FCC PART 15, SUBPART B and C; FCC 15.231; and RSS-210 & RSS GEN
TEST REPORT

for

FLOOD AND FREEZE SENSOR

Model: WST-621

Prepared for

ECOLINK INTELLIGENT TECHNOLOGY, INC.
2055 CORTE DEL NOGAL
CARLSBAD, CALIFORNIA 92011

Prepared by: _____

JAMES ROSS

Approved by: _____

KYLE FUJIMOTO

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DATE: MARCH 29, 2023

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GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced without the written permission of Compatible Electronics, unless done so in full.

This report must not be used by the client to claim product certification, approval or endorsement by NVLAP, NIST or any agency of the United States government.

Device Tested: Flood and Freeze Sensor
Model: WST-621
S/N: N/A

Product Description: The equipment under test is a battery-powered wireless sensor for detecting flooding or freezing conditions and wirelessly reporting these conditions to a wireless security panel. The transmit frequency is 319.50 MHz.
The clock oscillator are 31 kHz, 4 MHz, 9.984375 MHz and 16 MHz.
Dimensions: 2.50" diameter, 0.375" thick.

Modifications: The EUT was not modified to meet the specifications.

Customer: Ecolink Intelligent Technology, Inc.
2055 Corte Del Nogal
Carlsbad, California 92011

Test Dates: September 21 and December 9, 2022; and March 29, 2023

Test Specifications covered by accreditation:

Test Specifications: Emissions requirements
CFR Title 47, Part 15, Subpart B;
CFR Title 47, Part 15, Subpart C, sections 15.205, 15.209, and 15.231;
RSS-210 and RSS-Gen

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Test Procedures: ANSI C63.4 and ANSI C63.10

Test Deviations: The test procedure was not deviated from during the testing.

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Conducted RF Emissions, 150 kHz – 30 MHz	This test was not performed because the EUT operates on battery power only and cannot be plugged into the AC public mains.
2	Spurious Radiated RF Emissions, 9 kHz – 3.195 GHz (Transmitter and Digital portion)	Complies with the **Class B** limits of CFR Title 47, Part 15 Subpart B; the limits of CFR Title 47, Part 15 Subpart C, sections 15.205, 15.209, and 15.231; and the limits of RSS-210 and RSS-Gen. See section 6.3 for Measurement Uncertainty.
3	-20 dB Bandwidth	Complies with limits of CFR Title 47, Part 15 Subpart C, section 15.231 (c); and the limits of RSS-210
4	Transmission Time	Complies with limits of CFR Title 47, Part 15 Subpart C, section 15.231 (a)(1) and (a)(2); and the limits of RSS-210.

*U = Expanded Uncertainty with a coverage factor of k=2

1. PURPOSE

This document is a qualification test report based on the emissions tests performed on the Flood and Freeze Sensor, Model: WST-621. The emissions measurements were performed according to the measurement procedure described in ANSI C63.4 and ANSI C63.10. The tests were performed to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the **Class B** specification limits defined by CFR Title 47, Part 15 Subpart B section, 15.109; the specification limits defined by CFR Title 47, Part 15 Subpart C sections 15.205, 15.209 and 15.231; and the specifications limits defined by RSS-210 and RSS-Gen.

1.1 Decision Rule & Risk

If a measured value exceeds a specification limit it implies non-compliance. If the value is below a specification limit it implies compliance. Measurement uncertainty of the laboratory is reported with all measurement results but generally not taken into consideration unless a standard, rule or law requires it to be considered.

Qualification test reports are only produced for products that are in compliance with the test requirements, therefore results are always in conformity. Otherwise, an engineering report or just the data is provided to the customer.

When performing a measurement and making a statement of conformity, in or out-of-specification to manufacturer's specifications or Pass/Fail against a requirement, there are two possible outcomes:

- The result is reported as conforming with the specification
- The result is reported as not conforming with the specification

The decision rule is defined below.

When the test result is found to be below the limit but within our measurement uncertainty of the limit, it is our policy that the final acceptance decision is left to the customer, after discussing the implications and potential risks of the decision.

When the test result is found to be exactly on the specification, it is our policy, in the case of unwanted emissions measurements to consider the result non-compliant, however, the final decision is left to the customer, after discussing the implications and potential risks of the decision.

When the test result is found to be over the specification limit under any condition, it is our policy to consider the result non-compliant.

In terms of uncertainty of measurement, the laboratory is a calibrated and tightly controlled environment and generally exceptionally stable, the measurement uncertainties are evaluated without the considering of the test sample. When it comes to the test sample however, as most testing is performed on a single sample rather than a sample population, and that sample is often a pre-production representation of the final product, that test sample represents a significantly higher source of measurement uncertainty. We advise our customers of this and that when in doubt (small test to limit margins), they may wish to perform statistical sampling on a population to gain a higher confidence in the results. All lab reported results are that of a single sample in any event.

2. ADMINISTRATIVE DATA

2.1 Location of Testing

The emissions tests described herein were performed at the test facility of Compatible Electronics, 114 Olinda Drive, Brea, California 92823.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

Ecolink Intelligent Technology, Inc.

David Shepard	Product Compliance/QA Specialist
Jay Stone	Director of Engineering

Compatible Electronics Inc.

Kyle Fujimoto	Senior Test Engineer
James Ross	Senior Test Engineer

2.4 Date Test Sample was Received

The test sample was received prior to the initial test date in this report.

2.5 Disposition of the Test Sample

The test sample has not been returned to Ecolink Intelligent Technology, Inc. as of the date of this report.

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
FCC	Federal Communications Commission
DoC	Declaration of Conformity
N/A	Not Applicable
Tx	Transmit
Rx	Receive
Inc.	Incorporated
RSS	Radio Standards Specification
RF	Radio Frequency
BLE	Bluetooth Low Energy
CFR	Code of Federal Regulations
PCB	Printed Circuit Board
DC	Direct Current
LED	Light Emitting Diode

3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this emission Test Report.

SPEC	TITLE
FCC Title 47, Part 15 Subpart B	FCC Rules – Radio frequency devices (including digital devices) – Unintentional Radiators
FCC Title 47, Part 15 Subpart C	FCC Rules – Radio frequency devices (including digital devices) – Intentional Radiators
RSS-210 Issue 10: 2019 + Amendment (April 2020)	License-exempt Radio Apparatus: Category I Equipment
RSS-Gen Issue 5: 2018 + Amendment 1: 2019 + Amendment 2: 2021	General Requirements for Compliance of Radio Apparatus
ANSI C63.4: 2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10: 2013	American National Standard of procedure for compliance testing of unlicensed wireless devices

4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration – Emissions

The Flood and Freeze Sensor, Model: WST-621 (EUT) tested in the following two configurations:

- Configuration 1 – The EUT was tested as a standalone device and placed in the center of the test table
- Configuration 2 – The EUT was tested with its optional External Sensor Adapter and placed at the edge of the test table. The External Sensor Adapter contained a Water Detection Rope connected to its sensor port.

In each configuration, the EUT was transmtting at 319.5 MHz on a continuous basis.

The EUT was tested for emissions while in the X, Y and Z axis. The X orientation is when the EUT is parallel to the ground mounted horizontally. The Y orientation is when the EUT is perpendicular to the ground mounted vertically. The Z orientation is when the EUT is perpendicular to the ground mounted horizontally.

The EUT had a fresh battery installed prior to the testing.

The firmware inside the EUT allowed the EUT to continuously transmit at 319.5 MHz.

The firmware is stored on the company's servers.

The final radiated emissions data for the EUT was taken in the configuration described above. Please see Appendix E for the data sheets.

4.1.1 Cable Construction and Termination

Cable 1:

This is a 2-meter unshielded cable connecting the EUT's External Sensor Adapter to the Water Detection Rope. The cable has a 1/8 inch mono connector at the EUT end and a hard wired water detection sensor at the opposite end.

5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	ID
FLOOD AND FREEZE SENSOR (EUT)	ECOLINK INTELLIGENT TECHNOLOGY, INC.	WST-621	N/A	FCC: XQC-WST621 IC: 9863B-WST621
EXTERNAL SENSOR ADAPTER (EUT OPTIONAL)	ECOLINK INTELLIGENT TECHNOLOGY, INC.	WST-621	N/A	N/A
WATER DETECTION ROPE (EUT OPTIONAL)	ECOLINK INTELLIGENT TECHNOLOGY, INC.	WST-621	N/A	N/A
FIRMWARE	ECOLINK INTELLIGENT TECHNOLOGY, INC.	1.0	N/A	N/A

5.2 Emissions Test Equipment

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. DUE DATE
RF RADIATED AND AC CONDUCTED EMISSIONS TEST EQUIPMENT					
TDK TestLab	TDK RF Solutions, Inc.	9.22	700145	N/A	N/A
EMI Receiver, 20 Hz – 26.5 GHz	Keysight Technologies, Inc.	N9038A	MY51210510	November 17, 2021	November 17, 2023
EMI Receiver, 3 Hz – 44 GHz	Keysight Technologies, Inc.	N9038A	MY559050117	November 9, 2022	November 9, 2023
System Controller	Sunol Sciences Corporation	SC110V	112213-1	N/A	N/A
Turntable	Sunol Sciences Corporation	2011VS	N/A	N/A	N/A
Antenna-Mast	Sunol Sciences Corporation	TWR95-4	112213-3	N/A	N/A
Loop Antenna	Com-Power	AL-130R	121090	February 10, 2022	February 10, 2025
CombiLog Antenna	Com-Power	AC-220	61093	December 14, 2021	December 14, 2023
Horn Antenna	Com-Power	AH-118	10050113	December 16, 2021	December 16, 2023
Preamplifier	Com-Power	PA-118	181653	March 7, 2022	March 7, 2023
Below 1 GHz Radiated Cable	N/A	N/A	Asset #: 0006	August 2, 2021	August 2, 2023
Above 1 GHz Cable	Suhner	Sucoflex 102EA	2291	August 2, 2021	August 2, 2023
Above 1 GHz Cable	Suhner	Sucoflex 102EA	501393	August 2, 2021	August 2, 2023
Above 1 GHz Cable	Suhner	Sucoflex 102EA	501394	August 2, 2021	August 2, 2023
Computer	Hewlett Packard	p6716f	MXX1030PX0	N/A	N/A
LCD Monitor	Hewlett Packard	52031a	3CQ046N3MG	N/A	N/A

6. TEST SITE DESCRIPTION

6.1 Test Facility Description

Please refer to section 2.1 of this report for emissions test location.

6.2 EUT Mounting, Bonding and Grounding

For frequencies 1 GHz and below: The EUT was mounted on a 0.6 by 1.2 meter non-conductive table 0.8 meters above the ground plane.

For frequencies above 1 GHz: The EUT was mounted on a 0.6 by 1.2 meter non-conductive table 1.5 meters above the ground plane.

The EUT was not grounded.

6.3 Measurement Uncertainty

Compatible Electronics' U_{lab} value is less than U_{cispr}, thus based on this − compliance is deemed to occur if no measured disturbance exceeds the disturbance limit

$$u_c(y) = \sqrt{\sum_i c_i^2 \; u^2(x_i)}$$

Measurement		**U_{cispr}**	$U_{lab} = 2\,uc\,(y)$
Conducted disturbance (mains port)	(150 kHz – 30 MHz)	3.4 dB	2.72 dB
Radiated disturbance (electric field strength on an open area test site or alternative test site)	(30 MHz – 1 000 MHz)	6.3 dB	3.32 dB (Vertical) 3.30 dB (Horizontal)
Radiated disturbance (electric field strength on an open area test site or alternative test site)	(1 GHz - 6 GHz)	5.2 dB	4.06 dB
Radiated disturbance (electric field strength on an open area test site or alternative test site)	(6 GHz – 18 GHz)	5.5 dB	4.06 dB
Radiated disturbance (electric field strength on an open area test site or alternative test site)	(18 GHz – 26.5 GHz)	N/A	4.43 dB
Radiated disturbance (electric field strength on an open area test site or alternative test site)	(26.5 GHz – 40 GHz)	N/A	4.57 dB

7. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

7.1 RF Emissions

7.1.1 Conducted Emissions Test

The EMI Receiver was used as a measuring meter. A quasi-peak and/or average reading was taken only where indicated in the data sheets. A 10 dB attenuator was used for the protection of the EMI Receiver input stage, and the offset was adjusted accordingly to read the actual data measured. The LISN output was measured using the EMI Receiver. The output of the second LISN was terminated by a 50-ohm termination. The effective measurement bandwidth used for this test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding, and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI 63:4. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The conducted emissions from the EUT were maximized for operating mode as well as cable placement. The final data was collected under program control by computer software. The final qualification data is located in Appendix E.

Test Results:

This test was not performed because the EUT operates on battery power only and cannot be plugged into the AC public mains.

7.1.2 Radiated Emissions Test

The EMI Receiver was used as the measuring meter. An internal preamplifier was used to increase the sensitivity of the instrument during emissions tests up to 1000 MHz, and an external preamplifier was used to increase the sensitivity of the instrument during emissions tests above 1 GHz. The EMI Receiver was initially used with the Analyzer mode feature activated. In this mode, the EMI receiver can then record the actual frequency to be measured. This final reading is then taken accurately in the EMI Receiver mode, which considers the cable loss, amplifier gain and antenna factors, so that a true reading is compared to the true limit. The effective measurement bandwidth used for the radiated emissions test was according to the frequency measured.

The frequencies below 1 GHz, except for the fundamental frequency, and the 2nd and 3rd harmonic of the fundamental frequency, were quasi-peaked using the quasi-peak detector of the EMI Receiver.

The harmonic frequencies above 1 GHz were averaged using the duty cycle correction calculation.

