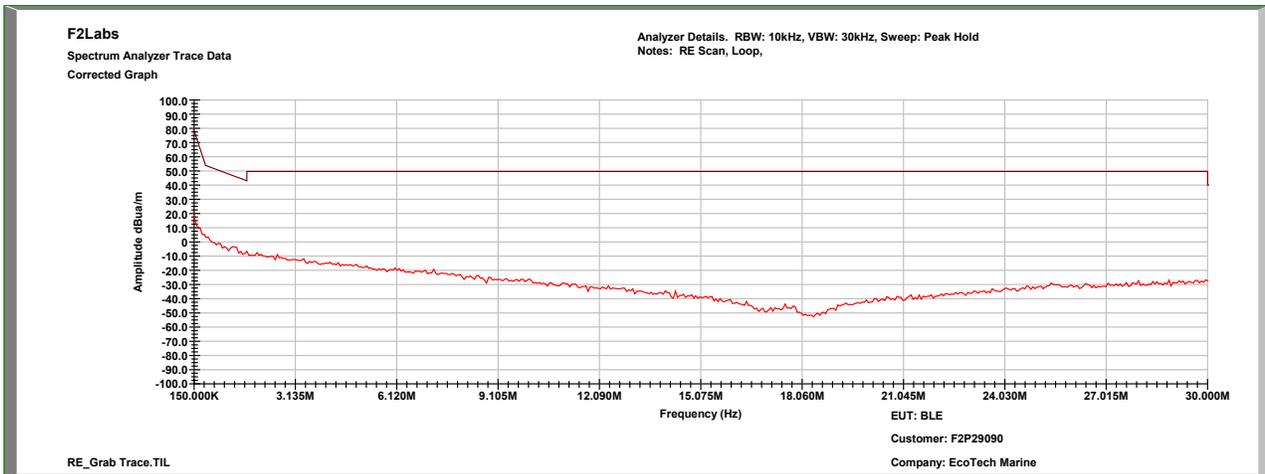


|                      |   |                           |            |
|----------------------|---|---------------------------|------------|
| <b>Test Date(s):</b> | 2022-11-22  | <b>Test Engineer(s):</b>  | J. Chiller |
| <b>Standards:</b>    | CFR 47 Part 15.247(d);<br>Part 15.209 / KDB558074 | <b>Air Temperature:</b>   | 22.9°C     |
|                      |   | <b>Relative Humidity:</b> | 22%        |
| <b>Results:</b>      | Complies  |                           |            |

### Characterization Scan, 0.009 MHz to 0.15 MHz (Loop Antenna)



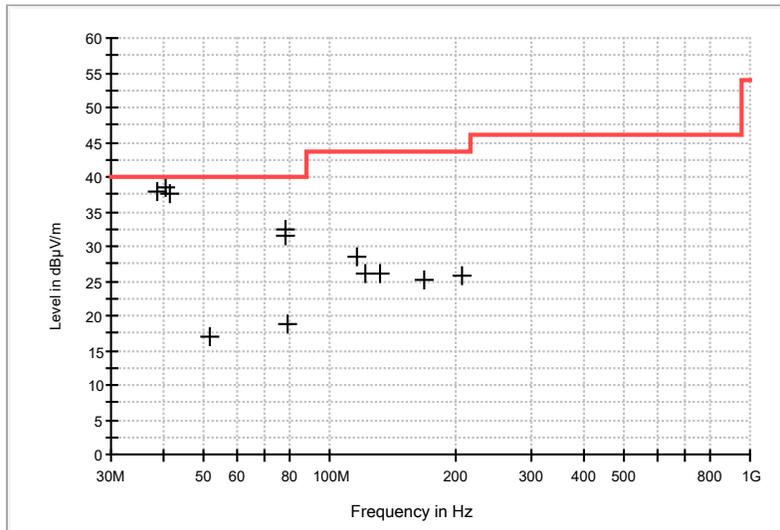
### Characterization Scan, 0.15 MHz to 30 MHz (Loop Antenna)





