

Rain Bird Corporation **TEST REPORT**

SCOPE OF WORK

EMC TESTING ON LAWN SPRINKLER CONTROL, MODEL(S): RC218-230

REPORT NUMBER

105214472LAX-009

ISSUE DATE

19-October-2022

REVISED DATE

02-May-2023

06-June-2024

PAGES

111

DOCUMENT CONTROL NUMBER

Non-Specific EMC Report Shell Rev. December 2017

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EMC TEST REPORT (FULL COMPLIANCE)

Report Number: 105214472LAX-009

Project Number: G105214472

Original Report Issue Date: 19-October-2022

Report Revision 1 Date: 02-May-2023

Report Revision 2 Date: 06-June-2024

Model(s) Tested: RC2I8-230

Model not tested but declared equivalent: RC2I6-230, RC2I4-230, ARC6I-230V

Standards: EN IEC 61000-6-1:2019
Electromagnetic compatibility (EMC) – Part 6-1: Generic standards
– Immunity standard for residential, commercial and light-industrial environments

EN IEC 61000-6-3:2021
Electromagnetic compatibility (EMC) – Part 6-3: Generic standards
– Emission standard for equipment in residential environments

ETSI EN 301 489-1:2019 Ed.2.2.3
ETSI EN 301 489-17:2020 Ed.3.2.4

EN 61000-3-2:2014
EN 61000-3-3:2013

Tested by:

Intertek Testing Services NA, Inc.
25800 Commercentre Drive
Lake Forest, CA 92630
USA

Client:

Rain Bird Corporation
2475-A Paseo De Las Americas #1318
San Diego, CA 92154
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1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
6	Radiated Emissions EN IEC 61000-6-3:2021, EN 55032, Class B	Complies
7	AC Mains Conducted Emissions EN IEC 61000-6-3:2021, EN 55032, Class B	Complies
8	Harmonics EN 61000-3-2:2014	Complies
9	Flicker EN 61000-3-3:2013	Complies
10	Electro-Static Discharge Immunity Test EN 61000-4-2:2009	Complies
11	Radiated, Radio-Frequency, Electromagnetic Immunity EN 61000-4-3:2006 +A1:2008, +A2:2010	Complies
12	Electrical Fast Transient/Burst Immunity Test EN 61000-4-4:2012	Complies
13	Immunity to Surges EN 61000-4-5:2014	Complies
14	Conducted, Radio-Frequency, Electromagnetic Immunity Test EN 61000-4-6:2014	Complies
15	Power Frequency Magnetic Field Immunity Test EN 61000-4-8:2010	Complies
16	Voltage Dips/Interruptions Immunity Test EN 61000-4-11:2004	Complies
17	Revision History	--

3 Client Information

This EUT was tested at the request of:

Client: Rain Bird Corporation
2475-A Paseo De Las Americas #1318
San Diego, CA 92154
USA

Contact: Francisco Pio
Telephone: +52 (664) 969-4497
Email: fpio@rainbird.com

4 Description of Equipment Under Test and Variant Models

Manufacturer: Rain Bird Corporation
9491 Ridgehaven Court, Suite C
San Diego, CA 92123
USA

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Lawn Sprinkler Control	Rain Bird Corporation	RC2I8-230 (*)	--
AC/AC Adapter	Rain Bird Corporation	XY-24000650CE	--

* Model RC2I8-230 is representative of model variants RC2I6-230 (six stations model) and RC2I4-230 (four stations model). The model differences are related to the number of station outputs.

The model RC2I6-230 does not have the components populated in the PCB for the #7 and up to #8 output circuits; Model RC2I4-230 does not have the components populated in the PCB for #5 and up to #8 output circuits, respectively.

Other than that, All the models are electrically and mechanically equivalent products.

Receive Date:	09/22/2022
Received Condition:	Good
Type:	Prototype

Description of Equipment Under Test (provided by client)

The EuT model RC2I8-230 is a programmable sprinkler control that activates and deactivates remotely located valves that supply water to irrigation zones of the lawn. The EuT supplies a voltage of 24V~ to the solenoids of the valves.

The EuT is provided with 1 master valve output and 8 zone outputs. The master valve output and only one zone output can be activated at a given time.

The EuT is supplied with 24V~ by an external power supplied (EPS) provided with the unit. The EPS is rated 230V~ 50Hz 100mA input; and 24V~ 650 mA output.

The EuT offers Wi-Fi and Bluetooth communication capabilities for its operation and programming by means of a embedded radio module

The EuT is compatible with accessories such as rain sensors. These accessories are sold separately. The intended application is medium scale residential or commercial installations, designed for indoor installation.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
Controller: 24V~ EPS: 230V~	Controller: 600mA EPS: 100mA	Controller: 50 – 60Hz EPS: 50Hz	1

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Manual watering mode (WiFi Active)
2	Manual watering mode (WiFi OFF/Standby)
3	Manual watering mode (BLE Active)

Software used by the EUT:

No.	Descriptions of EUT Exercising
1	Unknown.

Variant Models:

The following variant models were not tested as part of this evaluation but have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

- RC2I6-230
- RC2I4-230
- ARC6I-230V

Note:

Model RC2I8-230 is representative of model variants RC2I6-230 (six stations model) and RC2I4-230 (four stations model). The model differences are related to the number of station outputs.

The model RC2I6-230 does not have the components populated in the PCB for the #7 and up to #8 output circuits; Model RC2I4-230 does not have the components populated in the PCB for #5 and up to #8 output circuits, respectively.

Other than that, All the models are electrically and mechanically equivalent products.

New model variant (ARC6I-230V) is mechanical and electronically equivalent to RC2I6-230 which is already included in the test report, except for a different artwork and colors on the faceplate of product. The difference in model name is due to differences in marketing strategies.

5 System Setup and Method

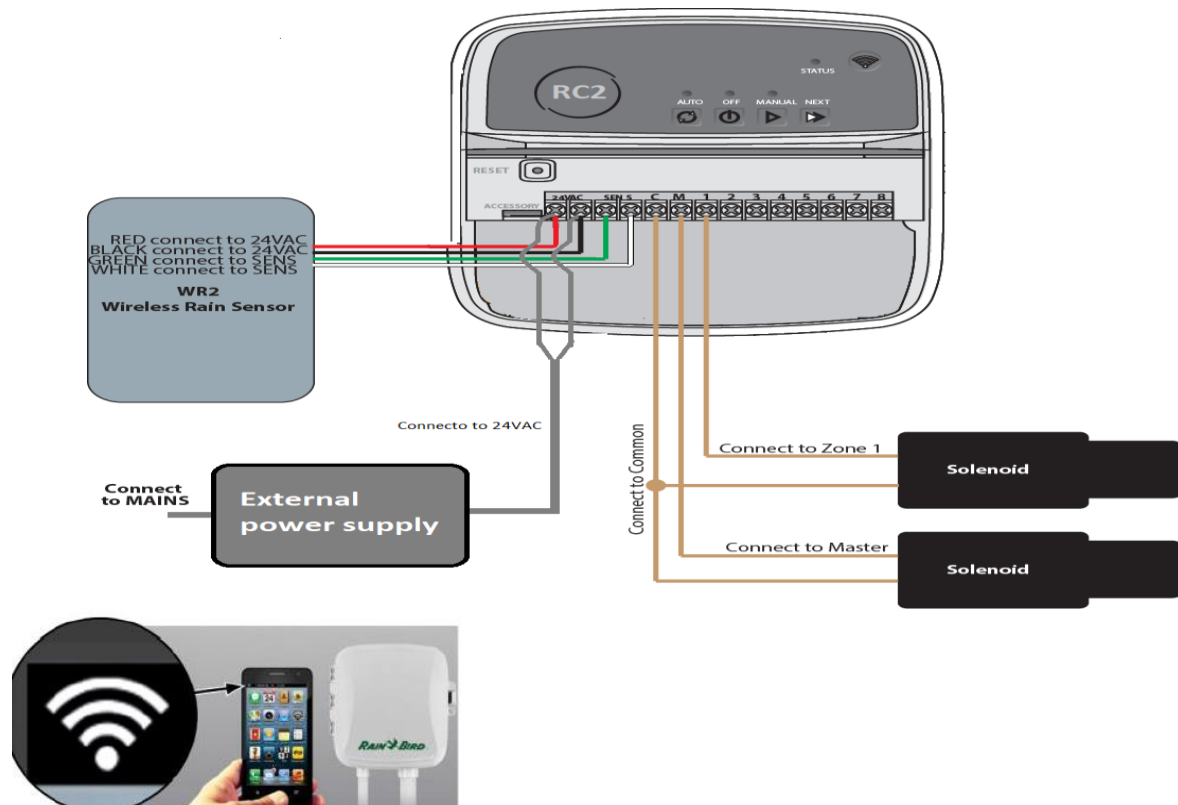
Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
1	AC Input Cable	1.5	None	None	AC Source to External Power Supply
2	AC Output Cable	2	None	None	External Power Supply to Control

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Solenoid	Rain Bird	G4 EZ	--
Wireless Rain Sensor	Rain Bird	WR2RFC868	--
Double-Ridged Horn	ETS Lindgren	3115	00031626
Spectrum Analyzer	Rohde & Schwarz	FSP40	100027
Smart Phone	Samsung	Galaxy Note 10	R58MA6TKDJB
Laptop	Dell	Latitude 5400	F39D2DD9-AC69-41C0-A654-73EE884E027D

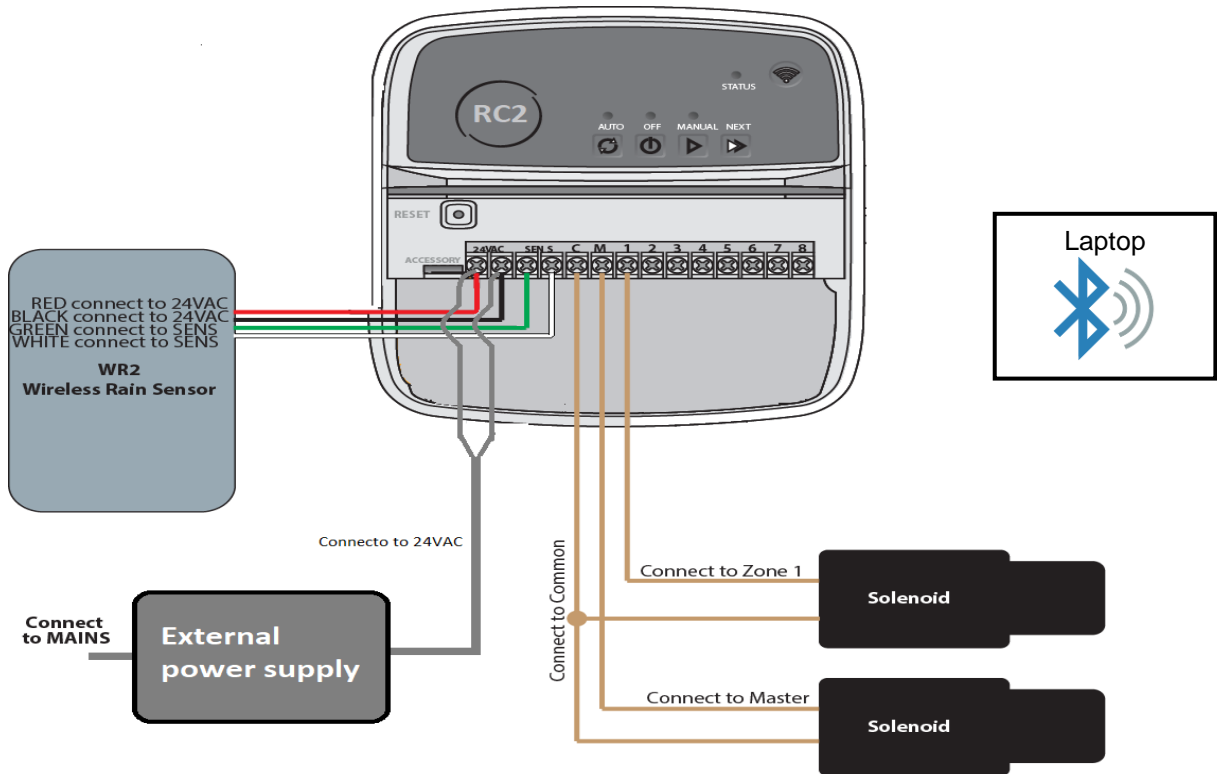
5.1 Method:

- Configuration as required by EN 61000-6-3, EN 55032, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11, EN 61000-3-2, EN 61000-3-3.

5.2 EUT Block Diagram: Wi-Fi



5.3 EUT Block Diagram: BLE



Notes: Laptop used USB hardware to program RC2 for Bluetooth Transmission.

5.4 EUT Performance Criteria and Monitoring:

Performance as required by EN 61000-6-1 clause 4.

A functional description and a definition of the equipment under test's (EUT) specific performance criteria, during or as a consequence of immunity testing, shall be provided by the manufacturer and noted in the test report. They shall be consistent with one of the following general criteria for each test as specified in Table 1 to Table 4:

- a) Performance criterion A: The EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. If the performance level is not specified by the manufacturer, this may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.
- b) Performance criterion B: The EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. However, during the test degradation of performance is allowed but no change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.
- c) Performance criterion C: Temporary loss of function is allowed during the test, provided the function is self-recoverable or can be restored by the operation of the controls.

If, as a result of the application of the tests defined in this standard, the EUT becomes dangerous or unsafe, it shall be deemed to have failed the test.

Compliance is based on the information above. However, the following criteria will be used to identify the performance of the EUT during testing.

- A) Zero Errors of any kind (no noticeable degradation in performance).
- B) Observed degradation of performance, but the EUT self recovers to pre-test condition, once disturbance is removed.
- C) Observed degradation of performance that requires operator intervention to recover to pre-test condition.

Performance as required by Clause 6.1 General performance criteria of ETSI EN 301-489-17

The performance criteria are:

- performance criteria A for immunity tests with phenomena of a continuous nature;
- performance criteria B for immunity tests with phenomena of a transient nature;
- performance criteria C for immunity tests with power interruptions exceeding a certain time.

Table 1: Performance criteria

Criteria	During Test	After Test
A	Shall operate as intended (see note 1) Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 3). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance (see note 2). Shall be no unintentional transmission.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3) Shall be no loss of stored data or user programmable functions.
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3).
<p>NOTE 1: Operate as intended during the test allows a level of degradation not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.</p> <p>NOTE 2: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.</p> <p>NOTE 3: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.</p>		

Product Specific Performance:

No.	Description
1	The EuT model RC218-230 is a programmable sprinkler control that activates and deactivates remotely located valves that supply water to irrigation zones of the lawn.

Description of how performance was observed during testing:

No.	Description
1	Monitor solenoids activation and LED indicators.
2	It is a failure if there is an interruption of output activation.
3	In standby mode, no unintentional transmitting events allowed. In this mode, the EUT performance was monitored by a spectrum analyzer connected to an antenna port. Spectrum Analyzer was set to the MAXHOLD mode at the EUT operating frequency and it was monitored for any unintentional transmission.
4	Visually observed the display on the spectrum analyzer if it is intentionally or unintentionally transmitting signals.
5	The wireless link of the EUT is monitored with antenna and spectrum analyzer for continuous activity.

6 Radiated Emissions

6.1 Method

Tests are performed in accordance with EN 55032 & CISPR 16-2-3.

TEST SITE: Lake Forest EMC Lab

3m ALSE: The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	U _{cispr}
Radiated Emissions, 3m	30-1000 MHz	4.2 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	5.1 dB	5.2 dB (FAR)
Radiated Emissions, 3m	6-18 GHz	5.5 dB	5.5 dB (FAR)

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 32 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + Correction Factor

FS = RA + AF + CF - AG

Where

FS = Field Strength in dB μ V/m

RA = Receiver Amplitude (including preamplifier) in dB μ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

Correction Factor = AF + CF - AG

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

RA = 52.0 dB μ V

AF = 7.4 dB/m

CF = 1.6 dB

AG = 29.0 dB

FS = 32 dB μ V/m

To convert from dB μ V to μ V or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
 NF = Net Reading in $dB\mu V$

Example:

$FS = RA + \text{Correction Factor}$
 $\text{Correction Factor} = AF + CF - AG = 7.4 + 1.6 - 29 = -20$
 $FS = 52.0 + (-20) = 32.0$
 $UF = 10^{(32 \text{ dB}\mu V / 20)} = 39.8 \mu V/m$

6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
001669	EMI Test Receiver	Rhode & Schwarz	ESW44	101636	06/17/2022	06/17/2023
001707	Broadband Hybrid Antenna 30MHz-6GHz	SunAR RF Motion	JB6	A110618	10/15/2021	10/15/2022
001518	RF Cable 30MHz-18GHz	Rohde & Schwarz	TSPR-B7	101529	01/11/2022	01/11/2023
001771	TSPR-B7; RF CABLE NP; 30 MHz To 18GHz	Rohde & Schwarz	TSPR-B7	101547	01/12/2022	01/12/2023
000637	EMC Emissions	Panashield	3m Chamber	250831-D-2	05/29/2021	05/29/2024
001576	Preamplifier 100kHz - 1 GHz	Rhode & Schwarz	TS-PR1	102068	01/12/2022	01/12/2023
001515	Horn Antenna 750MHz - 18GHz	ETS Lindgren	3115	00161631	05/17/2022	05/17/2023
001556	Preamplifier 1 - 18GHz	Rhode & Schwarz	TS-PR18	102144	01/12/2022	01/12/2023
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/0 920	10/22/2021	10/22/2022

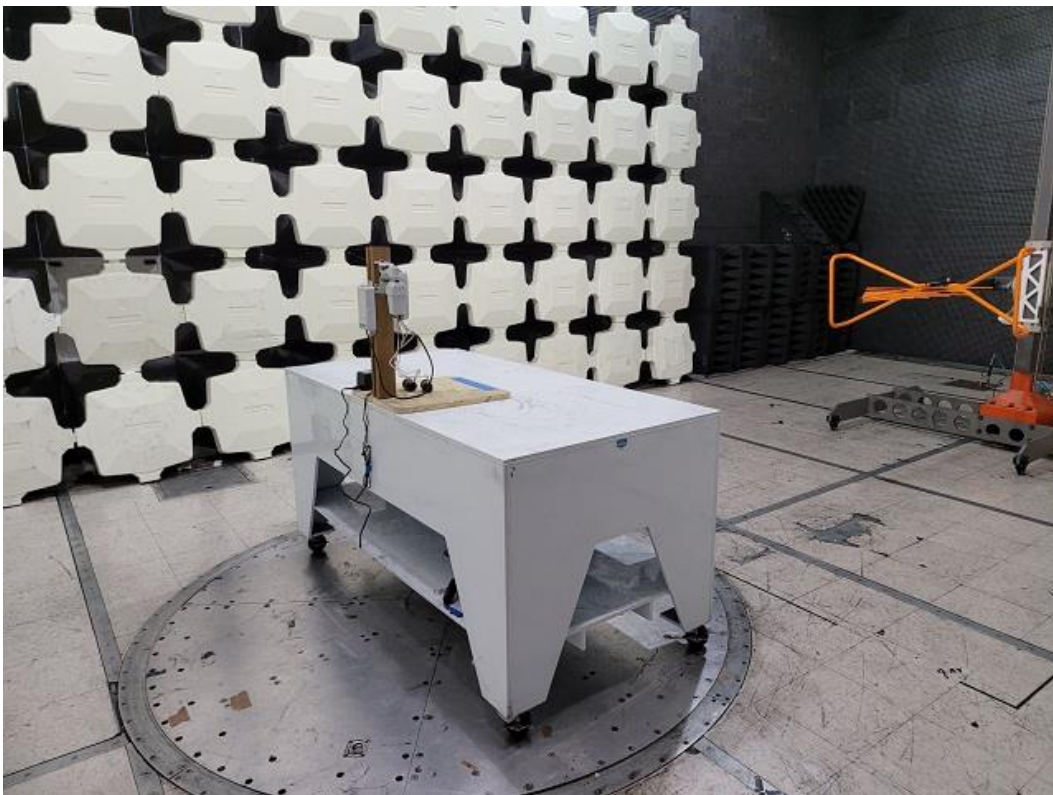
Software Utilized:

Name	Manufacturer	Version
BAT-EMC	NEXIO	Version 3.19.1.19

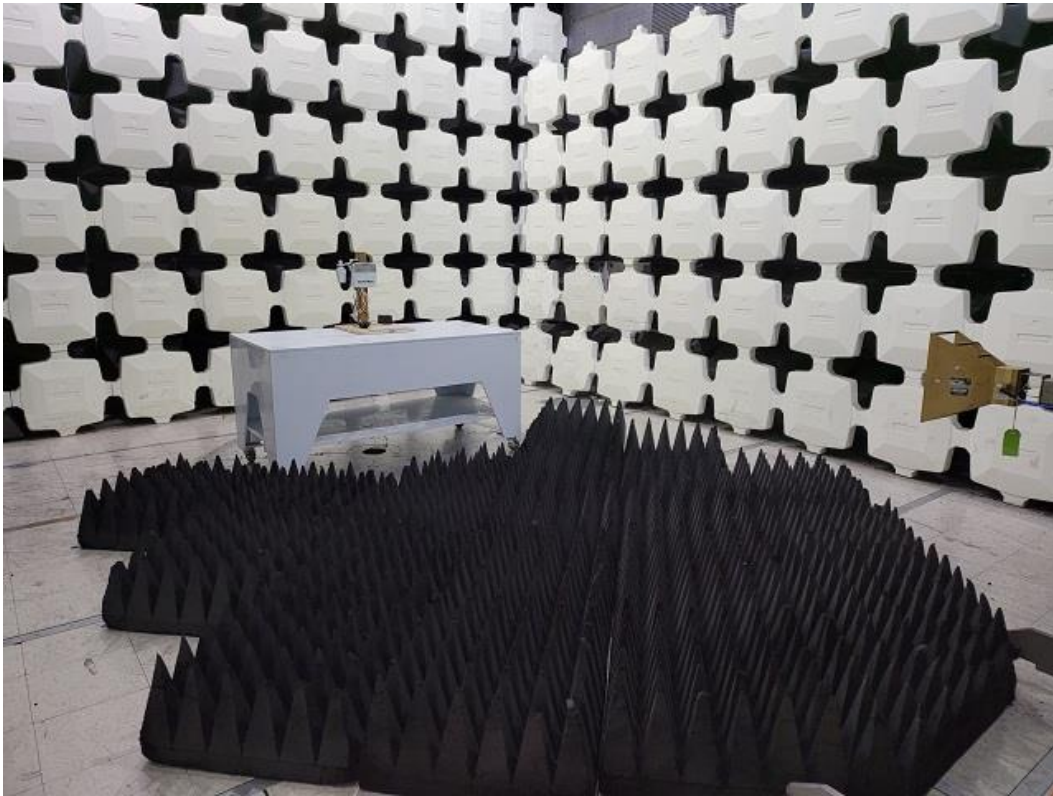
6.3 Results:

The sample tested was found to Comply.

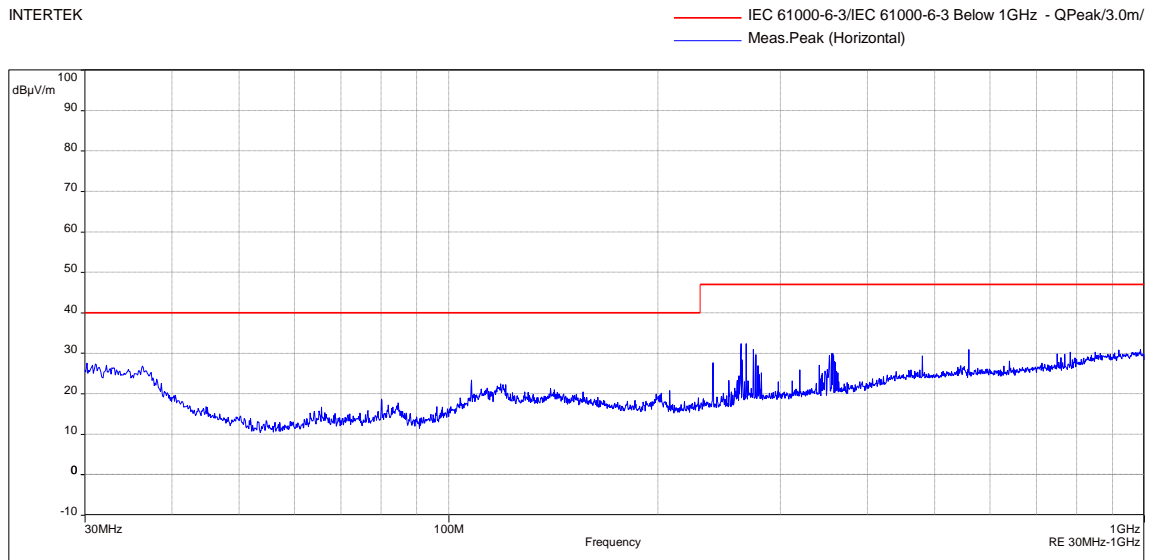
6.4 Setup Photographs:



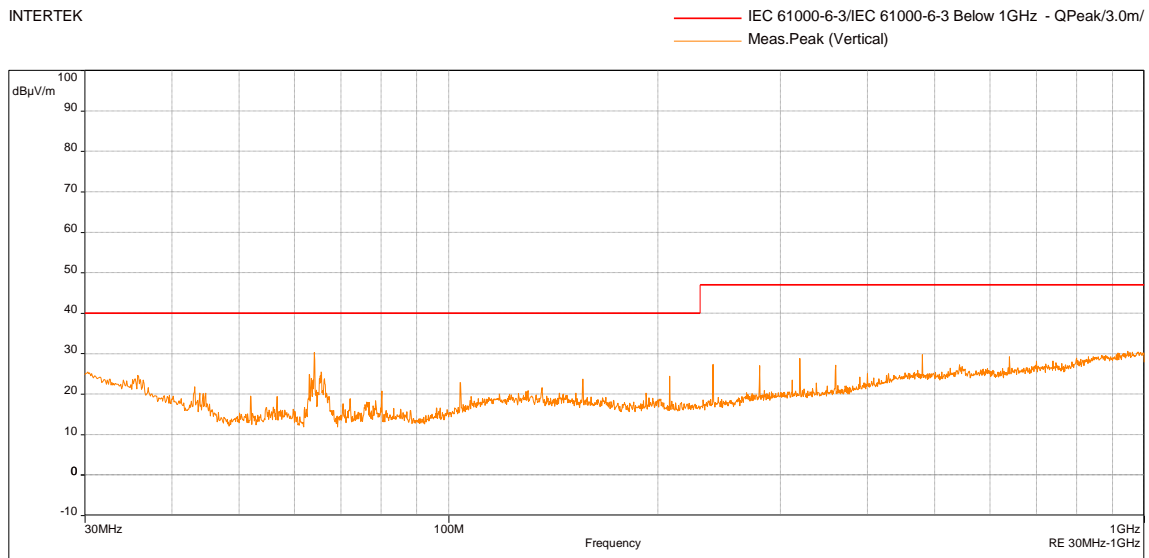
6.5 Setup Photographs:



6.6 Plots: WiFi Active



EN 61000-6-3 / EN 55032 - Radiated Emissions, Peak Scan Horizontal Polarization
@ 230VAC/50Hz



EN 61000-6-3 / EN 55032 - Radiated Emissions, Peak Scan Vertical Polarization
@ 230VAC/50Hz

6.7 Data: WiFi Active

Test Personnel: Peejar Ching
 Supervising/Reviewing Engineer:
 (Where Applicable) Melvin Sanchez

Test Date: 10/05/2022

Product Standard: EN 61000-6-3, ETSI EN 301 489-1, ETSI EN 301 489-17
 Input Voltage: 230VAC/50Hz

Limit Applied: Table 3, Clause 3.1 of EN 61000-6-3, EN 55032, Class B

Pretest Verification w/
 Ambient Signals or
 BB Source: BB Source

Ambient Temperature: 20.69 °C

Relative Humidity: 61 %
 Atmospheric Pressure: 991 mbars

EN 61000-6-3 / EN 55032, Radiated Emissions (Quasi Peak Horizontal)							
Frequency MHz	QP Level (dBuV)	Limit @ 3m dB(dBuV)	QP Margin (dB)	RA (dBuV)	Azimuth (°)	Height (m)	Correction Factor dB
30.194	16.49	40	-23.51	20.09	233.5	3.54	-3.6
263.382	8.09	47	-38.91	18.71	4.75	1.97	-10.62
267.747	8.56	47	-38.44	18.75	168	3.34	-10.19
274.343	9.16	47	-37.84	19.11	0	2.63	-9.95
560.008	26.86	47	-20.14	32.39	13.25	1.21	-5.53
987.002	18.76	47	-28.24	18.9	180	1.63	-0.14
Detectors/Bandwidths (Det/RBW/VBW)= 120kHz/500kHz							

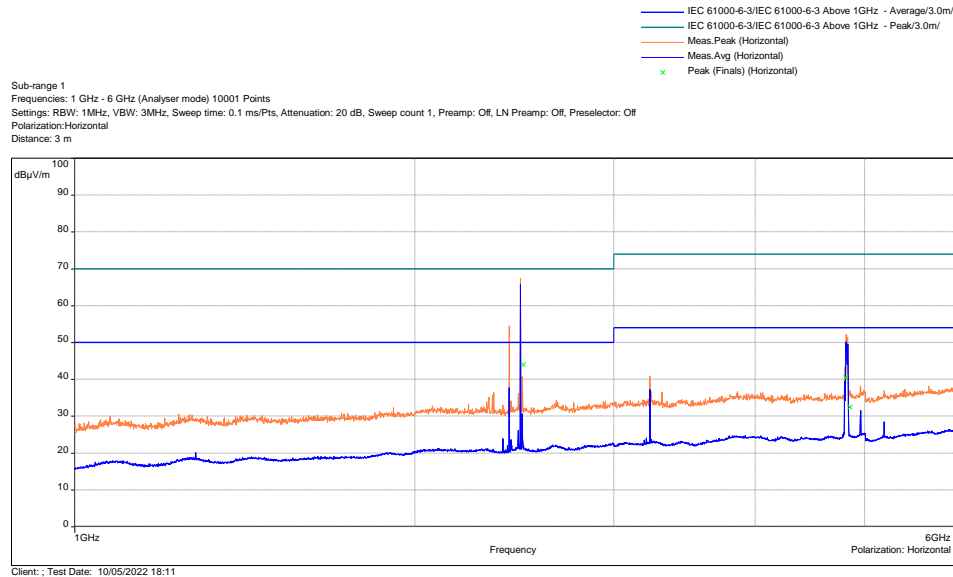
EN 61000-6-3 / EN 55032, Radiated Emissions (Quasi Peak Vertical)							
Frequency MHz	QP Level (dBuV)	Limit @ 3m dB(dBuV)	QP Margin (dB)	RA (dBuV)	Azimuth (°)	Height (m)	Correction Factor dB
30.291	17.2	40	-22.8	20.87	109	1.87	-3.67
63.077	15.97	40	-24.03	32.58	311.5	1.97	-16.61
64.144	17.89	40	-22.11	34.39	118	2.06	-16.5
65.599	20.67	40	-19.33	37.07	246.5	2.18	-16.4
156.003	21.45	40	-18.55	32.39	307.5	1	-10.94
*207.995	22.86	40	-17.14	35.77	163.5	1.82	-12.91
Detectors/Bandwidths (Det/RBW/VBW)= 120kHz/500kHz							

Note: Testing was performed at a distance of 3m. The radiated emission test limits are referred to 10m. Data obtained at closer distances are compared to the 10m limits in this report.

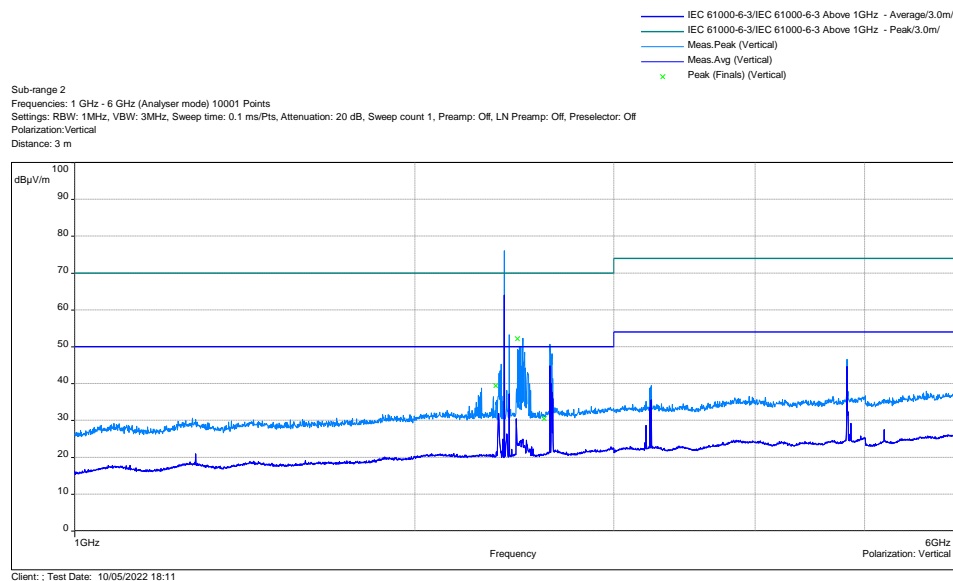
Test Result: (*) The **EUT PASSED** Radiated Emission test with – 17.14 dB margin at 207.995 MHz

Deviations, Additions, or Exclusions: None

6.8 Plots: WiFi Active



EN 61000-6-3 / EN 55032 - Radiated Emissions, Peak/AVE Scan Horizontal Polarization
@ 230VAC/50Hz - Above 1GHz



EN 61000-6-3 / EN 55032 - Radiated Emissions, Peak/AVE Scan Vertical Polarization
@ 230VAC/50Hz - Above 1GHz

Note: According to ETSI EN 301-489-17 Clause 4.3 Exclusion Bands: The frequencies on which the transmitter part of the EUT is intended to operate shall be excluded from radiated emission measurements.