All other frequencies above 1 GHz were averaged using the average detector of the EMI Receiver.

The EMI test chamber of Compatible Electronics, Inc. was used for radiated emissions testing. This test site is in full compliance with ANSI C63.4. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength). The gunsight method was used when measuring with the horn antenna to ensure accurate results.

The EUT was tested at a 3-meter test distance. The six highest emissions are listed in Table 1.

The measurement bandwidths and transducers used for the radiated emissions test were:

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
9 kHz to 150 kHz	200 Hz	Loop Antenna
150 kHz to 30 MHz	9 kHz	Loop Antenna
30 MHz to 1 GHz	120 kHz	CombiLog Antenna
1 GHz to 3.195 GHz	1 MHz	Horn Antenna

Test Results:

The EUT complies with the **Class B** limits of CFR Title 47, Part 15, Subpart B; the limits of CFR Title 47, Part 15, Subpart C sections 15.205, 15.209 and 15.231; and the limits of RSS-210 and RSS-Gen for radiated emissions.

7.1.3 RF Emissions Test Results

Table 1 RADIATED EMISSION RESULTS
Flood and Freeze Sensor, Model: WST-621

Frequency (MHz)	Corrected Reading* (dBµV/m)	Specification Limit (dBµV/m)	Delta (Cor. Reading – Spec. Limit) (dB)
319.50 (H) (X-Axis) (FD) (#2)	75.78 (Avg)	75.89 (Avg)	-0.11
322.00 (H) (X-Axis) (#1)	45.86 (QP)	46.00 (QP)	-0.14
322.00 (H) (X-Axis) (#2)	45.76 (QP)	46.00 (QP)	-0.24
322.02 (V) (Y-Axis) (#2)	44.96 (QP)	46.00 (QP)	-1.04
319.50 (V) (Y-Axis) (FD) (#2)	74.62 (Avg)	75.89 (Avg)	-1.27
319.50 (V) (Z-Axis) (FD) (#2)	74.28 (Avg)	75.89 (Avg)	-1.61

Notes:

* The complete emissions data is given in Appendix E of this report.
(V) Vertical
(H) Horizontal
(QP) Quasi-Peak
(Avg) Average
(FD) Fundamental
(#1) No External Sensor Adapter
(#2) With External Sensor Adapter

7.1.4 Sample Calculations

A correction factor for the antenna, cable and a distance factor (if any) must be applied to the meter reading before a true field strength reading can be obtained. This Corrected Meter Reading is then compared to the specification limit in order to determine compliance with the limits.

Conversion to logarithmic terms: Specification limit (µV/m) log x 20 = Specification Limit in dBuV/m

To correct for distance when measuring at a distance other than the specification

For measurements below 30 MHz: (Specification distance / test distance) log x 40 = distance factor

For measurements above 30 MHz: (Specification distance / test distance) log x 20 = distance factor

Note: When using an Active Antenna, the Antenna factor shall be subtracted due to the combination of the internal amplification and antenna loss.

Corrected Meter Reading = meter reading + F – A + C

where: F = antenna factor
A= amplifier gain
C = cable loss

The correction factors for the antenna and the amplifier gain are attached in Appendix D of this report. The data sheets are attached in Appendix E.

The distance factor D is 0 when the test is performed at the required specification distance.

When the limit is in terms of magnetic field, the following equation applies:

$$H[dB(\mu A/m)] = V[dB(\mu V)] + L_C\,[dB] - G_{PA}\,[dB] + AF^H\,[dB(S/m)]$$

where: H is the magnetic field strength (to be compared with the limit),
V is the voltage level measured by the receiver or spectrum analyzer,
L_C is the cable loss,
G_{PA} is the gain of the preamplifier (if used), and
AF^H is the magnetic antenna factor.

The G_{PA} term is only included in the equation when an external preamplifier is used in the measurement chain, in front of the receiver or spectrum analyzer. An external preamplifier is not usually necessary (or even advisable, due to risk of saturating the input mixer of the receiver) when an active loop antenna is used. In that case, the antenna factor of the loop already includes the gain of its built-in preamplifier.

If the "electrical" antenna factor is used instead, the above equation becomes:

$$H[dB(\mu A/m)] = V[dB(\mu V)] + L_C\,[dB] - G_{PA}[dB] + AF^E\,[dB(m^{-1})\,] - 51.5\,[dB\Omega]$$

where: AF^E is the "electric" antenna factor, as provided by the antenna calibration laboratory.

When the limit is in terms of electric field, the following equation applies:

$$E[dB(\mu V/m)] = V[dB(\mu V)] + L_C[dB] - G_{PA}[dB] + AF^E\,[dB(m^{-1})\,]$$

or, if the magnetic antenna factor is used:

$$E[dB(\mu V/m)] = V[dB(\mu V)] + L_C[dB] - G_{PA}[dB] + AF^H\,[dB(S/m)] + 51.5[dB\Omega]$$

The display of the receiver (or spectrum analyzer) **shall not** be configured in units of current, e.g. µA or dB(µA). That conversion is calculated inside the receiver (or spectrum analyzer) using its input impedance, which is 50 Ω, while the magnetic field calculation is based on the free-space impedance of 377 Ω.

7.1.5 Duty Cycle Calculation

The fundamental and harmonics were measured at a 3-meter test distance. The EMI Receiver was used to obtain the final test data. The final qualification data sheets are in Appendix E.

Where

$$\delta(\mathrm{dB}) = 20\log\left[\sum\left(nt_1 + mt_2 + \ldots + \xi t_x\right)/T\right]$$

n is the number of pulses of duration t_1
m is the number of pulses of duration t_2
ξ is the number of pulses of duration t_x
T is the period of the pulse train or 100 ms if the pulse train length is greater than 100 ms

Duty Cycle Correction Factor = -19.00 dB

Time of One Small Pulse = 160 µs

Time of One Medium Puilse = 520 µs

Time of One Large Pulse = 1410 µs

Number of Small Pulses = 58

Number of Medium Pulses = 1

Number of Large Pulses = 1

Total On Time = 11210 µs = 11.21 ms

The time between pulses is greater than 100 ms

Duty Cycle = 11.21 ms / 100 ms = 11.21 %

7.1.6 99 % Bandwidth

The 99 % bandwidth was measured using an EMI Receiver.

The following steps were performed for measuring the 99 % bandwidth per RSS-GEN, Issue 5, clause 6.7:

1. Set RBW to 1 % to 5 % of the actual occupied bandwidth
2. Set VBW to greater than 3 times the RBW
3. Set the EMI Receiver to the occupied bandwidth Function set at 99 %
4. Set the peak detector to max hold
5. Set the sweep time to auto
6. Allow the trace to stabilize

Please note that this was only used to determine the emission bandwidth and that there are no limits or pass/fail criteria for this test. Please see the data sheets located in Appendix E.

7.1.7 -20 dB Bandwidth

The -20 dB bandwidth was measured using an EMI Receiver.

The following steps were performed for measuring the -20 dB bandwidth:

1. Set RBW from 1% to 5% of the Occupied Bandwidth
2. Set the span to 100 kHz or 200 kHz
3. Set VBW to greater than 3 times the RBW
4. Set the peak detector to max hold
5. Set the sweep time to auto
6. Allow the trace to stabilize
7. Set the markers to -20 dB of the peak fundamental emission

Test Results:

The EUT complies with limits of CFR Title 47, Part 15, Subpart C section 15.231 (c); and the limits of RSS-210.

7.1.8 Transmission Time

The transmission time was measured using an EMI Receiver.

The following steps were performed for measuring transmission time:

1. Set RBW = 120 kHz
2. Set VBW = 510 kHz
3. Span = 0 Hz
4. Set the sweep time to 10 seconds
5. Push a button on the EUT, which automatically activated the transmitter
6. Allow the trace to stabilize
7. Set the 1st marker to start of the transmission
8. Set the 2nd marker to the end of the transmission
9. Verify the transmission does not go beyond 5 seconds

Test Results:

The EUT complies with limits of CFR Title 47, Part 15, Subpart C section 15.231 (a)(1) and (a)(2); and the limits of RSS-210.

7.1.9 Variation of the Input Power

The variation of the input power test was performed using the EMI Receiver. The EUT input power was varied between 85% and 115% of the nominal rated supply voltage. The carrier frequency was monitored for any change in amplitude.

Test Results:

This test was not performed because the EUT is battery power only.

8. CONCLUSIONS

The Flood and Freeze Sensor, Model: WST-621 (EUT), as tested, meets all the specification limits defined in RSS-210, RSS-Gen, the **Class B** specification limits defined in CFR Title 47, Part 15, Subpart B; and the specification limits defined in CFR Title 47, Part, 15, Subpart C, sections 15.205, 15.209 and 15.231.

APPENDIX A

LABORATORY ACCREDITATIONS AND RECOGNITIONS

LABORATORY ACCREDITATIONS AND RECOGNITIONS

NVLAP TESTING
NVLAP LAB CODE 200528-0

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For US, Canada, Australia/New Zealand, Japan, Taiwan, Korea, and the European Union, Compatible Electronics is currently accredited by NVLAP to ISO/IEC 17025.

For the most up-to-date version of our scopes and certificates please visit

http://celectronics.com/quality/scope/

Quote from ISO-ILAC-IAF Communiqué on the Management Systems Requirements of ISO/IEC 17025, General Requirements for the competence of testing and calibration laboratories:

"A laboratory's fulfilment of the requirements of ISO/IEC 17025 means the laboratory meets both the technical competence requirements and management system requirements that are necessary for it to consistently deliver technically valid test results and calibrations. The management system requirements in ISO/IEC 17025 are written in language relevant to laboratory operations and operate generally in accordance with the principles of ISO 9001"

Innovation, Science and Economic Development Canada
Lab Code 2154A

APPENDIX B

MODIFICATIONS TO THE EUT

MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC Subpart B, FCC 15.231, RSS-210, and RSS-Gen specifications.

All the rework described below was implemented during the test in a method that could be reproduced in all the units by the manufacturer.

No modifications were made to the EUT during the testing.

APPENDIX C

MODELS COVERED UNDER THIS REPORT

MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

Flood and Freeze Sensor
Model: WST-621
S/N: N/A

There are no additional models or part numbers covered under this report.

