March 27, 2023

Starling Medical
Alex Arevalos
7505 Fannin St., Ste.610
Houston, TX 77054

Dear Alex Arevalos,

Enclosed is the Electromagnetic Compatibility for the Starling Medical, Urine Analyzer, tested to the requirements of:

- FCC Part 15 Subpart B
- KDB996369 D04, Module Integration Guide

Thank you for using the services of Eurofins Electrical and Electronic Testing NA, Inc. Please contact me if you have any questions regarding these results or if Eurofins E&E can be of further service to you.

Sincerely,

Nancy LaBrecque
Documentation Department
Eurofins Electrical and Electronic Testing NA, Inc.

Reference: WIRA124547–KDB996369

A2LA ACCREDITED TESTING CERT #0591.06

Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	March 27, 2023	Initial Issue.

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1.0 Testing Summary

The Starling Medical, Urine Analyzer was found to be compliant to the following specification(s).

- FCC Part 15 Subpart B
- KDB996369 D04, Module Integration Guide

An Dang
EMC Laboratory Engineer

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements.

Matthew Hinojosa
EMC Laboratory Manager, Austin

2.0 Overview

Eurofins Electrical and Electronic Testing NA, Inc. was contracted by Starling Medical to perform testing on the Urine Analyzer, under purchase order number 20221222.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of Starling Medical, Urine Analyzer.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	Urine Analyzer
Equipment Emissions Class:	B

2.1 Test Site

All testing was performed at Eurofins Electrical and Electronic Testing NA, Inc., 13501 McCallen Pass, Austin, Texas 78753. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology. Eurofins Electrical and Electronic Testing NA, Inc. has been accredited by the American Association for Laboratory Accreditation (A2LA) (Certificate #: 0591.06) in accordance with ISO/IEC 17025:2017.

2.2 Measurement Uncertainty

Measurement uncertainty calculated as per NIST Technical Note (TN) 1297 and ANSI / NCSL Z540-2, as equivalent to EN 55016-4-2 / IEC CISPR 16-4-2.

Test Method	Typical Expanded Uncertainty (dB)	K	Confidence Level
Radiated Emissions, (30 MHz – 1 GHz)	±2.95	2	95%
Radiated Emissions, (1 GHz – 6 GHz)	±3.54	2	95%
Conducted Emission Voltage	±2.97	2	95%
Conducted Emission Telecom	±3.76	2	95%

Measurement Uncertainty

2.3 Equipment Overview and Test Configuration

Name of EUT/Model:	Urine Analyzer
Description of EUT and its intended use:	This urine analyzer seamlessly blend into the daily bathroom routine of any user. The device attaches onto the bowl of any standard toilet where a user can deliver a urine sample into the device and the internal sensors can analyze the urine. Data representative of biophysical changes is uploaded to the patient's electronic health record for clinician access.
Selected Operation Mode(s):	The device will come with a modified case allowing easy access to the PCB to connect the USB-C cable. Also we have included a switch to facilitate the on-off function while testing. You can connect the USB cable to a PC and run putty or similar COM port (Windows) or ttyACM device (Linux), which will be visible in the Device Manager. Please configure with: Speed 115200, Data bits 8, stop bit 1, parity None, flow control none. a. Set the data rate with the data rate ble_2Mbit b. Set the transmission pattern with the transmit pattern pattern_11110000 c. Set the radio channel with the start channel (Desired channel) d. Set the radio channel with the end channel (desired channel e. Run the parameters print command to confirm that the radio configuration is correct. f. Set the output power to 8dBm output power pos8dBm g. Set the board in the Modulated TX Carrier mode using the start Tx modulated carrier command.
Rational for the selection of the Operation Mode(s):	
Monitoring Method(s):	Has a User interface LED (green) that will be blinking during normal operation. Also, the communication to the COM console should be constant and consistent.
Emissions Class Declaration:	Class B
EUT Power Requirement	
Voltage:	3.3 V and 3.6 V
AC or DC:	DC
Voltage Frequency:	
Number of Phases:	1
Current:	0.600
Uses an external AC/DC Adapter:	False
Physical Description	
EUT Arrangement:	Table Top
System with Multiple Chassis:	False
Size (HxWxD) inches:	1.57 X 3 X 5.3 - Inches
Weight (lbs):	0.018
Other Info	
Highest Frequency used in device (MHz):	64 MHz
EUT Software (internal to EUT):	FW - developed using Nordic SDK
Support Software (used by support PC to exercise EUT):	Putty or similar

EUT List

Ref. ID	Slot #	Name/Description	Model Number	Part Number	Serial Number	Rev. #
		Urine Analyzer	UrinDx	123	123	2.1

Ports and Cabling

Ref. Id	Port Name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded? (Y/N)	Termination Box ID & Port Name
	USB-C	USB-C cable		1.80	1.81	No	

2.4 Modifications to the EUT

No modifications were made to the EUT.

2.5 Modifications to the Standard

No modifications were made to the Test Standard.

2.6 Disposition of EUT

The test sample including all support equipment (if any), submitted to the Electromagnetic Compatibility Lab for testing was returned to %%CustName%% upon completion of testing.

3.0 Electromagnetic Compatibility Emission Criteria

3.1 Limits for Conducted Disturbance at Mains Terminals

Test Method: ANSI 63.4:2014

Sample Calculation:

Sample formula for calculating the Corrected Data for the Conducted Emissions Measurements:

Freq (MHz)	QP (dBµV)	QP Lim (dBµV)	QP Margin (dB)	Avg (dBµV)	Avg Lim (dBµV)	Avg Margin (dB)	Result
0.209	60.242	79.00	18.758	55.939	66.00	10.061	**Pass**

*** QP Margin = QP Limit – QPK Level*
*** Same Calculation applies to Avg Margin.*

Test Requirement(s): The following standards specified below are covered in the scope of this section of the test report:

- FCC Part 15 Subpart B

The EUT shall meet the Class B limits shown in the table below.