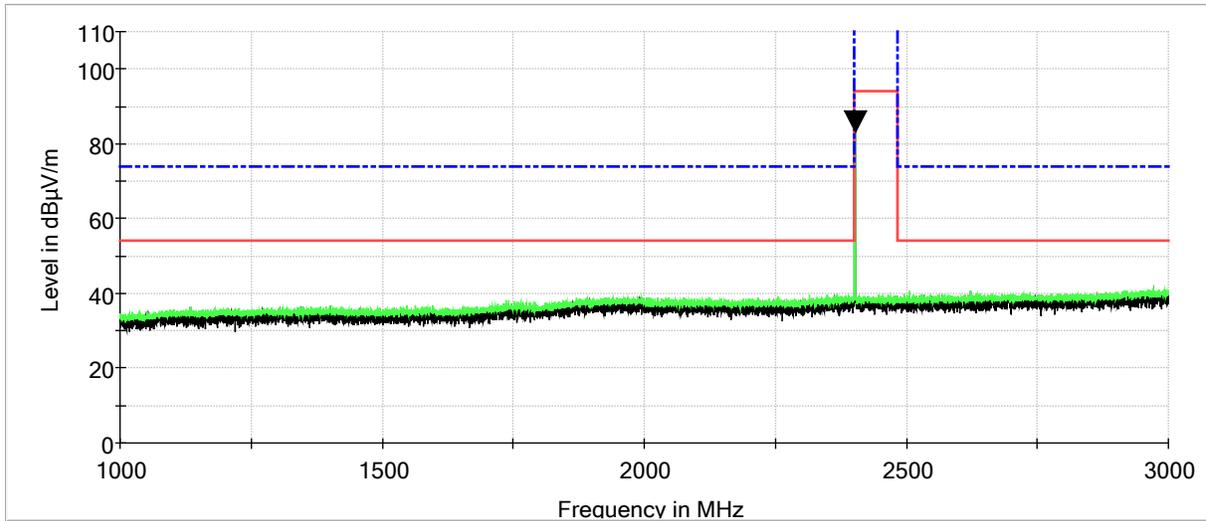
30 MHz to 1000 MHz

| Frequency (MHz) | Antenna Polarization | Azimuth (degrees) | Reading (dBµV) | Cable Loss & Antenna Factor (dB) | Emission (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
|-----------------|----------------------|-------------------|----------------|----------------------------------|-------------------|----------------|-------------|
| 38.720000       | V                    | 19.00             | 45.5           | -7.8                             | 37.70             | 40.0           | -2.3        |
| 40.480000       | V                    | 50.00             | 47.7           | -9.1                             | 38.60             | 40.0           | -1.4        |
| 41.440000       | V                    | 355.00            | 47.5           | -9.8                             | 37.70             | 40.0           | -2.3        |
| 51.728000       | V                    | 28.00             | 31.6           | -14.7                            | 16.90             | 40.0           | -23.1       |
| 77.724000       | V                    | 358.00            | 46.8           | -14.4                            | 32.40             | 40.0           | -7.6        |
| 78.112000       | V                    | 332.00            | 46.1           | -14.5                            | 31.60             | 40.0           | -8.4        |
| 79.276000       | H                    | 233.00            | 33.4           | -14.6                            | 18.80             | 40.0           | -21.2       |
| 115.942000      | V                    | 36.00             | 37.2           | -8.7                             | 28.50             | 43.5           | -15.0       |
| 121.180000      | H                    | 312.00            | 34.3           | -8.2                             | 26.10             | 43.5           | -17.4       |
| 131.462000      | H                    | 251.00            | 34.2           | -8.2                             | 26.00             | 43.5           | -17.5       |
| 167.934000      | H                    | 247.00            | 35.0           | -9.7                             | 25.30             | 43.5           | -18.2       |
| 205.570000      | H                    | 340.00            | 36.3           | -10.4                            | 25.90             | 43.5           | -17.6       |