APPENDIX D

DIAGRAMS, CHARTS, AND PHOTOS

FIGURE 1: CONDUCTED EMISSIONS TEST SETUP

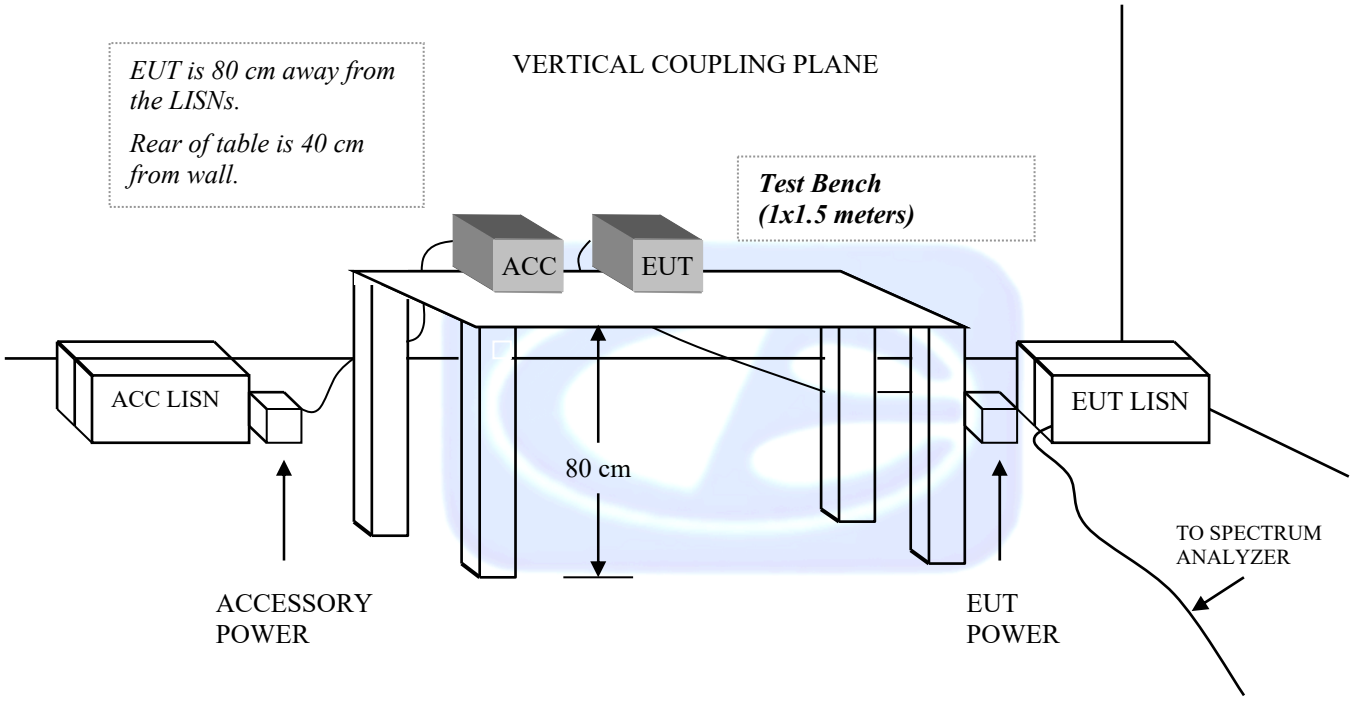
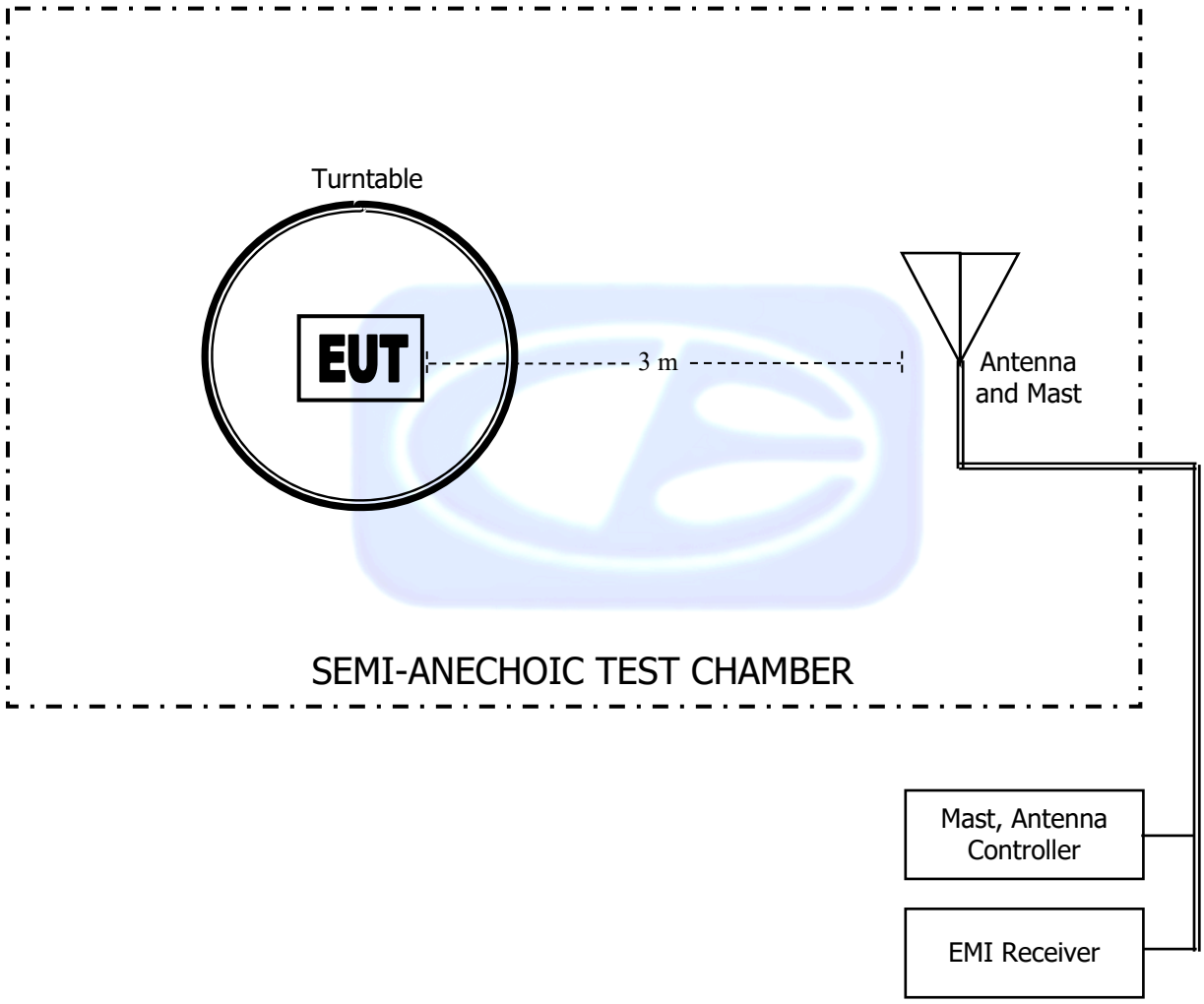


FIGURE 2: LAYOUT OF THE SEMI -ANECHOIC TEST CHAMBER



COM-POWER AL-130R

LOOP ANTENNA

S/N: 121090

CALIBRATION DATE: FEBRUARY 10, 2022

FREQUENCY (MHz)	MAGNETIC (dB/m)	ELECTRIC (dB/m)
0.009	15.6	-35.8
0.01	15.8	-35.6
0.02	14.8	-36.6
0.03	15.6	-35.9
0.04	15.0	-36.5
0.05	14.4	-37.1
0.06	14.6	-36.9
0.07	14.3	-37.2
0.08	14.3	-37.2
0.09	14.4	-37.0
0.10	14.1	-37.4
0.20	14.1	-37.4
0.30	14.0	-37.5
0.40	13.9	-37.6
0.50	14.1	-37.3
0.60	14.1	-37.3
0.70	14.2	-37.3
0.80	14.2	-37.3
0.90	14.2	-37.2
1.00	14.4	-37.0
2.00	14.6	-36.9
3.00	14.6	-36.8
4.00	14.9	-36.6
5.00	14.9	-36.7
6.00	14.8	-36.7
7.00	14.6	-36.8
8.00	14.5	-37.0
9.00	14.3	-37.2
10.00	14.5	-37.0
11.00	14.6	-36.9
12.00	14.7	-36.7
13.00	14.9	-36.6
14.00	15.0	-36.5
15.00	14.9	-36.6
16.00	14.9	-36.6
17.00	14.6	-36.8
18.00	14.4	-37.1
19.00	14.5	-37.0
20.00	14.5	-37.0
21.00	14.2	-37.3
22.00	13.9	-37.5
23.00	13.9	-37.5
24.00	13.8	-37.7
25.00	13.4	-38.0
26.00	13.2	-38.2
27.00	13.2	-38.3
28.00	12.7	-38.7
29.00	12.7	-38.8
30.00	12.4	-39.0

COM-POWER AC-220

COMBILOG ANTENNA

S/N: 61093

CALIBRATION DATE: DECEMBER 14, 2021

FREQUENCY (MHz)	FACTOR (dB)	FREQUENCY (MHz)	FACTOR (dB)
30	22.50	200	16.00
35	21.40	250	17.40
40	21.00	300	19.70
45	20.60	350	20.00
50	19.70	400	22.20
60	16.10	450	22.40
70	12.80	500	23.10
80	12.50	550	23.40
90	14.20	600	24.90
100	15.40	650	25.30
120	16.50	700	25.40
125	16.80	750	26.40
140	15.90	800	26.70
150	16.60	850	27.10
160	18.50	900	27.90
175	15.90	950	28.00
180	15.50	1000	28.00

COM POWER AH-118

HORN ANTENNA

S/N: 10050113

CALIBRATION DATE: DECEMBER 16, 2021

FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	23.86	10.0	38.91
1.5	25.67	10.5	39.94
2.0	28.25	11.0	39.10
2.5	29.17	11.5	39.70
3.0	29.78	12.0	40.29
3.5	30.88	12.5	41.93
4.0	31.21	13.0	41.34
4.5	32.96	13.5	40.57
5.0	33.30	14.0	40.23
5.5	34.24	14.5	42.25
6.0	34.57	15.0	43.63
6.5	35.61	15.5	39.96
7.0	36.60	16.0	40.38
7.5	37.49	16.5	40.56
8.0	37.44	17.0	40.93
8.5	37.98	17.5	42.27
9.0	38.01	18.0	43.77
9.5	38.53		

COM-POWER PAM-118

PREAMPLIFIER

S/N: 181653

CALIBRATION DATE: MARCH 7, 2022

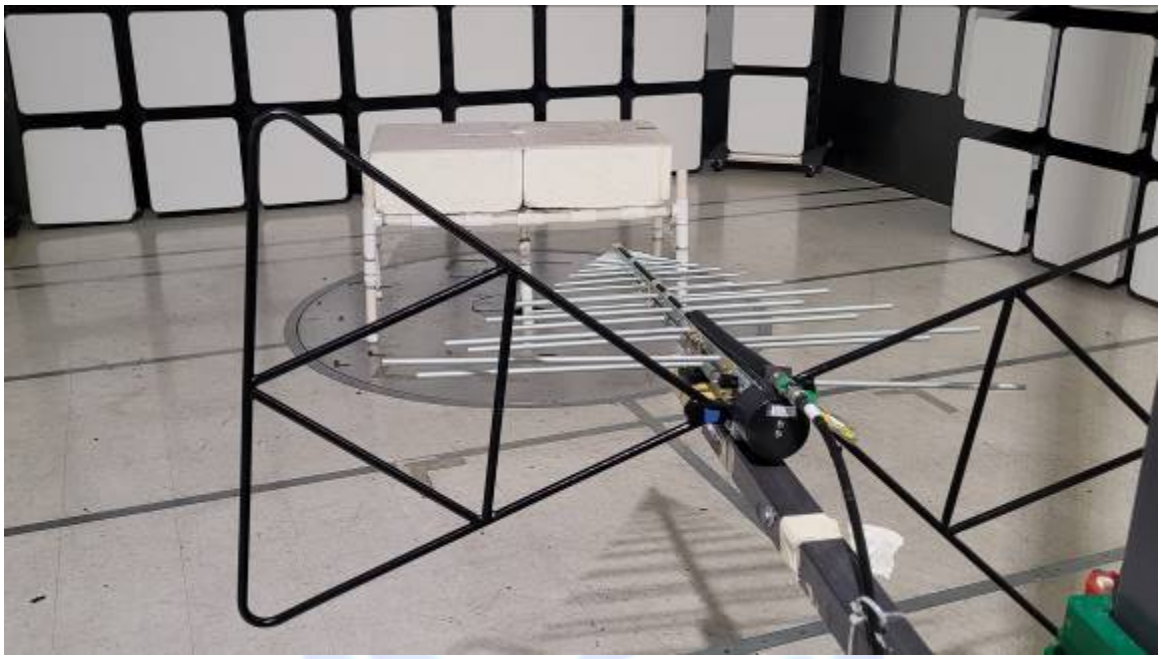
FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	40.02	6.0	38.84
1.1	39.72	6.5	39.20
1.2	39.93	7.0	39.46
1.3	39.98	7.5	39.67
1.4	39.99	8.0	39.28
1.5	40.20	8.5	38.63
1.6	40.05	9.0	38.96
1.7	40.15	9.5	39.33
1.8	40.20	10.0	39.58
1.9	40.33	11.0	38.25
2.0	40.33	12.0	40.03
2.5	40.60	13.0	40.55
3.0	40.76	14.0	40.36
3.5	40.87	15.0	39.34
4.0	40.39	16.0	37.34
4.5	39.55	17.0	42.14
5.0	40.34	18.0	42.54
5.5	39.45		

FRONT VIEW

WITHOUT EXTERNAL SENSOR ADAPTER

ECOLINK INTELLIGENT TECHNOLOGY, INC.
FLOOD AND FREEZE SENSOR
MODEL: WST-621
FCC SUBPART B AND C; RSS-210 AND RSS-GEN – RADIATED EMISSIONS – BELOW 1 GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

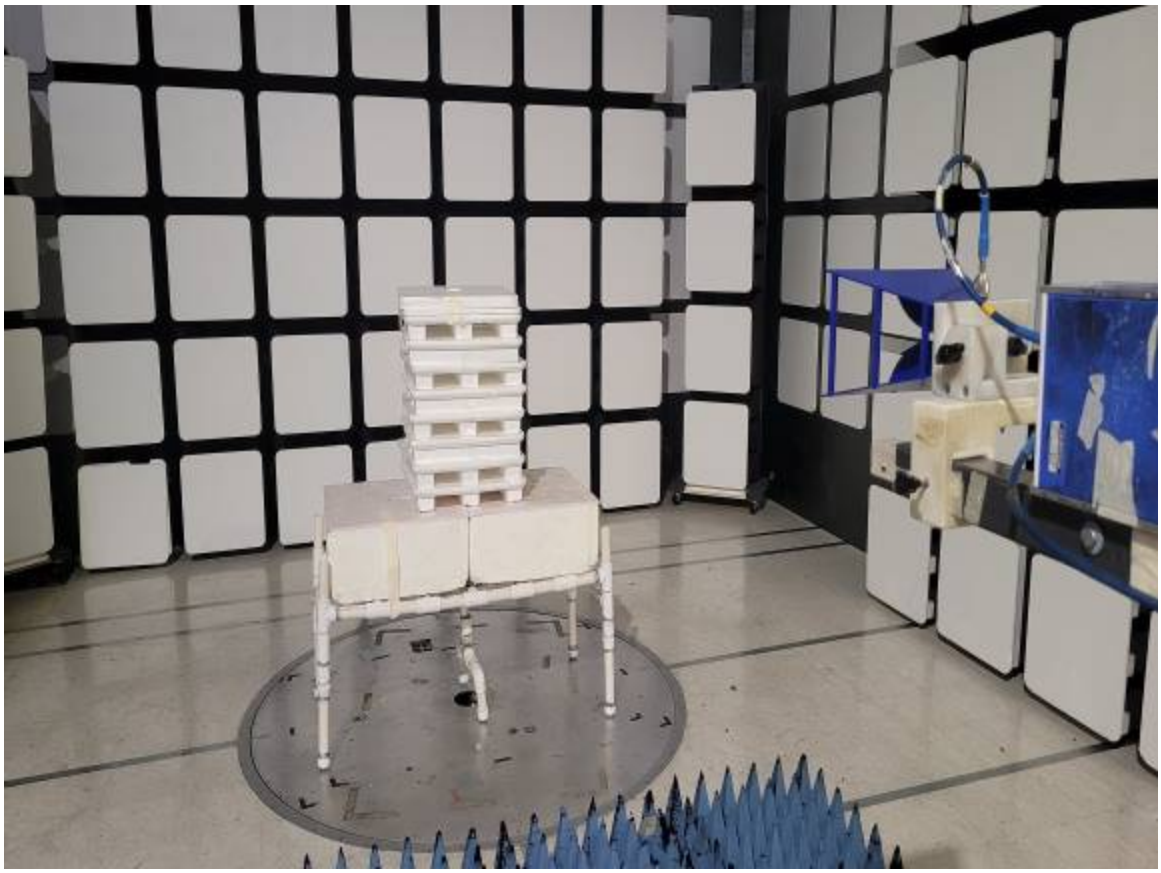


REAR VIEW

WITHOUT EXTERNAL SENSOR ADAPTER

ECOLINK INTELLIGENT TECHNOLOGY, INC.
FLOOD AND FREEZE SENSOR
MODEL: WST-621
FCC SUBPART B AND C; RSS-210 AND RSS-GEN – RADIATED EMISSIONS – BELOW 1 GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