Frequency Range (MHz)	Class B Limits(dBµV)		Class B Limits (dBµV)	
	Quasi-Peak	Average	Quasi- Peak	Average
0.15 - 0.5	79	66	66 to 56	56 to 46
0.5 - 5	73	60	56	46
5 - 30	73	60	60	50
Note 1 – The lower limit shall apply at the transition frequencies. Note 2 – The limit decreases linearly with the logarithm if the frequency in the range 0.15 MHz to 0.5 MHz.				

Conducted Emissions - Limits

Test Procedure: The EUT was placed on a non-metallic table, 80 cm above the ground plane and 40 cm away from the vertical reference ground plane. The method of testing, test conditions, and test procedures of ANSI C63.4-2014 were used. The EUT was powered through a 50 Ω/50 µH LISN. An EMI receiver, connected to the measurement port of the LISN, scanned the frequency range from 150 kHz to 30 MHz in order to find the peak conducted emissions. All peak emissions within 6 dB of the limit were re-measured using a quasi-peak and/or average detector as appropriate. Any measured frequency that exhibits a margin of compliance that is less than 3 dB below the specification limit is marked. Eurofins E&E recommends that every emission measured, has at least a 3 dB margin to allow for deviations in the emission characteristics that may occur during the production process. Photographs of test setup are presented below.

Test Software Used: TILE 7.4.2.5 was used to perform this test.

Test Results: The EUT was **not applicable** with the Class B requirement(s) of this section. Measured emissions were below applicable limits.

3.2 Radiated Emissions: Limits of Electromagnetic Radiation Disturbance

Test Method: ANSI C63.4-2014

Test Requirement(s): The following standards specified below are covered in the scope of this section of the test report:

- FCC Part 15 Subpart B

§15.109 (a) Except for Class B digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Field Strength (dBµV/m)
30 - 88	40.00
88 - 216	43.50
216 - 960	46.00
Above 960	54.00

Sample Calculation for Distance Correction factor (DCF) measurement:

$$F_d = 20*LOG_{10}(D_m/D_s)$$

where:

F_d = Distance Factor in dB
D_m = Measurement Distance in meters
D_s = Specification Distance in meters

Sample formula for calculating the Corrected Data for the Radiated Emissions Measurements:

Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]
35.010	26.00	30.00	4.00	-4.99	V	355	1.83	120.000

*** Correction factor = Antenna correction factor (dBm), pre-amp gain (dB) and cable loss (dB)*
*** QPK Margin (dB) = QPK Limit (*dBµV/m*) – QPK Level (*dBµV/m*)*
*** If DCF is needed, such factor will be implemented on the limit to match the distance required on the standard.*

Test Procedure: The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. The method of testing, test conditions, and test procedures of ANSI C63.4-2014 were used. Any measured frequency that exhibits a margin of compliance that is less than 3 dB below the specification limit is marked. Eurofins E&E recommends that every emission measured, has at least a 3 dB margin to allow for deviations in the emission characteristics that may occur during the production process.

For emissions between 30 MHz and 1000 MHz, a biconilog antenna was located 10 m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz resolution bandwidth.

Test Software Used: ELEKTRA Version 4.42.0 was used to perform this test.

Test Results: The EUT was compliant with the Class B requirement(s) of this section. Measured emissions were below applicable limits.

Environmental Conditions for Radiated Emission	
Ambient Temperature:	20.80° C
Relative Humidity:	42.60% RH
Atmospheric Pressure:	98.44 kPa