6.9 Data: WiFi Active

Test Personnel: Peejar Ching
 Supervising/Reviewing Engineer:
 (Where Applicable) Melvin Sanchez

Test Date: 10/05/2022

Product Standard: EN 61000-6-3, ETSI EN 301 489-1, ETSI EN 301 489-17
 Input Voltage: 230VAC/50Hz

Limit Applied: Table 3 clause 3.4 of EN 61000-6-3, EN 55032, Class B

Pretest Verification w/
 Ambient Signals or
 BB Source: BB Source

Ambient Temperature: 20.69 °C

Relative Humidity: 61 %
 Atmospheric Pressure: 991 mbars

EN 61000-6-3 / EN 55032, Radiated Emission (Ave-Peak Horizontal)										
Frequency (MHz)	Av Level (dB)	Av Limit (dBµV/m)	Av Margin (dB)	Pk Level (dB)	Pk Limit (dBµV/m)	Pk Margin (dB)	Azimuth (°)	Height (m)	RA (dBµV)	CF (dB)
2494	17.36	50	-32.64	44.02	70	-25.98	356	2.54	35.48	-18.12
4811	20.28	54	-33.72	40.49	74	-33.51	15.75	1.55	32.53	-12.25
4854	18.85	54	-35.15	32.52	74	-41.48	309	1.95	31.08	-12.23
Detectors/Bandwidths (Det/RBW/VBW)= 1MHz/3MHz										

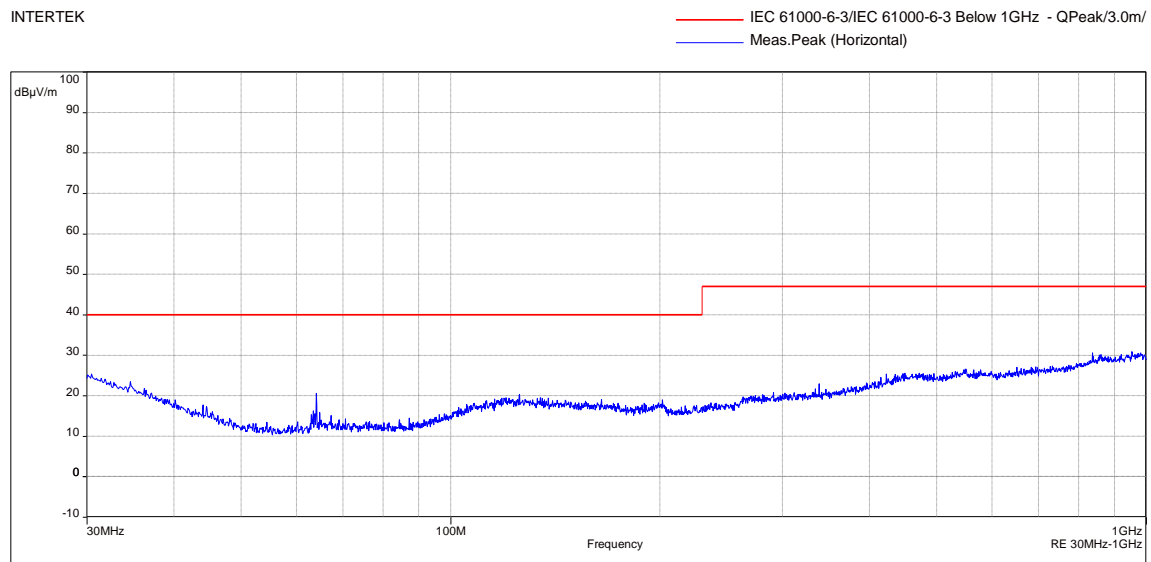
EN 61000-6-3 / EN 55032, Radiated Emissions (Ave-Peak Vertical)										
Frequency (MHz)	Av Level (dB)	Av Limit (dBµV/m)	Av Margin (dB)	Pk Level (dB)	Pk Limit (dBµV/m)	Pk Margin (dB)	Azimuth (°)	Height (m)	RA (dBµV)	CF (dB)
2358	16.61	50	-33.39	39.48	70	-30.52	280.25	1.17	34.82	-18.21
2602.5	16.15	50	-33.85	30.5	70	-39.5	359.25	2.41	33.56	-17.41
Detectors/Bandwidths (Det/RBW/VBW)= 1MHz/3MHz										

Test Result:

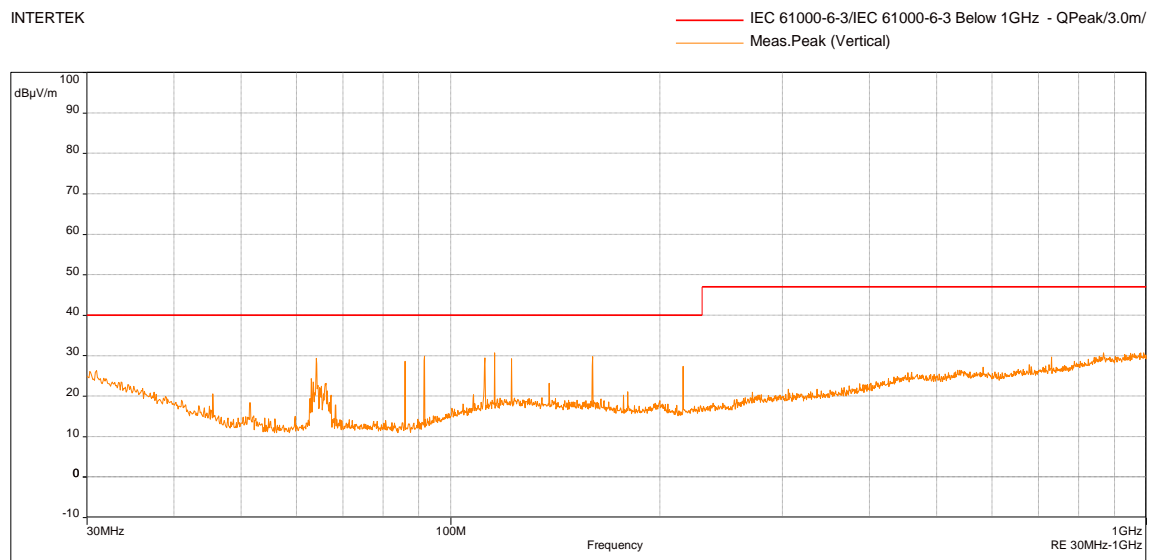
(*) The **EUT PASSED** Radiated Emission test with – 25.98 dB margin at 2494 MHz

Deviations, Additions, or Exclusions: None

6.10 Plots: Standby



EN 61000-6-3 / EN 55032 - Radiated Emissions, Peak Scan Horizontal Polarization
@ 230VAC/50Hz



EN 61000-6-3 / EN 55032 - Radiated Emissions, Peak Scan Vertical Polarization
@ 230VAC/50Hz

6.11 Data: Standby

Test Personnel: Peejar Ching
 Supervising/Reviewing Engineer:
 (Where Applicable) Melvin Sanchez

Test Date: 10/05/2022

Product Standard: EN 61000-6-3, ETSI EN 301 489-1, ETSI EN 301 489-17
 Input Voltage: 230VAC/50Hz
 Pretest Verification w/
 Ambient Signals or
 BB Source: BB Source

Limit Applied: Table 3, Clause 3.1 of EN 61000-6-3, EN 55032, Class B
 Ambient Temperature: 20.69 °C
 Relative Humidity: 61 %
 Atmospheric Pressure: 991 mbars

EN 61000-6-3 / EN 55032, Radiated Emissions (Quasi Peak Horizontal)							
Frequency MHz	QP Level (dBuV)	Limit @ 3m dB(dBuV)	QP Margin (dB)	RA (dBuV)	Azimuth (°)	Height (m)	Correction Factor dB
*30.485	16.09	40	-23.91	19.89	32	3.94	-3.8
64.144	7.27	40	-32.73	23.77	2.5	2	-16.5
125.642	9.13	40	-30.87	19.41	333	1.04	-10.28
953.44	18.38	47	-28.62	18.87	235	1.48	-0.49
Detectors/Bandwidths (Det/RBW/VBW)= 120kHz/500kHz							

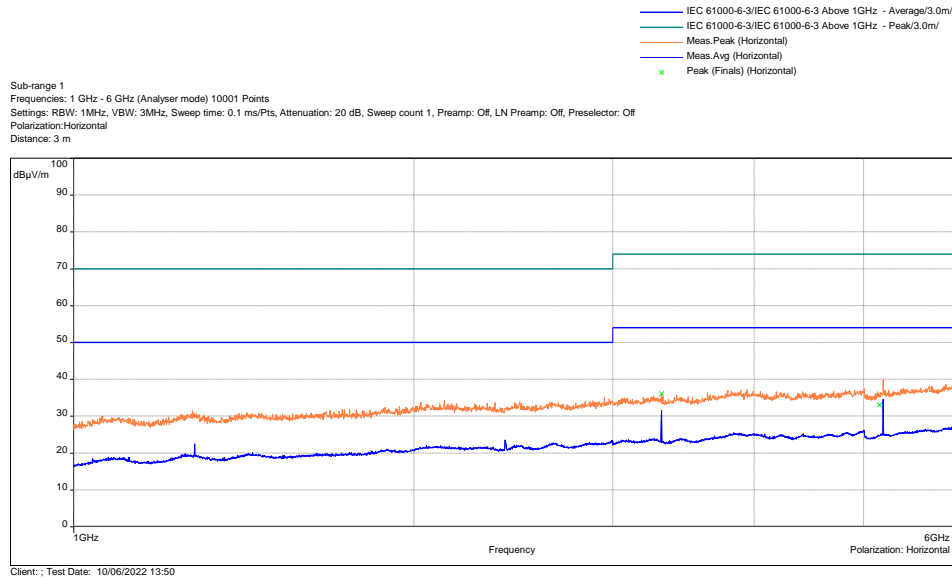
EN 61000-6-3 / EN 55032, Radiated Emissions (Quasi Peak Vertical)							
Frequency MHz	QP Level (dBuV)	Limit @ 3m dB(dBuV)	QP Margin (dB)	RA (dBuV)	Azimuth (°)	Height (m)	Correction Factor dB
64.144	13.38	40	-26.62	29.88	235.5	2.03	-16.5
91.692	4.08	40	-35.92	19.84	322.5	1.62	-15.76
111.965	8.39	40	-31.61	19.56	202	3.12	-11.17
115.748	8.69	40	-31.31	19.36	234.75	2.51	-10.67
122.344	9.15	40	-30.85	19.45	103.75	2.84	-10.3
159.98	8.71	40	-31.29	19.73	348.5	1.04	-11.02
Detectors/Bandwidths (Det/RBW/VBW)= 120kHz/500kHz							

Note: Testing was performed at a distance of 3m. The radiated emission test limits are referred to 10m. Data obtained at closer distances are compared to the 10m limits in this report.

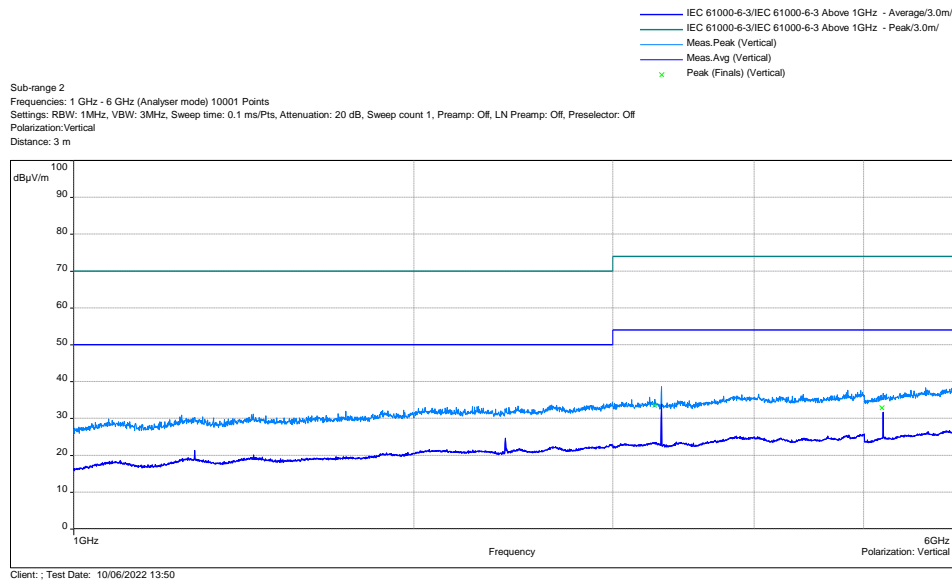
Test Result: (*) The **EUT PASSED** Radiated Emission test with – 23.91 dB margin at 30.485 MHz

Deviations, Additions, or Exclusions: None

6.12 Plots: Standby



EN 61000-6-3 / EN 55032 - Radiated Emissions, Peak/AVE Scan Horizontal Polarization
@ 230VAC/50Hz - Above 1GHz



EN 61000-6-3 / EN 55032 - Radiated Emissions, Peak/AVE Scan Vertical Polarization
@ 230VAC/50Hz - Above 1GHz

6.13 Data: Standby

Test Personnel: Peejar Ching
 Supervising/Reviewing Engineer:
 (Where Applicable) Melvin Sanchez

Test Date: 10/05/2022

Product Standard: EN 61000-6-3, ETSI EN 301 489-1, ETSI EN 301 489-17
 Input Voltage: 230VAC/50Hz

Limit Applied: Table 3 clause 3.4 of EN 61000-6-3, EN 55032, Class B

Pretest Verification w/
 Ambient Signals or
 BB Source: BB Source

Ambient Temperature: 20.69 °C

Relative Humidity: 61 %
 Atmospheric Pressure: 991 mbars

EN 61000-6-3 / EN 55032, Radiated Emission (Ave-Peak Horizontal)										
Frequency (MHz)	Av Level (dB)	Av Limit (dBµV/m)	Av Margin (dB)	Pk Level (dB)	Pk Limit (dBµV/m)	Pk Margin (dB)	Azimuth (°)	Height (m)	RA (dBµV)	CF (dB)
*3312	28.09	54	-25.91	36.11	74	-37.89	169	1.17	42.99	-14.9
5163.5	20.26	54	-33.74	33.07	74	-40.93	132.5	3.69	31.63	-11.37
Detectors/Bandwidths (Det/RBW/VBW)= 1MHz/3MHz										

EN 61000-6-3 / EN 55032, Radiated Emissions (Ave-Peak Vertical)										
Frequency (MHz)	Av Level (dB)	Av Limit (dBµV/m)	Av Margin (dB)	Pk Level (dB)	Pk Limit (dBµV/m)	Pk Margin (dB)	Azimuth (°)	Height (m)	RA (dBµV)	CF (dB)
3267	19.57	54	-34.43	33.53	74	-40.47	114	1.9	34.61	-15.04
5190.5	19.79	54	-34.21	32.94	74	-41.06	59.75	1.95	31.02	-11.23
Detectors/Bandwidths (Det/RBW/VBW)= 1MHz/3MHz										

Test Result:

(*) The **EUT PASSED** Radiated Emission test with – 25.91 dB margin at 33.12 MHz

Deviations, Additions, or Exclusions: None

7 AC Mains Conducted Emissions

7.1 Method

Tests are performed in accordance with EN 55032 & CISPR 16-2-1.

TEST SITE: Lake Forest EMC Lab

3m ALSE: The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucisp
AC Line Conducted Emissions	150 kHz - 30 MHz	2.8 dB	3.4 dB
Telco Port Emissions	150 kHz - 30 MHz	2.8 dB	5.0 dB

As shown in the table above our conducted emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 32 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculations

The following is how net line-conducted readings were determined:

$$NF = RF + LF + CF + AF$$

Where NF = Net Reading in dB μ V

RF = Reading from receiver in dB μ V

LF = LISN or ISN Correction Factor in dB

CF = Cable Correction Factor in dB

AF = Attenuator Loss Factor in dB

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where } UF = \text{Net Reading in } \mu\text{V}$$

NF = Net Reading in dB μ V

Example:

$$NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 \text{ dB}\mu\text{V}$$

$$UF = 10^{(49.1 \text{ dB}\mu\text{V} / 20)} = 285.1 \mu\text{V/m}$$

7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
001140	EMI Test Receiver	Rohde & Schwarz	ESC17	100825	03/29/2022	03/29/2023
001999	LISN	Rohde & Schwarz	ENV216	101450	01/11/2022	01/11/2023
001842	Cable	Fairview Microwave	FMC0101223 -360	NA	01/11/2022	01/11/2023
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/09 20	10/22/2021	10/22/2022

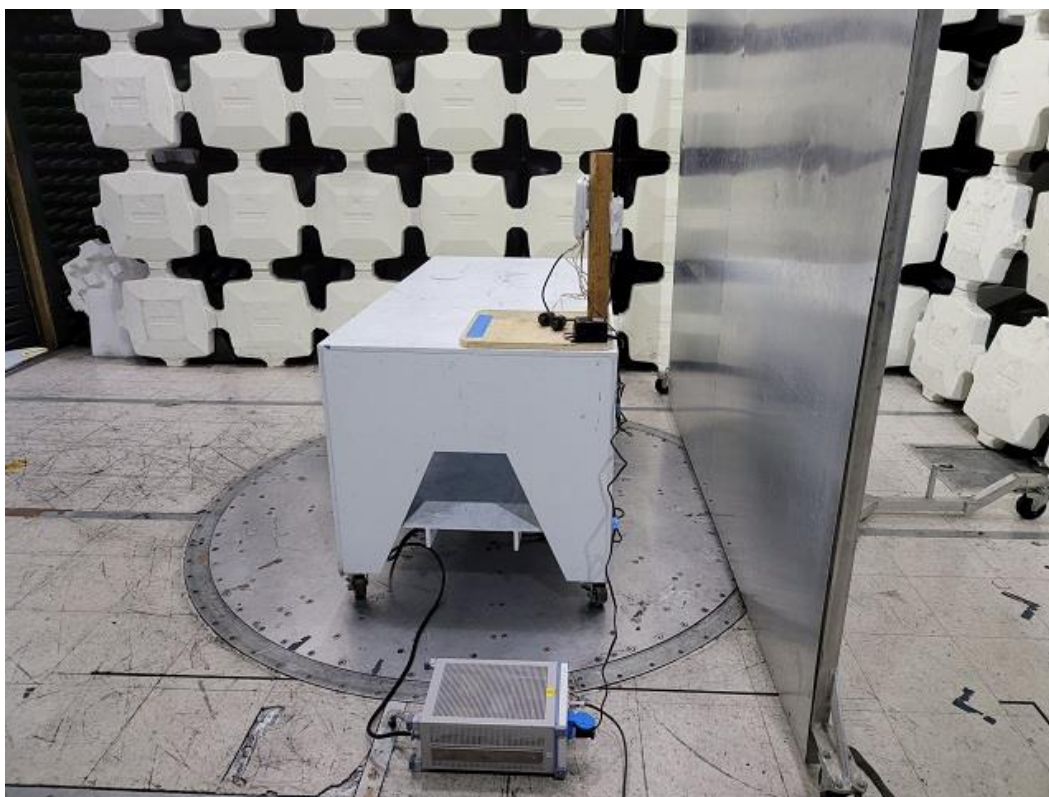
Software Utilized:

Name	Manufacturer	Version
BAT-EMC	NEXIO	Version 3.19.1.19

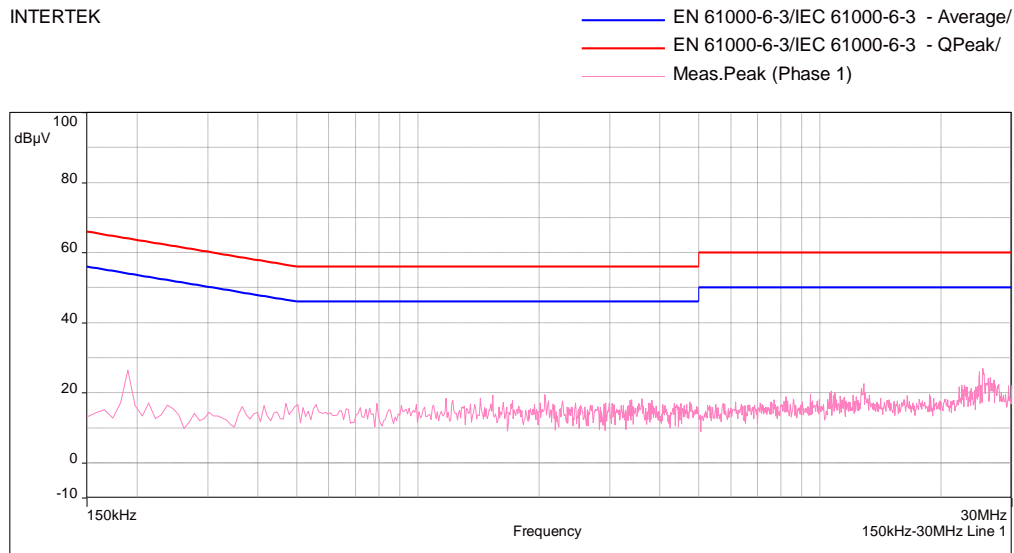
7.3 Results:

The sample tested was found to Comply.

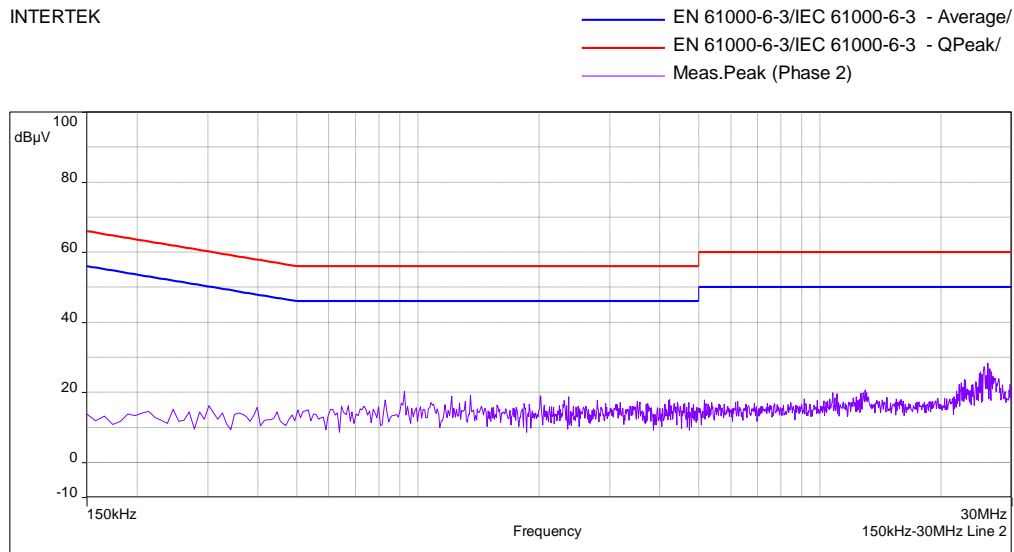
7.4 Setup Photographs:



7.5 Plots: WiFi Active



EN 61000-6-3 / EN 55032 - Conducted Emissions Peak Scan - Line 1 @ 230VAC/50Hz



EN 61000-6-3 / EN 55032 - Conducted Emissions Peak Scan - Line 2 @ 230VAC/50Hz

7.6 Data: WiFi Active

Test Personnel: Peejar Ching
 Supervising/Reviewing Engineer:
 (Where Applicable) Melvin Sanchez

Test Date: 10/05/2022

Product Standard: EN 61000-6-3, ETSI EN 301 489-1, ETSI EN 301 489-17
 Input Voltage: 230VAC/50Hz

Limit Applied: Table 4, Clause 4.3 of EN 61000-6-3, EN 55032, Class B

Pretest Verification w/
 Ambient Signals or
 BB Source: BB Source

Ambient Temperature: 20.69 °C

Relative Humidity: 61 %
 Atmospheric Pressure: 991 mbars

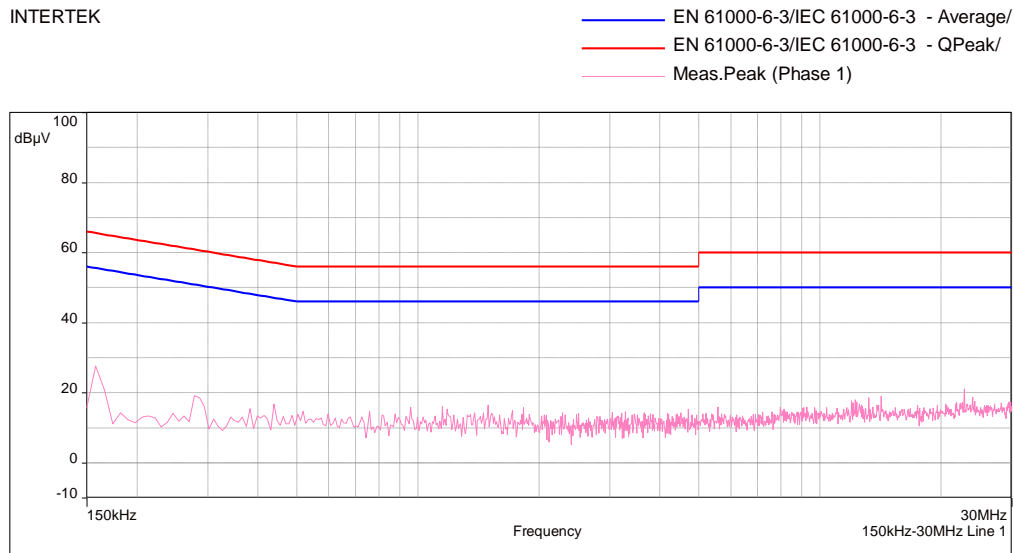
EN 61000-6-3 / EN 55032, Conducted Emissions (Line 1)							
Frequency (MHz)	Av Level (dBμV)	QP Level (dBμV)	Av Limit (dBμV)	QP Limit (dBμV)	Av Margin (dB)	QP Margin (dB)	Correction Factor (dB)
10.66619	5.92	15.12	50	60	-44.08	-44.88	9.61
12.08127	4.52	12.68	50	60	-45.48	-47.32	9.61
12.85767	14.65	19.44	50	60	-35.35	-40.56	9.61
18.7511	2.89	9.74	50	60	-47.11	-50.26	9.59
22.56654	8.62	17.36	50	60	-41.38	-42.64	9.54
25.39658	13.42	23.49	50	60	-36.58	-36.51	9.52
Detectors/Bandwidths (Det/RBW/VBW) = 9/30kHz							

EN 61000-6-3 / EN 55032, Conducted Emissions (Line 2)							
Frequency (MHz)	Av Level (dBμV)	QP Level (dBμV)	Av Limit (dBμV)	QP Limit (dBμV)	Av Margin (dB)	QP Margin (dB)	Correction Factor (dB)
1.396781	1.84	8.06	46	56	-44.16	-47.94	9.53
2.32606	2.41	8.62	46	56	-43.59	-47.38	9.53
10.77508	4.91	13.59	50	60	-45.09	-46.41	9.61
12.93584	11.82	15.71	50	60	-38.18	-44.29	9.62
22.8897	11.68	19.98	50	60	-38.32	-40.02	9.63
*26.15979	14.71	24.75	50	60	-35.29	-35.25	9.64
Detectors/Bandwidths (Det/RBW/VBW) = 9/30kHz							

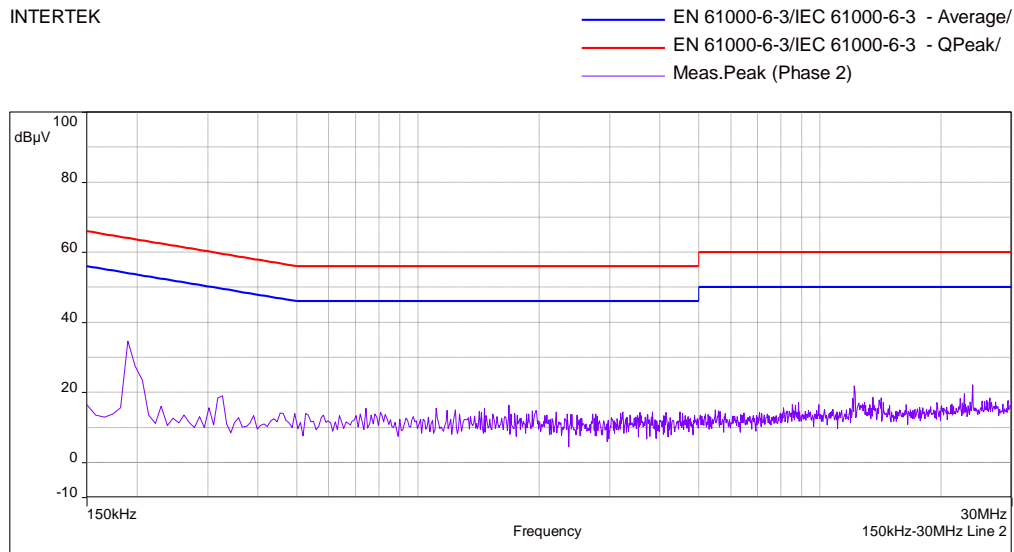
Test Result: (*) The **EUT PASSED** Conducted Emission test with – 35.29 dB margin at 26.15979 MHz

Deviations, Additions, or Exclusions: None

7.7 Plots: Standby



EN 61000-6-3 / EN 55032 - Conducted Emissions Peak Scan - Line 1 @ 230VAC/50Hz



EN 61000-6-3 / EN 55032 - Conducted Emissions Peak Scan - Line 2 @ 230VAC/50Hz

7.8 Data: Standby

Test Personnel: Peejar Ching
 Supervising/Reviewing Engineer:
 (Where Applicable) Melvin Sanchez

Test Date: 10/05/2022

Product Standard: EN 61000-6-3, ETSI EN 301 489-1, ETSI EN 301 489-17
 Input Voltage: 230VAC/50Hz

Limit Applied: Table 4, Clause 4.3 of EN 61000-6-3, EN 55032, Class B

Pretest Verification w/
 Ambient Signals or
 BB Source: BB Source

Ambient Temperature: 20.69 °C

Relative Humidity: 61 %
 Atmospheric Pressure: 991 mbars

EN 61000-6-3 / EN 55032, Conducted Emissions (Line 1)							
Frequency (MHz)	Av Level (dBµV)	QP Level (dBµV)	Av Limit (dBµV)	QP Limit (dBµV)	Av Margin (dB)	QP Margin (dB)	Correction Factor (dB)
1.497493	5.51	8.33	46	56	-40.49	-47.67	9.74
1.813448	5.59	8.7	46	56	-40.41	-47.3	9.77
4.681782	4.96	9.41	46	56	-41.04	-46.59	9.97
7.949254	5.29	9.78	50	60	-44.71	-50.22	10.15
13.22985	5.97	11.24	50	60	-44.03	-48.76	10.32
22.87073	7.73	12.37	50	60	-42.27	-47.63	10.5
Detectors/Bandwidths (Det/RBW/VBW) = 9/30kHz							

EN 61000-6-3 / EN 55032, Conducted Emissions (Line 2)							
Frequency (MHz)	Av Level (dBµV)	QP Level (dBµV)	Av Limit (dBµV)	QP Limit (dBµV)	Av Margin (dB)	QP Margin (dB)	Correction Factor (dB)
*0.15	17.83	35.52	56	66	-38.17	-30.48	9.57
1.420527	5.46	8.31	46	56	-40.54	-47.69	9.72
1.717467	5.54	8.59	46	56	-40.46	-47.41	9.75
12.18016	7.04	15.39	50	60	-42.96	-44.61	10.3
14.15368	6.6	12.69	50	60	-43.4	-47.31	10.37
24.05883	6.77	11.42	50	60	-43.23	-48.58	10.61
Detectors/Bandwidths (Det/RBW/VBW) = 9/30kHz							

Test Result:

(*) The **EUT PASSED** Conducted Emission test with – 38.17 dB margin at 0.15 MHz

Deviations, Additions, or Exclusions: None

8 Harmonics

8.1 Method

Tests are performed in accordance with EN 61000-3-2.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

Measurement Uncertainty

Measurement	Parameter	Expanded Uncertainty (k=2)	Permitted Error
Harmonics	Current	0.34 %	±5.0%

As shown in the table above our Expanded Measurement Uncertainty for harmonic current U_{lab} is less than the corresponding measurement error allowed by IEC61000-3-2 and IEC61000-4-7, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required. There are currently no U_{CISPR} reference values in CISPR 16 for Harmonics.

8.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
000898	Power Source	TESEQ	5001X-CTS-208-411-	1337A01349 (1)	01/13/2022	01/13/2023
000899	Power Conditioner	TESEQ	CTS (CCN-1000-1)	1337A01349 (2)	01/13/2022	01/13/2023
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/0920	10/22/2021	10/22/2022

Software Utilized:

Name	Manufacturer	Version
WIN2100	TESEQ	V.4.9.0

8.3 Results:

The sample tested was found to Comply.