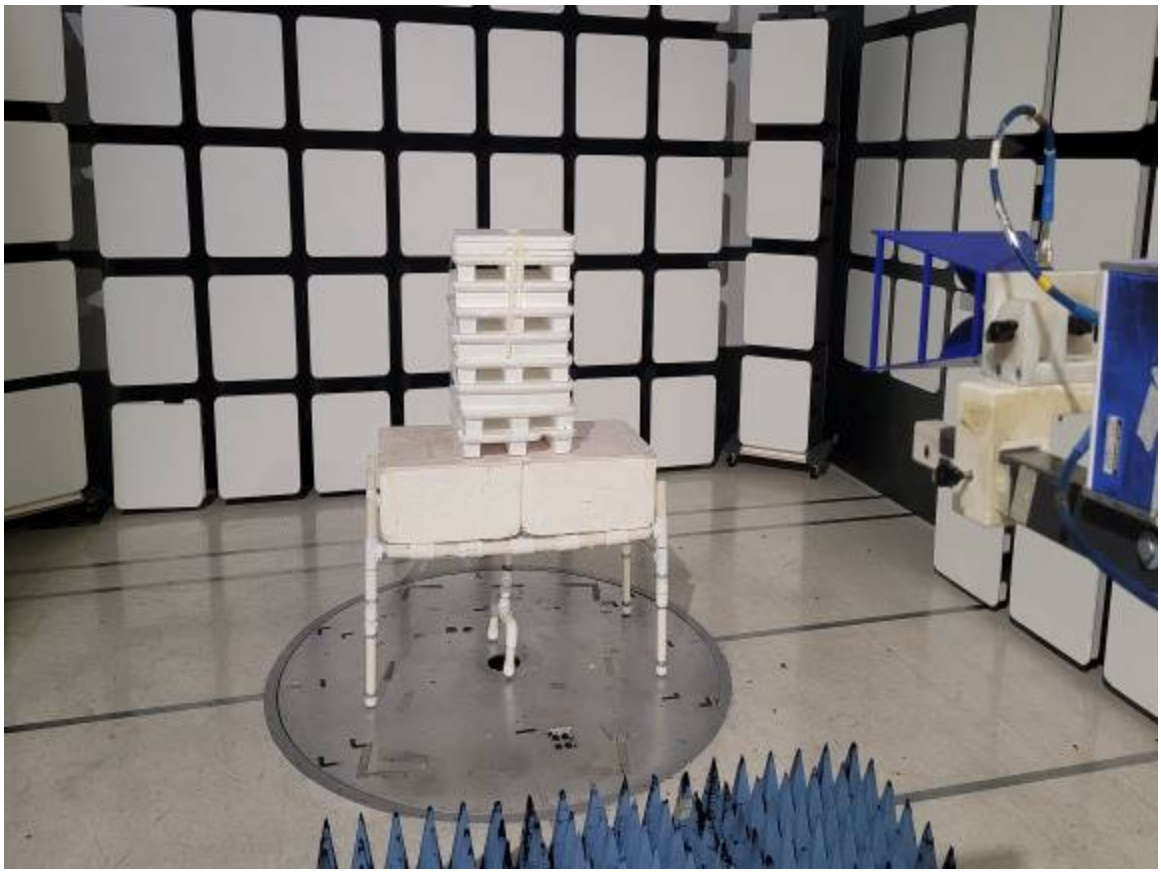


FRONT VIEW

WITHOUT EXTERNAL SENSOR ADAPTER

ECOLINK INTELLIGENT TECHNOLOGY, INC.
FLOOD AND FREEZE SENSOR
MODEL: WST-621
FCC SUBPART B AND C; RSS-210 AND RSS-GEN – RADIATED EMISSIONS – ABOVE 1 GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

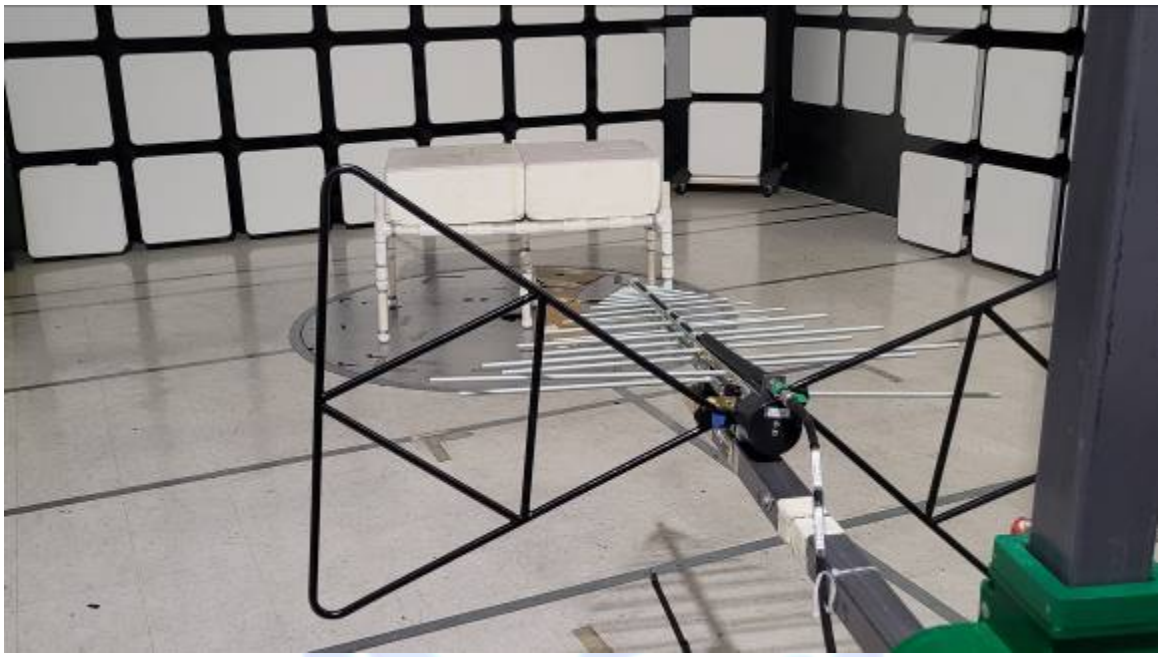


REAR VIEW

WITHOUT EXTERNAL SENSOR ADAPTER

ECOLINK INTELLIGENT TECHNOLOGY, INC.
FLOOD AND FREEZE SENSOR
MODEL: WST-621
FCC SUBPART B AND C; RSS-210 AND RSS-GEN – RADIATED EMISSIONS – ABOVE 1 GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

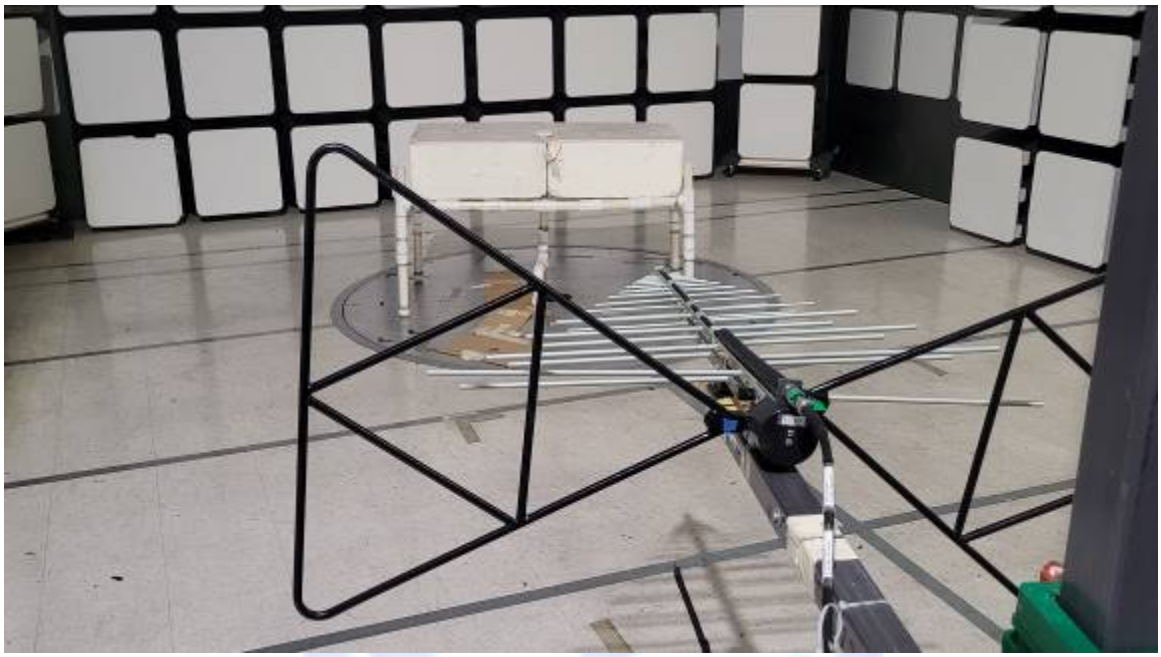


FRONT VIEW

WITH EXTERNAL SENSOR ADAPTER

ECOLINK INTELLIGENT TECHNOLOGY, INC.
FLOOD AND FREEZE SENSOR
MODEL: WST-621
FCC SUBPART B AND C; RSS-210 AND RSS-GEN – RADIATED EMISSIONS – BELOW 1 GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

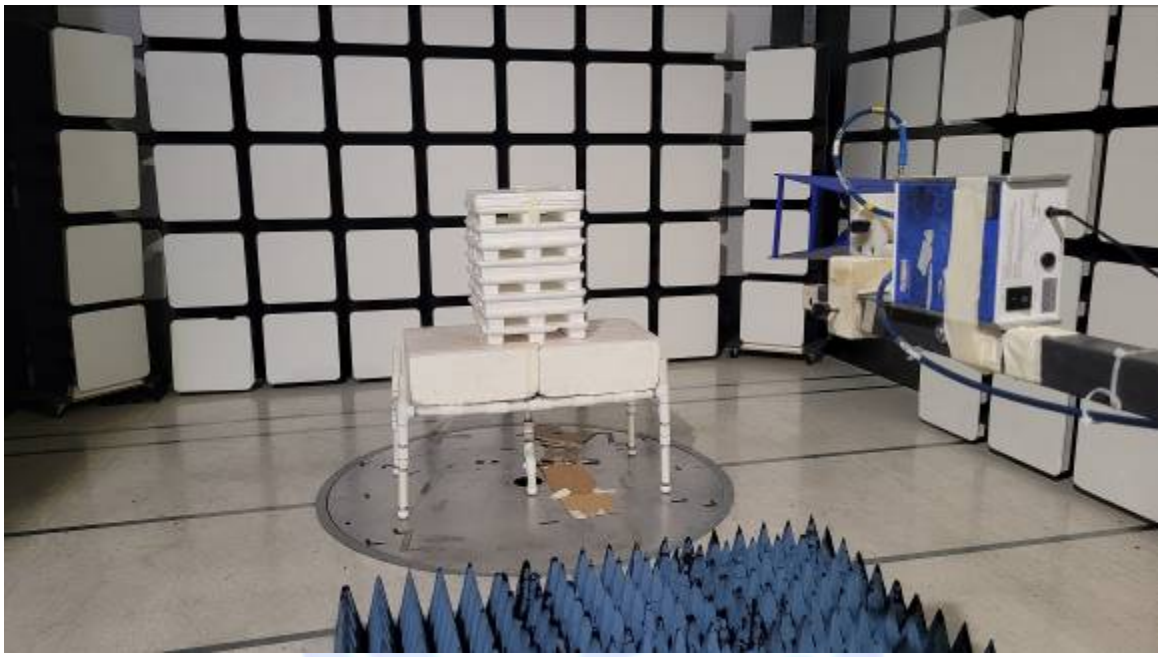


REAR VIEW

WITH EXTERNAL SENSOR ADAPTER

ECOLINK INTELLIGENT TECHNOLOGY, INC.
FLOOD AND FREEZE SENSOR
MODEL: WST-621
FCC SUBPART B AND C; RSS-210 AND RSS-GEN – RADIATED EMISSIONS – BELOW 1 GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