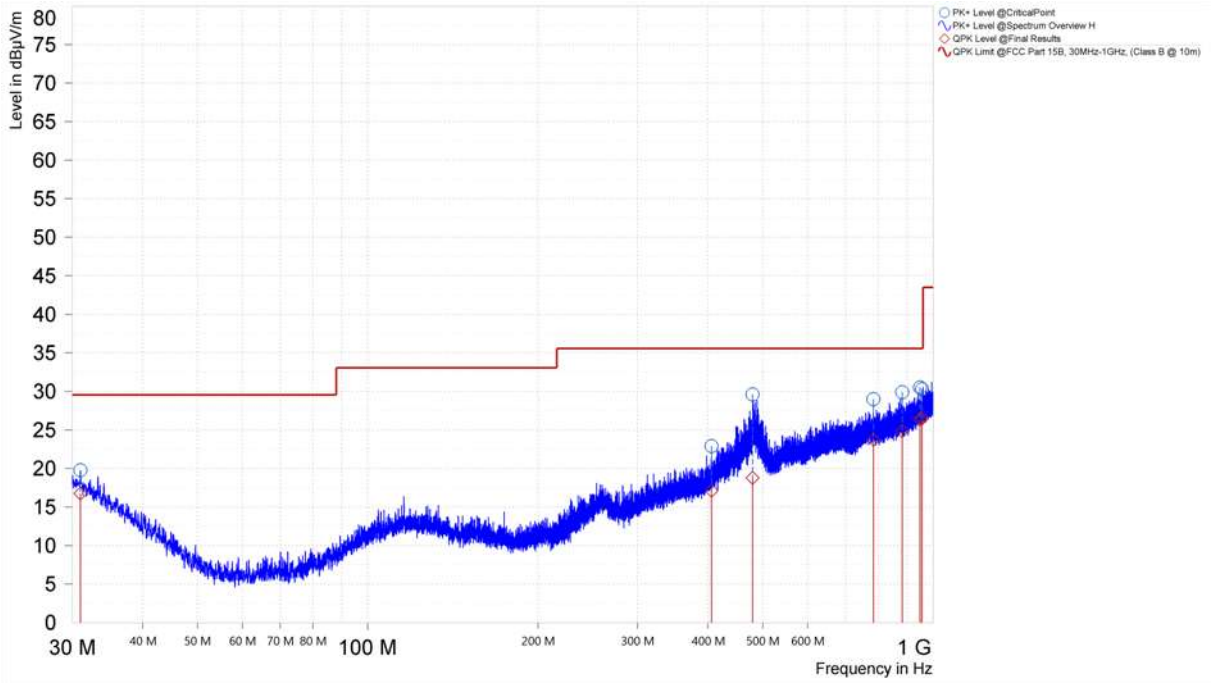
Test Engineer(s): An Dang

Test Date(s): 02/28/2023

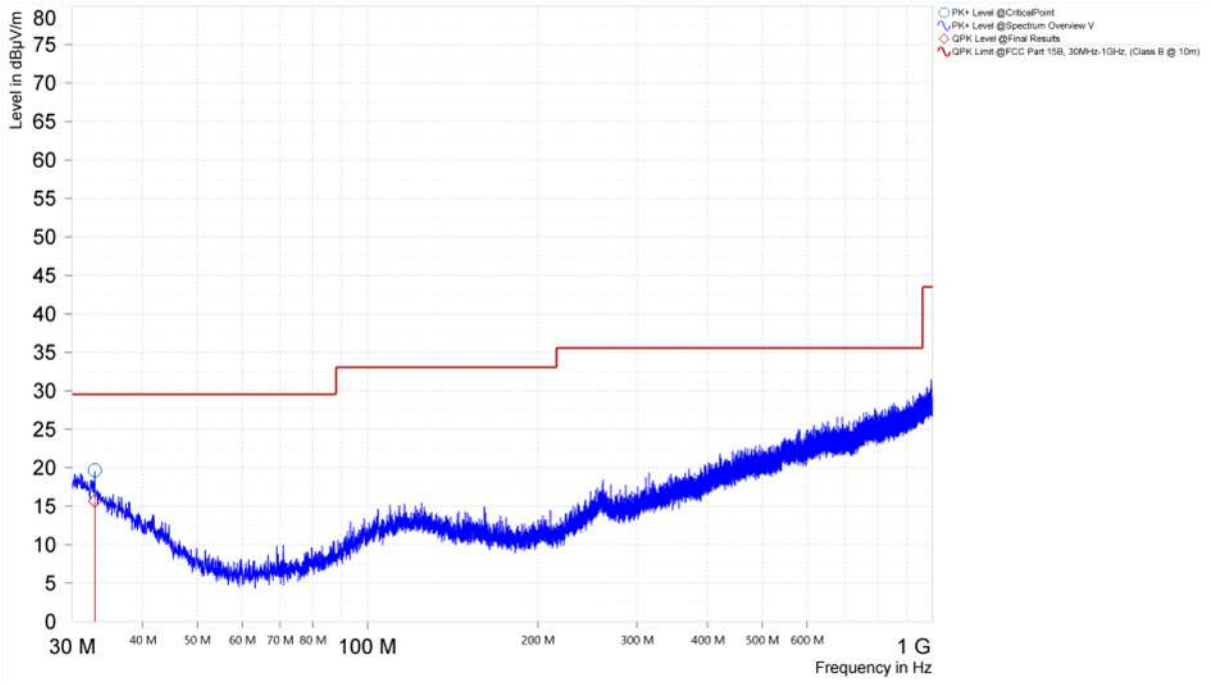
Test Data

Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]
31.020	16.75	29.55	12.80	-2.72	H	114.00	1.84	120.000
32.910	15.69	29.55	13.86	-3.70	V	129.00	2.90	120.000
405.480	17.11	35.57	18.46	-2.21	H	270.00	2.34	120.000
479.310	18.78	35.57	16.79	-0.65	H	130.00	1.80	120.000
784.170	23.73	35.57	11.84	3.53	H	222.00	3.93	120.000
882.150	24.84	35.57	10.73	4.65	H	225.00	1.81	120.000
948.000	26.34	35.57	9.23	5.83	H	34.00	3.00	120.000
955.770	26.48	35.57	9.09	6.00	H	290.00	3.67	120.000

Table 1. Radiated Emissions, Quasi-Peak (30 MHz – 1000 MHz), Test Results



Plot 1. Radiated Emissions, (30 MHz – 1000 MHz), Horizontal Plot



Plot 2. Radiated Emissions, (30 MHz – 1000 MHz), Vertical Plot

3.2 Radiated Spurious Emissions Verification Per KDB996369 D04, Module Integration Guide

Test Method: ANSI C63.26-2015

Test Requirement(s): Testing was performed per Per KDB996369 D04, Module Integration Guide Section 3.0. The test sample integrated a preapproved LTE transmitter module. The spurious emission limit for the LTE bands supported was defined as the following:

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. This calculation always yields a limit of -13dBm. This -13dBm limit was converted to a limit in field strength (dBuV/m) as allowed by ANSI C63.26: 2015 using the following equations:

$$E\ (dB\mu V/m) = EIRP\ (dBm) - 20\log(D) + 104.8;$$

where D is the measurement distance (in the far field region) in m.