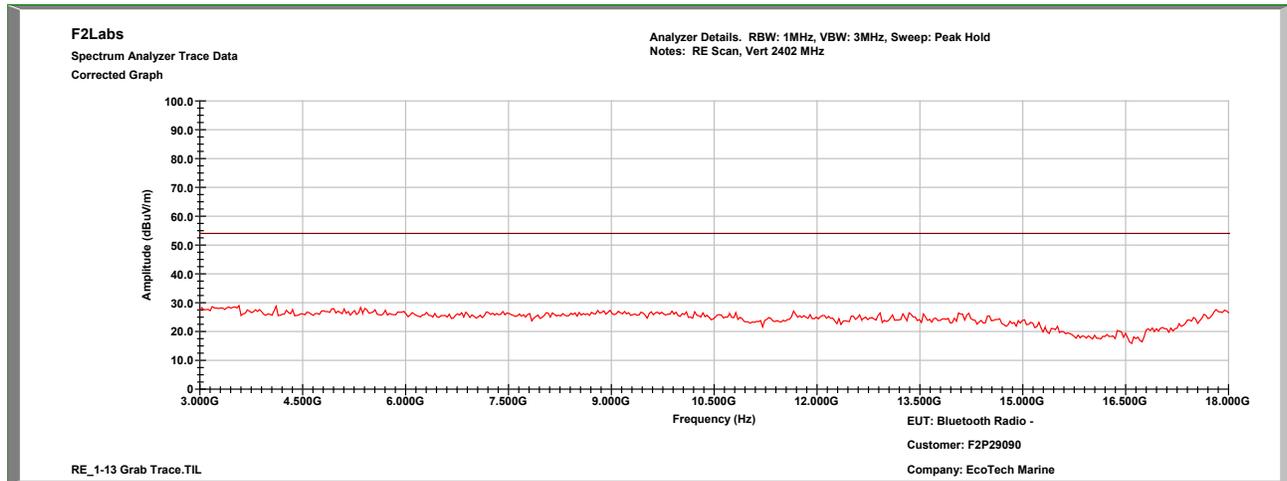




### Characterization Scan, 1 GHz to 3 GHz, Vertical

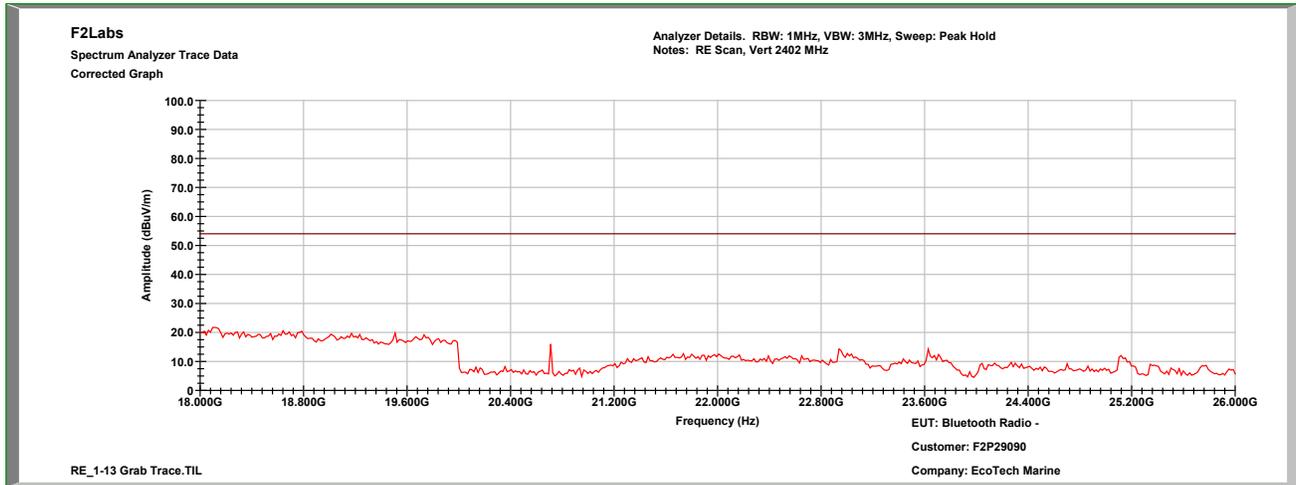


### Characterization Scan, 3 GHz to 18 GHz, Vertical



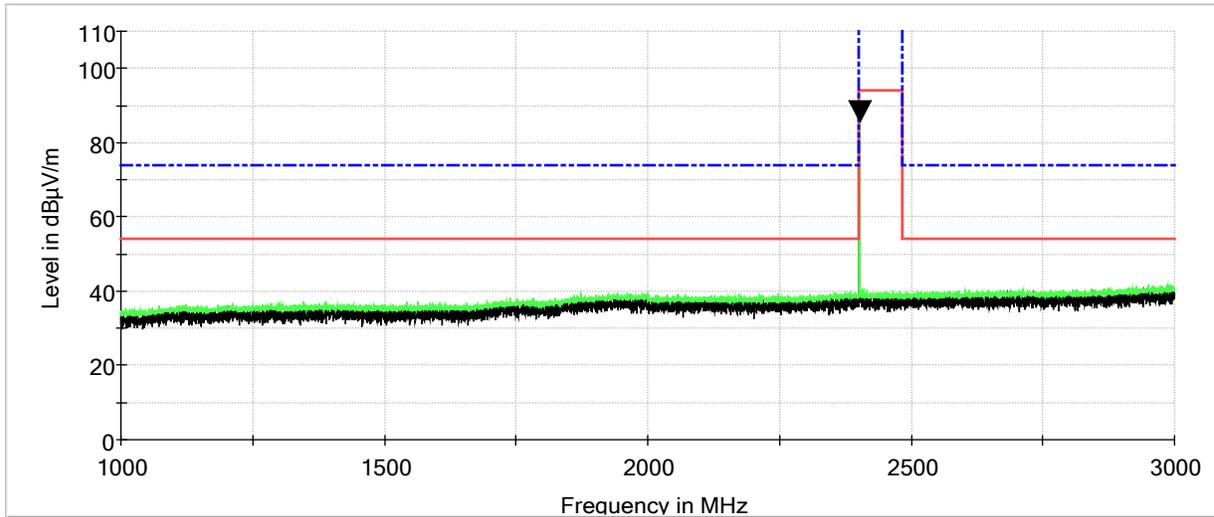