8.4 Setup Photographs:



8.5 Plots/Data:**Harmonics – Class-A per Ed. 4.0 (2014)(Run time)**

EUT: RC2

Tested by: P.Ching

Test category: Class-A per Ed. 4.0 (2014) (European limits)

Test Margin: 100

Test date: 10/4/2022

Start time: 6:08:24 PM

End time: 6:18:46 PM

Test duration (min): 10

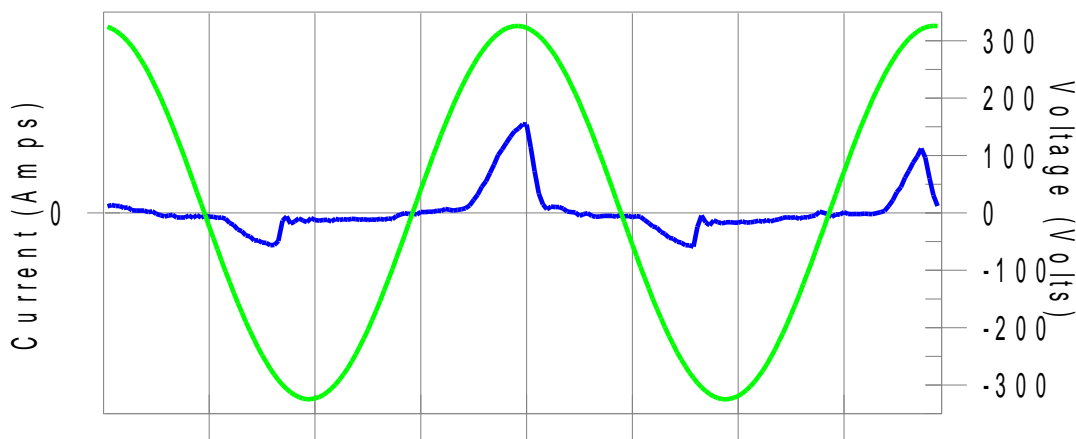
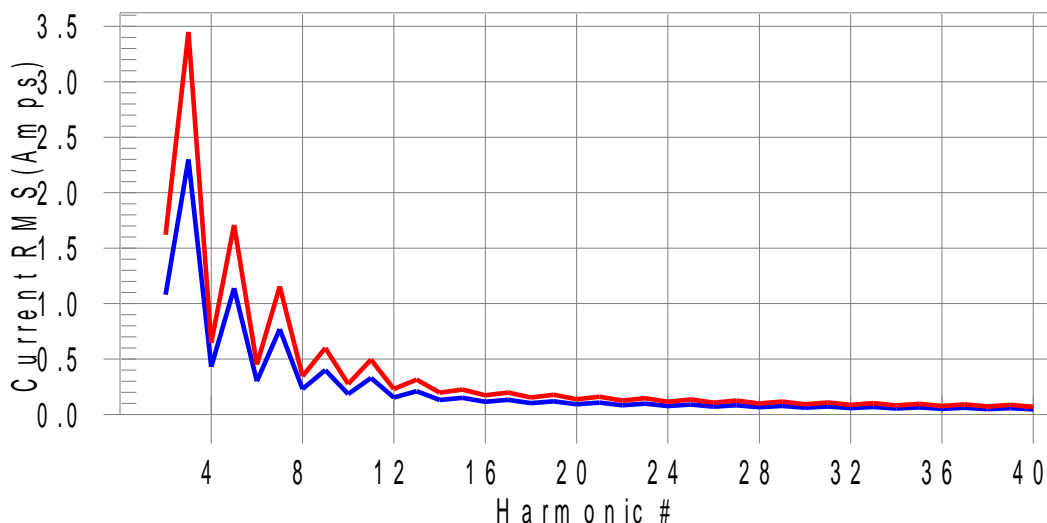
Data file name: H-000504.cts_data

Comment: Active

Customer: Rain Bird

Test Result: Pass

Source qualification: Normal

Current & voltage waveforms**Harmonics and Class A limit line****European Limits****Test result: Pass Worst harmonic was #4 with 0.8% of the limit.**

Current Test Result Summary (Run time)

EUT: RC2

Tested by: P.Ching

Test category: Class-A per Ed. 4.0 (2014) (European limits)

Test Margin: 100

Test date: 10/4/2022

Start time: 6:08:24 PM

End time: 6:18:46 PM

Test duration (min): 10

Data file name: H-000504.cts_data

Comment: Active

Customer: Rain Bird

Test Result: Pass

Source qualification: Normal

THC(A): 0.011

I-THD(%): 88.5

POHC(A): 0.000

POHC Limit(A): 0.251

Highest parameter values during test:

V_RMS (Volts): 230.20

Frequency(Hz): 50.00

I_Peak (Amps): 0.090

I_RMS (Amps): 0.020

I_Fund (Amps): 0.013

Crest Factor: 5.019

Power (Watts): 2.7

Power Factor: 0.708

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.004	1.080	N/A	0.004	1.620	N/A	Pass
3	0.005	2.300	0.2	0.005	3.450	0.2	Pass
4	0.005	0.430	1.2	0.005	0.645	0.8	Pass
5	0.003	1.140	N/A	0.003	1.710	N/A	Pass
6	0.004	0.300	N/A	0.004	0.450	N/A	Pass
7	0.002	0.770	N/A	0.002	1.155	N/A	Pass
8	0.003	0.230	N/A	0.003	0.345	N/A	Pass
9	0.001	0.400	N/A	0.001	0.600	N/A	Pass
10	0.002	0.184	N/A	0.002	0.276	N/A	Pass
11	0.001	0.330	N/A	0.001	0.495	N/A	Pass
12	0.001	0.153	N/A	0.001	0.230	N/A	Pass
13	0.001	0.210	N/A	0.001	0.315	N/A	Pass
14	0.001	0.131	N/A	0.001	0.197	N/A	Pass
15	0.001	0.150	N/A	0.001	0.225	N/A	Pass
16	0.000	0.115	N/A	0.000	0.173	N/A	Pass
17	0.001	0.132	N/A	0.001	0.198	N/A	Pass
18	0.000	0.102	N/A	0.000	0.153	N/A	Pass
19	0.001	0.118	N/A	0.001	0.178	N/A	Pass
20	0.000	0.092	N/A	0.000	0.138	N/A	Pass
21	0.001	0.107	N/A	0.001	0.161	N/A	Pass
22	0.000	0.084	N/A	0.000	0.125	N/A	Pass
23	0.000	0.098	N/A	0.000	0.147	N/A	Pass
24	0.000	0.077	N/A	0.001	0.115	N/A	Pass
25	0.000	0.090	N/A	0.000	0.135	N/A	Pass
26	0.000	0.071	N/A	0.000	0.107	N/A	Pass
27	0.000	0.083	N/A	0.000	0.125	N/A	Pass
28	0.000	0.066	N/A	0.001	0.099	N/A	Pass
29	0.000	0.078	N/A	0.000	0.116	N/A	Pass
30	0.000	0.061	N/A	0.000	0.092	N/A	Pass
31	0.000	0.073	N/A	0.000	0.109	N/A	Pass
32	0.000	0.058	N/A	0.000	0.086	N/A	Pass
33	0.000	0.068	N/A	0.000	0.102	N/A	Pass
34	0.000	0.054	N/A	0.000	0.081	N/A	Pass
35	0.000	0.064	N/A	0.000	0.096	N/A	Pass
36	0.000	0.051	N/A	0.000	0.077	N/A	Pass
37	0.000	0.061	N/A	0.000	0.091	N/A	Pass
38	0.000	0.048	N/A	0.000	0.073	N/A	Pass
39	0.000	0.058	N/A	0.000	0.087	N/A	Pass
40	0.000	0.046	N/A	0.000	0.069	N/A	Pass

Voltage Source Verification Data (Run time)

EUT: RC2

Tested by: P.Ching

Test category: Class-A per Ed. 4.0 (2014) (European limits)

Test Margin: 100

Test date: 10/4/2022

Start time: 6:08:24 PM

End time: 6:18:46 PM

Test duration (min): 10

Data file name: H-000504.cts_data

Comment: Active

Customer: Rain Bird

Test Result: Pass

Source qualification: Normal

Highest parameter values during test:

Voltage (Vrms): 230.20

Frequency(Hz): 50.00

I_Peak (Amps): 0.090

I_RMS (Amps): 0.020

I_Fund (Amps): 0.013

Crest Factor: 5.019

Power (Watts): 2.7

Power Factor: 0.708

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.055	0.460	12.02	OK
3	0.424	2.072	20.45	OK
4	0.031	0.460	6.84	OK
5	0.042	0.921	4.59	OK
6	0.023	0.460	5.08	OK
7	0.024	0.691	3.51	OK
8	0.012	0.460	2.61	OK
9	0.009	0.460	2.06	OK
10	0.006	0.460	1.31	OK
11	0.005	0.230	2.23	OK
12	0.010	0.230	4.51	OK
13	0.007	0.230	2.86	OK
14	0.006	0.230	2.55	OK
15	0.008	0.230	3.68	OK
16	0.006	0.230	2.82	OK
17	0.003	0.230	1.40	OK
18	0.009	0.230	4.07	OK
19	0.007	0.230	2.88	OK
20	0.025	0.230	10.92	OK
21	0.007	0.230	2.97	OK
22	0.004	0.230	1.70	OK
23	0.004	0.230	1.83	OK
24	0.005	0.230	2.06	OK
25	0.003	0.230	1.16	OK
26	0.003	0.230	1.11	OK
27	0.006	0.230	2.46	OK
28	0.005	0.230	1.96	OK
29	0.006	0.230	2.70	OK
30	0.005	0.230	1.96	OK
31	0.003	0.230	1.13	OK
32	0.002	0.230	1.03	OK
33	0.002	0.230	1.02	OK
34	0.003	0.230	1.10	OK
35	0.004	0.230	1.78	OK
36	0.002	0.230	0.96	OK
37	0.003	0.230	1.34	OK
38	0.003	0.230	1.18	OK
39	0.005	0.230	2.16	OK
40	0.015	0.230	6.36	OK

9 Flicker

9.1 Method

Tests are performed in accordance with EN 61000-3-3.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

Measurement Uncertainty

Measurement	Parameter	Expanded Uncertainty (k=2)	Permitted Error
Flicker	Pst	1.6 %	±8.0%
Flicker	dc	0.59 %	±8.0%

As shown in the table above our Expanded Measurement Uncertainty for Pst and dc U_{lab} is less than the corresponding measurement error allowed by IEC 61000-3-3, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required. There are currently no U_{CISPR} reference values in CISPR 16 for Flicker.

9.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
000898	Power Source	TESEQ	5001X-CTS-208-411-	1337A01349 (1)	01/13/2022	01/13/2023
000899	Power Conditioner	TESEQ	CTS (CCN-1000-1)	1337A01349 (2)	01/13/2022	01/13/2023
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/0920	10/22/2021	10/22/2022

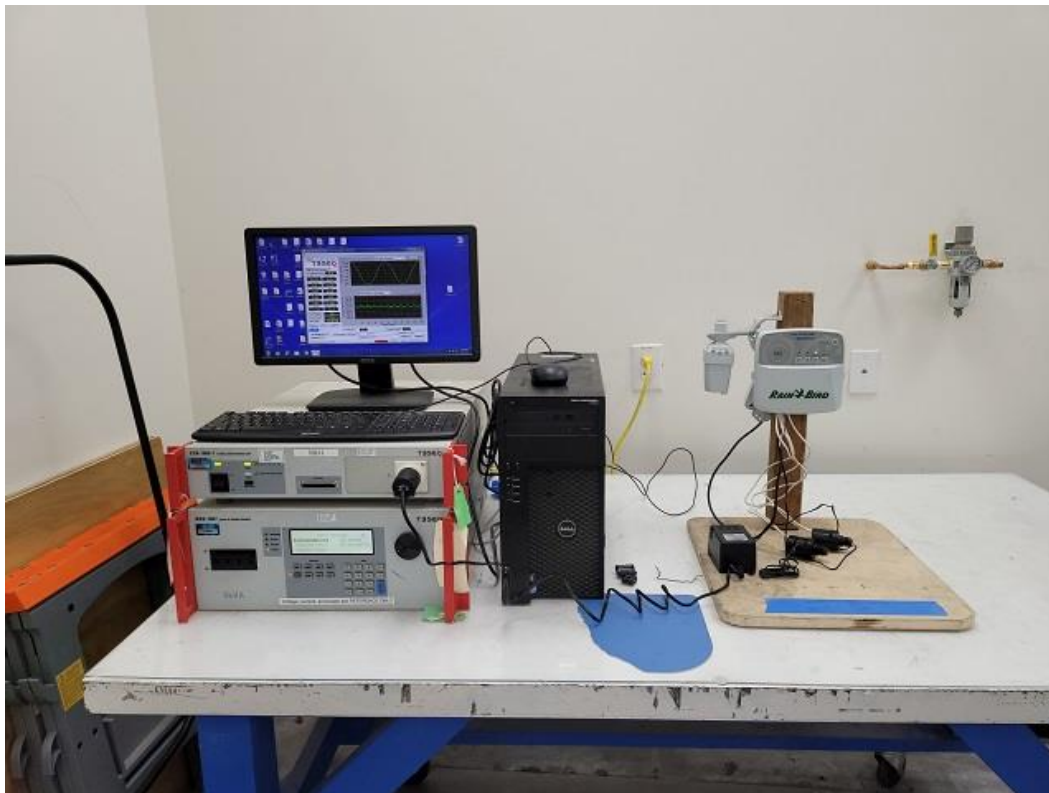
Software Utilized:

Name	Manufacturer	Version
WIN2100	TESEQ	V.4.9.0

9.3 Results:

The sample tested was found to Comply.

9.4 Setup Photographs:



9.5 Plots/Data:

Flicker Test Summary per EN/IEC61000-3-3 Ed. 3.0 (2013) (Run time)

EUT: RC2

Tested by: P,Ching

Test category: All parameters (European limits)

Test Margin: 100

Test date: 10/4/2022

Start time: 4:04:08 PM

End time: 6:06:19 PM

Test duration (min): 120

Data file name: F-000503.cts_data

Comment: Active

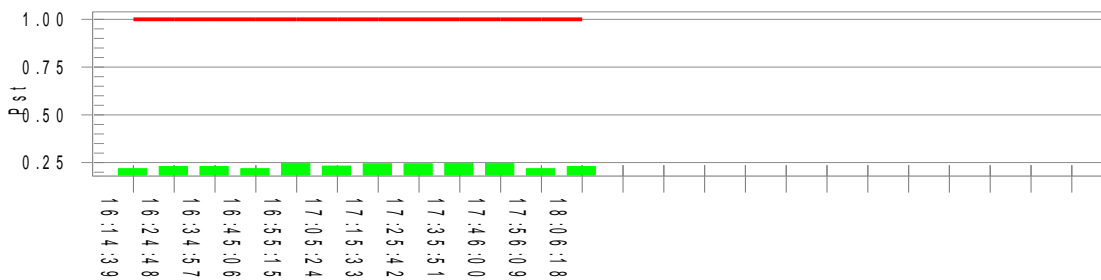
Customer: Rain Bird

Test Result: Pass

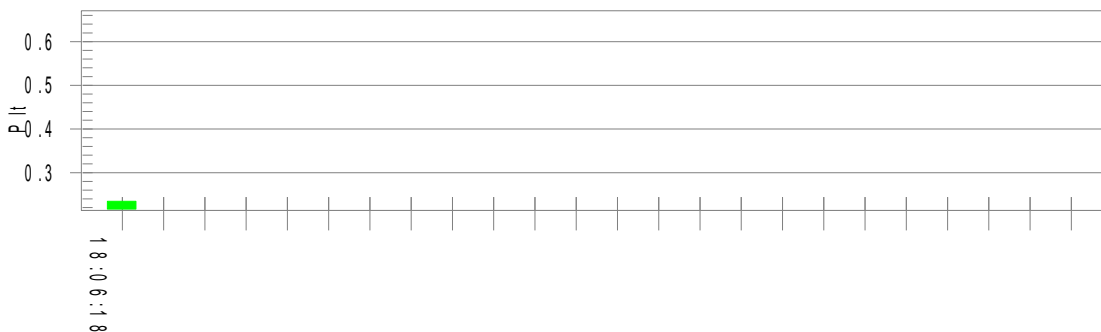
Status: Test Completed

Pst_t and limit line

European Limits



Plt and limit line

**Parameter values recorded during the test:**

Vrms at the end of test (Volt): 230.44

Highest dt (%): 0.00

T-max (mS): 0

Highest dc (%): 0.00

Highest dmax (%): 0.12

Highest Pst (10 min. period): 0.247

Highest Plt (2 hr. period): 0.234

Test limit (%): N/A N/A

Test limit (mS): 500.0 Pass

Test limit (%): 3.30 Pass

Test limit (%): 4.00 Pass

Test limit: 1.000 Pass

Test limit: 0.650 Pass

10 Electrostatic Discharge Immunity Test

10.1 Method

Tests are performed in accordance with EN 61000-4-2.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

10.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
002212	ESD Simulator	EMC Partner	ESD3000	2182	01/13/2022	01/13/2023
001516	Vertical Ground Plane (ESD)	Intertek	N/A	none	VBV	VBV
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/09 20	10/22/2021	10/22/2022

*VBV: Verified Before Used

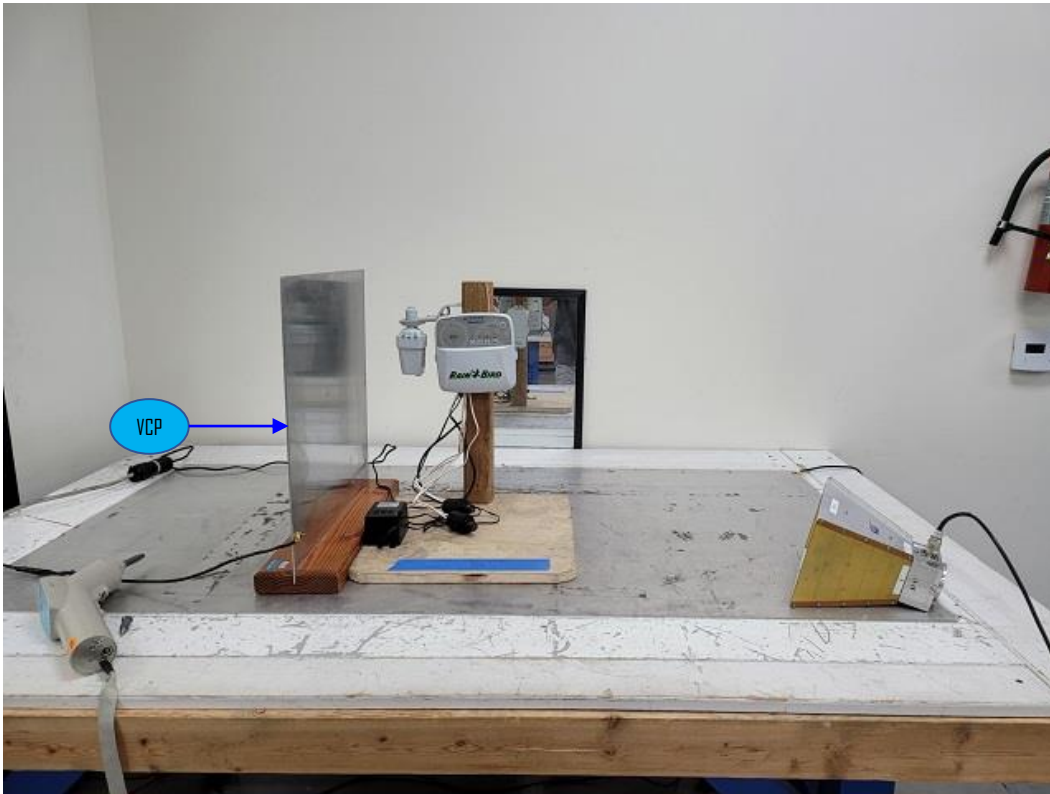
Software Utilized:

Name	Manufacturer	Version
None	N/A	N/A

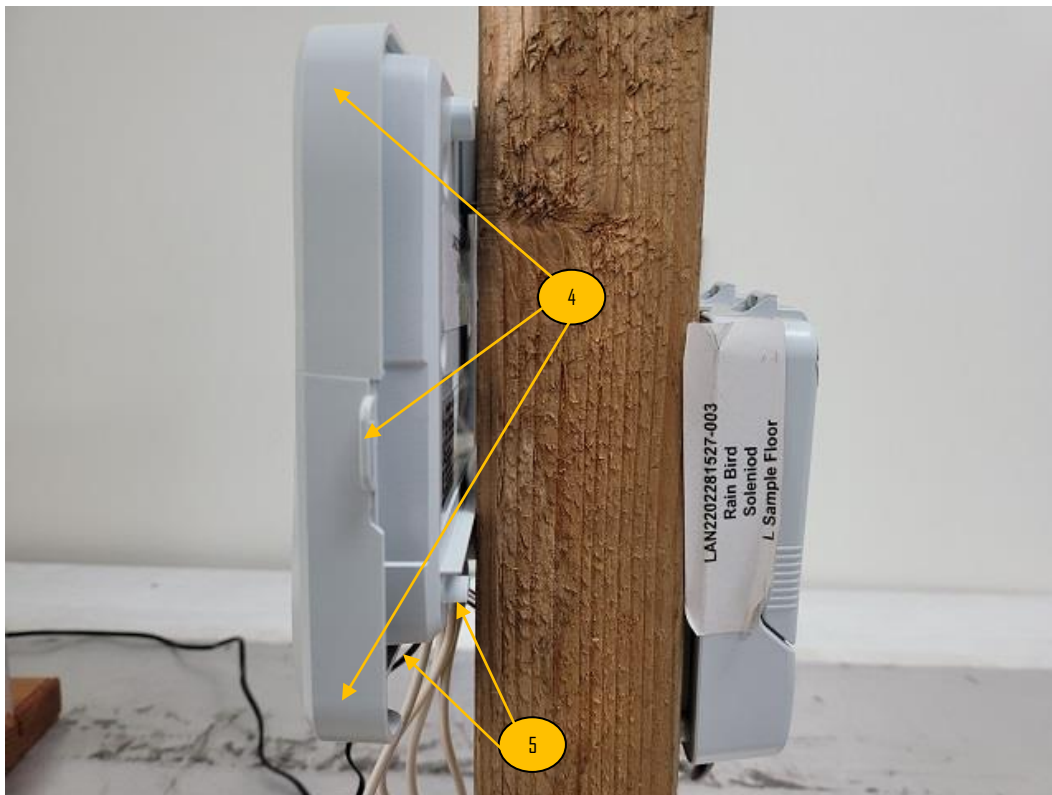
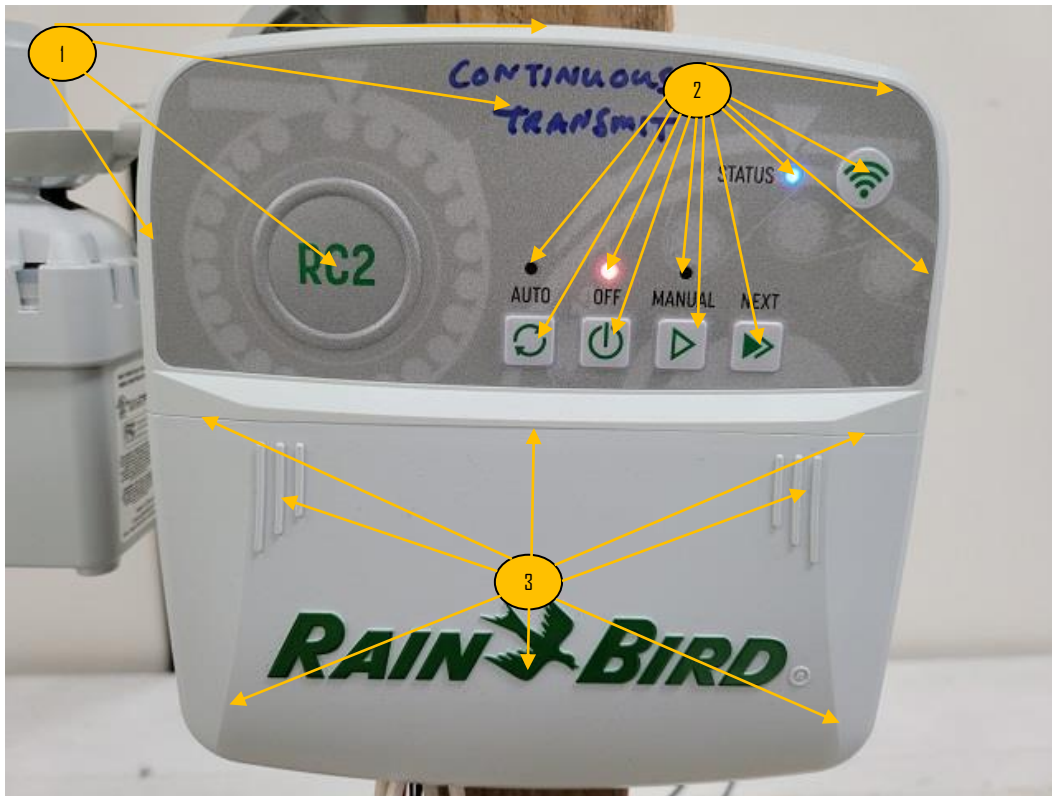
10.3 Results:

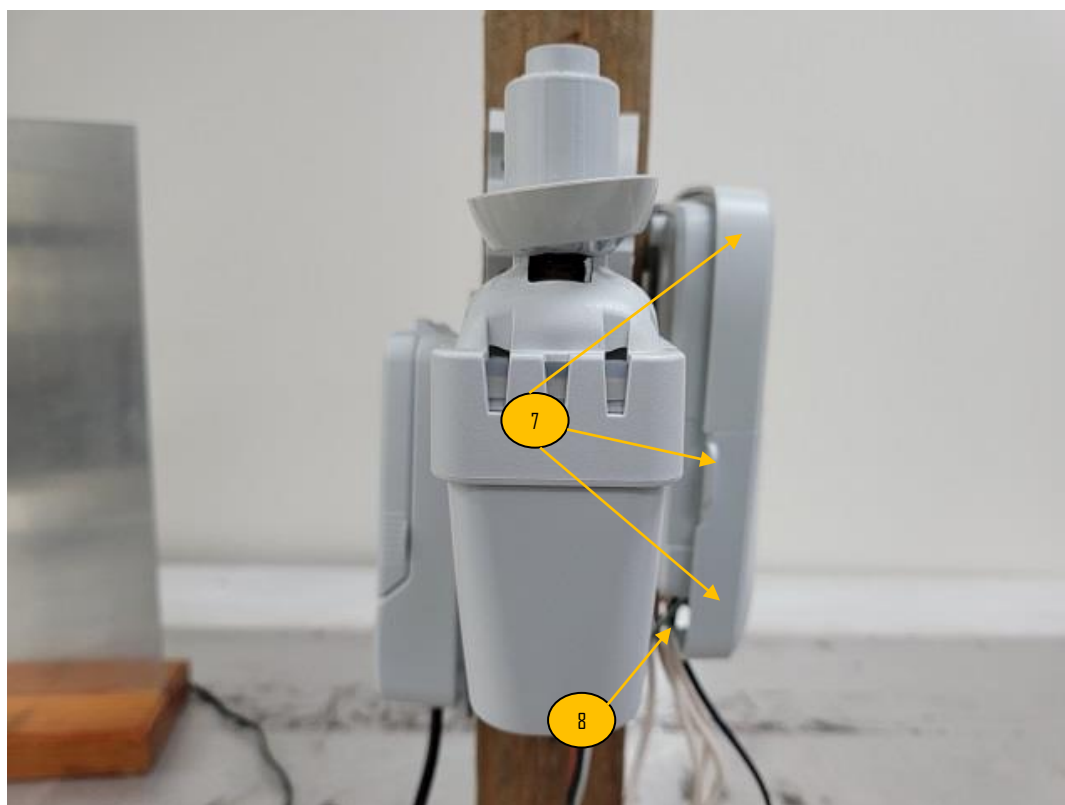
The sample tested was found to Comply.

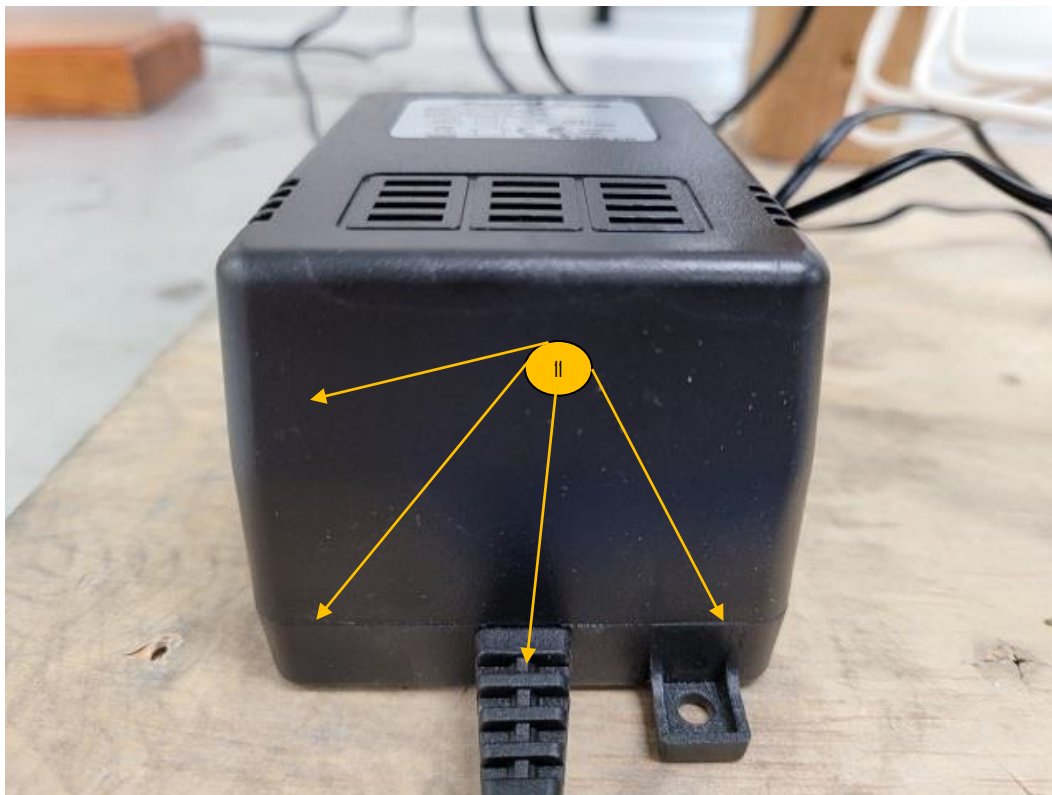
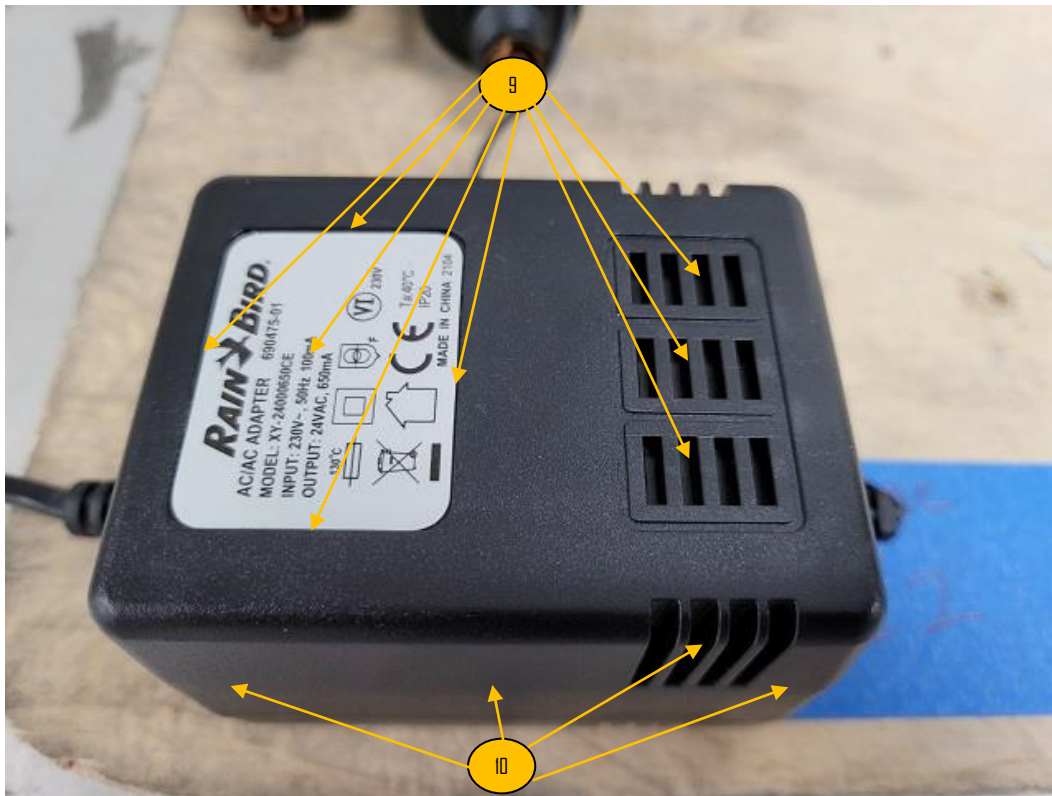
10.4 Setup Photographs:

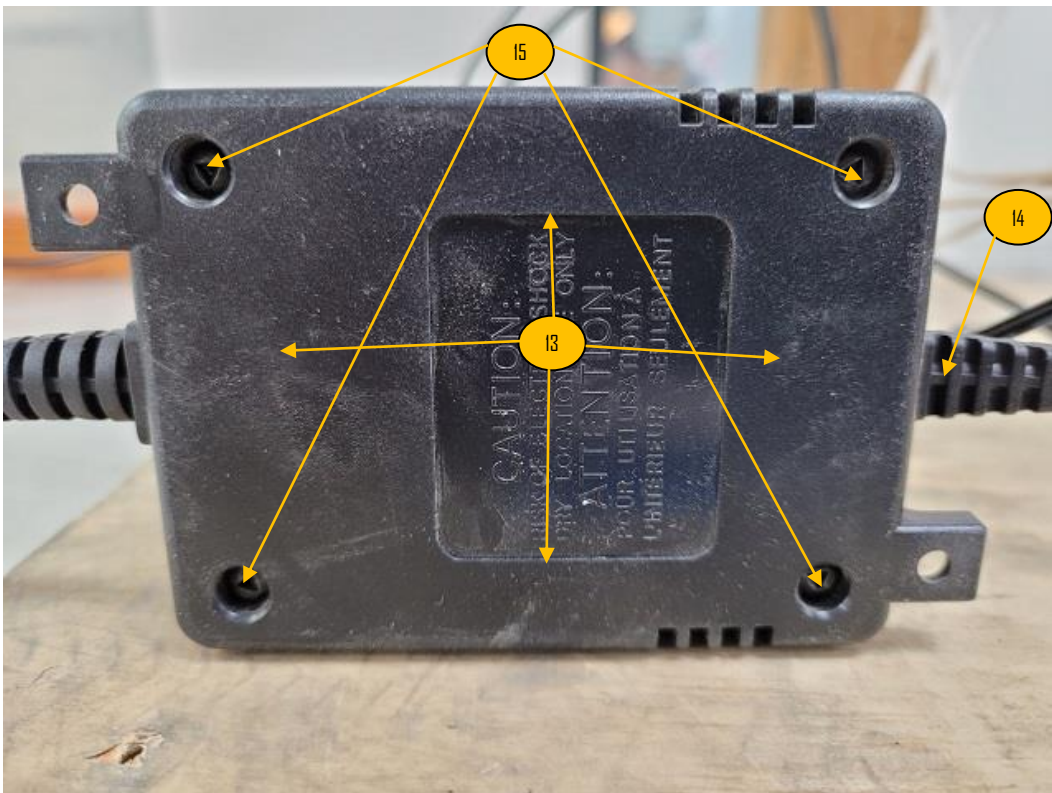
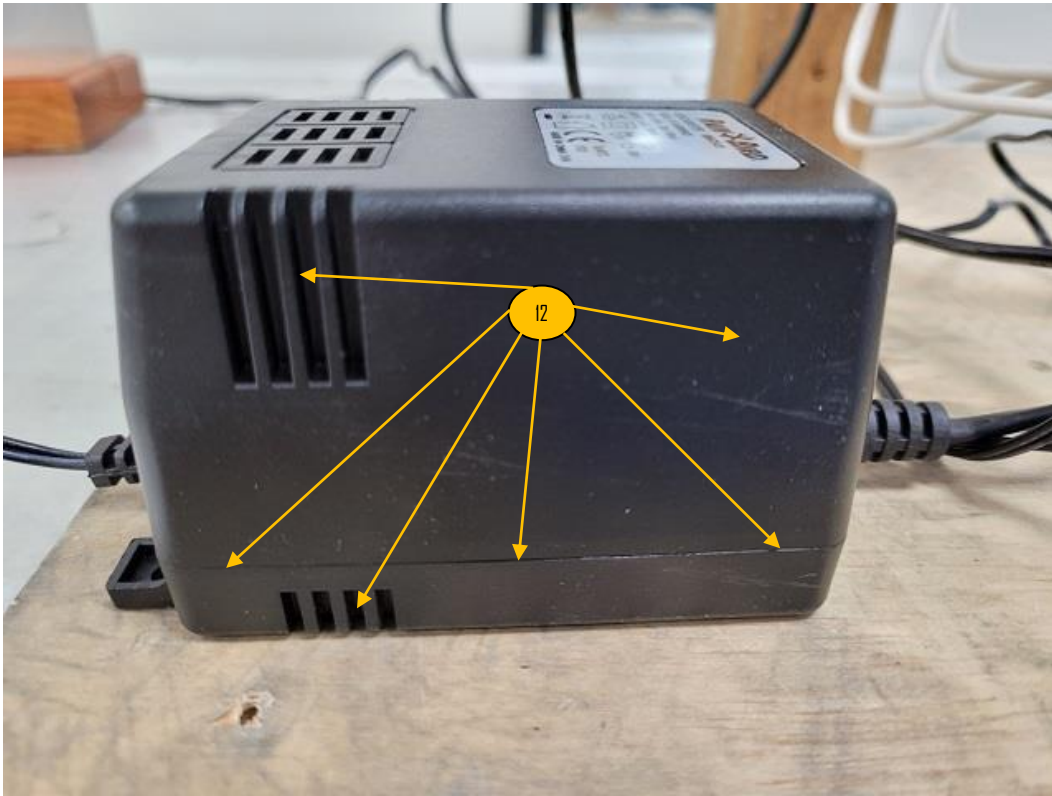


10.5 ESD Test Points:



10.6 ESD Test Points:

10.7 ESD Test Points:

10.8 ESD Test Points:

10.9 Data: WiFi Active & Standby

Test Personnel:	Peejar Ching	Test Date:	10/13/2022
Supervising/Reviewing Engineer:			
(Where Applicable)	Melvin Sanchez	Required Performance:	B
Product Standard:	EN 61000-6-1, ETSI EN 301 489-1, ETSI EN 301 489-17	Test Levels:	See Table Below
Input Voltage:	230VAC/50Hz	Ambient Temperature:	21.59 °C
Sparked Verified on VCP:	Yes	Relative Humidity:	56.8 %
470k x 2 Strap(s) Verified:	940kΩ	Atmospheric Pressure:	992 mbars

Test Point	Discharge Voltage Type	Test Voltages, Polarities and Result Classification												
		2 kV		4 kV		6 kV		8 kV			15 kV		___ kV	
		Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg		Pos	Neg	Pos	Neg
HCP	Contact			(A)	(A)					Air Discharges only above 8 kV				
VCP	Contact			(A)	(A)									
1	Air	(A)	(A)	(A)	(A)			(A)	(A)					
2	Air	(A)	(A)	(A)	(A)			(A)	(A)					
3	Air	(A)	(A)	(A)	(A)			(A)	(A)					
4	Air	(A)	(A)	(A)	(A)			(A)	(A)					
5	Air	(A)	(A)	(A)	(A)			(A)	(A)					
6	Air	(A)	(A)	(A)	(A)			(A)	(A)					
7	Air	(A)	(A)	(A)	(A)			(A)	(A)					
8	Air	(A)	(A)	(A)	(A)			(A)	(A)					
9	Air	(A)	(A)	(A)	(A)			(A)	(A)					
10	Air	(A)	(A)	(A)	(A)			(A)	(A)					
11	Air	(A)	(A)	(A)	(A)			(A)	(A)					
12	Air	(A)	(A)	(A)	(A)			(A)	(A)					
13	Air	(A)	(A)	(A)	(A)			(A)	(A)					
14	Air	(A)	(A)	(A)	(A)			(A)	(A)					
15	Air	(A)	(A)	(A)	(A)			(A)	(A)					

Notes:

(A) The EUT met the requirements without any degradation of performance.

Criteria	During Test	After Test
A	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ May show degradation of performance (Note 1) ➤ Shall be no loss of function ➤ Shall be no unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ Shall be no degradation of performance (Note 1) ➤ Shall be no loss function ➤ Shall be no loss of stored data or user programmable functions
B	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) ➤ May show degradation of performance (Note 1) ➤ No unintentional transmissions 	<ul style="list-style-type: none"> ➤ Functions shall be self-recoverable ➤ Shall operate as intended after recovering ➤ Shall be no loss of stored data or user programmable functions
C	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) 	<ul style="list-style-type: none"> ➤ Functions shall be recoverable by the operator ➤ Shall operate as intended after recovering ➤ Shall be no degradation of performance (Note 1)
Note 1: Degradation of performance during the test is understood as degradation to a level not below a minimum performance level specified by the manufacturer.		

Deviations, Additions, or Exclusions: None

11 Radiated, radio-frequency, electromagnetic field immunity test

11.1 Method

Tests are performed in accordance with EN 61000-4-3.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

11.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
Rental	High Frequency Antenna	AR	ATR80M6G	0464504	VBU	VBU
001573	Power Meter Dual Channel	Frankonia	PMS 1084	1081298/2015	01/13/2022	01/13/2023
001519	Signal Generator 9kHz - 6GHz	Rohde & Schwarz	SMA 100A	100593	01/11/2022	01/11/2023
001571	Dual Directional Coupler 80 -1000MHz	Verlatone	C3908-22	107868	01/11/2022	01/11/2023
001572	Coupler 690 - 6000 Mhz 400 WATTS 42 dB	Ophir	CUP00293	none	01/11/2022	01/11/2023
001510	Radiated Immunity RF Cable	Megaphase	TM8-N1N1-120-2	15015302001	VBU	VBU
001574	7/16 Din Cable Male - Male	Fairview Microwave	FMC1515405-36	None	VBU	VBU
001509	Radiated Immunity RF Cable	Megaphase	TM8-N1N1-72-2	15015301001	VBU	VBU
001513	Immunity Cable	Megaphase	TM8-N1N1-72-2	15023801002	VBU	VBU
000638	Radiated Immunity	Unknown	Chamber	None	VBU	VBU
001569	Amplifier 0.8 - 6.0GHz	Ophir	5200526	1002/1544	VBU	VBU
001570	Amplifier 80 - 1000MHz	Ophir	5200525	1001/1539	VBU	VBU
001374	6 meter low loss cable	A.H. Systems Inc.	SAC-26G-6	320	01/15/2020	VBU
001010	Field Monitor	ETS Lindgren	FM 5004	00128845	VBU	VBU
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/0920	10/22/2021	10/22/2022

*VBU: Verified Before Used

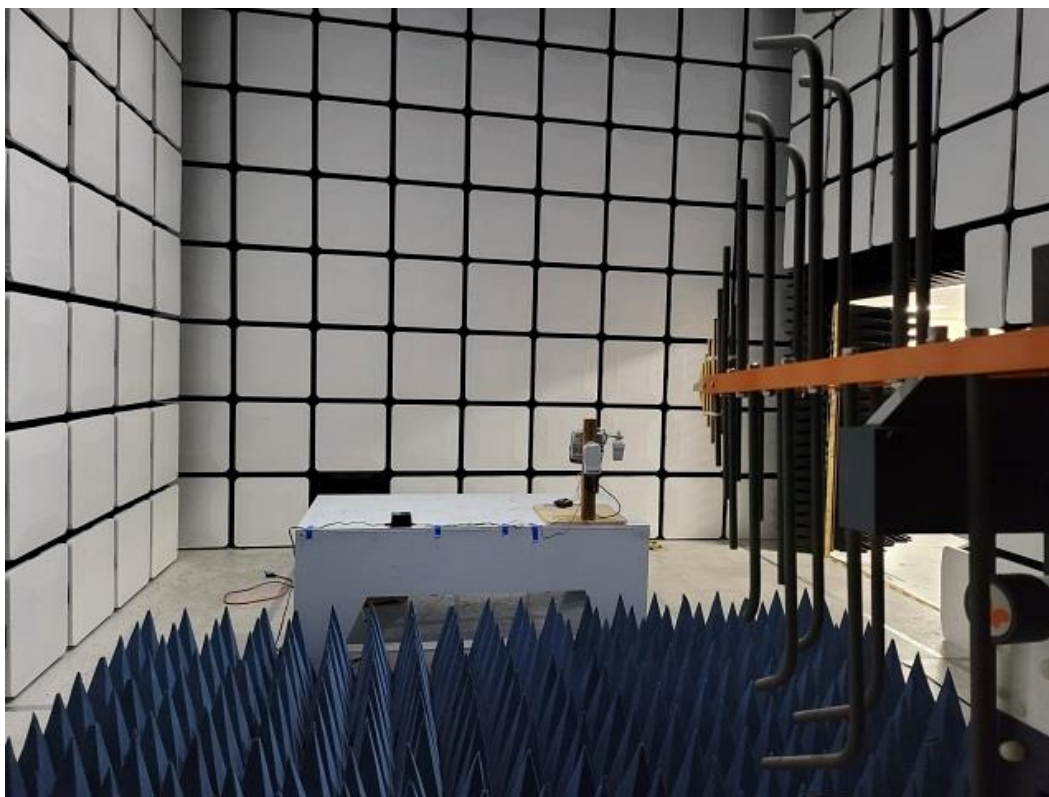
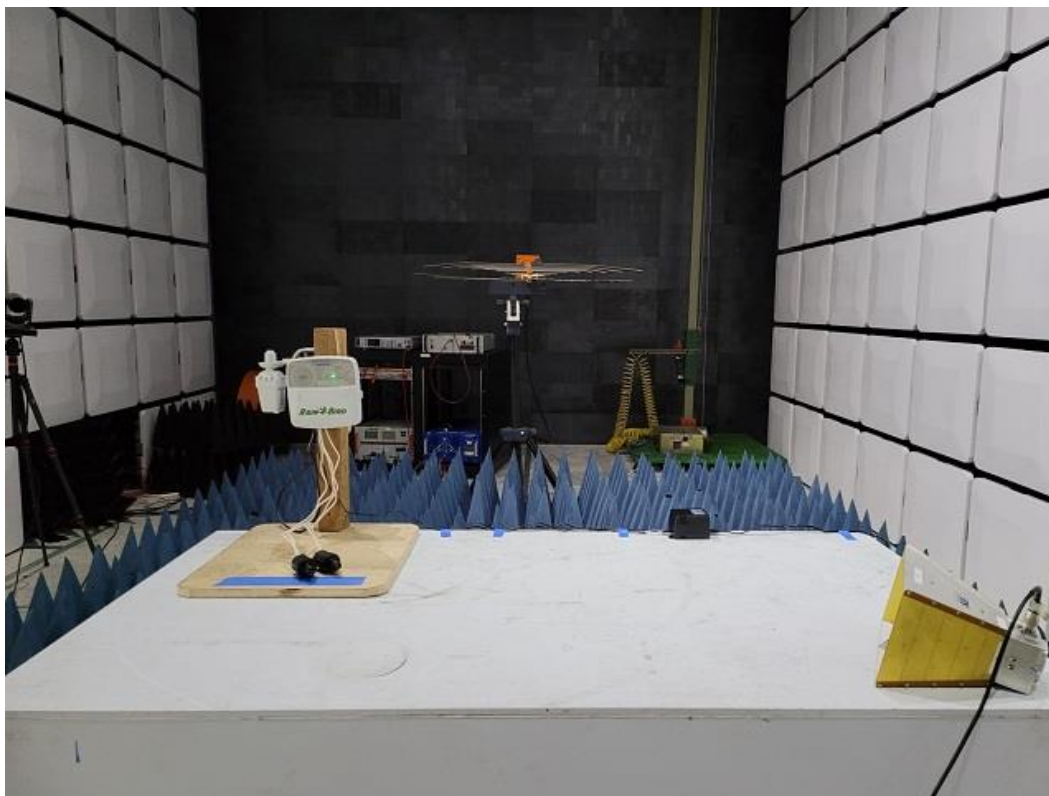
Software Utilized:

Name	Manufacturer	Version
BAT-EMC	NEXIO	Version: 3.19.1.19

11.3 Results:

The sample tested was found to Comply.

11.4 Setup Photographs:



11.5 Data: WiFi Active & Standby

Test Personnel: <u>Peejar Ching</u>	Test Date: <u>10/11/2022</u>
Supervising/Reviewing Engineer: (Where Applicable) <u>Melvin Sanchez</u>	Modulation: <u>80% AM @ 1kHz Sine Wave, 1% Step Size, 3s Dwell Time</u>
Product Standard: <u>EN 61000-6-1, ETSI EN 301 489-1, ETSI EN 301 489-17</u>	Required Performance: <u>A</u>
Input Voltage: <u>230VAC/50Hz</u>	Test Levels: <u>See Table Below</u>
Field Level Monitored: <u>3 V/m</u>	Ambient Temperature: <u>21 °C</u>
	Relative Humidity: <u>59 %</u>
	Atmospheric Pressure: <u>992.3 mbars</u>

Field Level (V/m)	Frequency Range MHz	Antenna Polarity, Azimuths and Result Classification							
		Vertical				Horizontal			
		0°	90°	180°	270°	0°	90°	180°	270°
3	80-1000	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
3	1000-6000	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)

General Notes:

0 degrees: Front of EUT with Display facing antenna
 90 degrees: Right side of EUT, when looking at display, facing antenna
 180 degrees: Back of EUT with Display facing away from antenna
 270 degrees: Left side of EUT, when looking at display, facing antenna

Notes:

(A) The EUT met the requirements without any degradation of performance.

Criteria	During Test	After Test
A	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ May show degradation of performance (Note 1) ➤ Shall be no loss of function ➤ Shall be no unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ Shall be no degradation of performance (Note 1) ➤ Shall be no loss function ➤ Shall be no loss of stored data or user programmable functions
B	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) ➤ May show degradation of performance (Note 1) ➤ No unintentional transmissions 	<ul style="list-style-type: none"> ➤ Functions shall be self-recoverable ➤ Shall operate as intended after recovering ➤ Shall be no loss of stored data or user programmable functions
C	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) 	<ul style="list-style-type: none"> ➤ Functions shall be recoverable by the operator ➤ Shall operate as intended after recovering ➤ Shall be no degradation of performance (Note 1)
Note 1: Degradation of performance during the test is understood as degradation to a level not below a minimum performance level specified by the manufacturer.		

Deviations, Additions, or Exclusions: None

12 Electrical Fast Transient/Burst Immunity Test

12.1 Method

Tests are performed in accordance with EN 61000-4-4.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

12.2 Test Equipment Used:

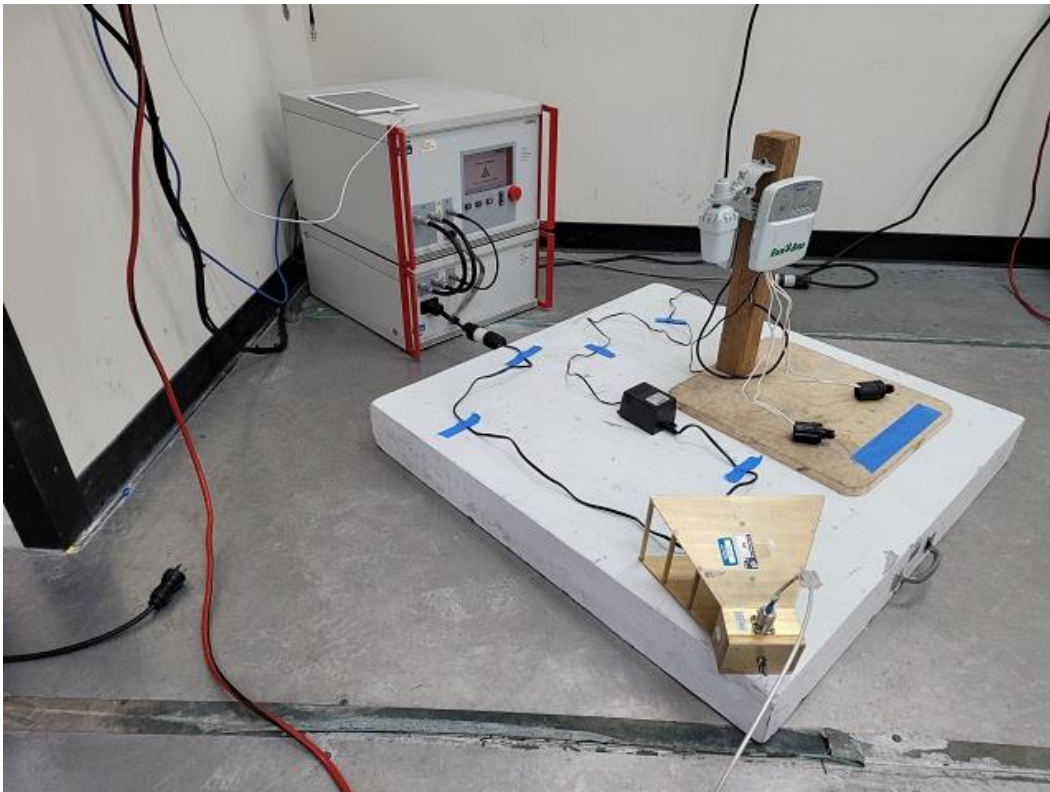
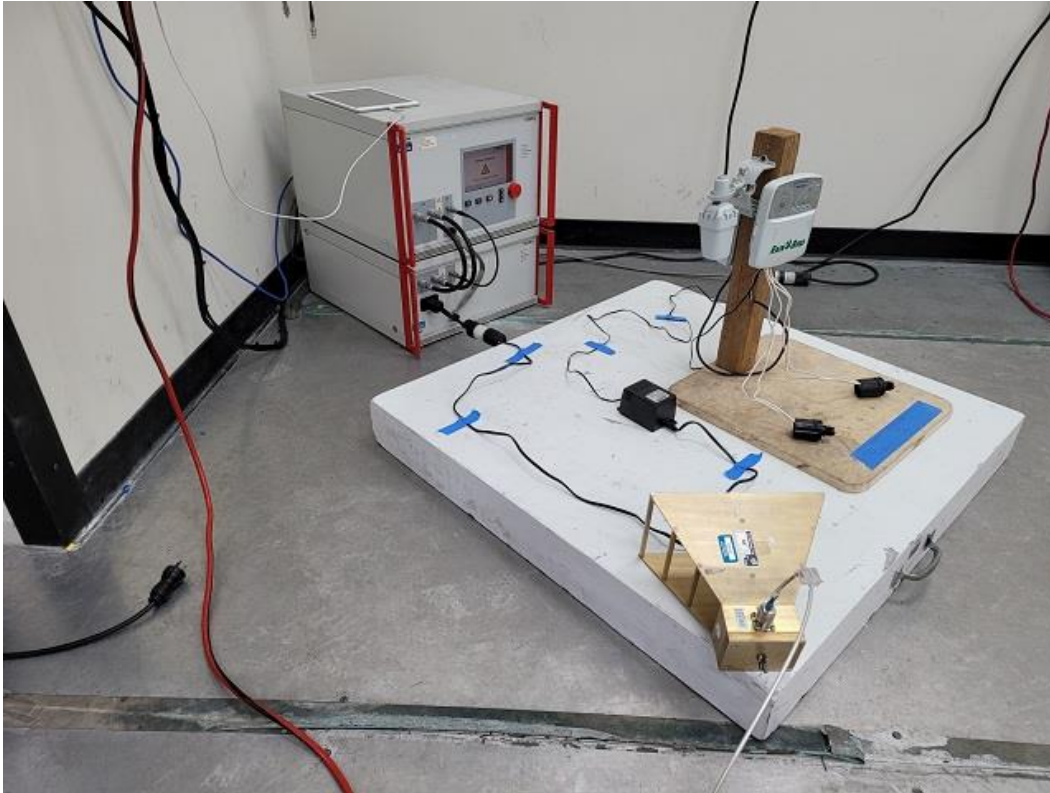
Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
001428	Surge Coupling Module	TESEQ	CDN3061	1469	01/11/2022	01/11/2023
001427	Surge Generator	TESEQ	NSG3060	1577	01/11/2022	01/11/2023
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/0920	10/22/2021	10/22/2022

Software Utilized:

Name	Manufacturer	Version
WIN3000	TESEQ	1.5.1

12.3 Results:

The sample tested was found to Comply.

12.4 Setup Photographs:

12.5 Data: WiFi Active & Standby

Test Personnel:	Oscar Moran / Peejar Ching	Test Date:	10/10/2022
Supervising/Reviewing Engineer:		Pulse Repetition Frequency:	5 kHz
(Where Applicable)	Melvin Sanchez	Required Performance:	B
Product Standard:	EN 61000-6-1, ETSI EN 301 489-1, ETSI EN 301 489-17	Test Levels:	See Table Below
Input Voltage:	230VAC/50Hz	Ambient Temperature:	22 °C
Waveform Verified on Oscilloscope:	Yes	Relative Humidity:	58.7 %
		Atmospheric Pressure:	992 mbars

Test Point	Coupling Method	Test Voltage, Polarities, and Result Classification									
		0.25 kV		0.5 kV		1kV		2 kV		4 kV	
		pos	neg	pos	neg	pos	neg	pos	neg	pos	neg
Power L1	Direct			(A)	(A)	(A)	(A)				
Power L2	Direct			(A)	(A)	(A)	(A)				
Power PE	Direct			(A)	(A)	(A)	(A)				

Notes:

(A) The EUT met the requirements without any degradation of performance.

Criteria	During Test	After Test
A	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ May show degradation of performance (Note 1) ➤ Shall be no loss of function ➤ Shall be no unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ Shall be no degradation of performance (Note 1) ➤ Shall be no loss function ➤ Shall be no loss of stored data or user programmable functions
B	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) ➤ May show degradation of performance (Note 1) ➤ No unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended after recovering ➤ Shall be no loss of stored data or user programmable functions
C	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) 	<ul style="list-style-type: none"> ➤ Functions shall be self-recoverable ➤ Functions shall be recoverable by the operator ➤ Shall operate as intended after recovering ➤ Shall be no degradation of performance (Note 1)
Note 1: Degradation of performance during the test is understood as degradation to a level not below a minimum performance level specified by the manufacturer.		

Deviations, Additions, or Exclusions: None

13 Immunity to Surge

13.1 Method

Tests are performed in accordance with EN 61000-4-5.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

13.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
001428	Surge Coupling Module	TESEQ	CDN3061	1469	01/11/2022	01/11/2023
001427	Surge Generator	TESEQ	NSG3060	1577	01/11/2022	01/11/2023
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/0920	10/22/2021	10/22/2022

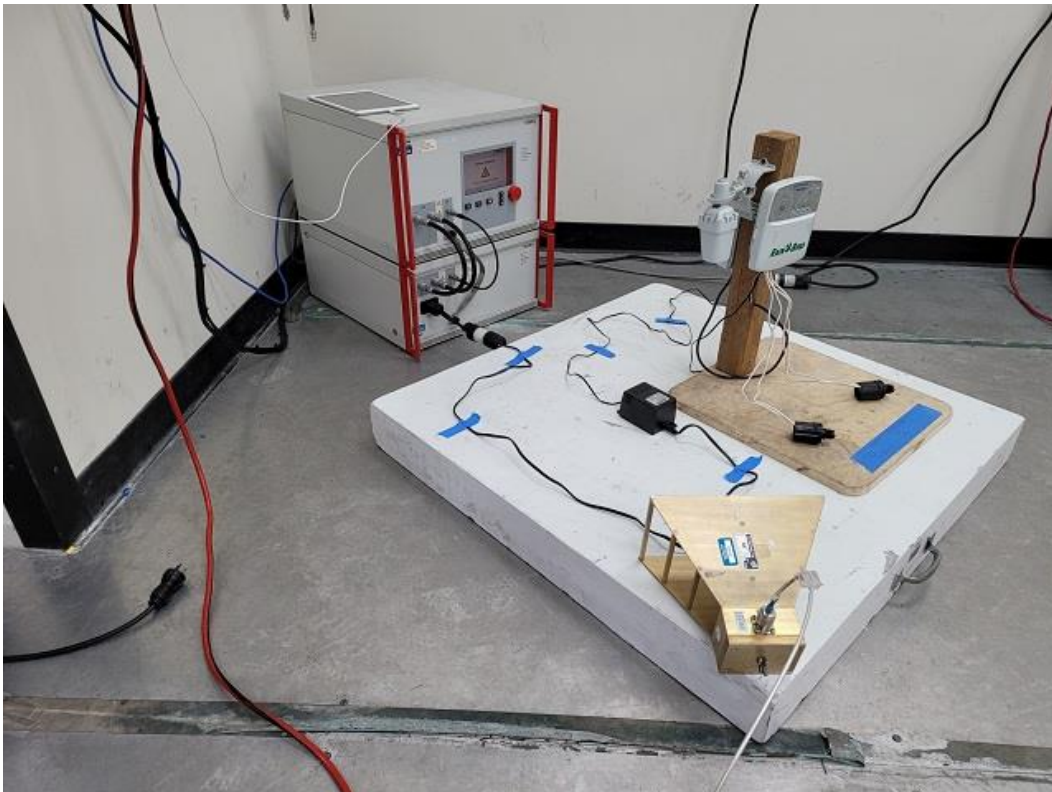
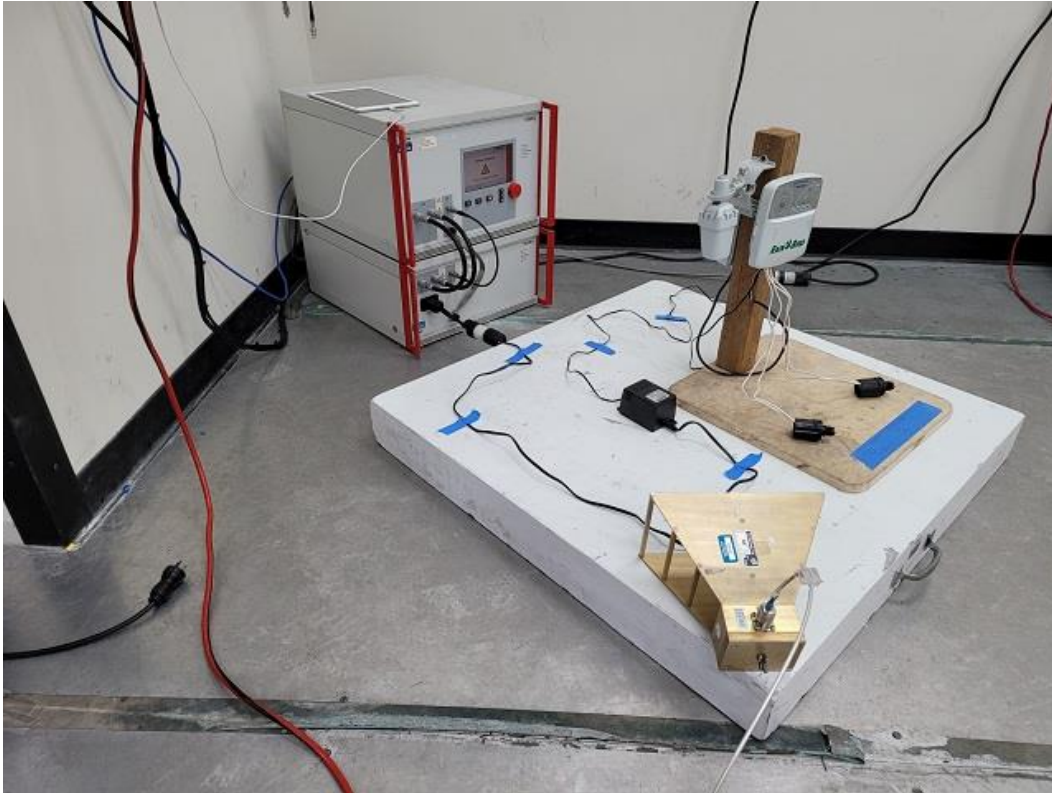
Software Utilized:

Name	Manufacturer	Version
WIN3000	TESEQ	1.5.1

13.3 Results:

The sample tested was found to Comply.

13.4 Setup Photographs:



13.5 Data: WiFi Active

Test Personnel: Peejar Ching
 Supervising/Reviewing Engineer:
 (Where Applicable) Melvin Sanchez

Test Date: 10/07/2022

Product Standard: EN 61000-6-1, ETSI EN 301 489-1, ETSI EN 301 489-17

Test Levels: See Table Below

Input Voltage: 230VAC/50Hz
 Waveform Verified on Oscilloscope: Yes

Performance Criteria: B
 Ambient Temperature: 20.69 °C
 Relative Humidity: 61 %
 Atmospheric Pressure: 991 mbars

Test	Test Voltages, Polarities, and Result Classification							
	0.5kV		1kV		2kV		4kV	
	pos	neg	pos	neg	pos	neg	pos	neg
L1-PE, at 0 deg	(A)	(A)	(A)	(A)	(A)	(A)		
L1-PE, at 90 deg	(A)	(A)	(A)	(A)	(A)	(A)		
L1-PE, at 180 deg	(A)	(A)	(A)	(A)	(A)	(A)		
L1-PE, at 270 deg	(A)	(A)	(A)	(A)	(A)	(A)		
N-PE, at 0 deg	(A)	(A)	(A)	(A)	(A)	(A)		
N-PE, at 90 deg	(A)	(A)	(A)	(A)	(A)	(A)		
N-PE, at 180 deg	(A)	(A)	(A)	(A)	(A)	(A)		
N-PE, at 270 deg	(A)	(A)	(A)	(A)	(A)	(A)		
L1-N, at 0 deg	(A)	(A)	(A)	(A)				
L1-N, at 90 deg	(A)	(A)	(A)	(A)				
L1-N, at 180 deg	(A)	(A)	(A)	(A)				
L1-N, at 270 deg	(A)	(A)	(A)	(A)				

Notes:

(A) The EUT met the requirements without any degradation of performance.

Criteria	During Test	After Test
A	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ May show degradation of performance (Note 1) ➤ Shall be no loss of function ➤ Shall be no unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ Shall be no degradation of performance (Note 1) ➤ Shall be no loss function ➤ Shall be no loss of stored data or user programmable functions
B	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) ➤ May show degradation of performance (Note 1) ➤ No unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended after recovering ➤ Shall be no loss of stored data or user programmable functions
C	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) 	<ul style="list-style-type: none"> ➤ Functions shall be self-recoverable ➤ Functions shall be recoverable by the operator ➤ Shall operate as intended after recovering ➤ Shall be no degradation of performance (Note 1)
Note 1: Degradation of performance during the test is understood as degradation to a level not below a minimum performance level specified by the manufacturer.		

Deviations, Additions, or Exclusions: None

13.6 Data: Standby

Test Personnel: Peejar Ching
 Supervising/Reviewing Engineer:
 (Where Applicable) Melvin Sanchez

Test Date: 10/10/2022

Product Standard: EN 61000-6-1, ETSI EN 301 489-1, ETSI EN 301 489-17

Test Levels: See Table Below

Input Voltage: 230VAC/50Hz
 Waveform Verified on Oscilloscope: Yes

Performance Criteria: B
 Ambient Temperature: 22 °C
 Relative Humidity: 58.7 %
 Atmospheric Pressure: 992 mbars

Test	Test Voltages, Polarities, and Result Classification							
	0.5kV		1kV		2kV		4kV	
	pos	neg	pos	neg	pos	neg	pos	neg
L1-PE, at 0 deg	(A)	(A)	(A)	(A)	(A)	(A)		
L1-PE, at 90 deg	(A)	(A)	(A)	(A)	(A)	(A)		
L1-PE, at 180 deg	(A)	(A)	(A)	(A)	(A)	(A)		
L1-PE, at 270 deg	(A)	(A)	(A)	(A)	(A)	(A)		
N-PE, at 0 deg	(A)	(A)	(A)	(A)	(A)	(A)		
N-PE, at 90 deg	(A)	(A)	(A)	(A)	(A)	(A)		
N-PE, at 180 deg	(A)	(A)	(A)	(A)	(A)	(A)		
N-PE, at 270 deg	(A)	(A)	(A)	(A)	(A)	(A)		
L1-N, at 0 deg	(A)	(A)	(A)	(A)				
L1-N, at 90 deg	(A)	(A)	(A)	(A)				
L1-N, at 180 deg	(A)	(A)	(A)	(A)				
L1-N, at 270 deg	(A)	(A)	(A)	(A)				

Notes:

(A) The EUT met the requirements without any degradation of performance.