Sample Calculation for Distance Correction factor (DCF) measurement:

$$F_d = 20*LOG_{10}\ (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

Sample formula for calculating the Corrected Data for the Radiated Emissions Measurements:

Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]
35.010	26.00	30.00	4.00	-4.99	V	355	1.83	120.000

*** Correction factor = Antenna correction factor (dBm), pre-amp gain (dB) and cable loss (dB)*
*** QPK Margin (dB) = QPK Limit (*dBµV/m*) – QPK Level (*dBµV/m*)*
*** If DCF is needed, such factor will be implemented on the limit to match the distance required on the standard.*

Test Procedure: The EUT was placed on a non-metallic table above the ground plane inside a semi-anechoic chamber. The method of testing, test conditions, and test procedures of ANSI C63.26-2015 were used. The test table height was 80cm for measurements below 1GHz and 1.5m for measurements above 1GHz. Any measured frequency that exhibits a margin of compliance that is less than 3 dB below the specification limit is marked. Eurofins E&E recommends that every emission measured, has at least a 3 dB margin to allow for deviations in the emission characteristics that may occur during the production process.

For emissions between 30 MHz and 1000 MHz, a biconilog antenna was located 10 m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz resolution bandwidth.

For emission above 1GHz, a double ridged guide horn was located 3 m from the EUT on an adjustable mast. A pre-scan was performed and used to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied depending on the geometry of the EUT. In order to ensure maximized emissions, the horn antenna was positioned both vertically and laterally. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a peak and average detector with a 1 MHz resolution bandwidth.

Test Software Used: ELEKTRA Version 4.42.0 was used to perform this test.

Test Results: The EUT was compliant with the requirement(s) of this section. Measured emissions from the host product with the integrated transmitter module were below applicable limits.

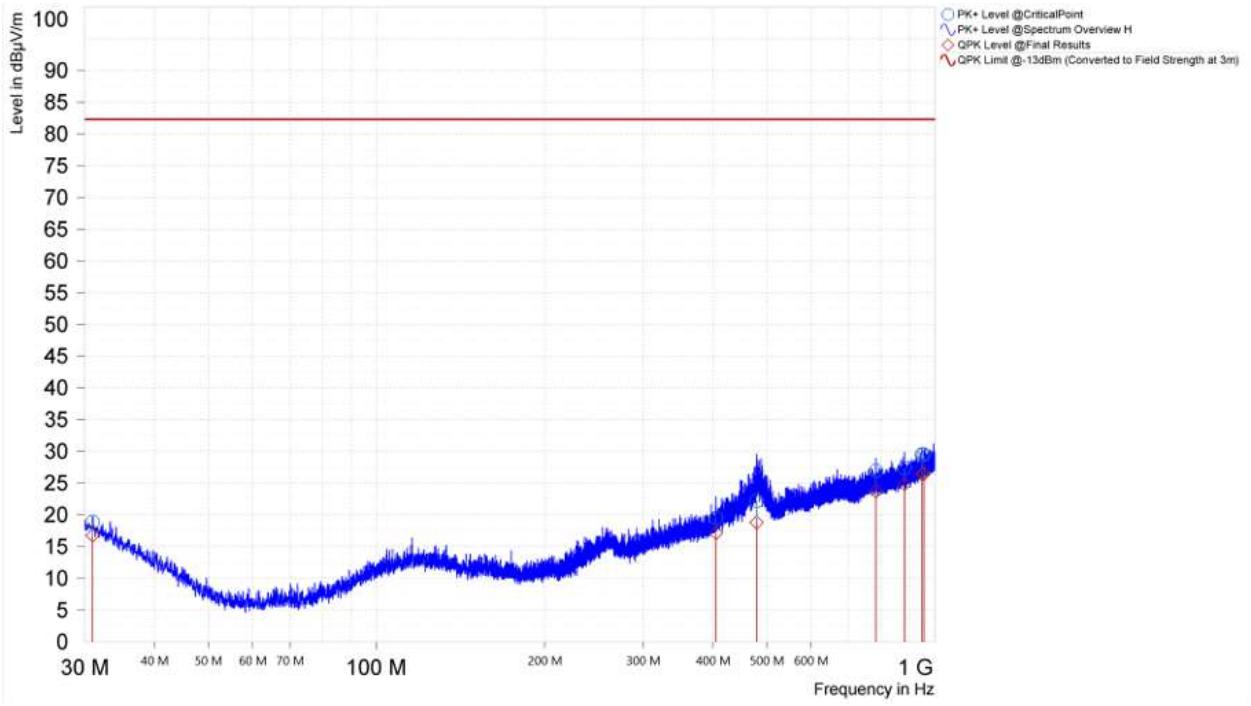
Environmental Conditions for Radiated Emission	
Ambient Temperature:	20.40° C
Relative Humidity:	33.00% RH
Atmospheric Pressure:	98.48 kPa