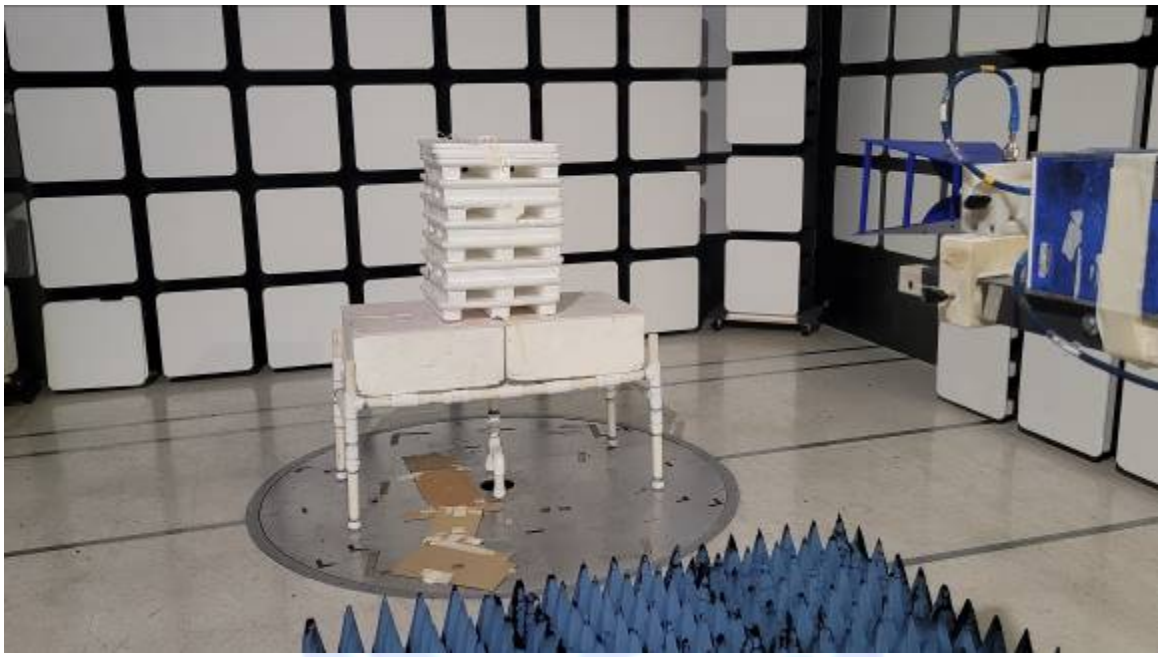


FRONT VIEW

WITH EXTERNAL SENSOR ADAPTER

ECOLINK INTELLIGENT TECHNOLOGY, INC.
FLOOD AND FREEZE SENSOR
MODEL: WST-621
FCC SUBPART B AND C; RSS-210 AND RSS-GEN – RADIATED EMISSIONS – ABOVE 1 GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



REAR VIEW

WITH EXTERNAL SENSOR ADAPTER

ECOLINK INTELLIGENT TECHNOLOGY, INC.
FLOOD AND FREEZE SENSOR
MODEL: WST-621
FCC SUBPART B AND C; RSS-210 AND RSS-GEN – RADIATED EMISSIONS – ABOVE 1 GHz

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

APPENDIX E

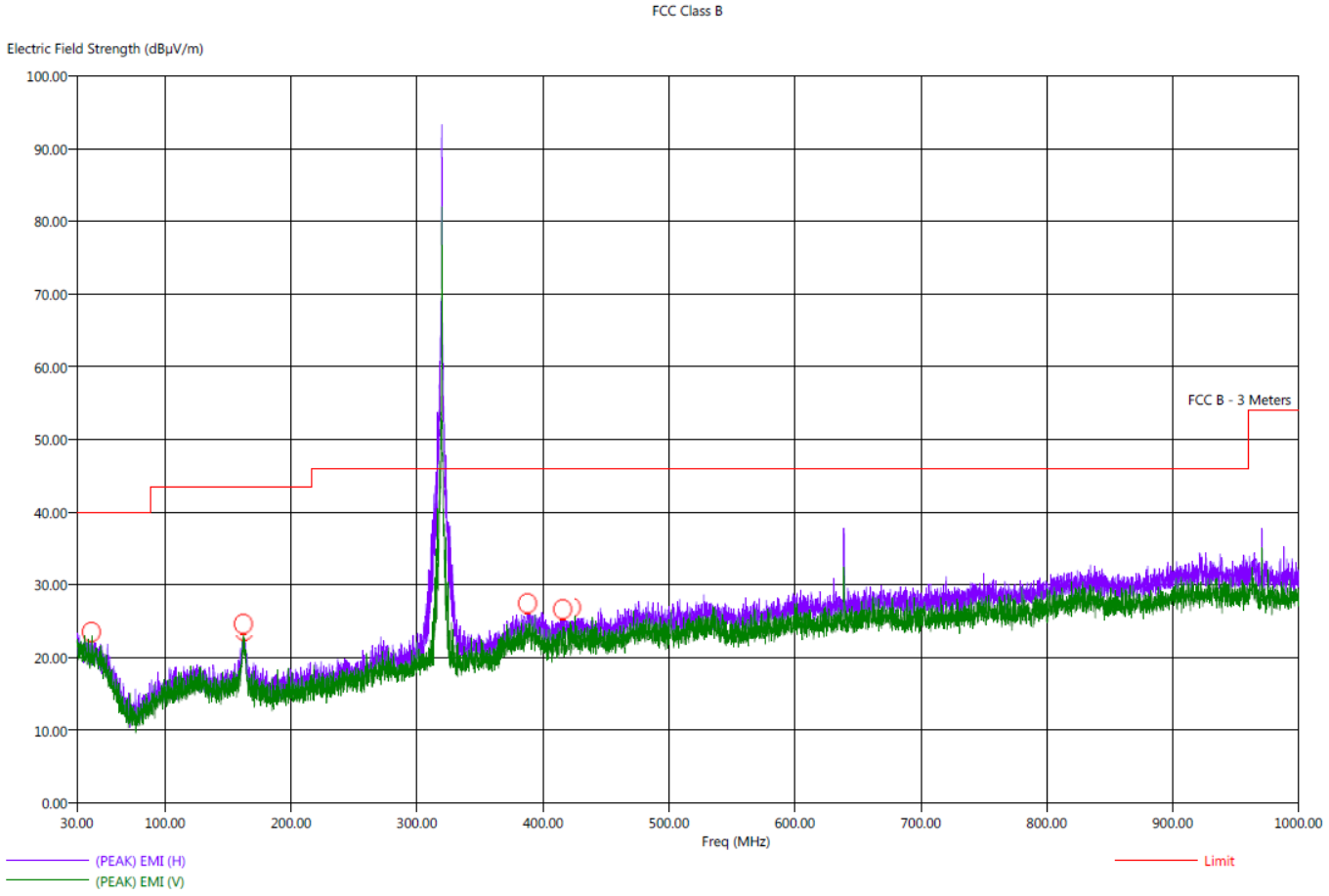
DATA SHEETS

RADIATED EMISSIONS

DATA SHEETS

Title: Pre-Scan - FCC Class B
File: 1 - LF - Pre-Scan - FCC Class B - X-Axis - 09-21-2022.set
Operator: Kyle Fujimoto
EUT Type: Flood and Freeze Sensor
EUT Condition: The EUT is continuously transmitting at 319.5 MHz
Company: Ecolink Intelligent Technology, Inc.
M/N: WST-621
S/N: N/A
X-Axis Worst Case
Note: The frequencies at 319.5 MHz, 639 MHz, and 958.5 MHz are subject to the limits of FCC 15.231 instead

9/21/2022 11:49:52 AM
Sequence: Preliminary Scan



Title: Final Scan - FCC Class B
File: 1 - LF - Final Scan - FCC Class B - X-Axis - 09-21-2022.set
Operator: Kyle Fujimoto
EUT Type: Flood and Freeze Sensor
EUT Condition: The EUT is continuously transmitting at 319.5 MHz
Company: Ecolink Intelligent Technology, Inc.
M/N: WST-621
S/N: N/A
X-Axis Worst Case
Note: The frequencies at 319.5 MHz, 639 MHz, and 958.5 MHz are subject to the limits of FCC 15.231 instead

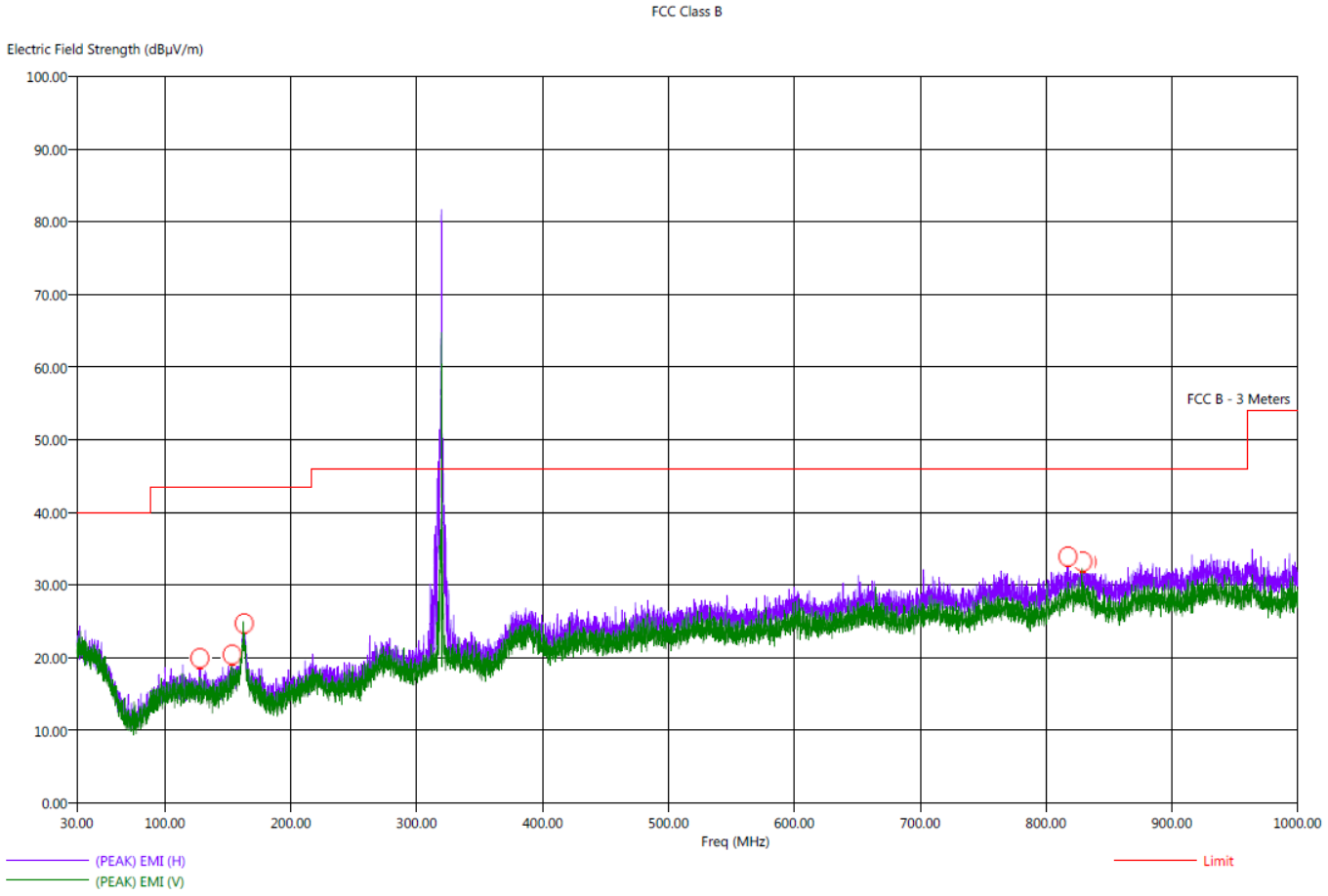
9/21/2022 12:30:39 PM
Sequence: Final Measurements

FCC Class B

Freq (MHz)	Pol	(PEAK) EMI (dBµV/m)	(QP) EMI (dBµV/m)	(PEAK) Margin (dB)	(QP) Margin (dB)	Limit (dBµV/m)	Transducer (dB)	Cable (dB)	Ttbl Agl (deg)	Twr Ht (cm)
41.40	H	28.38	23.40	-11.62	-16.60	40.00	20.90	0.47	194.75	270.38
162.10	H	31.97	26.44	-11.53	-17.06	43.50	22.91	1.07	210.75	175.04
162.80	H	31.73	26.30	-11.77	-17.20	43.50	22.61	1.07	145.75	111.52
387.80	H	34.10	28.58	-11.90	-17.42	46.00	23.39	1.68	356.75	206.86
415.70	H	32.79	27.45	-13.21	-18.55	46.00	22.18	1.74	249.75	126.02
422.70	H	32.59	27.75	-13.41	-18.25	46.00	22.46	1.75	58.25	286.68

Title: Pre-Scan - FCC Class B
File: 1 - LF - Pre-Scan - FCC Class B - With Cradle -X-Axis - 12-08-2022.set
Operator: Kyle Fujimoto
EUT Type: Flood and Freeze Sensor
EUT Condition: The EUT is continuously transmitting at 319.5 MHz - Mounted to External Sensor Adapter
Company: Ecolink Intelligent Technology, Inc.
M/N: WST-621
S/N: N/A
X-Axis
Note: The frequencies at 319.5 MHz, 639 MHz, and 958.5 MHz are subject to the limits of FCC 15.231 instead

12/8/2022 2:28:38 PM
Sequence: Preliminary Scan



Title: Final Scan - FCC Class B
File: 1 - LF - Final Scan - FCC Class B - With Cradle -X-Axis - 12-08-2022.set
Operator: Kyle Fujimoto
EUT Type: Flood and Freeze Sensor
EUT Condition: The EUT is continuously transmitting at 319.5 MHz - Mounted to External Sensor Adapter
Company: Ecolink Intelligent Technology, Inc.
M/N: WST-621
S/N: N/A
X-Axis Worst Case
Note: The frequencies at 319.5 MHz, 639 MHz, and 958.5 MHz are subject to the limits of FCC 15.231 instead