Criteria	During Test	After Test
A	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ May show degradation of performance (Note 1) ➤ Shall be no loss of function ➤ Shall be no unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ Shall be no degradation of performance (Note 1) ➤ Shall be no loss function ➤ Shall be no loss of stored data or user programmable functions
B	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) ➤ May show degradation of performance (Note 1) ➤ No unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended after recovering ➤ Shall be no loss of stored data or user programmable functions
C	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) 	<ul style="list-style-type: none"> ➤ Functions shall be self-recoverable ➤ Functions shall be recoverable by the operator ➤ Shall operate as intended after recovering ➤ Shall be no degradation of performance (Note 1)
Note 1: Degradation of performance during the test is understood as degradation to a level not below a minimum performance level specified by the manufacturer.		

Deviations, Additions, or Exclusions: None

14 Conducted, radio-frequency, electromagnetic field immunity test

14.1 Method

Tests are performed in accordance with EN 61000-4-6.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

14.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
001469	Attenuator	Pasternack	PE7021-6	none	VBV	VBV
001713	Compact gennator with built-in power amplifier. (IEC-61000-4-6)	Ametek	NSG 4070C	49406	01/12/2022	01/12/2023
001462	CDN	TESEQ	CDN M016	37381	01/11/2022	01/11/2023
001558	RF Cable	Megaphase	TM8-N1N1-84-2	17218401001	VBV	VBV
001559	RF Cable	Megaphase	TM8-N1N1-84-2	17218401002	VBV	VBV
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/0920	10/22/2021	10/22/2022

*VBV: Verified Before Used

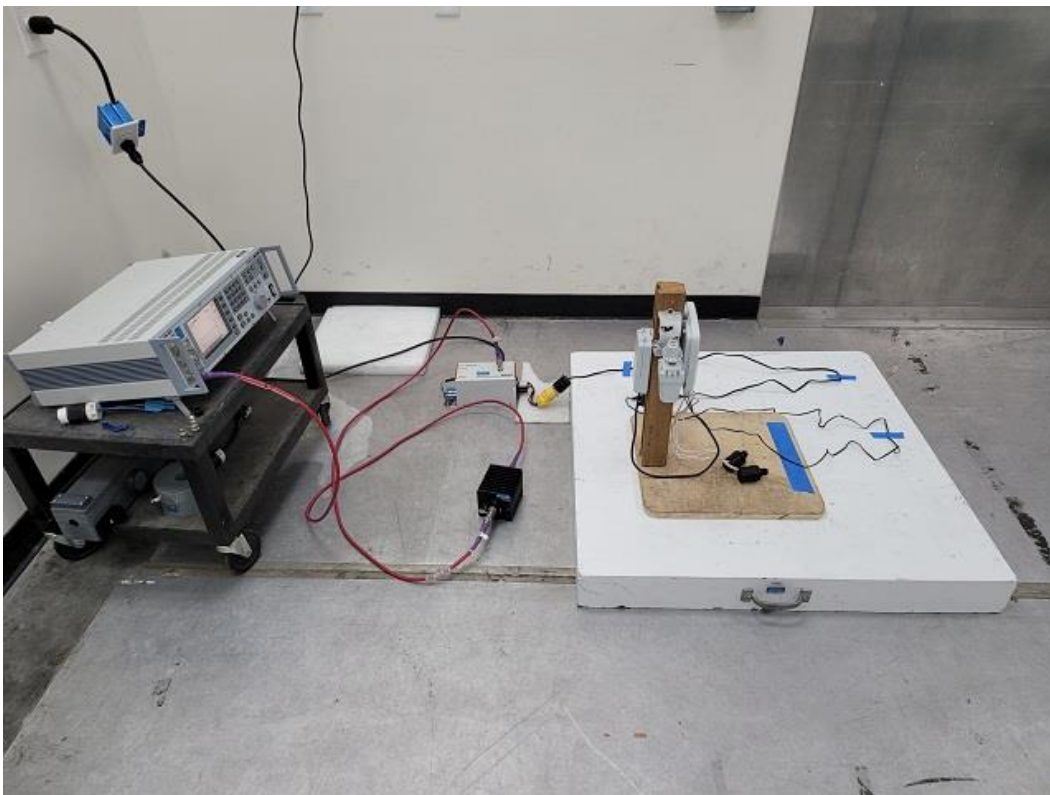
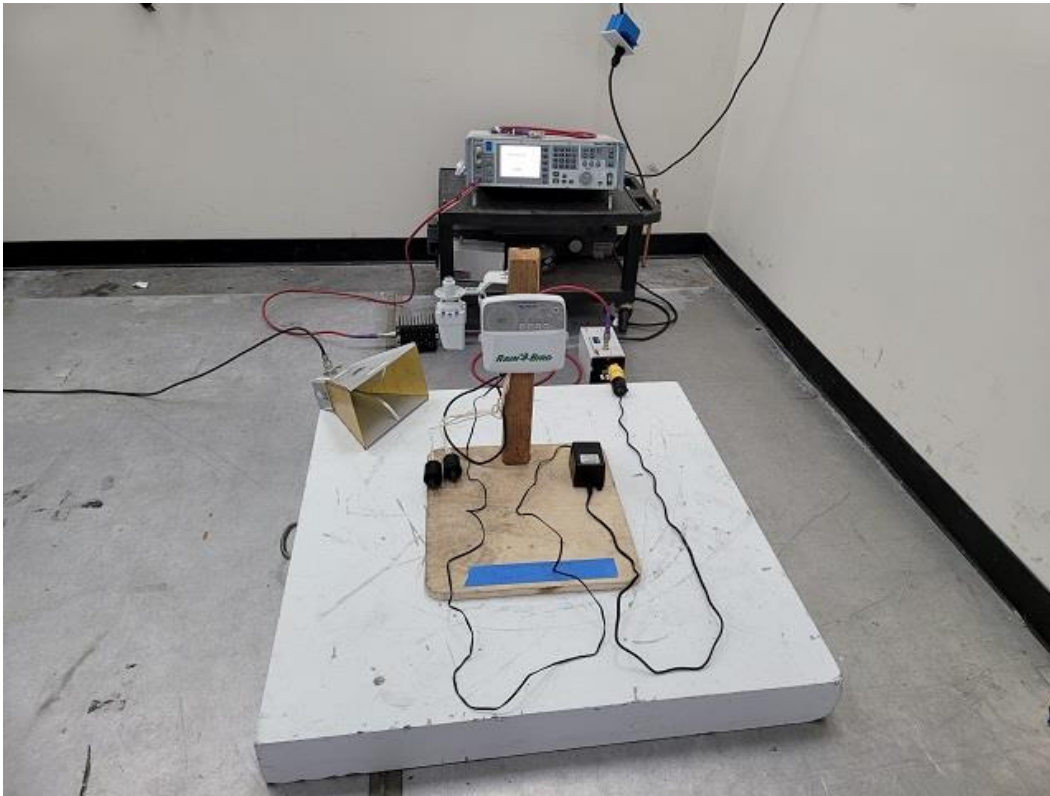
Software Utilized:

Name	Manufacturer	Version
None	--	--

14.3 Results:

The sample tested was found to Comply.

14.4 Setup Photographs:



14.5 Data: WiFi Active & Standby

Test Personnel:	<u>Peejar Ching</u>	Test Date:	<u>10/06/2022</u>
Supervising/Reviewing Engineer: (Where Applicable)	<u>Melvin Sanchez</u>	Modulation:	<u>80% AM @ 1kHz Sine Wave, 1% Step Size, 3s Dwell Time</u>
		Required Performance:	<u>A</u>
Product Standard:	<u>EN 61000-6-1, ETSI EN 301 489-1, ETSI EN 301 489-17</u>	Test Levels:	<u>See Table Below</u>
Input Voltage:	<u>230VAC/50Hz</u>	Ambient Temperature:	<u>21 °C</u>
Test Level Verification Performed:	<u>Yes</u>	Relative Humidity:	<u>59 %</u>
		Atmospheric Pressure:	<u>992.1 mbars</u>

Frequency Range (MHz)	Injection Device Type	Port Description	Test Level (V_{rms})	Result Classification
0.15 – 80	CDN	AC Mains	3	(A)

Notes:

(A) The EUT met the requirements without any degradation of performance.

Criteria	During Test	After Test
A	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ May show degradation of performance (Note 1) ➤ Shall be no loss of function ➤ Shall be no unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ Shall be no degradation of performance (Note 1) ➤ Shall be no loss of function ➤ Shall be no loss of stored data or user programmable functions
B	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) ➤ May show degradation of performance (Note 1) ➤ No unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended after recovering ➤ Shall be no loss of stored data or user programmable functions
C	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) 	<ul style="list-style-type: none"> ➤ Functions shall be self-recoverable ➤ Functions shall be recoverable by the operator ➤ Shall operate as intended after recovering ➤ Shall be no degradation of performance (Note 1)
Note 1: Degradation of performance during the test is understood as degradation to a level not below a minimum performance level specified by the manufacturer.		

Deviations, Additions, or Exclusions: None

15 Power Frequency Magnetic Field Immunity Test

15.1 Method

Tests are performed in accordance with EN 61000-4-8.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

15.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
000630	AC Current Clamp	Fluke	i200	none	01/13/2022	01/13/2023
001106	True RMS Multimeter	Fluke	179	18390472	01/13/2022	01/13/2023
000898	Power Source	TESEQ	5001IX-CTS-208-411-	1337A01349 (1)	01/13/2022	01/13/2023
000899	Power Conditioner	TESEQ	CTS (CCN-1000-1)	1337A01349 (2)	01/13/2022	01/13/2023
000559	Immunity Loop	Fischer CC	F-1000-4-8/9/10-L-M	4	03/11/2011	VBV
001132	Exposure Level Tester	Narda	ELT-400	N-0010	08/17/2022	08/17/2023
001133	B-Field Probe 100 cm2	Narda	2300/90.10	M-0446	08/17/2022	08/17/2023
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/0920	10/22/2021	10/22/2022

*VBV: Verified Before Used

Software Utilized:

Name	Manufacturer	Version
None	N/A	N/A

15.3 Results:

The sample tested was found to Comply.

15.4 Setup Photographs:



15.5 Data: WiFi Active

Test Personnel: Peejar Ching
 Supervising/Reviewing Engineer:
 (Where Applicable) Melvin Sanchez

Test Date: 10/13/2022

Product Standard: EN 61000-6-1, ETSI EN 301 489-1, ETSI EN 301 489-17

Test Levels: See Table Below

Input Voltage: 230VAC/50-60Hz

Performance Criteria: A

Ambient Temperature: 21.59 °C

Ambient Field Level: 0.28 µT

Relative Humidity: 56.8%

Test Field Level

Verified: 7.5 µT

Atmospheric Pressure: 992 mbars

Test Location/ Mode/ EUT Input	Test Level (A/m)	Frequency (Hz)	Result Classification		
			X – Axis	Y – Axis	Z – Axis
Enclosure/Normal Mode/ 230VAC-60Hz	3	60	(A)	(A)	(A)
Enclosure/Normal Mode/ 230VAC-50Hz	3	50	(A)	(A)	(A)

Notes:

(A) The EUT met the requirements without any degradation of performance.

Criteria	During Test	After Test
A	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ May show degradation of performance (Note 1) ➤ Shall be no loss of function ➤ Shall be no unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ Shall be no degradation of performance (Note 1) ➤ Shall be no loss function ➤ Shall be no loss of stored data or user programmable functions
B	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) ➤ May show degradation of performance (Note 1) ➤ No unintentional transmissions 	<ul style="list-style-type: none"> ➤ Functions shall be self-recoverable ➤ Shall operate as intended after recovering ➤ Shall be no loss of stored data or user programmable functions
C	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) 	<ul style="list-style-type: none"> ➤ Functions shall be recoverable by the operator ➤ Shall operate as intended after recovering ➤ Shall be no degradation of performance (Note 1)
Note 1: Degradation of performance during the test is understood as degradation to a level not below a minimum performance level specified by the manufacturer.		

Deviations, Additions, or Exclusions: None

16 Voltage Dips / Interruptions Immunity Tests

16.1 Method

Tests are performed in accordance with EN 61000-4-11.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

16.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
000898	Power Source	TESEQ	5001IX-CTS-208-411-	1337A01349 (1)	01/13/2022	01/13/2023
000899	Power Conditioner	TESEQ	CTS (CCN-1000-1)	1337A01349 (2)	01/13/2022	01/13/2023
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/0920	10/22/2021	10/22/2022

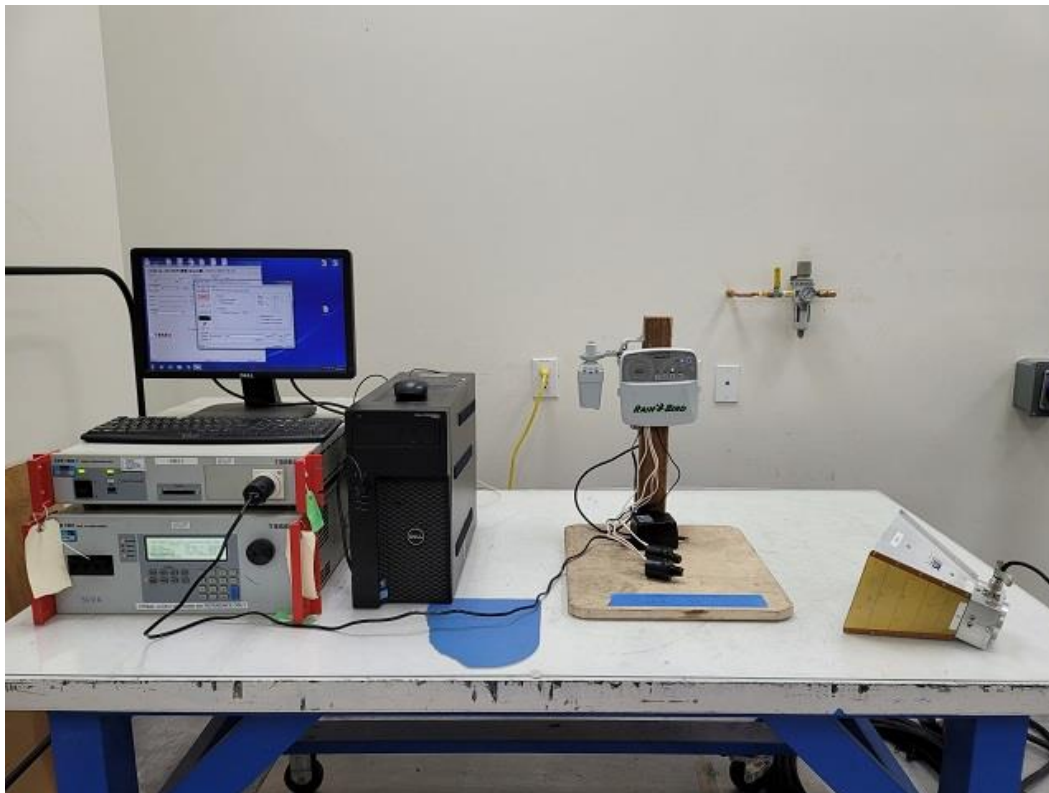
Software Utilized:

Name	Manufacturer	Version
WIN2100	TESEQ	SII

16.3 Results:

The sample tested was found to Comply.

16.4 Setup Photographs:



16.5 Data: WiFi Active & Standby

Test Personnel: Peejar Ching
 Supervising/Reviewing Engineer:
 (Where Applicable) Melvin Sanchez

Test Date: 10/04/2022

Product Standard: EN 61000-6-1, ETSI EN 301 489-1, ETSI EN 301 489-17
 Input Voltage: 230VAC/50Hz
 Waveform Verified on Oscilloscope: Yes

Test Levels: See Table Below
 Performance Criteria: B/C/C
 Ambient Temperature: 20.54 °C
 Relative Humidity: 58.5 %
 Atmospheric Pressure: 993 mbars

Specification	Rated Voltage (VAC)	Frequency (Hz)	Voltage Test Level (%)	Voltage Dip (%)	Test Voltage (VAC)	Duration (Periods)	Result
0%UT for 0.5 Cycle @ 0°	230	50	0	100	0	0.5 Cycle	(A)
0%UT for 0.5 Cycle @ 180°	230	50	0	100	0	0.5 Cycle	(A)
0%UT for 1 Cycles @ 0°	230	50	0	100	0	1 Cycle	(A)
0%UT for 1 Cycles @ 180°	230	50	0	100	0	1 Cycle	(A)
70%UT for 25 Cycles @ 0°	230	50	70	30	161	25 Cycles	(A)
70%UT for 25 Cycles @ 180°	230	50	70	30	161	25 Cycles	(A)
0%UT for 250 Cycles @ 0°	230	50	0	100	0	250 Cycles	(C)
0%UT for 250 Cycles @ 180°	230	50	0	100	0	250 Cycles	(C)

Notes:

(A) The EUT met the requirements without any degradation of performance

(C) The EUT met the requirements with degradation of performance. During interruptions, the EUT shuts-off. It requires user intervention to recover its function.

Criteria	During Test	After Test
A	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ May show degradation of performance (Note 1) ➤ Shall be no loss of function ➤ Shall be no unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ Shall be no degradation of performance (Note 1) ➤ Shall be no loss function ➤ Shall be no loss of stored data or user programmable functions
B	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) ➤ May show degradation of performance (Note 1) ➤ No unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended after recovering ➤ Shall be no loss of stored data or user programmable functions
C	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) 	<ul style="list-style-type: none"> ➤ Functions shall be self-recoverable ➤ Functions shall be recoverable by the operator ➤ Shall operate as intended after recovering ➤ Shall be no degradation of performance (Note 1)
Note 1: Degradation of performance during the test is understood as degradation to a level not below a minimum performance level specified by the manufacturer.		

Deviations, Additions, or Exclusions: None

17 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	10/19/2022	105214472LAX-009	PC	MS	Original Issue
1	05/02/2023	105214472LAX-009	PC	MS	1. Updated operating modes of the EUT in section 4 & supporting equipment table and block diagram in section 5. 2. Added Annex A, B, C, D, E, F G, H, I J, K & L for BLE Active testing.
2	06/06/2024	105214472LAX-009	PC	MS	Added Variant Model not tested but declared equivalent by the client: ARC6I-230V.

18 Annex A: Test Summary for the BLE configuration

Section	Test full name	Result
6	Radiated Emissions EN IEC 61000-6-3:2021, EN 55032, Class B	Complies
7	AC Mains Conducted Emissions EN IEC 61000-6-3:2021, EN 55032, Class B	Complies
8	Harmonics EN 61000-3-2:2014	Complies
9	Flicker EN 61000-3-3:2013	Complies
10	Electro-Static Discharge Immunity Test EN 61000-4-2:2009	Complies
11	Radiated, Radio-Frequency, Electromagnetic Immunity EN 61000-4-3:2006 +A1:2008, +A2:2010	Complies
12	Electrical Fast Transient/Burst Immunity Test EN 61000-4-4:2012	Complies
13	Immunity to Surges EN 61000-4-5:2014	Complies
14	Conducted, Radio-Frequency, Electromagnetic Immunity Test EN 61000-4-6:2014	Complies
15	Power Frequency Magnetic Field Immunity Test EN 61000-4-8:2010	Complies
16	Voltage Dips/Interruptions Immunity Test EN 61000-4-11:2004	Complies
17	Revision History	--

19 Annex B: Radiated Emissions

19.1 Method

Tests are performed in accordance with EN 55032 & CISPR 16-2-3.

TEST SITE: Lake Forest EMC Lab

3m ALSE: The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	U _{CISPR}
Radiated Emissions, 3m	30-1000 MHz	4.2 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	5.1 dB	5.2 dB (FAR)
Radiated Emissions, 3m	6-18 GHz	5.5 dB	5.5 dB (FAR)

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 32 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + Correction Factor

FS = RA + AF + CF - AG

Where

FS = Field Strength in dB μ V/m

RA = Receiver Amplitude (including preamplifier) in dB μ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

Correction Factor = AF + CF - AG

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

RA = 52.0 dB μ V

AF = 7.4 dB/m

CF = 1.6 dB

AG = 29.0 dB

FS = 32 dB μ V/m

To convert from dB μ V to μ V or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
 NF = Net Reading in $dB\mu V$

Example:

$FS = RA + \text{Correction Factor}$
 $\text{Correction Factor} = AF + CF - AG = 7.4 + 1.6 - 29 = -20$
 $FS = 52.0 + (-20) = 32.0$
 $UF = 10^{(32 \text{ dB}\mu V / 20)} = 39.8 \mu V/m$

19.2 Test Equipment Used:

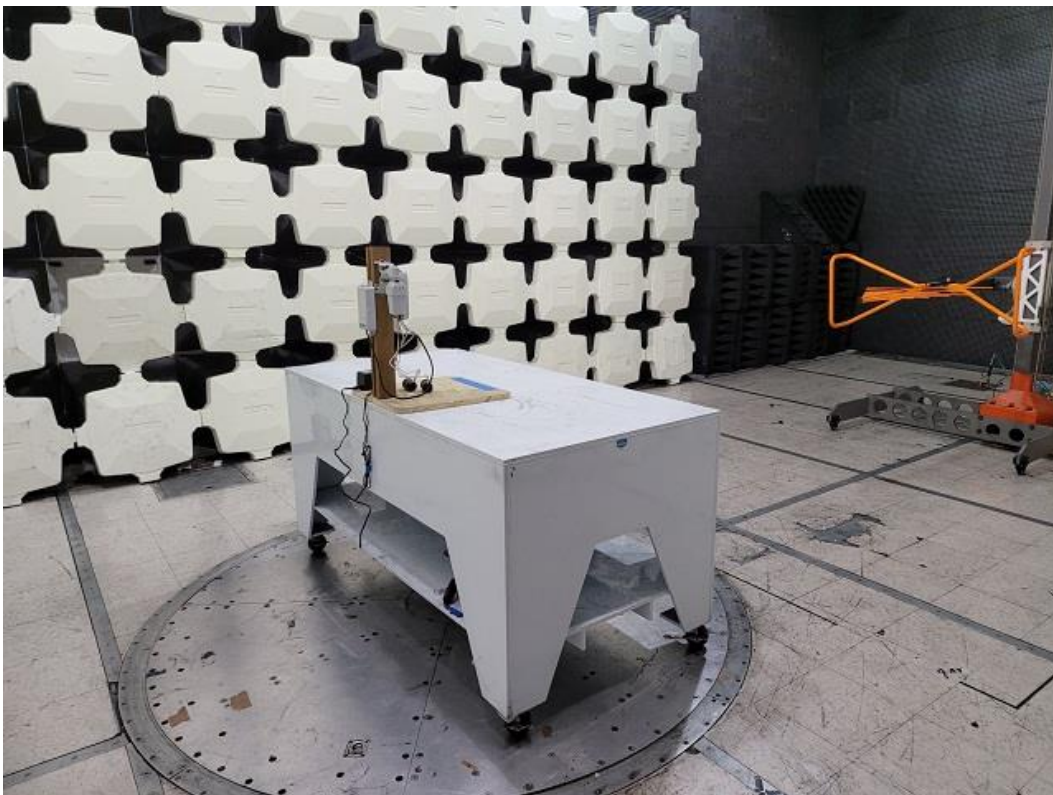
Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
001669	EMI Test Receiver	Rhode & Schwarz	ESW44	101636	06/20/2022	06/20/2023
001707	Broadband Hybrid Antenna 30MHz-6GHz	SunAR RF Motion	JB6	A110618	01/23/2023	01/23/2024
001518	RF Cable 30MHz-18GHz	Rohde & Schwarz	TSPR-B7	101529	01/11/2023	01/11/2024
001771	TSPR-B7; RF CABLE NP; 30 MHz To 18GHz	Rohde & Schwarz	TSPR-B7	101547	01/11/2023	01/11/2024
000637	EMC Emissions	Panashield	3m Chamber	250831-D-2	05/29/2021	05/29/2024
001576	Preamplifier 100kHz - 1 GHz	Rhode & Schwarz	TS-PR1	102068	01/12/2023	01/12/2024
001515	Horn Antenna 750MHz - 18GHz	ETS Lindgren	3115	00161631	05/17/2022	05/17/2023
001556	Preamplifier 1 - 18GHz	Rhode & Schwarz	TS-PR18	102144	01/12/2023	01/12/2024
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/0 920	10/19/2022	10/19/2023

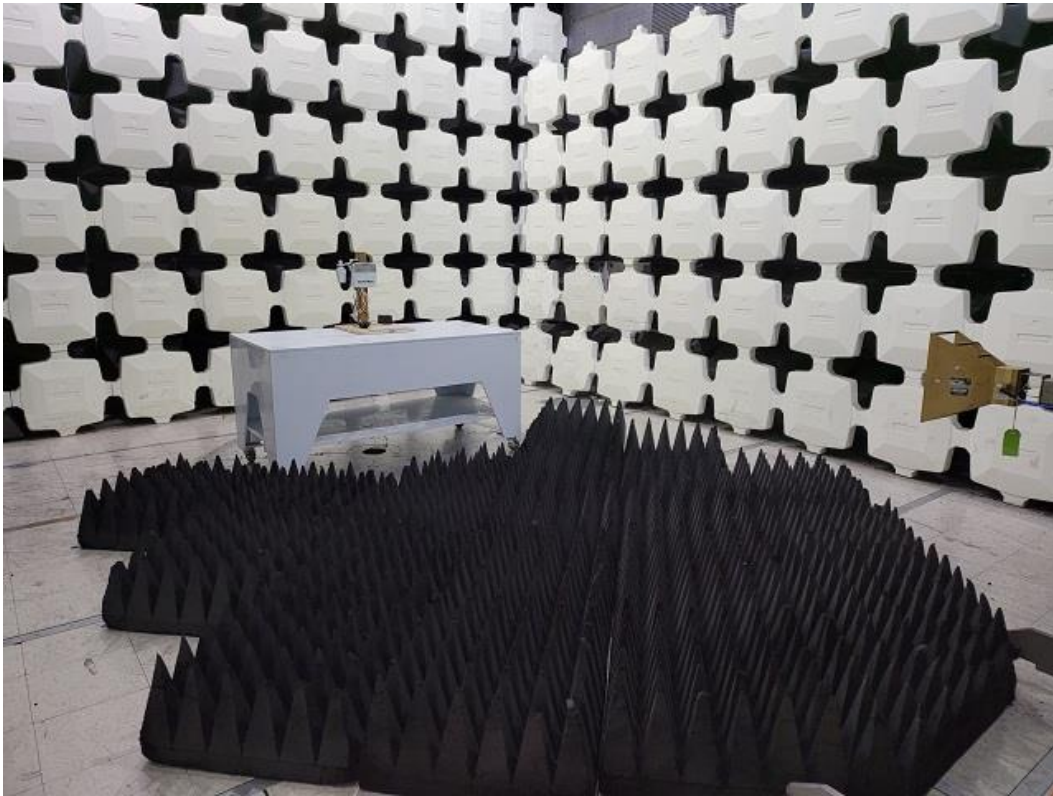
Software Utilized:

Name	Manufacturer	Version
BAT-EMC	NEXIO	Version 3.19.1.19

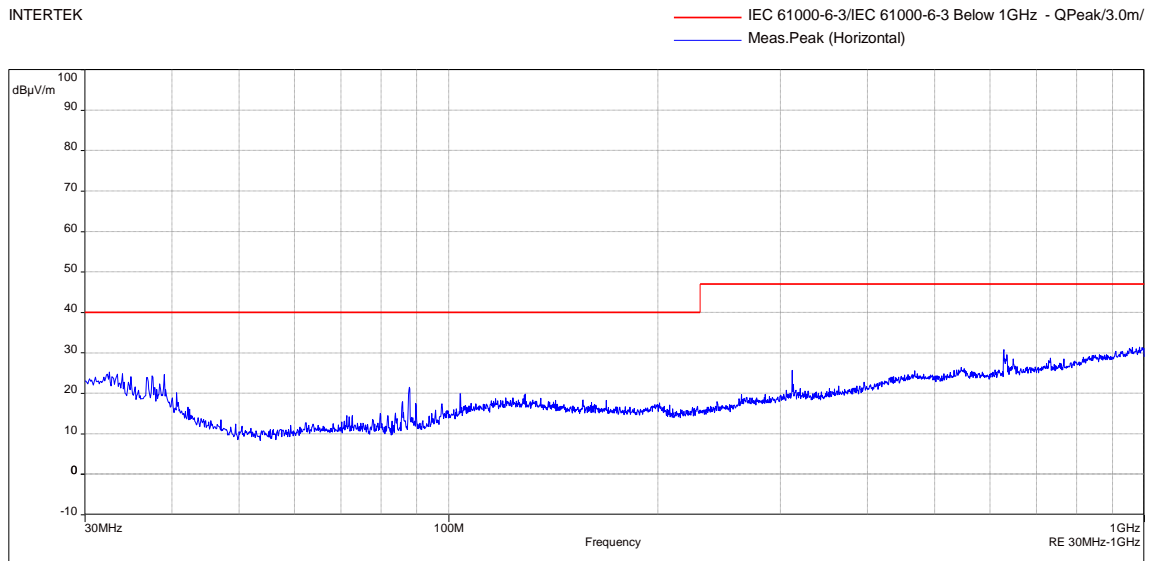
19.3 Results:

The sample tested was found to Comply.

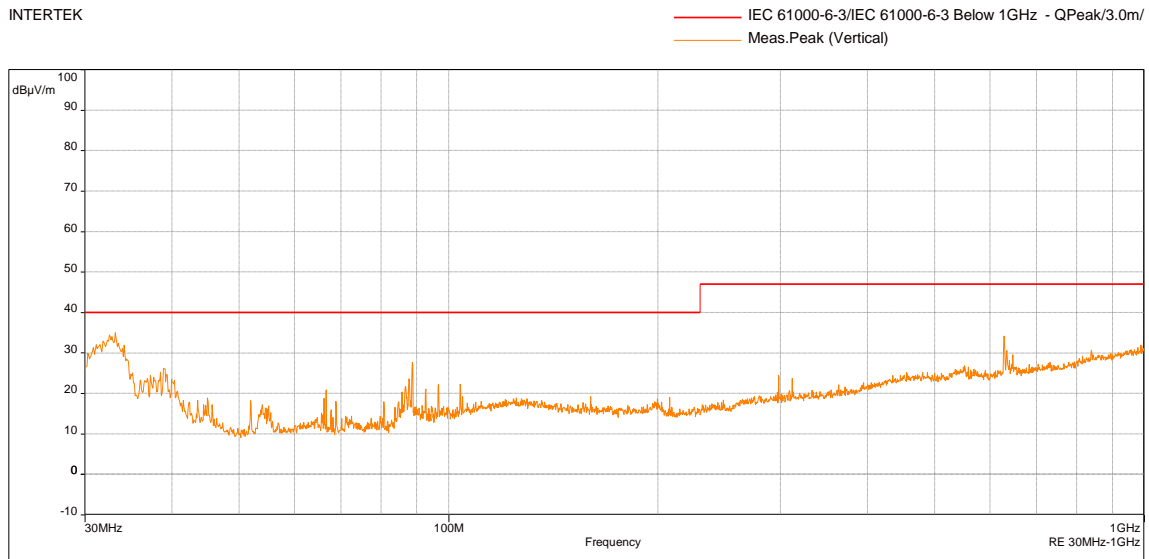
19.4 Setup Photographs:

19.5 Setup Photographs:

19.6 Plots: BLE Active



EN 61000-6-3 / EN 55032 - Radiated Emissions, Peak Scan Horizontal Polarization
@ 230VAC/50Hz



EN 61000-6-3 / EN 55032 - Radiated Emissions, Peak Scan Vertical Polarization
@ 230VAC/50Hz

19.7 Data: BLE Active

Test Personnel: Peejar Ching
 Supervising/Reviewing Engineer:
 (Where Applicable) Melvin Sanchez

Test Date: 03/24/2023

Product Standard: EN 61000-6-3, ETSI EN 301 489-1, ETSI EN 301 489-17
 Input Voltage: 230VAC/50Hz

Limit Applied: Table 3, Clause 3.1 of EN 61000-6-3, EN 55032, Class B

Pretest Verification w/
 Ambient Signals or
 BB Source: BB Source

Ambient Temperature: 20.69 °C

Relative Humidity: 61 %
 Atmospheric Pressure: 991 mbars

EN 61000-6-3 / EN 55032, Radiated Emissions (Quasi Peak Horizontal)							
Frequency MHz	QP Level (dBuV)	Limit @ 3m dB(dBuV)	QP Margin (dB)	RA (dBuV)	Azimuth (°)	Height (m)	Correction Factor dB
32.522	14.8	40	-25.2	21.89	259.5	3.76	-7.09
39.021	7.51	40	-32.49	19.33	61.25	1.24	-11.82
87.812	14.33	40	-25.67	32.41	225.75	2.14	-18.08
103.914	11.03	40	-28.97	24.74	135.75	1.88	-13.71
628.587	25.39	47	-21.61	30.1	333.25	1.01	-4.71
985.353	19.34	47	-27.66	18.86	220.25	2.37	0.48
Detectors/Bandwidths (Det/RBW/VBW)= 120kHz/500kHz							

EN 61000-6-3 / EN 55032, Radiated Emissions (Quasi Peak Vertical)							
Frequency MHz	QP Level (dBuV)	Limit @ 3m dB(dBuV)	QP Margin (dB)	RA (dBuV)	Azimuth (°)	Height (m)	Correction Factor dB
*33.201	28.28	40	-11.72	35.79	161.5	1.02	-7.51
38.924	8.94	40	-31.06	20.68	318.75	1.02	-11.74
87.715	14.26	40	-25.74	32.35	161.75	1.05	-18.09
88.685	19.73	40	-20.27	37.64	115.5	1.33	-17.91
628.878	24.48	47	-22.52	29.19	39	1	-4.71
989.039	19.62	47	-27.38	19.11	142.75	2.06	0.51
Detectors/Bandwidths (Det/RBW/VBW)= 120kHz/500kHz							

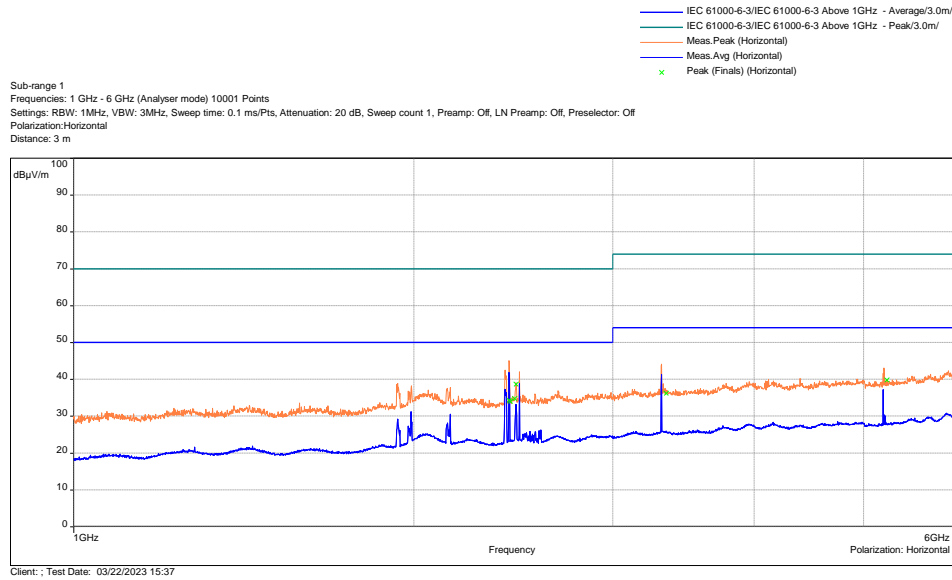
Note: Testing was performed at a distance of 3m. The radiated emission test limits are referred to 10m. Data obtained at closer distances are compared to the 10m limits in this report.