### Characterization Scan, 18 GHz to 26 GHz, Vertical

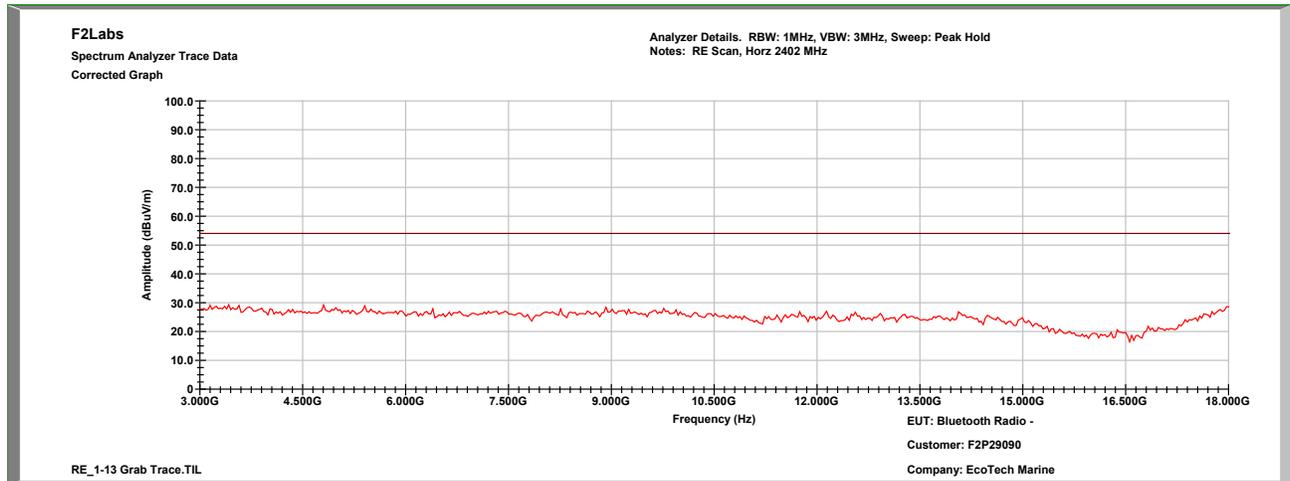




### Characterization Scan, 1 GHz to 3 GHz, Horizontal

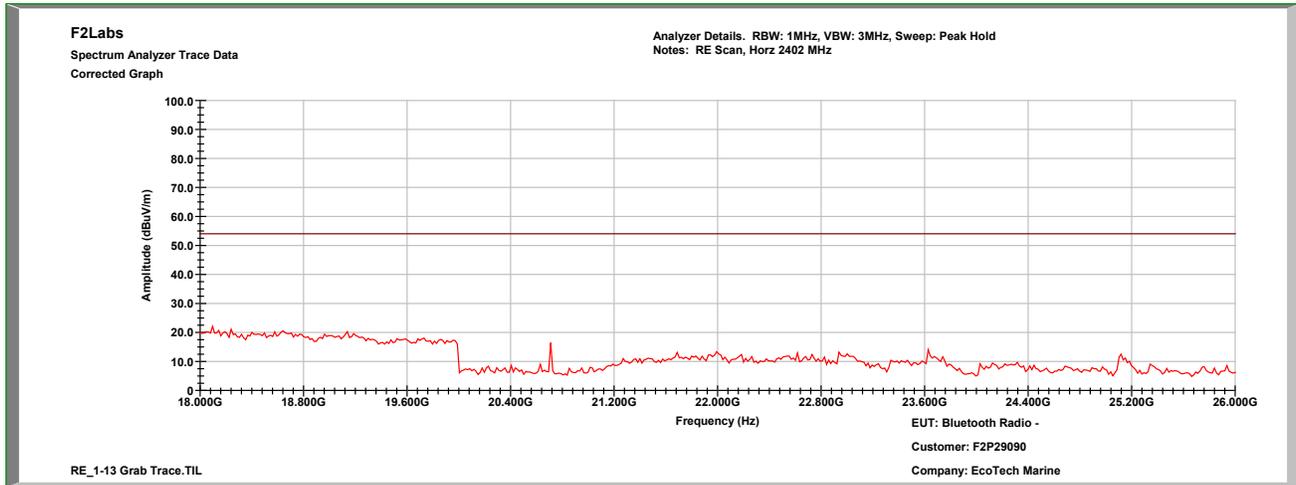


### Characterization Scan, 3 GHz to 18 GHz, Horizontal





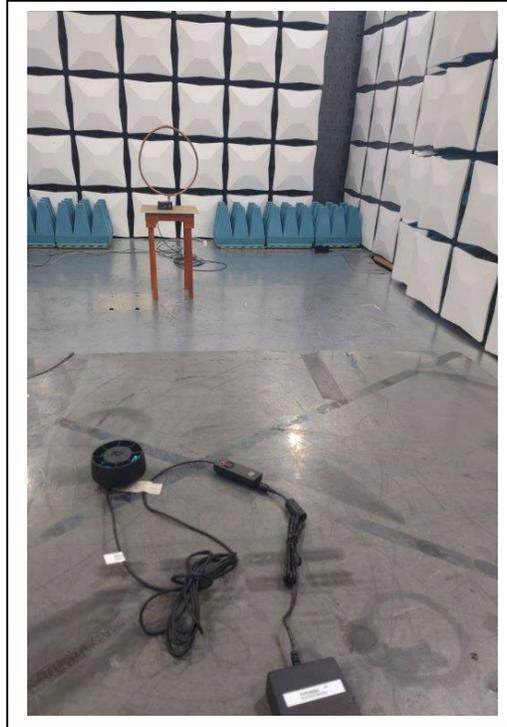
### Characterization Scan, 18 GHz to 26 GHz, Horizontal





8 PHOTOGRAPHS

Radiated Spurious Emissions: 0.009 MHz to 30 MHz





**Radiated Spurious Emissions: 30 MHz to 1000 MHz**



**Radiated Spurious Emissions: 1 GHz to 26 GHz**