Test Engineer(s): An Dang

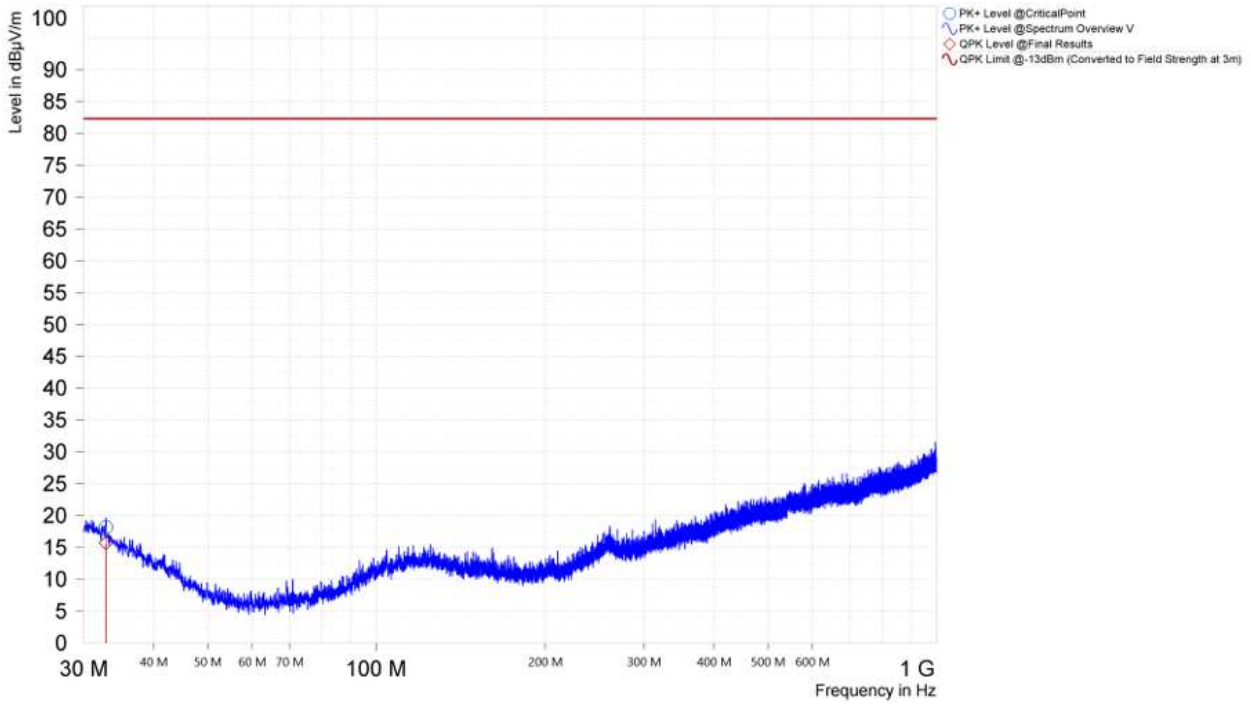
Test Date(s): 02/28/2023

Frequency [MHz]	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Results
31.020	16.75	82.25	65.50	-2.72	H	114	1.84	120.000	Pass
32.910	15.69	82.25	66.56	-3.70	V	129	2.9	120.000	Pass
405.480	17.11	82.25	65.14	-2.21	H	270	2.34	120.000	Pass
479.310	18.78	82.25	63.47	-0.65	H	130	1.8	120.000	Pass
784.170	23.73	82.25	58.52	3.53	H	222	3.93	120.000	Pass
882.150	24.84	82.25	57.41	4.65	H	225	1.81	120.000	Pass
948.000	26.34	82.25	55.91	5.83	H	34	3	120.000	Pass
955.770	26.48	82.25	55.77	6.00	H	290	3.67	120.000	Pass

Table 2. Radiated Spurious Emissions, (30 MHz – 1 GHz)



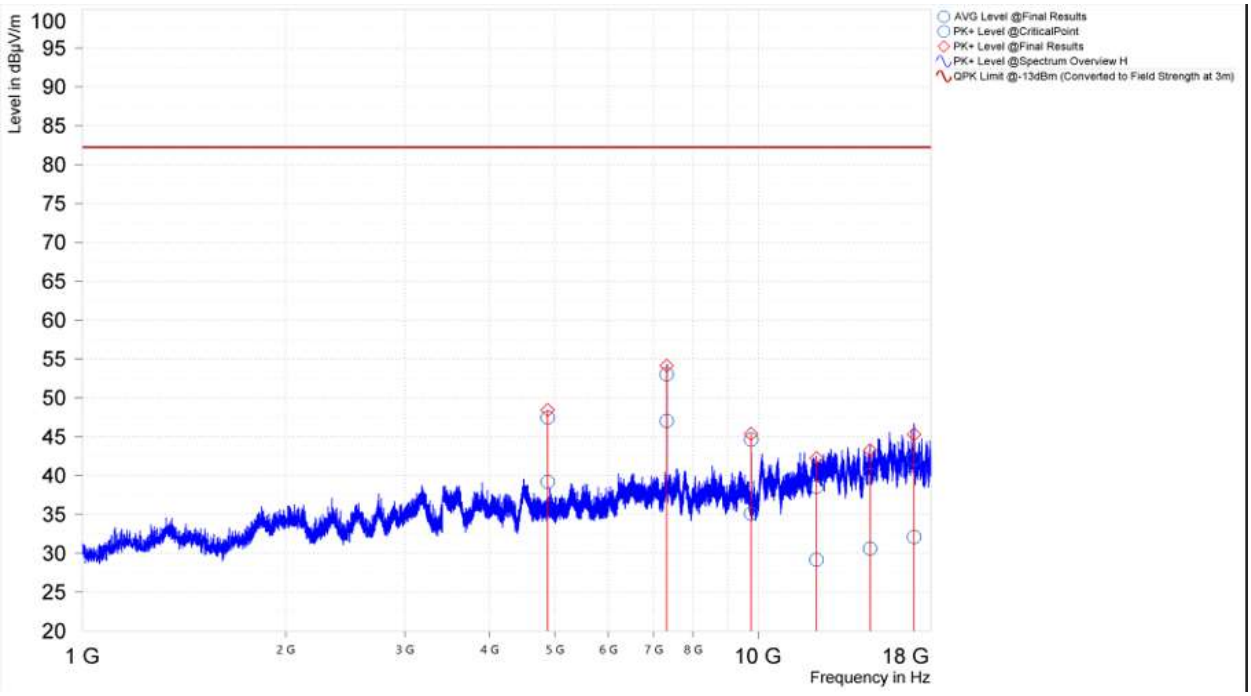
Plot 3. Radiated Spurious Emissions (30 MHz - 1 GHz), Horizontal Polarity