Test Result:

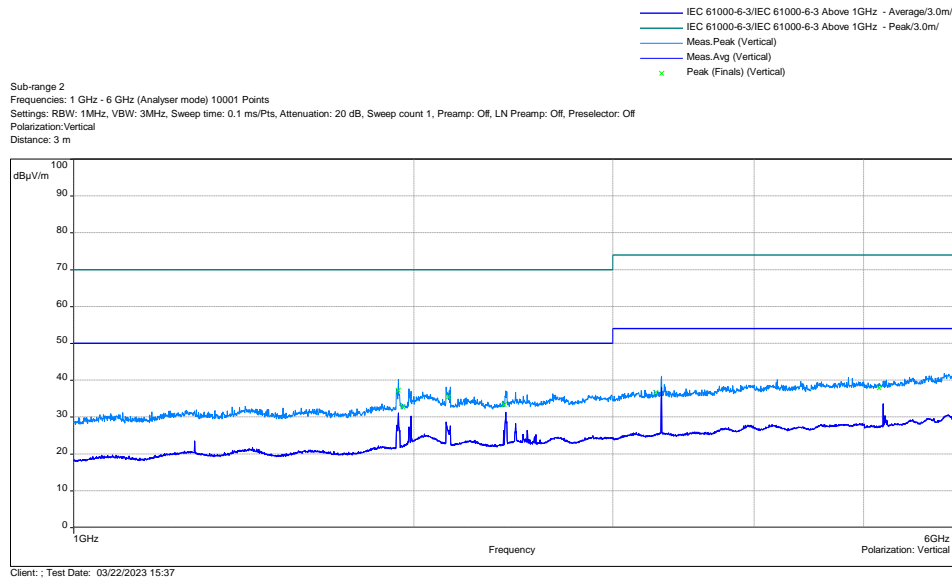
(*) The **EUT PASSED** Radiated Emission test with – 11.72 dB margin at 33.201 MHz

Deviations, Additions, or Exclusions: None

19.8 Plots: BLE Active



EN 61000-6-3 / EN 55032 - Radiated Emissions, Peak/AVE Scan Horizontal Polarization @ 230VAC/50Hz - Above 1GHz



EN 61000-6-3 / EN 55032 - Radiated Emissions, Peak/AVE Scan Vertical Polarization @ 230VAC/50Hz - Above 1GHz

Note: According to ETSI EN 301-489-17 Clause 4.3 Exclusion Bands: The frequencies on which the transmitter part of the EUT is intended to operate shall be excluded from radiated emission measurements.

19.9 Data: BLE Active

Test Personnel: Peejar Ching
 Supervising/Reviewing Engineer:
 (Where Applicable) Melvin Sanchez

Test Date: 03/22/2023

Product Standard: EN 61000-6-3, ETSI EN 301 489-1, ETSI EN 301 489-17
 Input Voltage: 230VAC/50Hz

Limit Applied: Table 3 clause 3.4 of EN 61000-6-3, EN 55032, Class B

Pretest Verification w/
 Ambient Signals or
 BB Source: BB Source

Ambient Temperature: 20.6 °C

Relative Humidity: 61 %

Atmospheric Pressure: 991 mbars

EN 61000-6-3 / EN 55032, Radiated Emission (Ave-Peak Horizontal)										
Frequency (MHz)	Av Level (dB)	Av Limit (dBµV/m)	Av Margin (dB)	Pk Level (dB)	Pk Limit (dBµV/m)	Pk Margin (dB)	Azimuth (°)	Height (m)	RA (dBµV)	CF (dB)
3344	23.23	54	-30.77	36.19	74	-37.81	63.25	3.49	38.83	-15.6
*5243.5	25.17	54	-28.83	39.84	74	-34.16	1.5	2.48	37.41	-12.24
Detectors/Bandwidths (Det/RBW/VBW)= 1MHz/3MHz										

EN 61000-6-3 / EN 55032, Radiated Emissions (Ave-Peak Vertical)										
Frequency (MHz)	Av Level (dB)	Av Limit (dBµV/m)	Av Margin (dB)	Pk Level (dB)	Pk Limit (dBµV/m)	Pk Margin (dB)	Azimuth (°)	Height (m)	RA (dBµV)	CF (dB)
1937	20.52	50	-29.48	37.27	70	-32.73	-0.75	1.3	40.41	-19.89
1955.5	19.66	50	-30.34	32.83	70	-37.17	277.25	3.48	39.08	-19.42
2146	20.77	50	-29.23	35.42	70	-34.58	110.5	1.49	39.45	-18.68
3272	22.63	54	-31.37	36.73	74	-37.27	109.25	3.61	38.41	-15.78
5160.5	24.92	54	-29.08	37.93	74	-36.07	85.75	1.09	37.24	-12.32
Detectors/Bandwidths (Det/RBW/VBW)= 1MHz/3MHz										

Test Result: (*) The **EUT PASSED** Radiated Emission test with – 28.83 dB margin at 5243.5 MHz

Deviations, Additions, or Exclusions: None

20 Annex C: AC Mains Conducted Emissions

20.1 Method

Tests are performed in accordance with EN 55032 & CISPR 16-2-1.

TEST SITE: Lake Forest EMC Lab

3m ALSE: The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucisp
AC Line Conducted Emissions	150 kHz - 30 MHz	2.8 dB	3.4 dB
Telco Port Emissions	150 kHz - 30 MHz	2.8 dB	5.0 dB

As shown in the table above our conducted emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 32 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculations

The following is how net line-conducted readings were determined:

$$NF = RF + LF + CF + AF$$

Where NF = Net Reading in dB μ V

RF = Reading from receiver in dB μ V

LF = LISN or ISN Correction Factor in dB

CF = Cable Correction Factor in dB

AF = Attenuator Loss Factor in dB

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where } UF = \text{Net Reading in } \mu\text{V}$$

NF = Net Reading in dB μ V

Example:

$$NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 \text{ dB}\mu\text{V}$$

$$UF = 10^{(49.1 \text{ dB}\mu\text{V} / 20)} = 285.1 \mu\text{V/m}$$

20.2 Test Equipment Used:

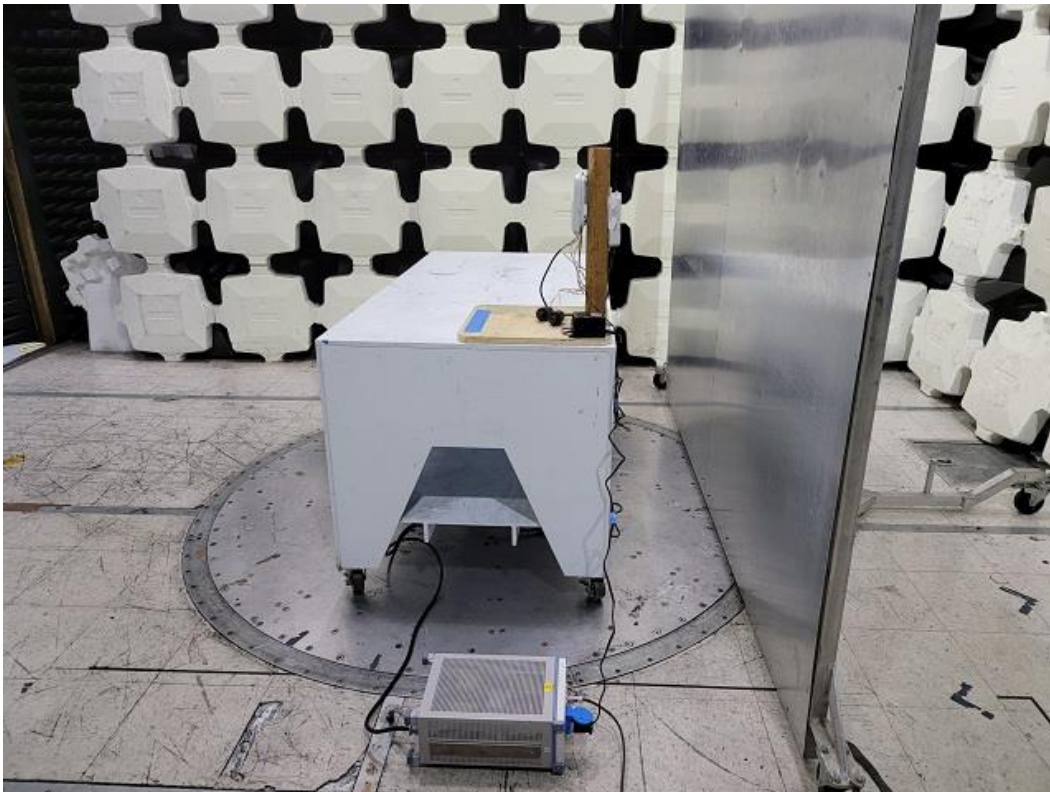
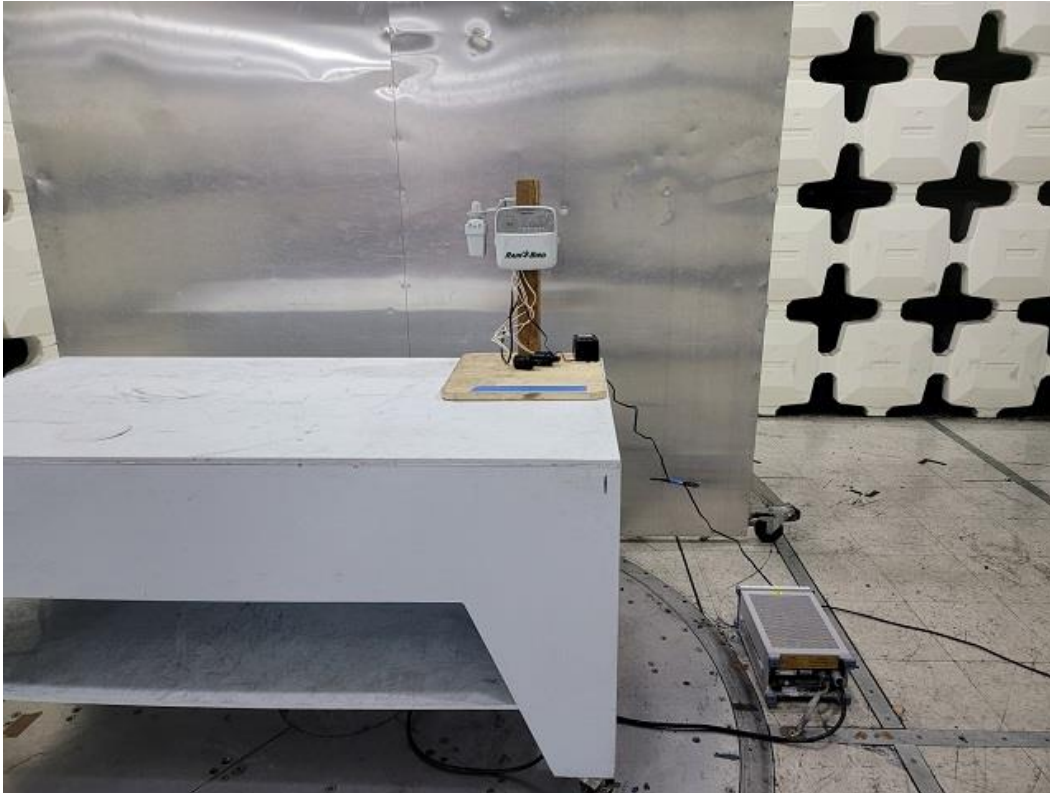
Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
001140	EMI Test Receiver	Rohde & Schwarz	ESC17	100825	01/10/2023	01/10/2024
001999	LISN	Rohde & Schwars	ENV216	101450	01/11/2023	01/11/2024
001882	Cable	Fairview Microwave	FMC0101223 -300	none	01/11/2023	01/11/2024
002159	Humidity/Temperture/Pressure M	Testo	622	39525175/09 20	10/19/2022	10/19/2023

Software Utilized:

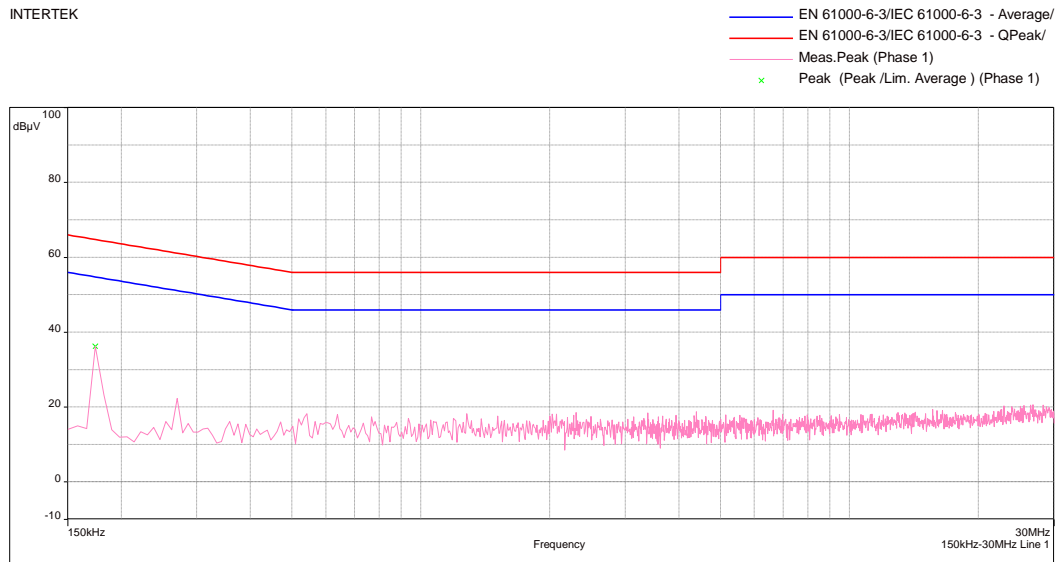
Name	Manufacturer	Version
BAT-EMC	NEXIO	Version 3.19.1.19

20.3 Results:

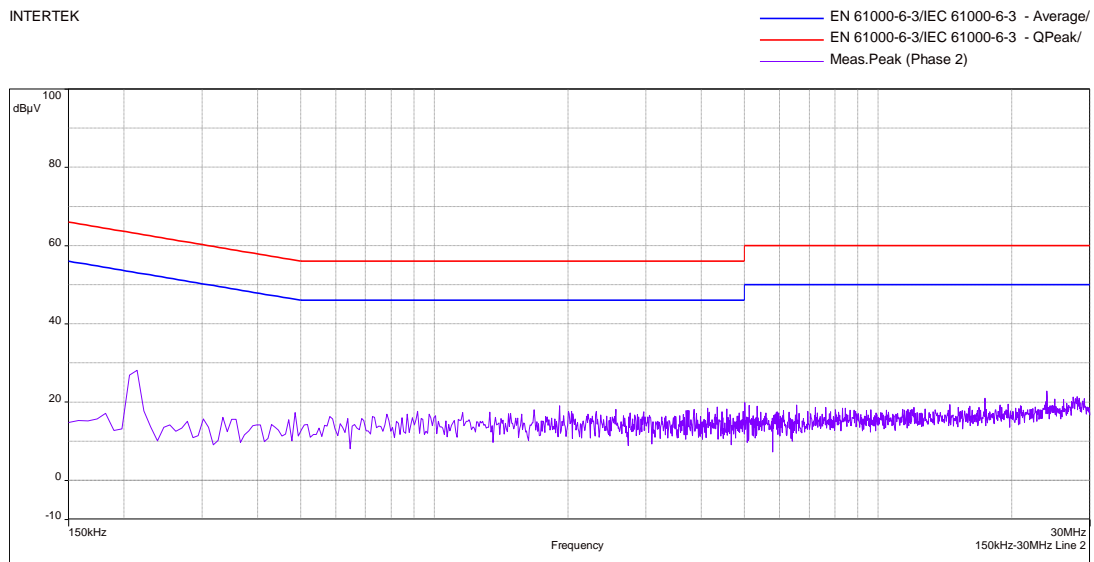
The sample tested was found to Comply.

20.4 Setup Photographs:

20.5 Plots: BLE Active



EN 61000-6-3 / EN 55032 - Conducted Emissions Peak Scan - Line 1 @ 230VAC/50Hz



EN 61000-6-3 / EN 55032 - Conducted Emissions Peak Scan - Line 2 @ 230VAC/50Hz

20.6 Data: BLE Active

Test Personnel: Peejar Ching
 Supervising/Reviewing Engineer:
 (Where Applicable) Melvin Sanchez

Test Date: 03/25/2023

Product Standard: EN 61000-6-3, ETSI EN 301 489-1, ETSI EN 301 489-17
 Input Voltage: 230VAC/50Hz

Limit Applied: Table 4, Clause 4.3 of EN 61000-6-3, EN 55032, Class B

Pretest Verification w/
 Ambient Signals or
 BB Source: BB Source

Ambient Temperature: 20.69 °C

Relative Humidity: 61 %
 Atmospheric Pressure: 991 mbars

EN 61000-6-3 / EN 55032, Conducted Emissions (Line 1)							
Frequency (MHz)	Av Level (dBμV)	QP Level (dBμV)	Av Limit (dBμV)	QP Limit (dBμV)	Av Margin (dB)	QP Margin (dB)	Correction Factor (dB)
*0.160266	19.38	39.02	55.57	65.57	-36.19	-26.55	9.59
0.220454	11.96	29.92	52.74	62.74	-40.79	-32.82	9.6
0.595214	3.7	11.31	46	56	-42.3	-44.69	9.67
2.326744	2.54	9	46	56	-43.46	-47	9.81
6.653643	1.03	7.59	50	60	-48.97	-52.41	10.08
22.89546	7.01	12.48	50	60	-42.99	-47.52	10.54
Detectors/Bandwidths (Det/RBW/VBW) = 9/30kHz							

EN 61000-6-3 / EN 55032, Conducted Emissions (Line 2)							
Frequency (MHz)	Av Level (dBμV)	QP Level (dBμV)	Av Limit (dBμV)	QP Limit (dBμV)	Av Margin (dB)	QP Margin (dB)	Correction Factor (dB)
0.166706	16.24	35.75	55.16	65.16	-38.92	-29.41	9.58
0.808507	2.96	9.01	46	56	-43.04	-46.99	9.67
1.914254	2.91	9.24	46	56	-43.09	-46.76	9.77
4.992691	1.58	7.94	46	56	-44.42	-48.06	10
12.0429	0.79	7.21	50	60	-49.21	-52.79	10.34
23.98584	9.33	14.17	50	60	-40.67	-45.83	10.79
Detectors/Bandwidths (Det/RBW/VBW) = 9/30kHz							

Test Result: (*) The **EUT PASSED** Conducted Emission test with – 26.55 dB margin at 0.160266 MHz

Deviations, Additions, or Exclusions: None

21 Annex D: Harmonics

21.1 Method

Tests are performed in accordance with EN 61000-3-2.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

Measurement Uncertainty

Measurement	Parameter	Expanded Uncertainty (k=2)	Permitted Error
Harmonics	Current	0.34 %	±5.0%

As shown in the table above our Expanded Measurement Uncertainty for harmonic current U_{lab} is less than the corresponding measurement error allowed by IEC61000-3-2 and IEC61000-4-7, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required. There are currently no U_{CISPR} reference values in CISPR 16 for Harmonics.

21.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
000898	Power Source	TESEQ	5001X-CTS-208-411-	1337A01349 (1)	01/11/2023	01/11/2024
000899	Power Conditioner	TESEQ	CTS (CCN-1000-1)	1337A01349 (2)	01/11/2023	01/11/2024
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/0920	10/19/2022	10/19/2023

Software Utilized:

Name	Manufacturer	Version
WIN2100	TESEQ	V.4.9.0

21.3 Results:

The sample tested was found to Comply.

21.4 Setup Photographs:



21.5 Plots/Data:

Harmonics – Class-A per Ed. 4.0 (2014)(Run time)

EUT: RC2

Test category: Class-A per Ed. 4.0 (2014) (European limits)

Tested by: P.Ching

Test Margin: 150

Test date: 5/2/2023

Start time: 4:59:05 PM

End time: 5:09:27 PM

Test duration (min): 10

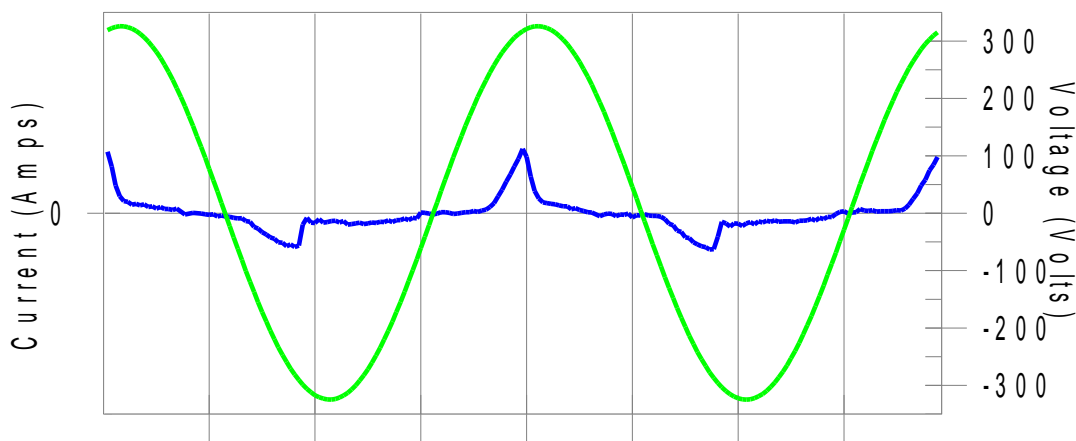
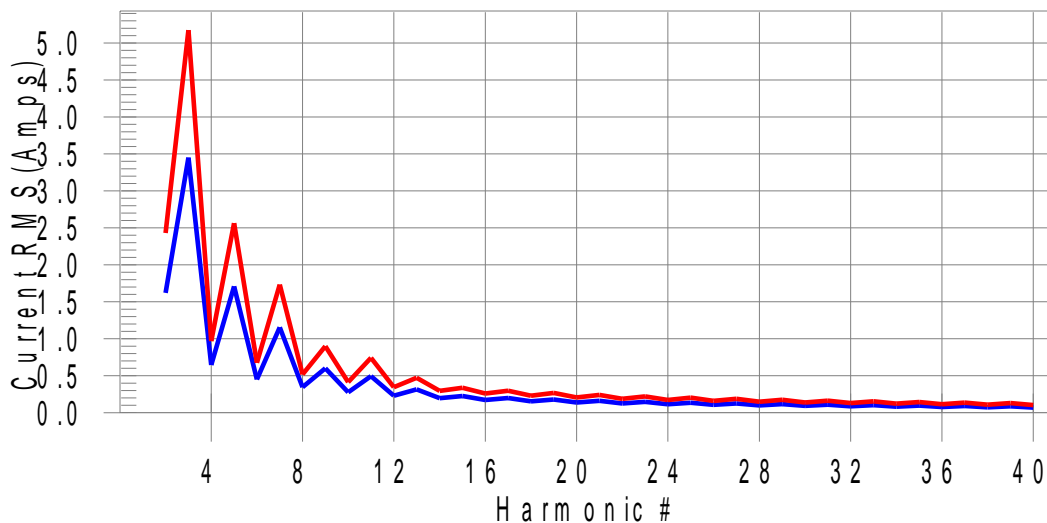
Data file name: H-000646.cts_data

Comment: Normal Operation BLE

Customer: Rain Bird

Test Result: Pass

Source qualification: Normal

Current & voltage waveforms**Harmonics and Class A limit line****European Limits****Test result: Pass Worst harmonic was #3 with 0.1% of the limit.**

Current Test Result Summary (Run time)

EUT: RC2 Tested by: P.Ching
 Test category: Class-A per Ed. 4.0 (2014) (European limits) Test Margin: 150
 Test date: 5/2/2023 Start time: 4:59:05 PM End time: 5:09:27 PM
 Test duration (min): 10 Data file name: H-000646.cts_data
 Comment: Normal Operation BLE
 Customer: Rain Bird

Test Result: Pass Source qualification: Normal
 THCA(A): 0.011 I-THD(%): 83.6 POHC(A): 0.000 POHC Limit(A): 0.377

Highest parameter values during test:

V_RMS (Volts):	230.19	Frequency(Hz):	50.00
I_Peak (Amps):	0.068	I_RMS (Amps):	0.017
I_Fund (Amps):	0.013	Crest Factor:	4.110
Power (Watts):	2.8	Power Factor:	0.728

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.004	1.620	N/A	0.004	2.430	N/A	Pass
3	0.005	3.450	0.2	0.005	5.175	0.1	Pass
4	0.005	0.645	N/A	0.005	0.968	N/A	Pass
5	0.003	1.710	N/A	0.003	2.565	N/A	Pass
6	0.004	0.450	N/A	0.004	0.675	N/A	Pass
7	0.001	1.155	N/A	0.001	1.733	N/A	Pass
8	0.003	0.345	N/A	0.003	0.518	N/A	Pass
9	0.001	0.600	N/A	0.001	0.900	N/A	Pass
10	0.002	0.276	N/A	0.002	0.414	N/A	Pass
11	0.000	0.495	N/A	0.000	0.743	N/A	Pass
12	0.001	0.230	N/A	0.001	0.344	N/A	Pass
13	0.001	0.315	N/A	0.001	0.473	N/A	Pass
14	0.001	0.197	N/A	0.001	0.295	N/A	Pass
15	0.001	0.225	N/A	0.001	0.338	N/A	Pass
16	0.001	0.173	N/A	0.001	0.259	N/A	Pass
17	0.001	0.198	N/A	0.001	0.297	N/A	Pass
18	0.000	0.153	N/A	0.000	0.230	N/A	Pass
19	0.001	0.178	N/A	0.001	0.266	N/A	Pass
20	0.000	0.138	N/A	0.000	0.207	N/A	Pass
21	0.001	0.161	N/A	0.001	0.241	N/A	Pass
22	0.000	0.125	N/A	0.000	0.188	N/A	Pass
23	0.000	0.147	N/A	0.000	0.220	N/A	Pass
24	0.000	0.115	N/A	0.000	0.172	N/A	Pass
25	0.000	0.135	N/A	0.000	0.203	N/A	Pass
26	0.000	0.107	N/A	0.000	0.160	N/A	Pass
27	0.000	0.125	N/A	0.000	0.187	N/A	Pass
28	0.000	0.099	N/A	0.000	0.149	N/A	Pass
29	0.000	0.116	N/A	0.000	0.175	N/A	Pass
30	0.000	0.092	N/A	0.000	0.138	N/A	Pass
31	0.000	0.109	N/A	0.000	0.163	N/A	Pass
32	0.000	0.086	N/A	0.000	0.129	N/A	Pass
33	0.000	0.102	N/A	0.000	0.153	N/A	Pass
34	0.000	0.081	N/A	0.000	0.122	N/A	Pass
35	0.000	0.096	N/A	0.000	0.145	N/A	Pass
36	0.000	0.077	N/A	0.000	0.115	N/A	Pass
37	0.000	0.091	N/A	0.000	0.137	N/A	Pass
38	0.000	0.073	N/A	0.000	0.109	N/A	Pass
39	0.000	0.087	N/A	0.000	0.130	N/A	Pass
40	0.000	0.069	N/A	0.000	0.104	N/A	Pass

Voltage Source Verification Data (Run time)

EUT: RC2

Tested by: P.Ching

Test category: Class-A per Ed. 4.0 (2014) (European limits) Test Margin: 150

Test date: 5/2/2023

Start time: 4:59:05 PM

End time: 5:09:27 PM

Test duration (min): 10

Data file name: H-000646.cts_data

Comment: Normal Operation BLE

Customer: Rain Bird

Test Result: Pass

Source qualification: Normal

Highest parameter values during test:

Voltage (Vrms): 230.19

Frequency(Hz): 50.00

I_Peak (Amps): 0.068

I_RMS (Amps): 0.017

I_Fund (Amps): 0.013

Crest Factor: 4.110

Power (Watts): 2.8

Power Factor: 0.728

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.055	0.460	11.91	OK
3	0.418	2.071	20.18	OK
4	0.034	0.460	7.37	OK
5	0.044	0.921	4.73	OK
6	0.020	0.460	4.34	OK
7	0.025	0.690	3.63	OK
8	0.013	0.460	2.80	OK
9	0.009	0.460	1.92	OK
10	0.005	0.460	1.08	OK
11	0.005	0.230	2.22	OK
12	0.009	0.230	4.01	OK
13	0.005	0.230	2.35	OK
14	0.007	0.230	3.06	OK
15	0.009	0.230	3.75	OK
16	0.008	0.230	3.36	OK
17	0.004	0.230	1.77	OK
18	0.010	0.230	4.49	OK
19	0.008	0.230	3.56	OK
20	0.028	0.230	12.18	OK
21	0.009	0.230	3.74	OK
22	0.004	0.230	1.75	OK
23	0.006	0.230	2.57	OK
24	0.006	0.230	2.46	OK
25	0.005	0.230	1.99	OK
26	0.004	0.230	1.84	OK
27	0.006	0.230	2.51	OK
28	0.007	0.230	2.91	OK
29	0.007	0.230	3.03	OK
30	0.006	0.230	2.74	OK
31	0.003	0.230	1.09	OK
32	0.002	0.230	1.07	OK
33	0.002	0.230	0.97	OK
34	0.003	0.230	1.21	OK
35	0.005	0.230	2.00	OK
36	0.003	0.230	1.41	OK
37	0.003	0.230	1.16	OK
38	0.002	0.230	1.08	OK
39	0.005	0.230	2.31	OK
40	0.015	0.230	6.56	OK

22 Annex E: Flicker

22.1 Method

Tests are performed in accordance with EN 61000-3-3.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

Measurement Uncertainty

Measurement	Parameter	Expanded Uncertainty (k=2)	Permitted Error
Flicker	Pst	1.6 %	±8.0%
Flicker	dc	0.59 %	±8.0%

As shown in the table above our Expanded Measurement Uncertainty for Pst and dc U_{lab} is less than the corresponding measurement error allowed by IEC 61000-3-3, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required. There are currently no U_{CISPR} reference values in CISPR 16 for Flicker.