12/8/2022 3:07:19 PM
Sequence: Final Measurements

FCC Class B

Freq (MHz)	Pol	(PEAK) EMI (dBµV/m)	(QP) EMI (dBµV/m)	(PEAK) Margin (dB)	(QP) Margin (dB)	Limit (dBµV/m)	Transducer (dB)	Cable (dB)	Ttbl Agl (deg)	Twr Ht (cm)
127.70	H	22.69	17.65	-20.81	-25.85	43.50	16.80	0.83	347.25	127.22
153.40	H	22.59	17.74	-20.91	-25.76	43.50	16.80	0.90	129.25	318.98
163.00	H	29.59	24.55	-13.91	-18.95	43.50	21.73	0.94	98.25	399.28
817.50	H	39.65	34.11	-6.35	-11.89	46.00	27.50	2.48	281.00	350.50
829.40	H	40.59	34.24	-5.41	-11.76	46.00	27.65	2.50	296.75	272.89
832.60	H	39.42	34.38	-6.58	-11.62	46.00	27.76	2.51	57.25	318.56

FUNDAMENTAL AND HARMONICS

DATA SHEETS

EUT WITH NO EXTERNAL SENSOR ADAPTER

DATA SHEETS

FCC 15.231

Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

Date: 09/21/2022
Lab: D
Tested By: Kyle Fujimoto

Fundamental

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
319.50	79.23	V	95.89	-16.66	Peak	3.75	148.11	**X-Axis**
319.50	60.23	V	75.89	-15.66	Avg	3.75	148.11	**Vertical Polarization**
319.50	91.46	V	95.89	-4.43	Peak	273.25	168.00	**Y-Axis**
319.50	72.46	V	75.89	-3.43	Avg	273.25	168.00	**Vertical Polarization**
319.50	91.33	V	95.89	-4.56	Peak	88.50	181.61	**Z-Axis**
319.50	72.33	V	75.89	-3.56	Avg	88.50	181.61	**Vertical Polarization**
319.50	93.23	H	95.89	-2.66	Peak	265.00	100.00	**X-Axis**
319.50	74.23	H	75.89	-1.66	Avg	265.00	100.00	**Horizontal Polarization**
319.50	86.90	H	95.89	-8.99	Peak	3.25	228.77	**Y-Axis**
319.50	67.90	H	75.89	-7.99	Avg	3.25	228.77	**Horizontal Polarization**
319.50	88.37	H	95.89	-7.53	Peak	359.50	100.00	**Z-Axis**
319.50	69.37	H	75.89	-6.53	Avg	359.50	100.00	**Horizontal Polarization**

FCC 15.231

Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

Date: 09/21/2022
Lab: D
Tested By: Kyle Fujimoto

Harmonics
Transmit Mode - X-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
639.00	34.69	V	75.89	-41.20	Peak	296.75	239.34	
639.00	15.69	V	55.89	-40.20	Avg	296.75	239.34	
958.50	40.17	V	75.89	-35.72	Peak	35.75	111.34	
958.50	21.17	V	55.89	-34.72	Avg	35.75	111.34	
1278.00	34.98	V	73.97	-38.99	Peak	300.25	143.34	
1278.00	15.98	V	53.97	-37.99	Avg	300.25	143.34	
1597.50	42.12	V	73.97	-31.85	Peak	285.00	111.40	
1597.50	23.12	V	53.97	-30.85	Avg	285.00	111.40	
1917.00	35.58	V	75.89	-40.31	Peak	38.00	143.34	
1917.00	16.58	V	55.89	-39.31	Avg	38.00	143.34	
2236.50	42.75	V	73.97	-31.22	Peak	162.25	207.04	
2236.50	23.75	V	53.97	-30.22	Avg	162.25	207.04	
2556.00	40.53	V	75.89	-35.36	Peak	269.75	222.98	
2556.00	21.53	V	55.89	-34.36	Avg	269.75	222.98	
2875.50	49.36	V	73.97	-24.61	Peak	271.00	207.10	
2875.50	30.36	V	53.97	-23.61	Avg	271.00	207.10	
3195.00	40.21	V	75.89	-35.68	Peak	73.50	222.80	
3195.00	21.21	V	55.89	-34.68	Avg	73.50	222.80	

FCC 15.231

Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

Date: 09/21/2022
Lab: D
Tested By: Kyle Fujimoto

Harmonics
Transmit Mode - Y-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
639.00	42.02	V	75.89	-33.87	Peak	109.25	175.16	
639.00	23.02	V	55.89	-32.87	Avg	109.25	175.16	
958.50	41.05	V	75.89	-34.84	Peak	126.50	159.28	
958.50	22.05	V	55.89	-33.84	Avg	126.50	159.28	
1278.00	42.36	V	73.97	-31.61	Peak	175.50	222.74	
1278.00	23.36	V	53.97	-30.61	Avg	175.50	222.74	
1597.50	53.48	V	73.97	-20.49	Peak	177.25	159.16	
1597.50	34.48	V	53.97	-19.49	Avg	177.25	159.16	
1917.00	59.79	V	75.89	-16.10	Peak	163.75	159.16	
1917.00	40.79	V	55.89	-15.10	Avg	163.75	159.16	
2236.50	56.31	V	73.97	-17.66	Peak	162.50	175.10	
2236.50	37.31	V	53.97	-16.66	Avg	162.50	175.10	
2556.00	56.31	V	75.89	-19.58	Peak	162.50	175.10	
2556.00	37.31	V	55.89	-18.58	Avg	162.50	175.10	
2875.50	57.21	V	73.97	-16.76	Peak	259.00	207.16	
2875.50	38.21	V	53.97	-15.76	Avg	259.00	207.16	
3195.00	54.50	V	75.89	-21.39	Peak	273.25	143.28	
3195.00	35.50	V	55.89	-20.39	Avg	273.25	143.28	

FCC 15.231
Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

Date: 09/21/2022
Lab: D
Tested By: Kyle Fujimoto

Harmonics
Transmit Mode - Z-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
639.00	40.42	V	75.89	-35.47	Peak	60.75	191.04	
639.00	21.42	V	55.89	-34.47	Avg	60.75	191.04	
958.50	44.35	V	75.89	-31.54	Peak	181.00	111.46	
958.50	25.35	V	55.89	-30.54	Avg	181.00	111.46	
1278.00	43.98	V	73.97	-29.99	Peak	179.75	175.52	
1278.00	24.98	V	53.97	-28.99	Avg	179.75	175.52	
1597.50	53.57	V	73.97	-20.40	Peak	156.00	159.34	
1597.50	34.57	V	53.97	-19.40	Avg	156.00	159.34	
1917.00	48.20	V	75.89	-27.69	Peak	246.00	159.34	
1917.00	29.20	V	55.89	-26.69	Avg	246.00	159.34	
2236.50	42.91	V	73.97	-31.06	Peak	31.00	159.22	
2236.50	23.91	V	53.97	-30.06	Avg	31.00	159.22	
2556.00	49.57	V	75.89	-26.32	Peak	314.00	159.18	
2556.00	30.57	V	55.89	-25.32	Avg	314.00	159.18	
2875.50	49.57	V	73.97	-24.40	Peak	314.00	159.16	
2875.50	30.57	V	53.97	-23.40	Avg	314.00	159.16	
3195.00	63.46	V	75.89	-12.43	Peak	76.25	111.16	
3195.00	44.46	V	55.89	-11.43	Avg	76.25	111.16	

FCC 15.231
Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

Date: 09/21/2022
Lab: D
Tested By: Kyle Fujimoto

Harmonics
Transmit Mode - X-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
639.00	39.82	H	75.89	-36.07	Peak	216.50	238.98	
639.00	20.82	H	55.89	-35.07	Avg	216.50	238.98	
958.50	40.70	H	75.89	-35.19	Peak	32.25	127.10	
958.50	21.70	H	55.89	-34.19	Avg	32.25	127.10	
1278.00	45.31	H	73.97	-28.66	Peak	209.75	127.34	
1278.00	26.31	H	53.97	-27.66	Avg	209.75	127.34	
1597.50	55.43	H	73.97	-18.54	Peak	34.75	207.28	
1597.50	36.43	H	53.97	-17.54	Avg	34.75	207.28	
1917.00	62.03	H	75.89	-13.86	Peak	79.75	191.04	
1917.00	43.03	H	55.89	-12.86	Avg	79.75	191.04	
2236.50	57.54	H	73.97	-16.43	Peak	276.25	127.46	
2236.50	38.54	H	53.97	-15.43	Avg	276.25	127.46	
2556.00	54.18	H	75.89	-21.71	Peak	260.25	127.28	
2556.00	35.18	H	55.89	-20.71	Avg	260.25	127.28	
2875.50	67.35	H	73.97	-6.62	Peak	312.50	127.46	
2875.50	48.35	H	53.97	-5.62	Avg	312.50	127.46	
3195.00	61.41	H	75.89	-14.48	Peak	310.50	159.10	
3195.00	42.41	H	55.89	-13.48	Avg	310.50	159.10	

FCC 15.231

Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

Date: 09/21/2022
Lab: D
Tested By: Kyle Fujimoto

Harmonics
Transmit Mode - Y-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
639.00	39.79	H	75.89	-36.10	Peak	324.25	126.56	
639.00	20.79	H	55.89	-35.10	Avg	324.25	126.56	
958.50	40.65	H	75.89	-35.24	Peak	198.75	127.40	
958.50	21.65	H	55.89	-34.24	Avg	198.75	127.40	
1278.00	46.79	H	73.97	-27.18	Peak	168.75	159.34	
1278.00	27.79	H	53.97	-26.18	Avg	168.75	159.34	
1597.50	52.57	H	73.97	-21.40	Peak	165.75	175.16	
1597.50	33.57	H	53.97	-20.40	Avg	165.75	175.16	
1917.00	58.69	H	75.89	-17.20	Peak	27.25	111.34	
1917.00	39.69	H	55.89	-16.20	Avg	27.25	111.34	
2236.50	49.48	H	73.97	-24.49	Peak	352.75	127.28	
2236.50	30.48	H	53.97	-23.49	Avg	352.75	127.28	
2556.00	54.95	H	75.89	-20.94	Peak	125.50	175.04	
2556.00	35.95	H	55.89	-19.94	Avg	125.50	175.04	
2875.50	61.35	H	73.97	-12.62	Peak	213.00	127.22	
2875.50	42.35	H	53.97	-11.62	Avg	213.00	127.22	
3195.00	58.56	H	75.89	-17.33	Peak	197.00	159.52	
3195.00	39.56	H	55.89	-16.33	Avg	197.00	159.52	

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Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

Date: 09/21/2022
Lab: D
Tested By: Kyle Fujimoto

Harmonics
Transmit Mode - Z-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
639.00	42.14	H	75.89	-33.75	Peak	184.00	111.28	
639.00	23.14	H	55.89	-32.75	Avg	184.00	111.28	
958.50	38.63	H	75.89	-37.26	Peak	248.00	143.34	
958.50	19.63	H	55.89	-36.26	Avg	248.00	143.34	
1278.00	44.11	H	73.97	-29.86	Peak	169.25	158.80	
1278.00	25.11	H	53.97	-28.86	Avg	169.25	158.80	
1597.50	57.80	H	73.97	-16.17	Peak	173.25	110.92	
1597.50	38.80	H	53.97	-15.17	Avg	173.25	110.92	
1917.00	64.14	H	75.89	-11.75	Peak	149.25	126.44	
1917.00	45.14	H	55.89	-10.75	Avg	149.25	126.44	
2236.50	55.57	H	73.97	-18.40	Peak	0.00	124.95	
2236.50	36.57	H	53.97	-17.40	Avg	0.00	124.95	
2556.00	51.70	H	75.89	-24.19	Peak	150.25	191.28	
2556.00	32.70	H	55.89	-23.19	Avg	150.25	191.28	
2875.50	63.40	H	73.97	-10.57	Peak	135.25	159.16	
2875.50	44.40	H	53.97	-9.57	Avg	135.25	159.16	
3195.00	55.13	H	75.89	-20.76	Peak	24.00	111.58	
3195.00	36.13	H	55.89	-19.76	Avg	24.00	111.58	

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Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

Date: 09/21/2022
Lab: D
Tested By: Kyle Fujimoto

Non Harmonic Emissions from the Tx and Digital Portion - 9 kHz to 30 MHz
Non Harmonic Emissions from the Tx and Digital Portion - 1 GHz To 3195 MHz

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
								No Emissions Detected
								from 9 kHz to 30 MHz
								for the digital portion
								of the EUT
								No Emissions Detected
								from 1 GHz to 3195 MHz
								for the digital portion
								of the EUT
								No Emissions Detected
								from 9 kHz to 30 MHz
								for the Non-Harmonic Emissions
								of the Transmitter for the EUT
								No Emissions Detected
								from 1 GHz to 3195 MHz
								for the Non-Harmonic Emissions
								of the Transmitter for the EUT
								Investigated in the X-Axis,
								Y-Axis, and Z-Axis

EUT WITH EXTERNAL SENSOR ADAPTER

DATA SHEETS

FCC 15.231

Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

Date: 12/09/2022
Lab: D
Tested By: Kyle Fujimoto

Fundamental - With External Sensor Adapter

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
319.50	74.69	V	95.89	-21.20	Peak	142.50	122.98	**X-Axis**
319.50	55.69	V	75.89	-20.20	Avg	142.50	122.98	**Vertical Polarization**
319.50	93.62	V	95.89	-2.27	Peak	177.50	168.17	**Y-Axis**
319.50	74.62	V	75.89	-1.27	Avg	177.50	168.17	**Vertical Polarization**
319.50	93.28	V	95.89	-2.61	Peak	10.50	192.77	**Z-Axis**
319.50	74.28	V	75.89	-1.61	Avg	10.50	192.77	**Vertical Polarization**
319.50	94.78	H	95.89	-1.11	Peak	7.00	127.76	**X-Axis**
319.50	75.78	H	75.89	-0.11	Avg	7.00	127.76	**Horizontal Polarization**
319.50	85.41	H	95.89	-10.48	Peak	161.50	151.28	**Y-Axis**
319.50	66.41	H	75.89	-9.48	Avg	161.50	151.28	**Horizontal Polarization**
319.50	87.57	H	95.89	-8.32	Peak	182.50	117.31	**Z-Axis**
319.50	68.57	H	75.89	-7.32	Avg	182.50	117.31	**Horizontal Polarization**