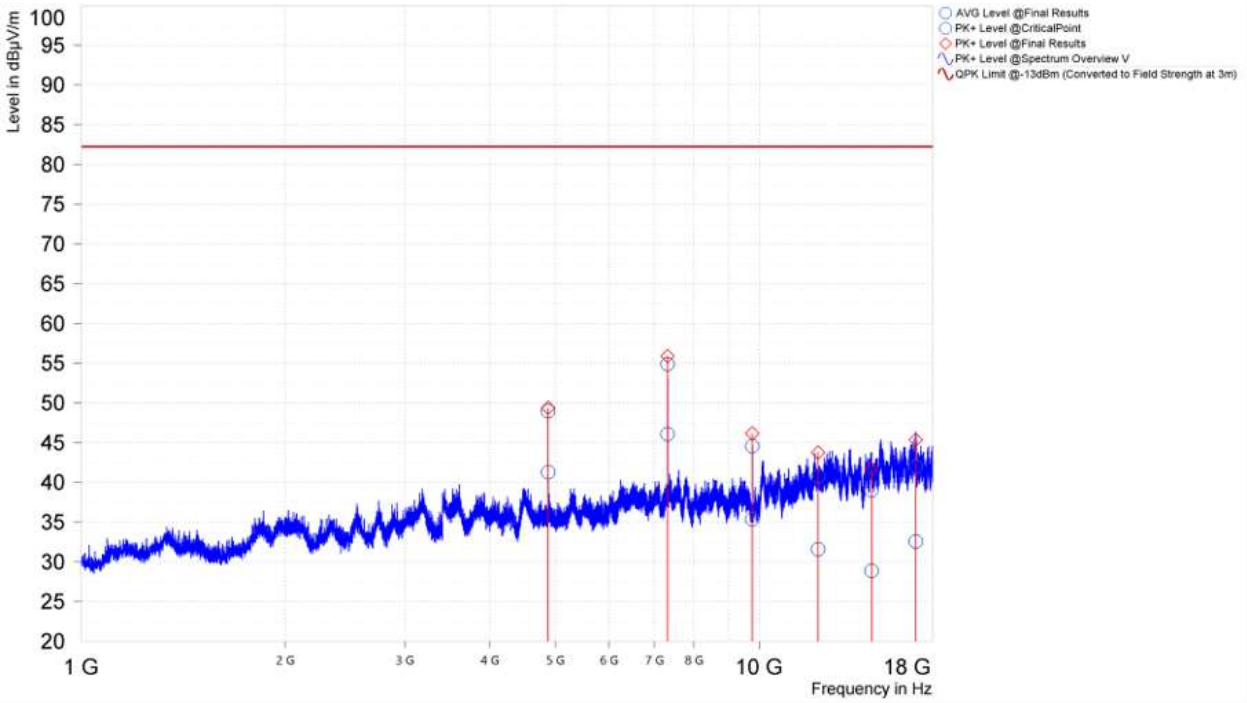
Plot 4. Radiated Spurious Emissions (30 MHz - 1 GHz), Vertical Polarity

Frequency [MHz]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	Correction [dB]	Polarization	Azimuth [deg]	Antenna Height [m]	Meas. BW [kHz]	Result
4,879.000	48.42	82.25	33.83	-3.36	H	353	3.79	1,000.000	Pass
4,881.000	49.38	82.25	32.87	-3.33	V	216	2.2	1,000.000	Pass
7,318.500	55.90	82.25	26.35	-2.80	V	24	1.5	1,000.000	Pass
7,319.000	54.12	82.25	28.13	-2.79	H	52	4	1,000.000	Pass
9,758.000	46.16	82.25	36.09	-1.77	V	249	1	1,000.000	Pass
9,758.500	45.33	82.25	36.92	-1.77	H	0	3.94	1,000.000	Pass
12,194.000	42.25	82.25	40.00	-1.87	H	45	3.98	1,000.000	Pass
12,202.500	43.76	82.25	38.49	-1.91	V	159	1.07	1,000.000	Pass
14,631.000	43.27	82.25	38.98	0.78	H	285	4	1,000.000	Pass
14,631.000	41.71	82.25	40.54	0.78	V	26	2.53	1,000.000	Pass
17,006.500	45.28	82.25	36.97	-1.21	H	342	1.28	1,000.000	Pass
17,007.500	45.35	82.25	36.90	-1.21	V	272	1	1,000.000	Pass

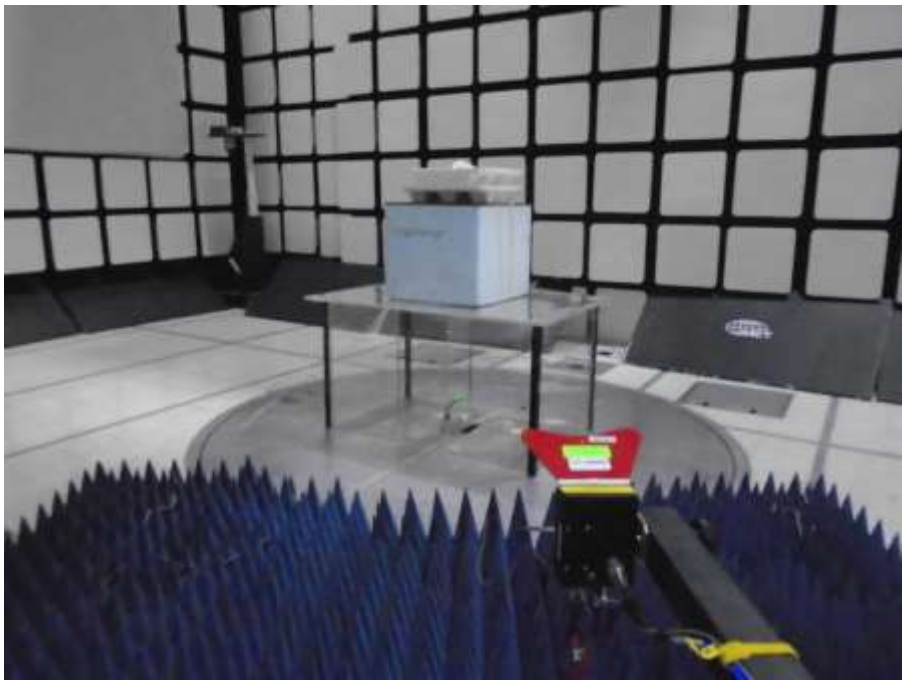
Table 3. Radiated Spurious Emissions, (Above 1 GHz)