22.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
000898	Power Source	TESEQ	5001X-CTS-208-411-	1337A01349 (1)	01/11/2023	01/11/2024
000899	Power Conditioner	TESEQ	CTS (CCN-1000-1)	1337A01349 (2)	01/11/2023	01/11/2024
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/0920	10/19/2022	10/19/2023

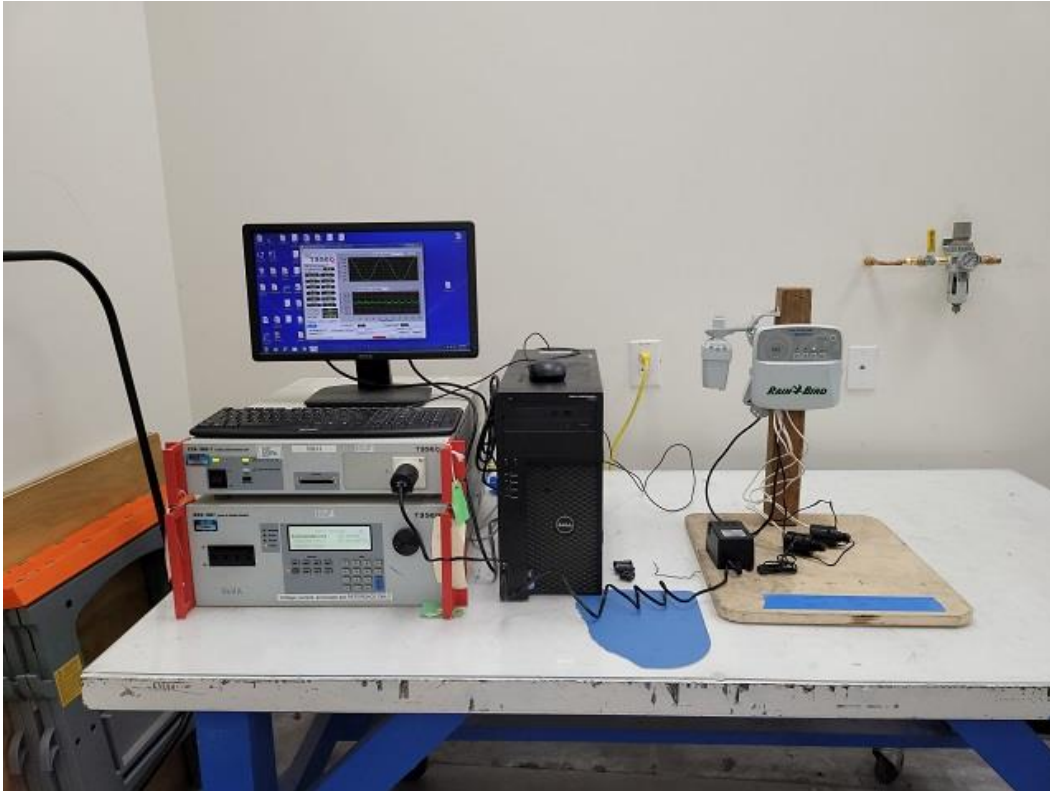
Software Utilized:

Name	Manufacturer	Version
WIN2100	TESEQ	V.4.9.0

22.3 Results:

The sample tested was found to Comply.

22.4 Setup Photographs:



22.5 Plots/Data:

Flicker Test Summary per EN/IEC61000-3-3 Ed. 3.0 (2013) (Run time)

EUT: RC2

Tested by: P.Ching

Test category: All parameters (European limits)

Test Margin: 100

Test date: 3/27/2023

Start time: 4:03:13 PM

End time: 6:05:24 PM

Test duration (min): 120

Data file name: F-000618.cts_data

Comment: Normal Operation

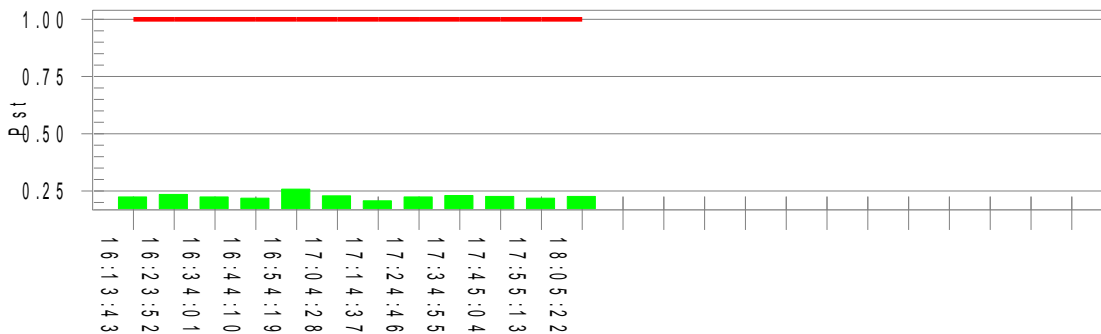
Customer: RainBird

Test Result: Pass

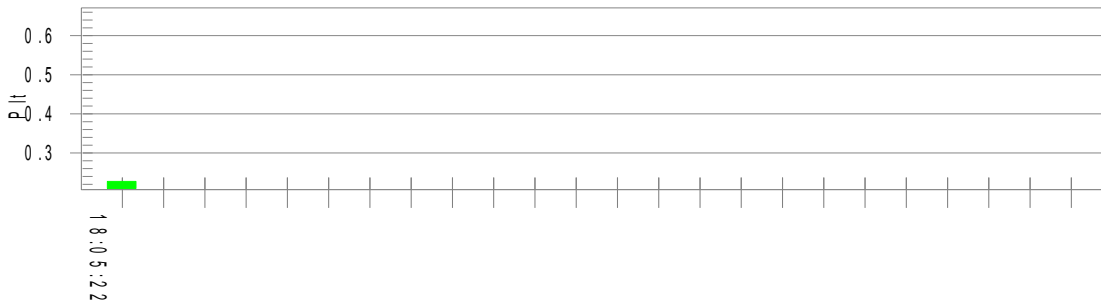
Status: Test Completed

Pst_i and limit line

European Limits



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt): 230.47

Highest dt (%): 0.21

T-max (mS): 0

Highest dc (%): 0.00

Highest dmax (%): 0.13

Highest Pst (10 min. period): 0.258

Highest Plt (2 hr. period): 0.227

Test limit (%): N/A

Test limit (mS): 500.0

Test limit (%): 3.30

Test limit (%): 4.00

Test limit: 1.000

Test limit: 0.650

N/A

Pass

Pass

Pass

Pass

Pass

23 Annex F: Electrostatic Discharge Immunity Test

23.1 Method

Tests are performed in accordance with EN 61000-4-2.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

23.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
002212	ESD Gun	EMC Partner	ESD3000	2182	01/12/2023	01/12/2024
001516	Grace made new Vertical Ground Plane (ESD)	Intertek	N/A	none	VBV	VBV
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/09 20	10/19/2022	10/19/2023

*VBV: Verified Before Used

Software Utilized:

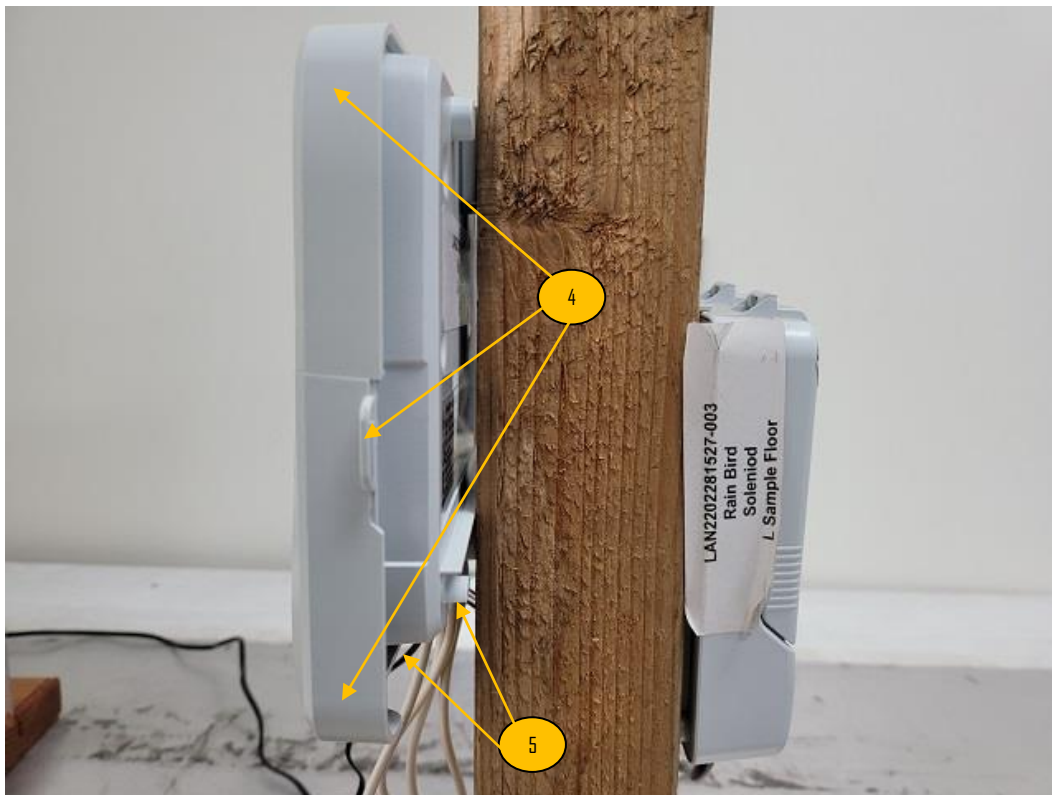
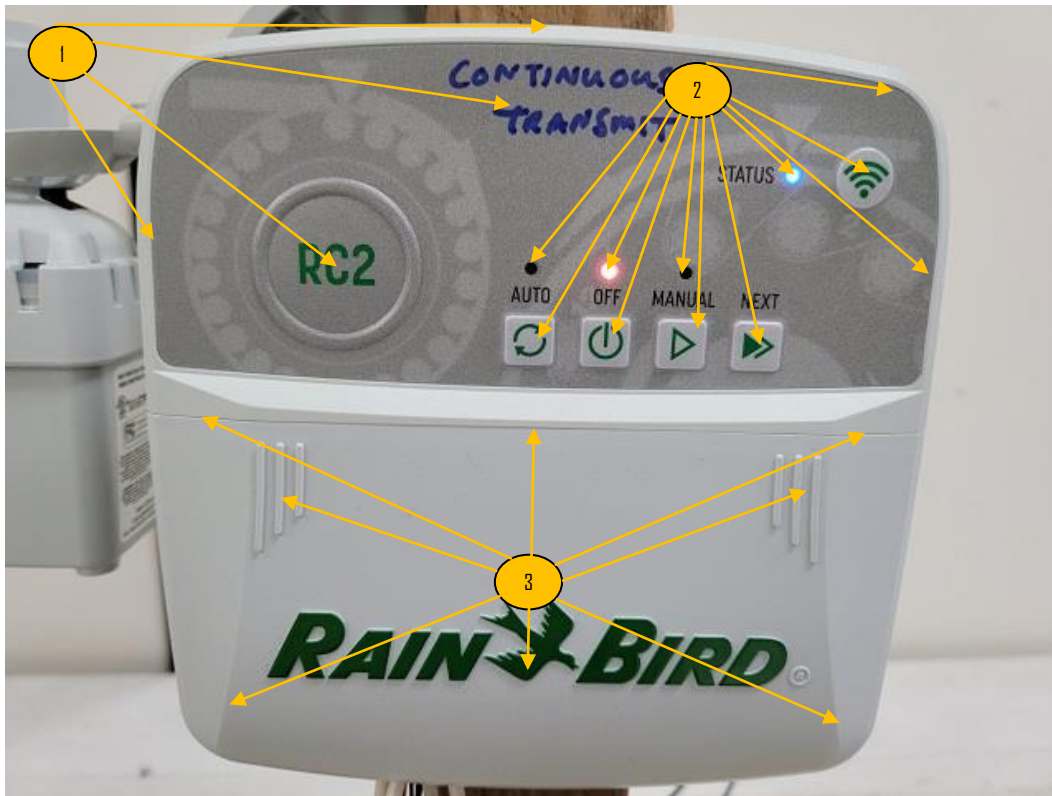
Name	Manufacturer	Version
None	N/A	N/A

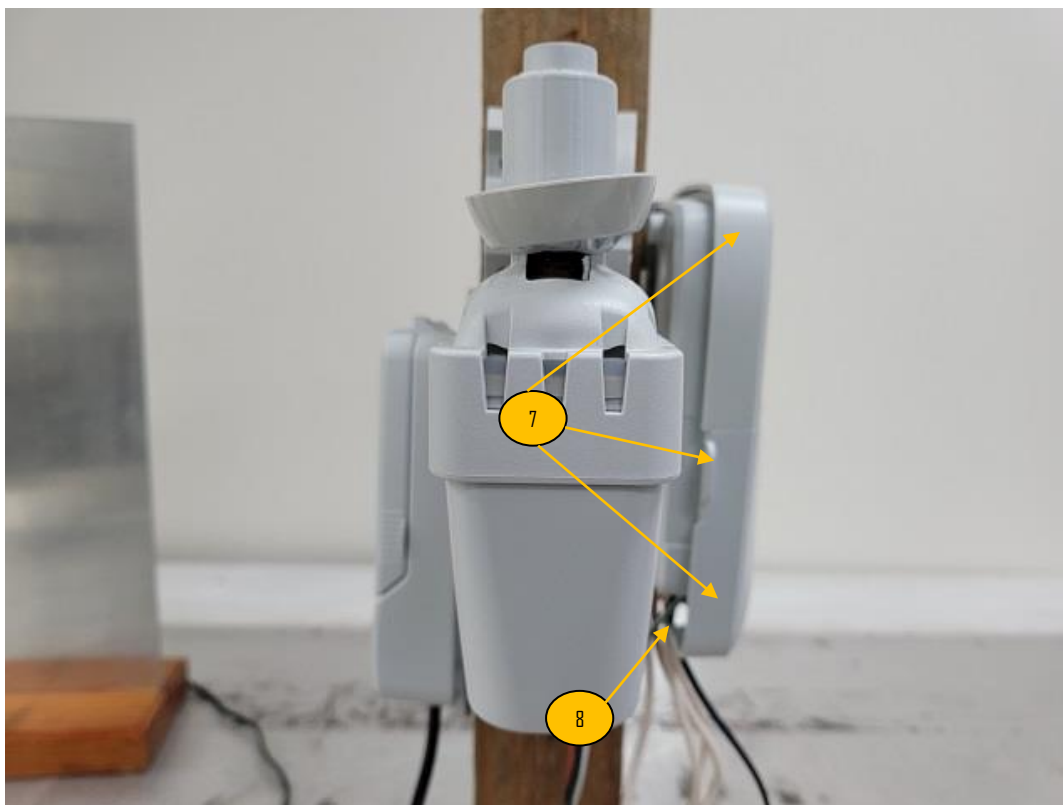
23.3 Results:

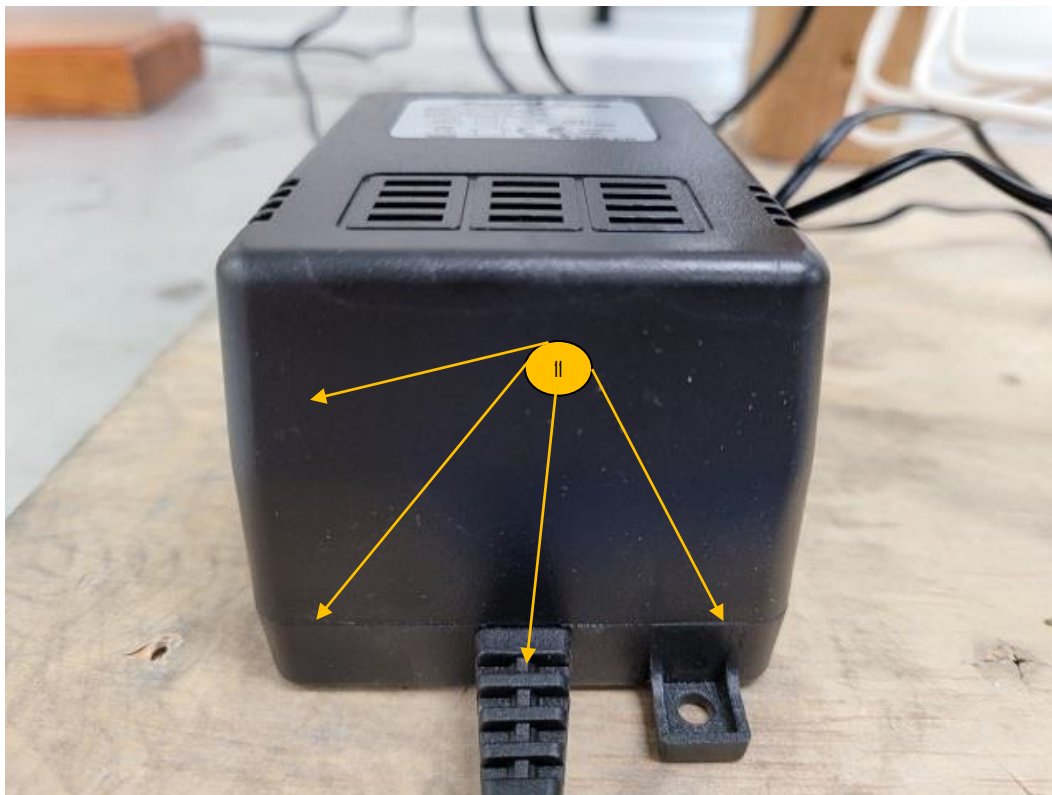
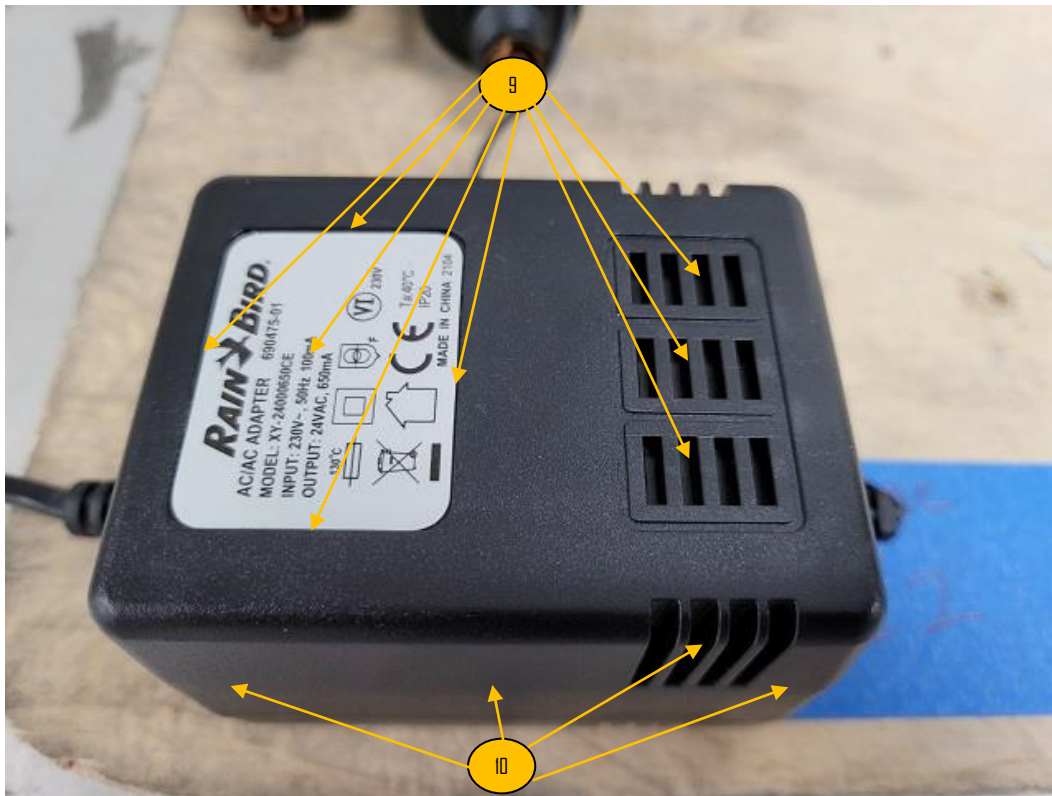
The sample tested was found to Comply.

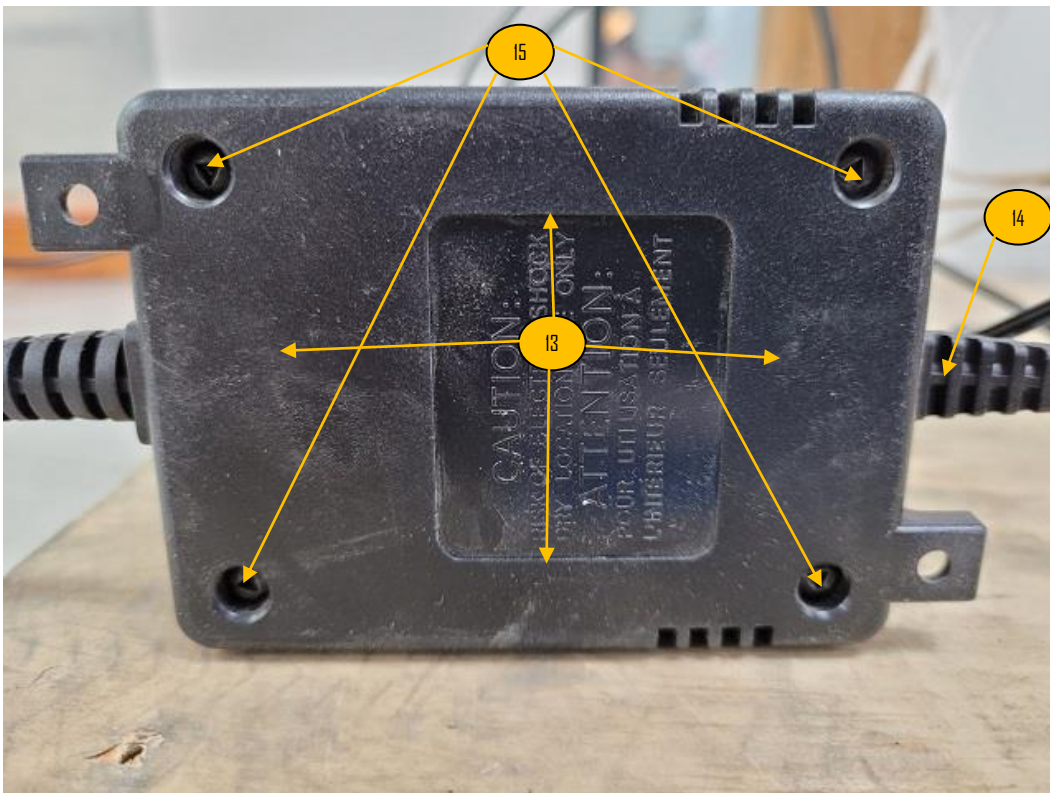
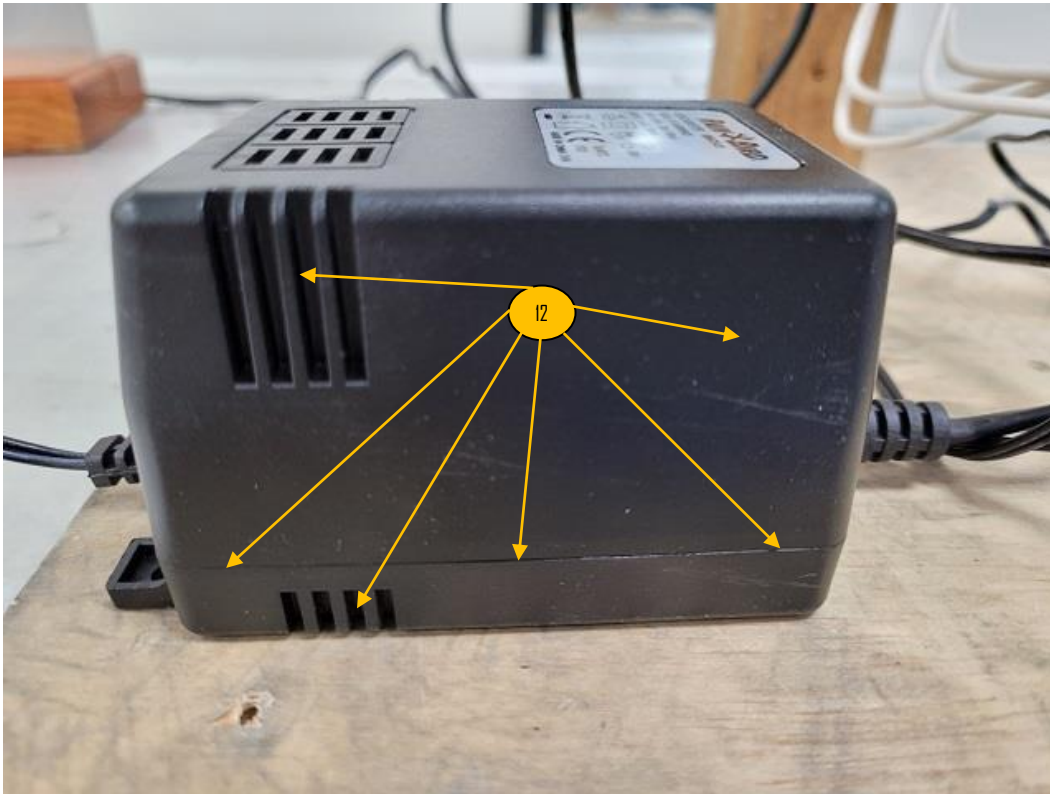


23.5 ESD Test Points:



23.6 ESD Test Points:

23.7 ESD Test Points:

23.8 ESD Test Points:

23.9 Data: BLE Active

Test Personnel:	Peejar Ching	Test Date:	03/28/2023
Supervising/Reviewing Engineer:			
(Where Applicable)	Melvin Sanchez	Required Performance:	B
Product Standard:	EN 61000-6-1, ETSI EN 301 489-1, ETSI EN 301 489-17	Test Levels:	See Table Below
Input Voltage:	230VAC/50Hz	Ambient Temperature:	21.59 °C
Sparked Verified on VCP:	Yes	Relative Humidity:	56.8 %
470k x 2 Strap(s) Verified:	940kΩ	Atmospheric Pressure:	992 mbars

Test Point	Discharge Voltage Type	Test Voltages, Polarities and Result Classification												
		2 kV		4 kV		6 kV		8 kV			15 kV		___ kV	
		Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg		Pos	Neg	Pos	Neg
HCP	Contact			(A)	(A)					Air Discharges only above 8 kV				
VCP	Contact			(A)	(A)									
1	Air	(A)	(A)	(A)	(A)			(A)	(A)					
2	Air	(A)	(A)	(A)	(A)			(A)	(A)					
3	Air	(A)	(A)	(A)	(A)			(A)	(A)					
4	Air	(A)	(A)	(A)	(A)			(A)	(A)					
5	Air	(A)	(A)	(A)	(A)			(A)	(A)					
6	Air	(A)	(A)	(A)	(A)			(A)	(A)					
7	Air	(A)	(A)	(A)	(A)			(A)	(A)					
8	Air	(A)	(A)	(A)	(A)			(A)	(A)					
9	Air	(A)	(A)	(A)	(A)			(A)	(A)					
10	Air	(A)	(A)	(A)	(A)			(A)	(A)					
11	Air	(A)	(A)	(A)	(A)			(A)	(A)					
12	Air	(A)	(A)	(A)	(A)			(A)	(A)					
13	Air	(A)	(A)	(A)	(A)			(A)	(A)					
14	Air	(A)	(A)	(A)	(A)			(A)	(A)					
15	Air	(A)	(A)	(A)	(A)			(A)	(A)					

Notes:

(A) The EUT met the requirements without any degradation of performance.

Criteria	During Test	After Test
A	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ May show degradation of performance (Note 1) ➤ Shall be no loss of function ➤ Shall be no unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ Shall be no degradation of performance (Note 1) ➤ Shall be no loss function ➤ Shall be no loss of stored data or user programmable functions
B	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) ➤ May show degradation of performance (Note 1) ➤ No unintentional transmissions 	<ul style="list-style-type: none"> ➤ Functions shall be self-recoverable ➤ Shall operate as intended after recovering ➤ Shall be no loss of stored data or user programmable functions
C	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) 	<ul style="list-style-type: none"> ➤ Functions shall be recoverable by the operator ➤ Shall operate as intended after recovering ➤ Shall be no degradation of performance (Note 1)
Note 1: Degradation of performance during the test is understood as degradation to a level not below a minimum performance level specified by the manufacturer.		

Deviations, Additions, or Exclusions: None

24 Annex G: Radiated, radio-frequency, electromagnetic field immunity test

24.1 Method

Tests are performed in accordance with EN 61000-4-3.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

24.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
Rental	High Frequency Antenna	AR	ATR80M6G	0464504	VBU	VBU
001573	Power Meter Dual Channel	Frankonia	PMS 1084	1081298/2015	01/12/2023	01/12/2024
001519	Signal Generator 9kHz - 6GHz	Rohde & Schwarz	SMA 100A	100593	01/11/2023	01/11/2024
001571	Dual Directional Coupler 80 -1000MHz	Verlatone	C3908-22	107868	01/11/2023	01/11/2024
001572	Coupler 690 - 6000 MHz 400 WATTS 42 dB	Ophir	CUP00293	none	01/10/2023	01/10/2024
001510	Radiated Immunity RF Cable	Megaphase	TM8-N1N1-120-2	15015302001	VBU	VBU
001574	7/16 Din Cable Male - Male	Fairview Microwave	FMC1515405-36	None	VBU	VBU
001509	Radiated Immunity RF Cable	Megaphase	TM8-N1N1-72-2	15015301001	VBU	VBU
001513	Immunity Cable	Megaphase	TM8-N1N1-72-2	15023801002	VBU	VBU
000638	Radiated Immunity	Unknown	Chamber	None	VBU	VBU
001569	Amplifier 0.8 - 6.0GHz	Ophir	5200526	1002/1544	VBU	VBU
001570	Amplifier 80 - 1000MHz	Ophir	5200525	1001/1539	VBU	VBU
001374	6 meter low loss cable	A.H. Systems Inc.	SAC-26G-6	320	VBU	VBU
001010	Field Monitor	ETS Lindgren	FM 5004	00128845	VBU	VBU
002200A	Hygro-Thermometer, Probe	Fluke	2626-S	C0B266	09/20/2022	09/20/2023

*VBU: Verified Before Used

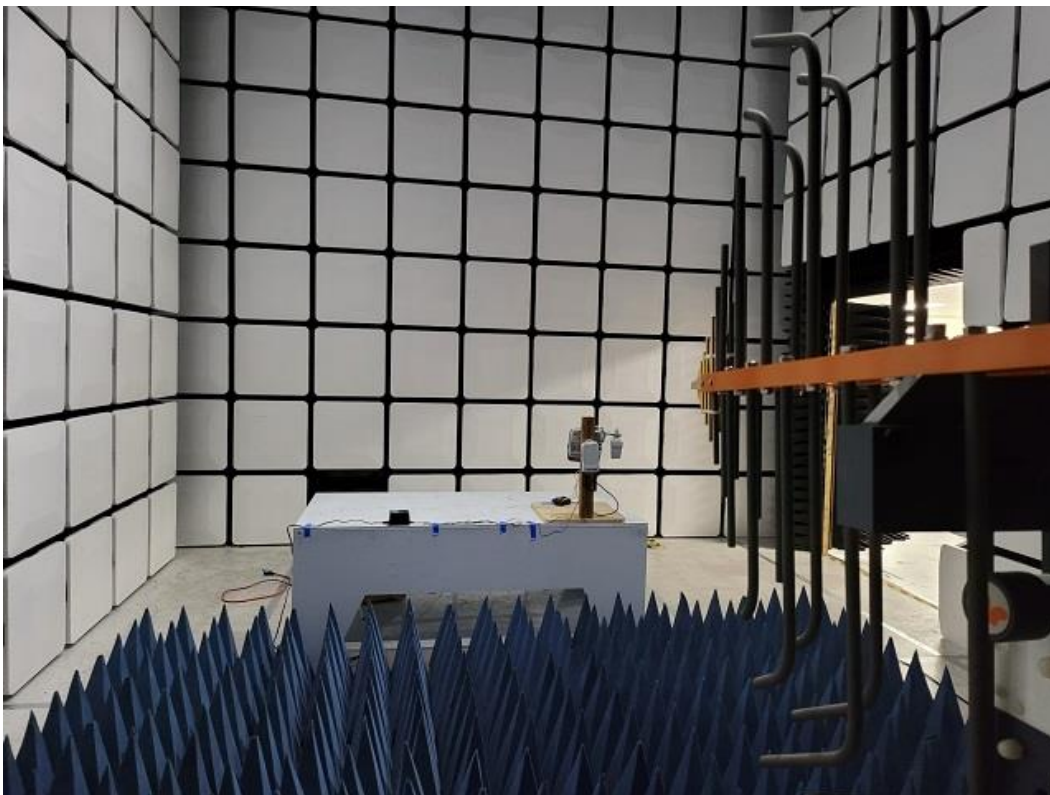
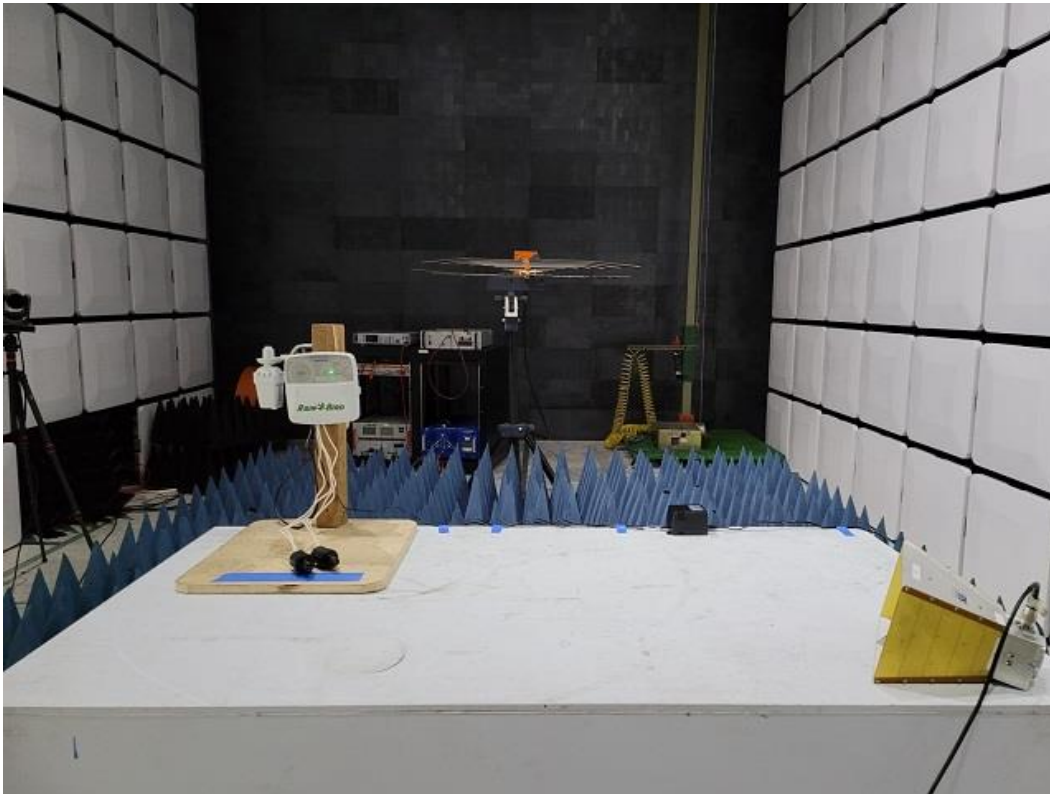
Software Utilized:

Name	Manufacturer	Version
BAT-EMC	NEXIO	Version: 3.19.1.19

24.3 Results:

The sample tested was found to Comply.