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Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

Date: 12/09/2022
Lab: D
Tested By: Kyle Fujimoto

Harmonics - With External Sensor Adapter
Transmit Mode - X-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
639.00	31.97	V	75.89	-43.93	Peak	334.50	161.79	
639.00	12.97	V	55.89	-42.93	Avg	334.50	161.79	
958.50	36.20	V	75.89	-39.70	Peak	181.25	149.13	
958.50	17.20	V	55.89	-38.70	Avg	181.25	149.13	
1278.00	35.60	V	73.97	-38.37	Peak	0.25	150.02	
1278.00	16.60	V	53.97	-37.37	Avg	0.25	150.02	
1597.50	43.13	V	73.97	-30.84	Peak	271.25	178.50	
1597.50	24.13	V	53.97	-29.84	Avg	271.25	178.50	
1917.00	51.38	V	75.89	-24.51	Peak	155.25	142.86	
1917.00	32.38	V	55.89	-23.51	Avg	155.25	142.86	
2236.50	38.59	V	73.97	-35.38	Peak	96.75	133.25	
2236.50	19.59	V	53.97	-34.38	Avg	96.75	133.25	
2556.00	57.27	V	75.89	-18.62	Peak	317.75	246.50	
2556.00	38.27	V	55.89	-17.62	Avg	317.75	246.50	
2875.50	60.65	V	73.97	-13.32	Peak	340.75	206.50	
2875.50	41.65	V	53.97	-12.32	Avg	340.75	206.50	
3195.00	45.85	V	75.89	-30.04	Peak	224.50	194.32	
3195.00	26.85	V	55.89	-29.04	Avg	224.50	194.32	

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Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

Date: 12/09/2022
Lab: D
Tested By: Kyle Fujimoto

Harmonics - With External Sensor Adapter
Transmit Mode - Y-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
639.00	37.20	V	75.89	-38.69	Peak	263.50	119.70	
639.00	18.20	V	55.89	-37.69	Avg	263.50	119.70	
958.50	37.21	V	75.89	-38.68	Peak	180.75	119.70	
958.50	18.21	V	55.89	-37.68	Avg	180.75	119.70	
1278.00	39.86	V	73.97	-34.11	Peak	286.00	120.65	
1278.00	20.86	V	53.97	-33.11	Avg	286.00	120.65	
1597.50	51.64	V	73.97	-22.34	Peak	240.00	178.62	
1597.50	32.64	V	53.97	-21.34	Avg	240.00	178.62	
1917.00	56.16	V	75.89	-19.74	Peak	166.75	187.56	
1917.00	37.16	V	55.89	-18.74	Avg	166.75	187.56	
2236.50	42.55	V	73.97	-31.42	Peak	219.75	187.58	
2236.50	23.55	V	53.97	-30.42	Avg	219.75	187.58	
2556.00	57.80	V	75.89	-18.09	Peak	185.25	142.20	
2556.00	38.80	V	55.89	-17.09	Avg	185.25	142.20	
2875.50	64.68	V	73.97	-9.29	Peak	142.75	155.64	
2875.50	45.68	V	53.97	-8.29	Avg	142.75	155.64	
3195.00	49.09	V	75.89	-26.80	Peak	281.75	170.98	
3195.00	30.09	V	55.89	-25.80	Avg	281.75	170.98	

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Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

Date: 12/09/2022
Lab: D
Tested By: Kyle Fujimoto

Harmonics - With External Sensor Adapter
Transmit Mode - Z-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
639.00	36.48	V	75.89	-39.41	Peak	94.75	103.94	
639.00	17.48	V	55.89	-38.41	Avg	94.75	103.94	
958.50	40.98	V	75.89	-34.91	Peak	226.00	123.28	
958.50	21.98	V	55.89	-33.91	Avg	226.00	123.28	
1278.00	41.10	V	73.97	-32.87	Peak	185.25	163.76	
1278.00	22.10	V	53.97	-31.87	Avg	185.25	163.76	
1597.50	45.43	V	73.97	-28.54	Peak	308.00	169.37	
1597.50	26.43	V	53.97	-27.54	Avg	308.00	169.37	
1917.00	60.25	V	75.89	-15.64	Peak	149.25	244.71	
1917.00	41.25	V	55.89	-14.64	Avg	149.50	244.71	
2236.50	40.07	V	73.97	-33.90	Peak	177.50	242.20	
2236.50	21.07	V	53.97	-32.90	Avg	177.50	242.20	
2556.00	56.92	V	75.89	-18.97	Peak	250.50	173.79	
2556.00	37.92	V	55.89	-17.97	Avg	250.50	173.79	
2875.50	67.29	V	73.97	-6.68	Peak	322.75	191.52	
2875.50	48.29	V	53.97	-5.68	Avg	322.75	191.52	
3195.00	51.82	V	75.89	-24.07	Peak	122.00	115.16	
3195.00	32.82	V	55.89	-23.07	Avg	122.00	115.16	

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Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

Date: 12/09/2022
Lab: D
Tested By: Kyle Fujimoto

Harmonics - With External Sensor Adapter
Transmit Mode - X-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
639.00	35.92	H	75.89	-39.98	Peak	160.75	157.85	
639.00	16.92	H	55.89	-38.98	Avg	160.75	157.85	
958.50	38.79	H	75.89	-37.10	Peak	167.00	157.91	
958.50	19.79	H	55.89	-36.10	Avg	167.00	157.91	
1278.00	37.79	H	73.97	-36.18	Peak	96.75	123.10	
1278.00	18.79	H	53.97	-35.18	Avg	96.75	123.10	
1597.50	52.10	H	73.97	-21.87	Peak	350.00	114.74	
1597.50	33.10	H	53.97	-20.87	Avg	350.00	114.74	
1917.00	62.12	H	75.89	-13.77	Peak	205.25	111.70	
1917.00	43.12	H	55.89	-12.77	Avg	205.25	111.70	
2236.50	40.98	H	73.97	-32.99	Peak	225.25	140.53	
2236.50	21.98	H	53.97	-31.99	Avg	225.25	140.53	
2556.00	60.93	H	75.89	-14.96	Peak	202.00	157.73	
2556.00	41.93	H	55.89	-13.96	Avg	202.00	157.73	
2875.50	67.94	H	73.97	-6.03	Peak	41.50	100.11	
2875.50	48.94	H	53.97	-5.03	Avg	41.50	100.11	
3195.00	53.77	H	75.89	-22.12	Peak	60.50	165.61	
3195.00	34.77	H	55.89	-21.12	Avg	60.50	165.61	

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Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

Date: 12/09/2022
Lab: D
Tested By: Kyle Fujimoto

Harmonics - With External Sensor Adapter
Transmit Mode - Y-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
639.00	36.56	H	75.89	-39.33	Peak	183.50	119.70	
639.00	17.56	H	55.89	-38.33	Avg	183.50	119.70	
958.50	40.24	H	75.89	-35.65	Peak	225.25	185.61	
958.50	21.24	H	55.89	-34.65	Avg	225.25	185.61	
1278.00	42.62	H	73.97	-31.35	Peak	126.50	189.97	
1278.00	23.62	H	53.97	-30.35	Avg	126.50	189.97	
1597.50	50.56	H	73.97	-23.41	Peak	127.00	102.14	
1597.50	31.56	H	53.97	-22.41	Avg	127.00	102.14	
1917.00	60.08	H	75.89	-15.81	Peak	4.25	100.65	
1917.00	41.08	H	55.89	-14.81	Avg	4.25	100.65	
2236.50	41.67	H	73.97	-32.30	Peak	5.50	188.35	
2236.50	22.67	H	53.97	-31.30	Avg	5.50	188.35	
2556.00	59.07	H	75.89	-16.82	Peak	277.00	204.47	
2556.00	40.07	H	55.89	-15.82	Avg	277.00	204.47	
2875.50	66.84	H	73.97	-7.13	Peak	14.50	238.38	
2875.50	47.84	H	53.97	-6.13	Avg	14.50	238.38	
3195.00	48.93	H	75.89	-26.96	Peak	211.00	196.41	
3195.00	29.93	H	55.89	-25.96	Avg	211.00	196.41	

FCC 15.231

Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

Date: 12/09/2022
Lab: D
Tested By: Kyle Fujimoto

Harmonics - With External Sensor Adapter
Transmit Mode - Z-Axis

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
639.00	33.54	H	75.89	-42.35	Peak	117.00	132.47	
639.00	14.54	H	55.89	-41.35	Avg	117.00	132.47	
958.50	38.05	H	75.89	-37.84	Peak	333.25	105.73	
958.50	19.05	H	55.89	-36.84	Avg	333.25	105.73	
1278.00	37.27	H	73.97	-36.70	Peak	347.50	120.05	
1278.00	18.27	H	53.97	-35.70	Avg	347.50	120.05	
1597.50	53.37	H	73.97	-20.60	Peak	141.00	107.58	
1597.50	34.37	H	53.97	-19.60	Avg	141.00	107.58	
1917.00	60.10	H	75.89	-15.79	Peak	202.25	157.61	
1917.00	41.10	H	55.89	-14.79	Avg	202.25	157.61	
2236.50	41.93	H	73.97	-32.04	Peak	12.25	127.34	
2236.50	22.93	H	53.97	-31.04	Avg	12.25	127.34	
2556.00	58.87	H	75.89	-17.02	Peak	308.25	102.22	
2556.00	39.87	H	55.89	-16.02	Avg	308.25	102.22	
2875.50	63.76	H	73.97	-10.21	Peak	6.75	157.01	
2875.50	44.76	H	53.97	-9.21	Avg	6.75	157.01	
3195.00	43.61	H	75.89	-32.28	Peak	350.00	157.01	
3195.00	24.61	H	55.89	-31.28	Avg	350.00	157.01	

FCC 15.231

Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

Date: 09/21/2022
Lab: D
Tested By: Kyle Fujimoto

Non Harmonic Emissions from the Tx and Digital Portion - 9 kHz to 30 MHz
Non Harmonic Emissions from the Tx and Digital Portion - 1 GHz To 3195 MHz

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
								No Emissions Detected
								from 9 kHz to 30 MHz
								for the digital portion
								of the EUT
								No Emissions Detected
								from 1 GHz to 3195 MHz
								for the digital portion
								of the EUT
								No Emissions Detected
								from 9 kHz to 30 MHz
								for the Non-Harmonic Emissions
								of the Transmitter for the EUT
								No Emissions Detected
								from 1 GHz to 3195 MHz
								for the Non-Harmonic Emissions
								of the Transmitter for the EUT
								Investigated in the X-Axis,
								Y-Axis, and Z-Axis