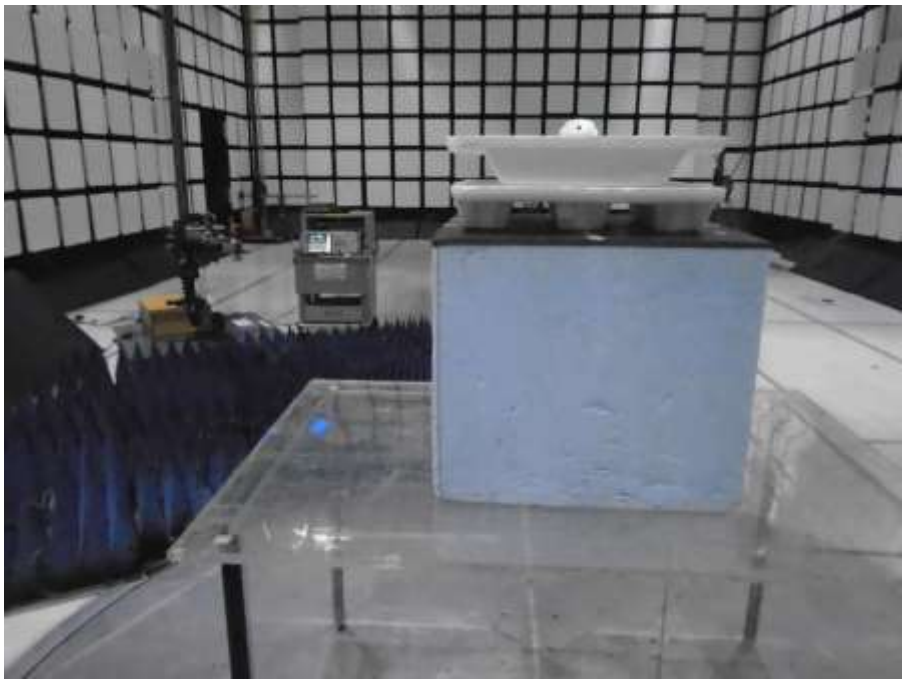
Plot 5. Radiated Spurious Emissions (1 GHz – 18 GHz), Horizontal Polarity



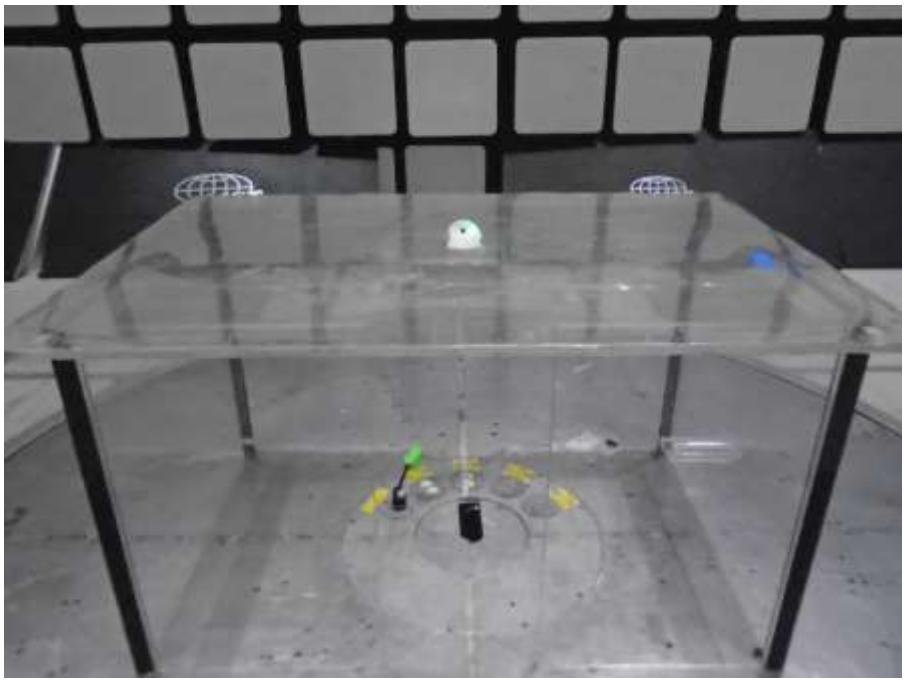
Plot 6. Radiated Spurious Emissions (1 GHz – 18 GHz), Vertical Polarity