24.4 Setup Photographs:



24.5 Data: BLE Active

Test Personnel:	<u>Peejar Ching</u>	Test Date:	<u>03/27/2023</u>
Supervising/Reviewing Engineer:		Modulation:	<u>80% AM @ 1kHz Sine Wave, 1% Step Size, 3s Dwell Time</u>
(Where Applicable)	<u>Melvin Sanchez</u>	Required Performance:	<u>A</u>
Product Standard:	<u>EN 61000-6-1, ETSI EN 301 489-1, ETSI EN 301 489-17</u>	Test Levels:	<u>See Table Below</u>
Input Voltage:	<u>230VAC/50Hz</u>	Ambient Temperature:	<u>21 °C</u>
Field Level Monitored:	<u>3 V/m</u>	Relative Humidity:	<u>59 %</u>
		Atmospheric Pressure:	<u>992.3 mbars</u>

Field Level (V/m)	Frequency Range MHz	Antenna Polarity, Azimuths and Result Classification							
		Vertical				Horizontal			
		0°	90°	180°	270°	0°	90°	180°	270°
3	80-1000	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
3	1000-6000	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)

General Notes:

0 degrees: Front of EUT with Display facing antenna
 90 degrees: Right side of EUT, when looking at display, facing antenna
 180 degrees: Back of EUT with Display facing away from antenna
 270 degrees: Left side of EUT, when looking at display, facing antenna

Notes:

(A) The EUT met the requirements without any degradation of performance.

Criteria	During Test	After Test
A	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ May show degradation of performance (Note 1) ➤ Shall be no loss of function ➤ Shall be no unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ Shall be no degradation of performance (Note 1) ➤ Shall be no loss function ➤ Shall be no loss of stored data or user programmable functions
B	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) ➤ May show degradation of performance (Note 1) ➤ No unintentional transmissions 	<ul style="list-style-type: none"> ➤ Functions shall be self-recoverable ➤ Shall operate as intended after recovering ➤ Shall be no loss of stored data or user programmable functions
C	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) 	<ul style="list-style-type: none"> ➤ Functions shall be recoverable by the operator ➤ Shall operate as intended after recovering ➤ Shall be no degradation of performance (Note 1)
Note 1: Degradation of performance during the test is understood as degradation to a level not below a minimum performance level specified by the manufacturer.		

Deviations, Additions, or Exclusions: None

25 Annex H: Electrical Fast Transient/Burst Immunity Test

25.1 Method

Tests are performed in accordance with EN 61000-4-4.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

25.2 Test Equipment Used:

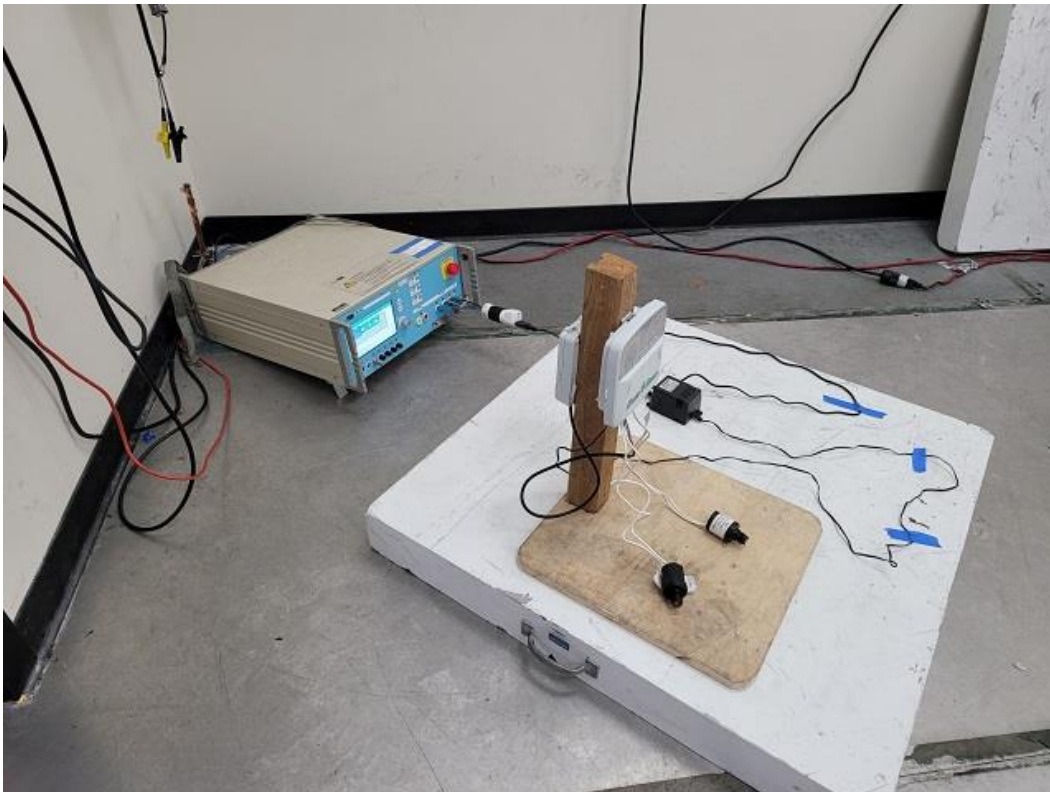
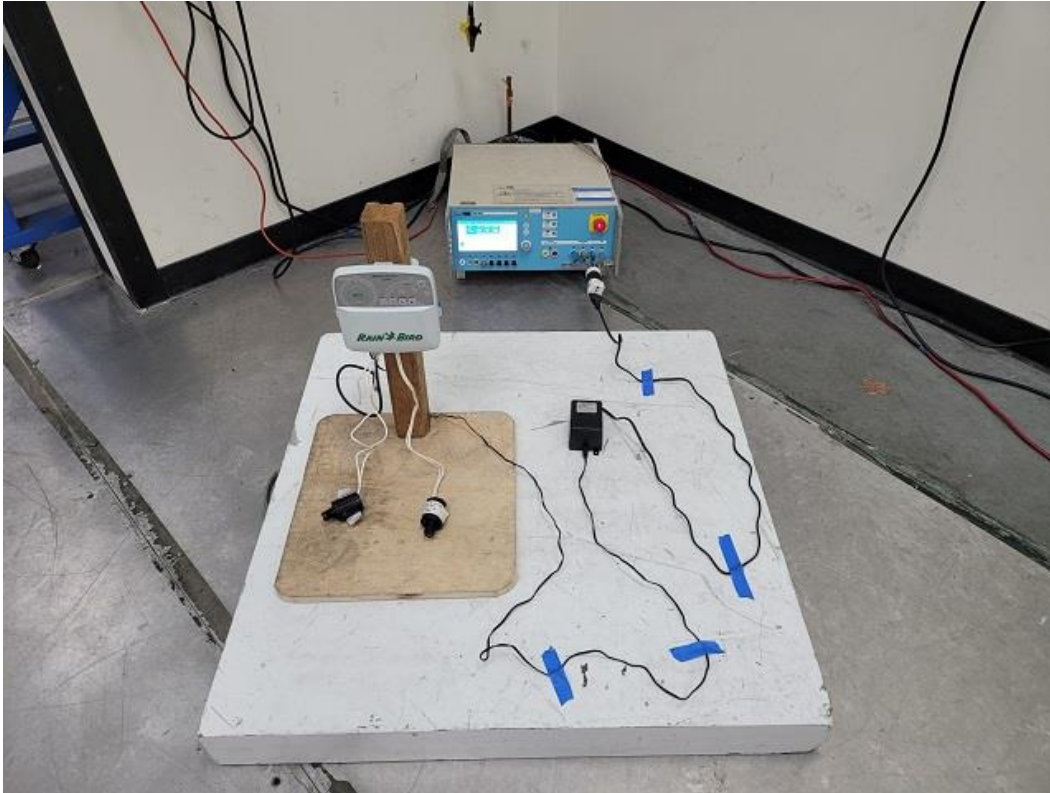
Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
002145	Impulse generator	EMC Partner	IMU-MGS	109938-1543	01/10/2023	01/10/2024
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/0920	10/19/2022	10/19/2023

Software Utilized:

Name	Manufacturer	Version
TEMA 3000	EMC Partner	V2.23 rev. e849aad

25.3 Results:

The sample tested was found to Comply.

25.4 Setup Photographs:

25.5 Data: BLE Active

Test Personnel:	Peejar Ching	Test Date:	03/26/2023
Supervising/Reviewing Engineer:		Pulse Repetition Frequency:	5 kHz
(Where Applicable)	Melvin Sanchez	Required Performance:	B
Product Standard:	EN 61000-6-1, ETSI EN 301 489-1, ETSI EN 301 489-17	Test Levels:	See Table Below
Input Voltage:	230VAC/50Hz	Ambient Temperature:	22 °C
Waveform Verified on Oscilloscope:	Yes	Relative Humidity:	58.7 %
		Atmospheric Pressure:	992 mbars

Test Point	Coupling Method	Test Voltage, Polarities, and Result Classification									
		0.25 kV		0.5 kV		1kV		2 kV		4 kV	
		pos	neg	pos	neg	pos	neg	pos	neg	pos	neg
Power L1	Direct			(A)	(A)	(A)	(A)				
Power L2	Direct			(A)	(A)	(A)	(A)				
Power PE	Direct			(A)	(A)	(A)	(A)				

Notes:

(A) The EUT met the requirements without any degradation of performance.

Criteria	During Test	After Test
A	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ May show degradation of performance (Note 1) ➤ Shall be no loss of function ➤ Shall be no unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ Shall be no degradation of performance (Note 1) ➤ Shall be no loss function ➤ Shall be no loss of stored data or user programmable functions
B	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) ➤ May show degradation of performance (Note 1) ➤ No unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended after recovering ➤ Shall be no loss of stored data or user programmable functions
C	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) 	<ul style="list-style-type: none"> ➤ Functions shall be self-recoverable ➤ Functions shall be recoverable by the operator ➤ Shall operate as intended after recovering ➤ Shall be no degradation of performance (Note 1)
Note 1: Degradation of performance during the test is understood as degradation to a level not below a minimum performance level specified by the manufacturer.		

Deviations, Additions, or Exclusions: None

26 Annex I: Immunity to Surge

26.1 Method

Tests are performed in accordance with EN 61000-4-5.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

26.2 Test Equipment Used:

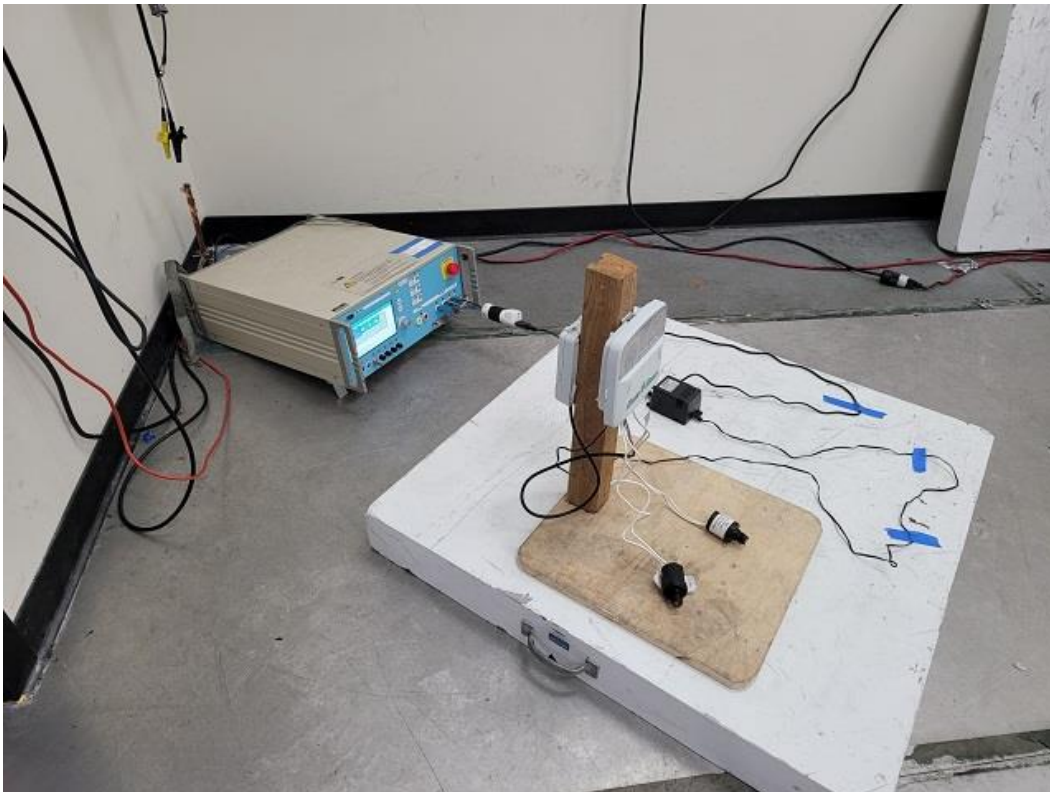
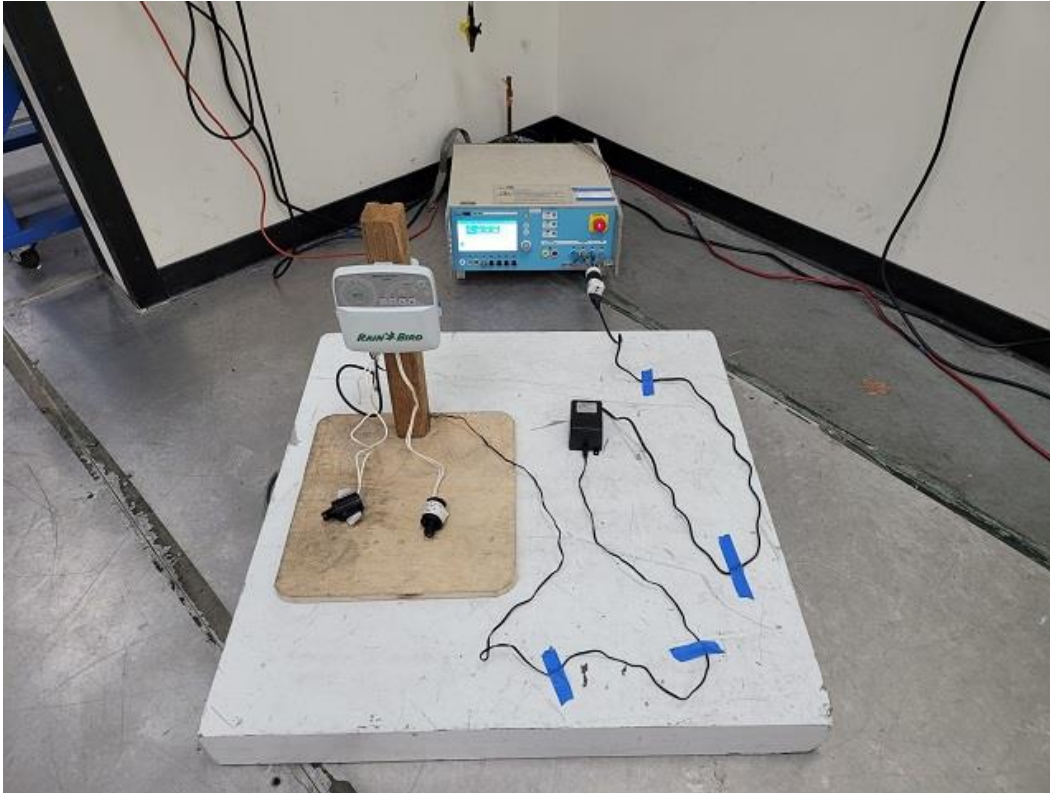
Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
002145	Impulse generator	EMC Partner	IMU-MGS	109938-1543	01/10/2023	01/10/2024
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/0920	10/19/2022	10/19/2023

Software Utilized:

Name	Manufacturer	Version
TEMA 3000	EMC Partner	V2.23 rev. e849aad

26.3 Results:

The sample tested was found to Comply.

26.4 Setup Photographs:

26.5 Data: BLE

Test Personnel: Peejar Ching
 Supervising/Reviewing Engineer:
 (Where Applicable) Melvin Sanchez

Test Date: 03/24/2023

Product Standard: EN 61000-6-1, ETSI EN 301 489-1, ETSI EN 301 489-17

Test Levels: See Table Below

Input Voltage: 230VAC/50Hz
 Waveform Verified on Oscilloscope: Yes

Performance Criteria: B
 Ambient Temperature: 20.69 °C
 Relative Humidity: 61 %
 Atmospheric Pressure: 991 mbars

Test	Test Voltages, Polarities, and Result Classification							
	0.5kV		1kV		2kV		4kV	
	pos	neg	pos	neg	pos	neg	pos	neg
L1-PE, at 0 deg	(A)	(A)	(A)	(A)	(A)	(A)		
L1-PE, at 90 deg	(A)	(A)	(A)	(A)	(A)	(A)		
L1-PE, at 180 deg	(A)	(A)	(A)	(A)	(A)	(A)		
L1-PE, at 270 deg	(A)	(A)	(A)	(A)	(A)	(A)		
N-PE, at 0 deg	(A)	(A)	(A)	(A)	(A)	(A)		
N-PE, at 90 deg	(A)	(A)	(A)	(A)	(A)	(A)		
N-PE, at 180 deg	(A)	(A)	(A)	(A)	(A)	(A)		
N-PE, at 270 deg	(A)	(A)	(A)	(A)	(A)	(A)		
L1-N, at 0 deg	(A)	(A)	(A)	(A)				
L1-N, at 90 deg	(A)	(A)	(A)	(A)				
L1-N, at 180 deg	(A)	(A)	(A)	(A)				
L1-N, at 270 deg	(A)	(A)	(A)	(A)				

Notes:

(A) The EUT met the requirements without any degradation of performance.

Criteria	During Test	After Test
A	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ May show degradation of performance (Note 1) ➤ Shall be no loss of function ➤ Shall be no unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ Shall be no degradation of performance (Note 1) ➤ Shall be no loss function ➤ Shall be no loss of stored data or user programmable functions
B	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) ➤ May show degradation of performance (Note 1) ➤ No unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended after recovering ➤ Shall be no loss of stored data or user programmable functions
C	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) 	<ul style="list-style-type: none"> ➤ Functions shall be self-recoverable ➤ Functions shall be recoverable by the operator ➤ Shall operate as intended after recovering ➤ Shall be no degradation of performance (Note 1)
Note 1: Degradation of performance during the test is understood as degradation to a level not below a minimum performance level specified by the manufacturer.		

Deviations, Additions, or Exclusions: None

27 Annex J: Conducted, radio-frequency, electromagnetic field immunity test

27.1 Method

Tests are performed in accordance with EN 61000-4-6.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

27.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
001469	Attenuator	Pasternack	PE7021-6	none	VBU	VBU
001713	Compact gernator with built-in power amplifier. (IEC-61000-4-6)	Ametek	NSG 4070C	49406	01/11/2023	01/11/2024
001462	CDN	TESEQ	CDN M016	37381	01/09/2023	01/09/2024
001558	RF Cable	Megaphase	TM8-N1N1-84-2	17218401001	VBU	VBU
001559	RF Cable	Megaphase	TM8-N1N1-84-2	17218401002	VBU	VBU
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/0920	10/19/2022	10/19/2023

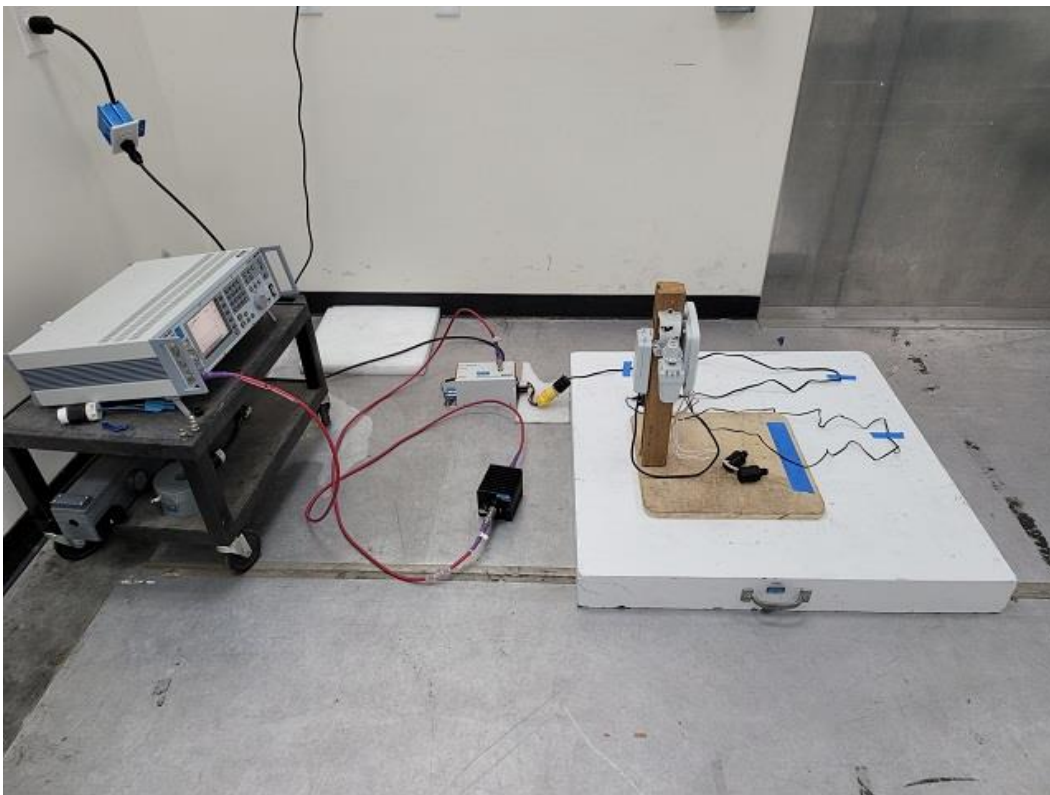
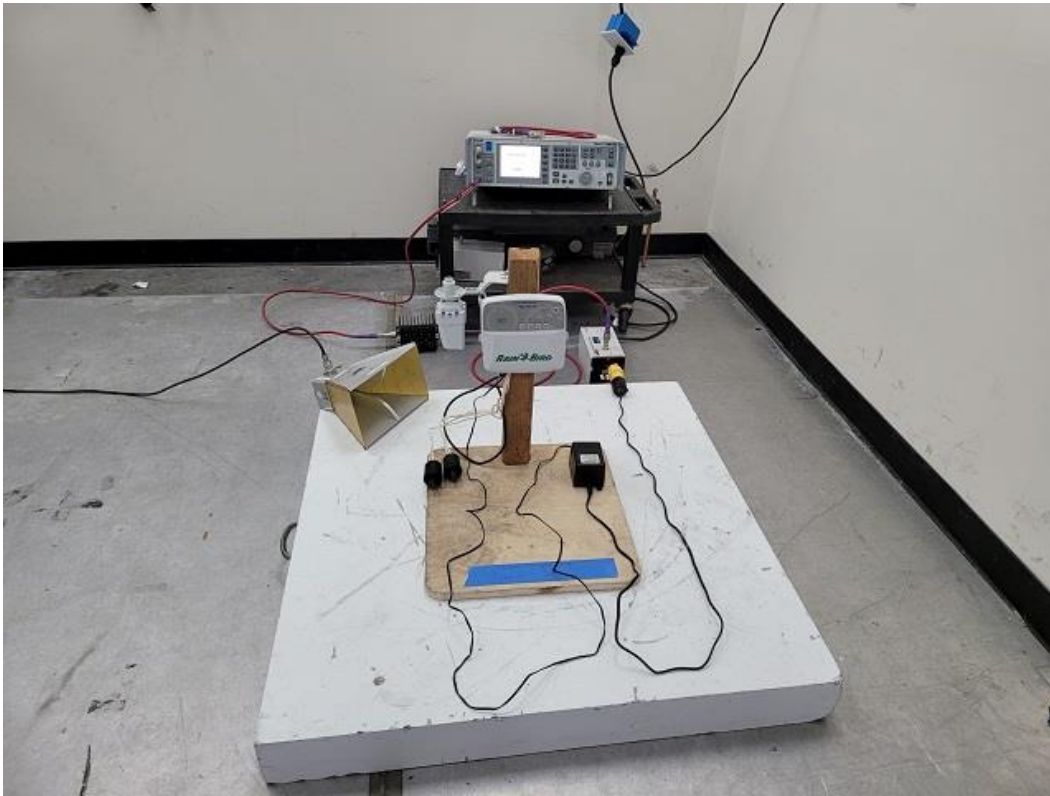
*VBU: Verified Before Used

Software Utilized:

Name	Manufacturer	Version
None	--	--

27.3 Results:

The sample tested was found to Comply.

27.4 Setup Photographs:

27.5 Data: BLE Active

Test Personnel:	<u>Peejar Ching</u>	Test Date:	<u>03/23/2023</u>
Supervising/Reviewing Engineer: (Where Applicable)	<u>Melvin Sanchez</u>	Modulation:	<u>80% AM @ 1kHz Sine Wave, 1% Step Size, 3s Dwell Time</u>
		Required Performance:	<u>A</u>
Product Standard:	<u>EN 61000-6-1, ETSI EN 301 489-1, ETSI EN 301 489-17</u>	Test Levels:	<u>See Table Below</u>
Input Voltage:	<u>230VAC/50Hz</u>	Ambient Temperature:	<u>21 °C</u>
Test Level Verification Performed:	<u>Yes</u>	Relative Humidity:	<u>59 %</u>
		Atmospheric Pressure:	<u>992.1 mbars</u>

Frequency Range (MHz)	Injection Device Type	Port Description	Test Level (V_{rms})	Result Classification
0.15 – 80	CDN	AC Mains	3	(A)

Notes:

(A) The EUT met the requirements without any degradation of performance.

Criteria	During Test	After Test
A	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ May show degradation of performance (Note 1) ➤ Shall be no loss of function ➤ Shall be no unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ Shall be no degradation of performance (Note 1) ➤ Shall be no loss of function ➤ Shall be no loss of stored data or user programmable functions
B	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) ➤ May show degradation of performance (Note 1) ➤ No unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended after recovering ➤ Shall be no loss of stored data or user programmable functions
C	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) 	<ul style="list-style-type: none"> ➤ Functions shall be self-recoverable ➤ Functions shall be recoverable by the operator ➤ Shall operate as intended after recovering ➤ Shall be no degradation of performance (Note 1)
Note 1: Degradation of performance during the test is understood as degradation to a level not below a minimum performance level specified by the manufacturer.		

Deviations, Additions, or Exclusions: None

28 Annex K: Power Frequency Magnetic Field Immunity Test

28.1 Method

Tests are performed in accordance with EN 61000-4-8.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

28.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
000566	Stepdown X-former	GE	9T51B0410	none	VBU	VBU
000559	Immunity Loop	Fischer CC	F-1000-4-8/9/10-L-M	4	VBU	VBU
000630	AC Current Clamp	Fluke	i200	none	01/12/2023	01/12/2024
001211	Multimeter	Fluke	177	20020562	01/12/2023	01/12/2024
000898	Power Source	TESEQ	5001IX-CTS-208-411-	1337A01349 (1)	01/11/2023	01/11/2024
000899	Power Conditioner	TESEQ	CTS (CCN-1000-1)	1337A01349 (2)	01/11/2023	01/11/2024
002200A	Hygro-Thermometer, Probe	Fluke	2626-S	C0B266	09/20/2022	09/20/2023

*VBU: Verified Before Used

Software Utilized:

Name	Manufacturer	Version
None	N/A	N/A

28.3 Results:

The sample tested was found to Comply.

28.4 Setup Photographs:

28.5 Data: BLE Active

Test Personnel: Peejar Ching
 Supervising/Reviewing Engineer:
 (Where Applicable) Melvin Sanchez

Test Date: 03/27/2023

Product Standard: EN 61000-6-1, ETSI EN 301 489-1, ETSI EN 301 489-17

Test Levels: See Table Below

Input Voltage: 230VAC/50-60Hz

Performance Criteria: A

Ambient Temperature: 21.59 °C

Ambient Field Level: 0.28 µT

Relative Humidity: 56.8%

Test Field Level

Verified: 7.5 µT

Atmospheric Pressure: 992 mbars

Test Location/ Mode/ EUT Input	Test Level (A/m)	Frequency (Hz)	Result Classification		
			X – Axis	Y – Axis	Z – Axis
Enclosure/Normal Mode/ 230VAC-60Hz	3	60	(A)	(A)	(A)
Enclosure/Normal Mode/ 230VAC-50Hz	3	50	(A)	(A)	(A)

Notes:

(A) The EUT met the requirements without any degradation of performance.

Criteria	During Test	After Test
A	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ May show degradation of performance (Note 1) ➤ Shall be no loss of function ➤ Shall be no unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ Shall be no degradation of performance (Note 1) ➤ Shall be no loss function ➤ Shall be no loss of stored data or user programmable functions
B	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) ➤ May show degradation of performance (Note 1) ➤ No unintentional transmissions 	<ul style="list-style-type: none"> ➤ Functions shall be self-recoverable ➤ Shall operate as intended after recovering ➤ Shall be no loss of stored data or user programmable functions
C	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) 	<ul style="list-style-type: none"> ➤ Functions shall be recoverable by the operator ➤ Shall operate as intended after recovering ➤ Shall be no degradation of performance (Note 1)
Note 1: Degradation of performance during the test is understood as degradation to a level not below a minimum performance level specified by the manufacturer.		

Deviations, Additions, or Exclusions: None

29 Annex L: Voltage Dips / Interruptions Immunity Tests

29.1 Method

Tests are performed in accordance with EN 61000-4-11.

TEST SITE: Lake Forest EMC Lab

The EMC Lab has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 380, and 440 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

29.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
000898	Power Source	TESEQ	5001IX-CTS-208-411-	1337A01349 (1)	01/11/2023	01/11/2024
000899	Power Conditioner	TESEQ	CTS (CCN-1000-1)	1337A01349 (2)	01/11/2023	01/11/2024
002159	Humidity/Temperature/Pressure M	Testo	622	39525175/0920	10/19/2022	10/19/2023

Software Utilized:

Name	Manufacturer	Version
WIN2100	TESEQ	SII

29.3 Results:

The sample tested was found to Comply.

29.4 Setup Photographs:

29.5 Data: BLE Active

Test Personnel: Peejar Ching
 Supervising/Reviewing Engineer:
 (Where Applicable) Melvin Sanchez

Test Date: 03/19/2023

Product Standard: EN 61000-6-1, ETSI EN 301 489-1, ETSI EN 301 489-17
 Input Voltage: 230VAC/50Hz

Waveform Verified on Oscilloscope: Yes

Test Levels: See Table Below
 Performance Criteria: B/C/C
 Ambient Temperature: 20.54 °C
 Relative Humidity: 58.5 %
 Atmospheric Pressure: 993 mbars

Specification	Rated Voltage (VAC)	Frequency (Hz)	Voltage Test Level (%)	Voltage Dip (%)	Test Voltage (VAC)	Duration (Periods)	Result
0%UT for 0.5 Cycle @ 0°	230	50	0	100	0	0.5 Cycle	(A)
0%UT for 0.5 Cycle @ 180°	230	50	0	100	0	0.5 Cycle	(A)
0%UT for 1 Cycles @ 0°	230	50	0	100	0	1 Cycle	(A)
0%UT for 1 Cycles @ 180°	230	50	0	100	0	1 Cycle	(A)
70%UT for 25 Cycles @ 0°	230	50	70	30	161	25 Cycles	(A)
70%UT for 25 Cycles @ 180°	230	50	70	30	161	25 Cycles	(A)
0%UT for 250 Cycles @ 0°	230	50	0	100	0	250 Cycles	(C)
0%UT for 250 Cycles @ 180°	230	50	0	100	0	250 Cycles	(C)

Notes:

(A) The EUT met the requirements without any degradation of performance

(C) The EUT met the requirements with degradation of performance. During interruptions, the EUT shuts-off. It requires user intervention to recover its function.

Criteria	During Test	After Test
A	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ May show degradation of performance (Note 1) ➤ Shall be no loss of function ➤ Shall be no unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended ➤ Shall be no degradation of performance (Note 1) ➤ Shall be no loss function ➤ Shall be no loss of stored data or user programmable functions
B	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) ➤ May show degradation of performance (Note 1) ➤ No unintentional transmissions 	<ul style="list-style-type: none"> ➤ Shall operate as intended after recovering ➤ Shall be no loss of stored data or user programmable functions
C	<ul style="list-style-type: none"> ➤ May show loss of function (one or more) 	<ul style="list-style-type: none"> ➤ Functions shall be self-recoverable ➤ Functions shall be recoverable by the operator ➤ Shall operate as intended after recovering ➤ Shall be no degradation of performance (Note 1)
Note 1: Degradation of performance during the test is understood as degradation to a level not below a minimum performance level specified by the manufacturer.		

Deviations, Additions, or Exclusions: None