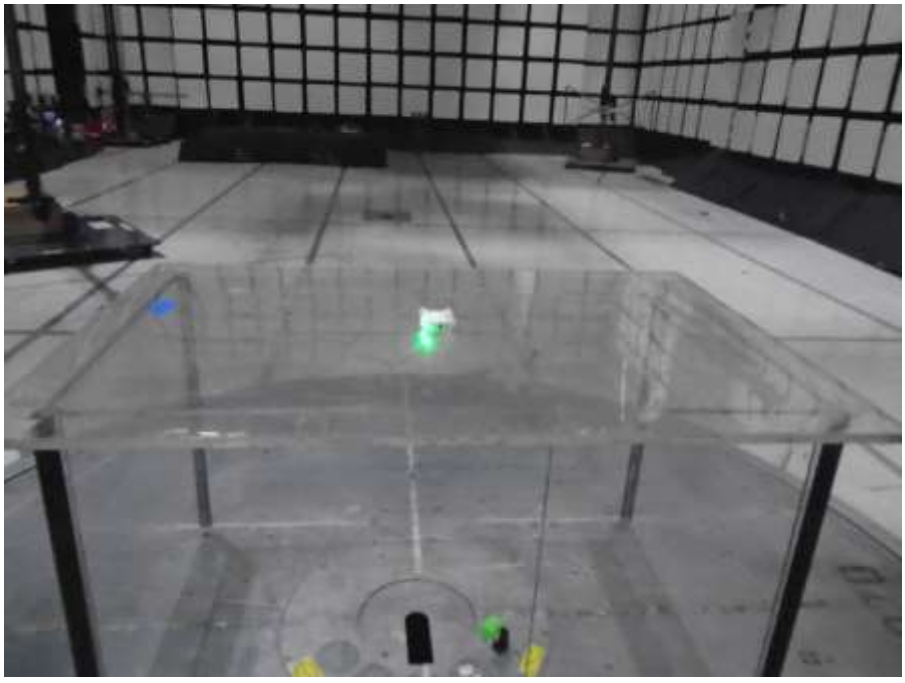
Photograph 1. Radiated Spurious Emissions, Antenna View



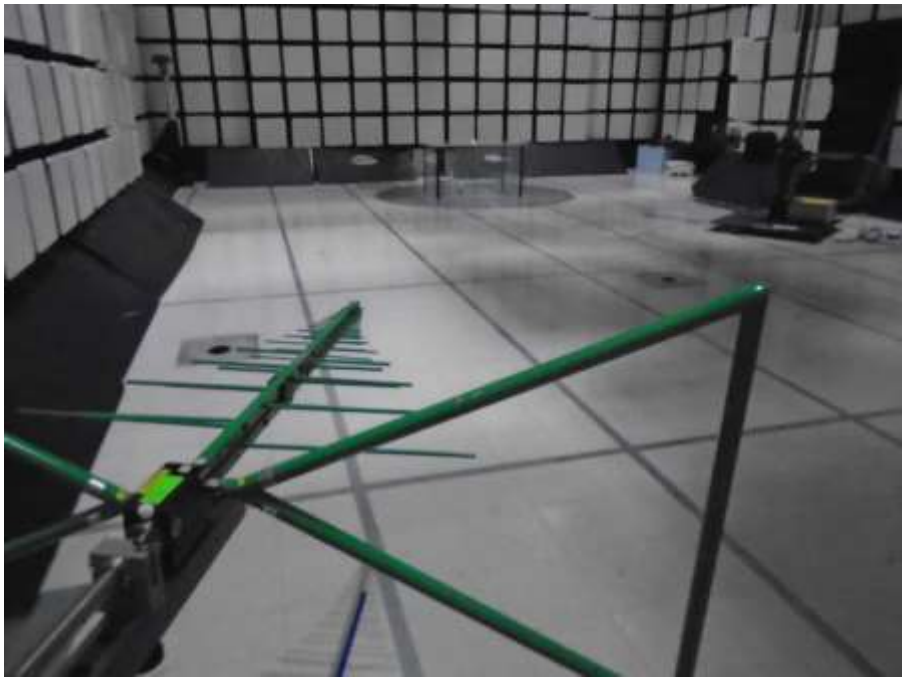
Photograph 2. Radiated Spurious Emissions, Rear View



Photograph 3. Radiated Emissions, (30 MHz – 1000 MHz), Setup Front View



Photograph 4. Radiated Emissions, (30 MHz – 1000 MHz), Setup Rear View



Photograph 5. Radiated Emissions, (30 MHz – 1000 MHz), Setup Antenna View

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

Test Name: Radiated Emissions				**Test Date(s):**	**02/27/2023**
MET Asset #	**Nomenclature**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
30 MHz – 1 GHz					
1A1083	Test Receiver	Rohde & Schwarz	ESU40	10/14/2022	10/14/2023
1A1088	Preamplifier	Rohde & Schwarz	TS-PR1	See Note	
1A1050	BiLog Antenna	Schaffner	CBL 6112D	01/24/2023	01/24/2024
3A3118	Temperature, Humidity and Pressure Recorder	Omega	OM-CP-PRHTEMP2000	11/30/2022	11/30/2023
1A1044	Generator	COM-Power Corp	CG- 520	See Note	
1A1073	Multi Device Controller	ETS EMCO	2090	See Note	
1A1106	10 M Semi-Anechoic Chamber (NSA)	ETS - Lindgren	04X07	01/06/2022	01/06/2025
1 GHz – 18 GHz					
1A1180	Amplifier	Miteq	AMF-7D-01001800-22-10P	See Note	
1A1047	Horn Antenna	ETS - Lindgren	3117	06/16/2022	06/16/2024
1A1099	Generator	COM-Power Corp	CGO 51000	See Note	
1A1080	Multi Device Controller	ETS EMCO	2090	See Note	
Note:	Functionally tested equipment is verified using calibrated instrumentation at the time of testing.				

Table 4. Radiated Emissions, Test Equipment

END OF REPORT