BAND EDGES

DATA SHEETS

EUT WITH NO EXTERNAL SENSOR ADAPTER

DATA SHEETS

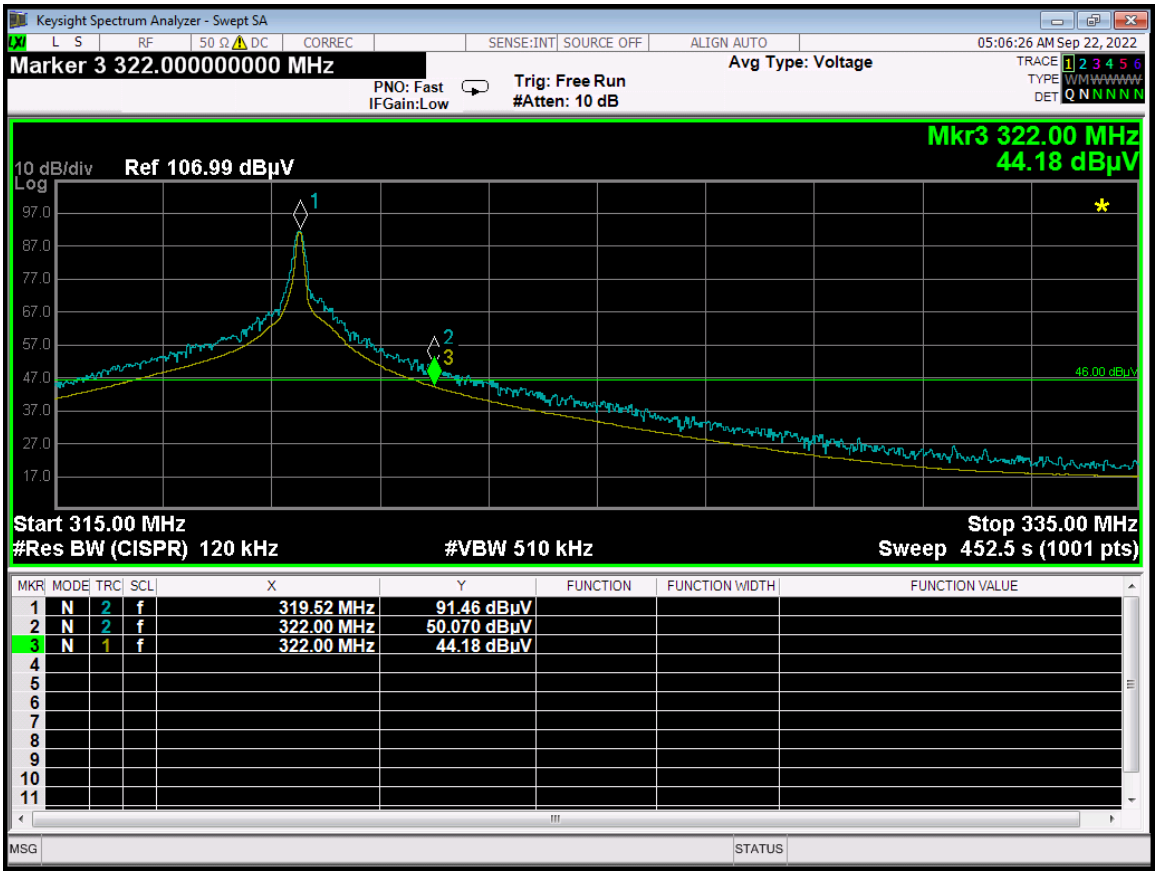
FCC 15.231

Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

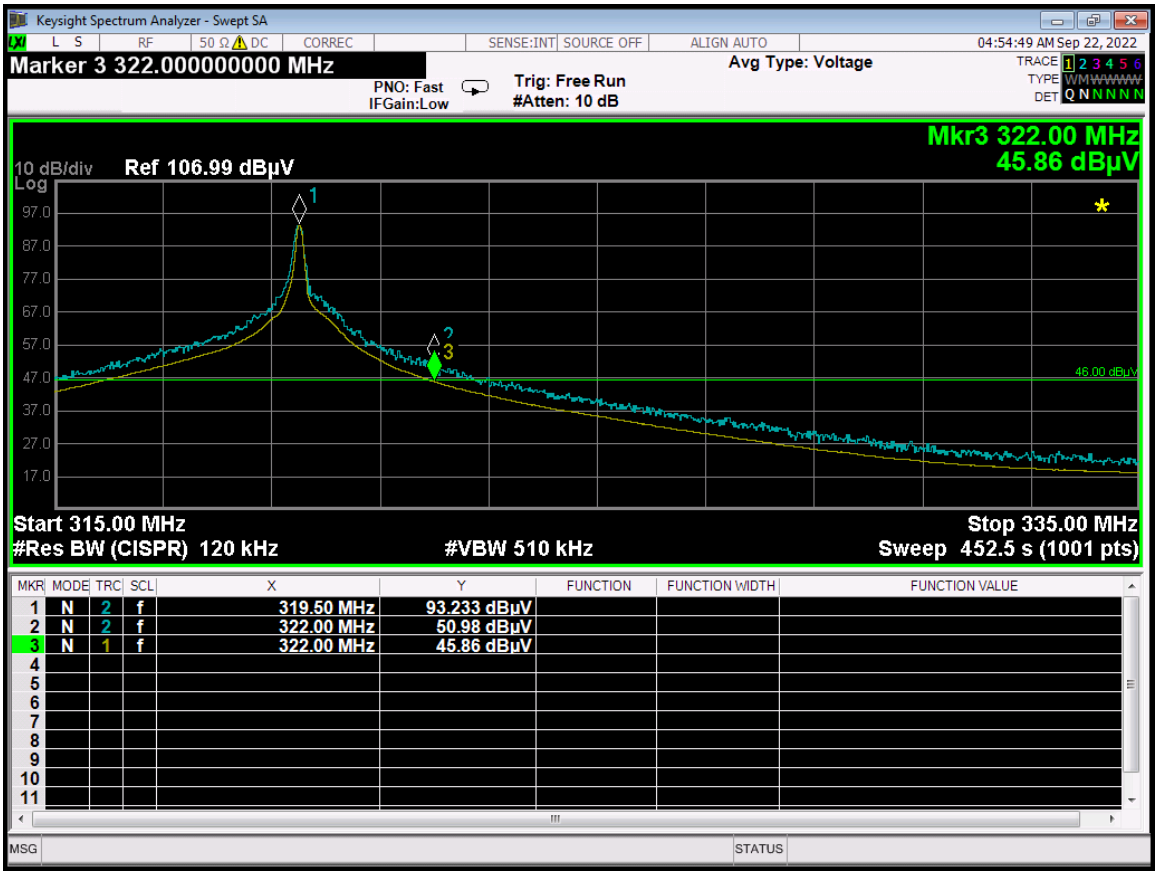
Date: 09/21/2022
Lab: D
Tested By: Kyle Fujimoto

Band Edges at 322 MHz

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
319.50	91.46	V	95.89	-4.43	Peak	273.25	168.00	**Fundamental**
319.50	72.46	V	75.89	-3.43	Avg	273.25	168.00	**Y-Axis Worst Case**
322.00	50.07	V	66.00	-15.93	Peak	273.25	168.00	**Band Edge - Y-Axis**
322.00	44.18	V	46.00	-1.82	QP	273.25	168.00	**Vertical Polarization**
319.50	93.23	H	95.89	-2.66	Peak	265.00	100.00	**Fundamental**
319.50	74.23	H	75.89	-1.66	Avg	265.00	100.00	**X-Axis Worst Case**
322.00	50.98	H	66.00	-15.02	Peak	273.25	168.00	**Band Edge - X-Axis**
322.00	45.86	H	46.00	-0.14	QP	273.25	168.00	**Horizontal Polarization**



Band Edge - 322 MHz - Vertical Polarization - Y-Axis



Band Edge - 322 MHz - Horizontal Polarization - X-Axis

EUT WITH EXTERNAL SENSOR ADAPTER

DATA SHEETS

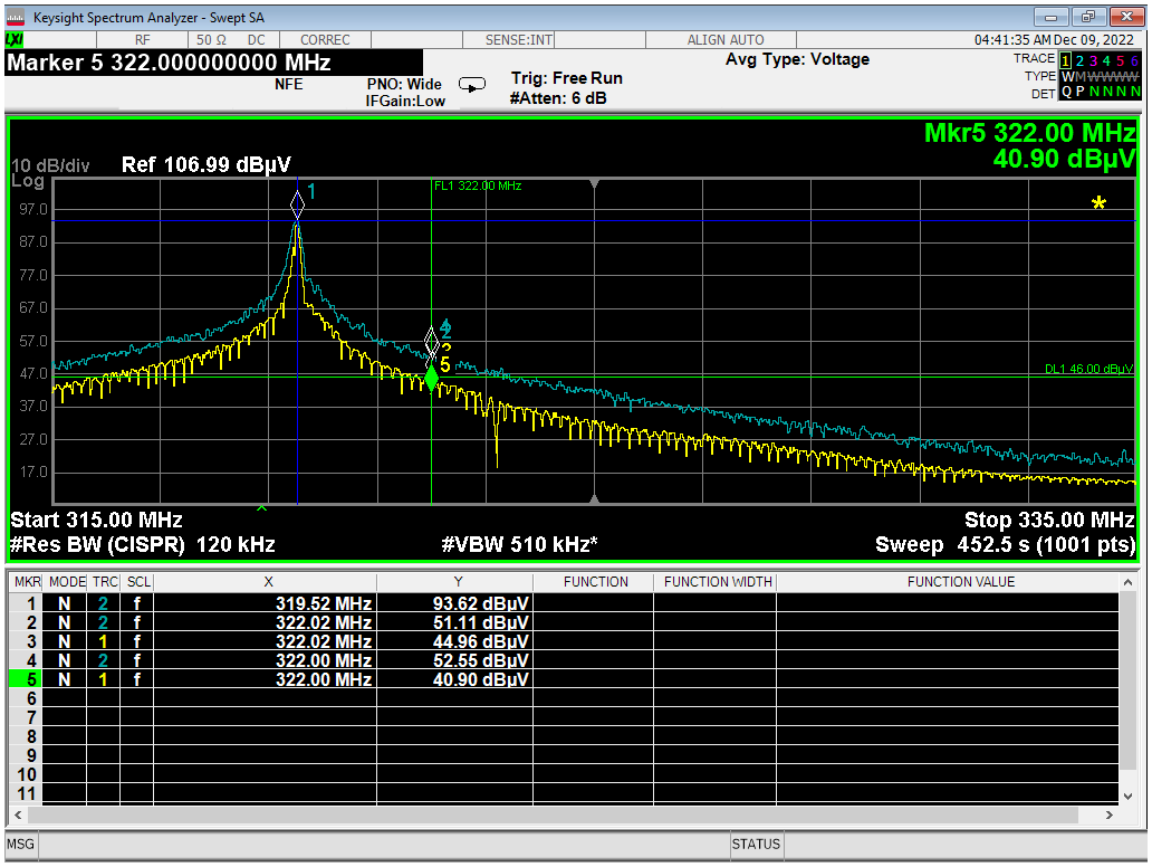
FCC 15.231

Ecolink Intelligent Technology, Inc.
Flood and Freeze Sensor
Model: WST-621

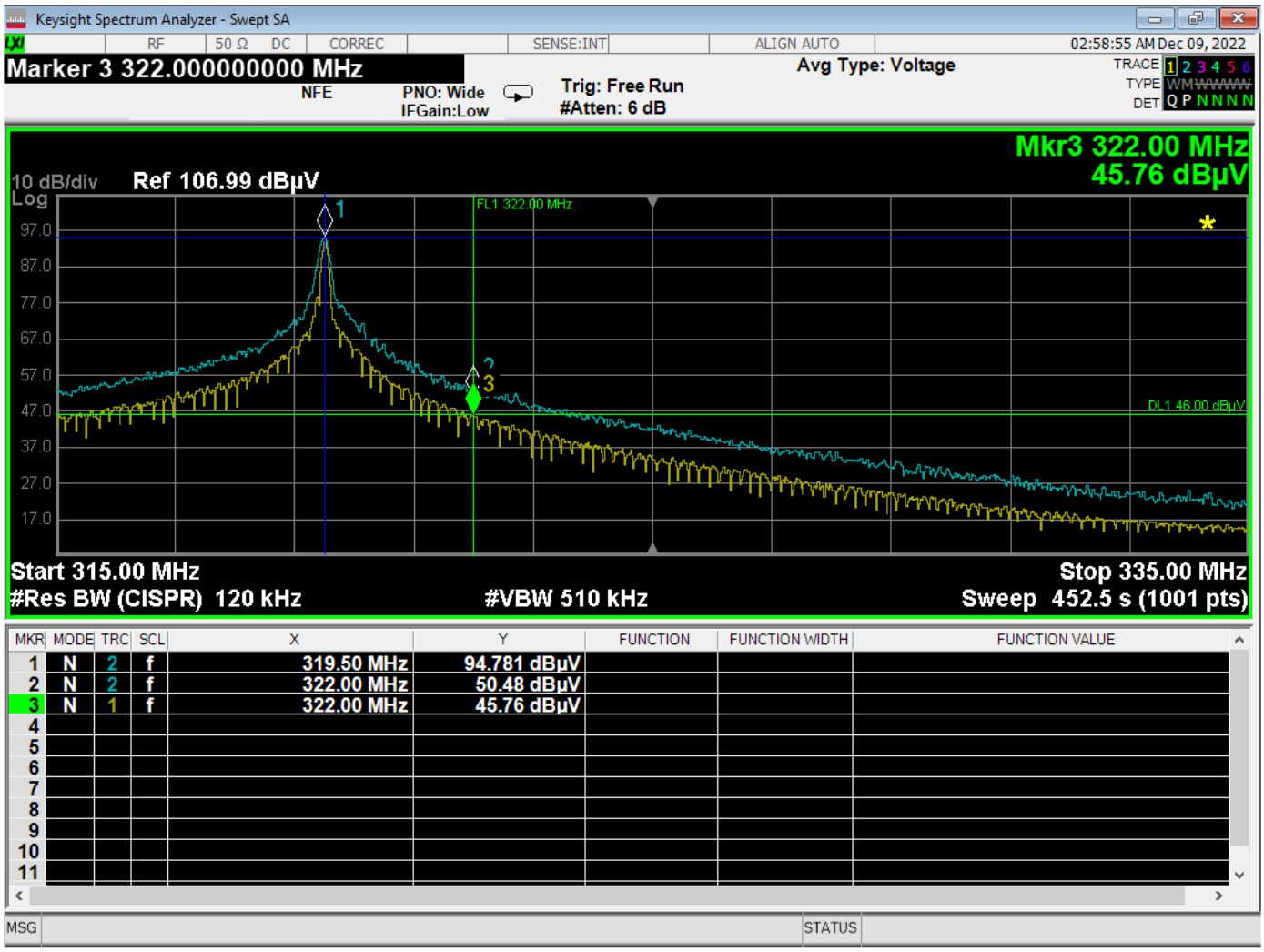
Date: 12/09/2022
Lab: D
Tested By: Kyle Fujimoto

Band Edges at 322 MHz - With External Sensor Adapter

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit (dBuV/m)	Margin (dB)	Peak / QP / Avg	Table Angle (deg)	Ant. Height (cm)	Comments
319.50	93.62	V	95.89	-2.27	Peak	177.50	168.17	**Fundamental**
319.50	74.62	V	75.89	-1.27	Avg	177.50	168.17	**Y-Axis Worst Case**
322.02	51.11	V	66.00	-14.89	Peak	177.50	168.17	**Band Edge - Y-Axis**
322.02	44.96	V	46.00	-1.04	QP	177.50	168.17	**Vertical Polarization**
319.50	94.78	H	95.89	-1.11	Peak	7.00	127.76	**Fundamental**
319.50	75.78	H	75.89	-0.11	Avg	7.00	127.76	**X-Axis Worst Case**
322.00	50.48	H	66.00	-15.52	Peak	7.00	127.76	**Band Edge - X-Axis**
322.00	45.76	H	46.00	-0.24	QP	7.00	127.76	**Horizontal Polarization**



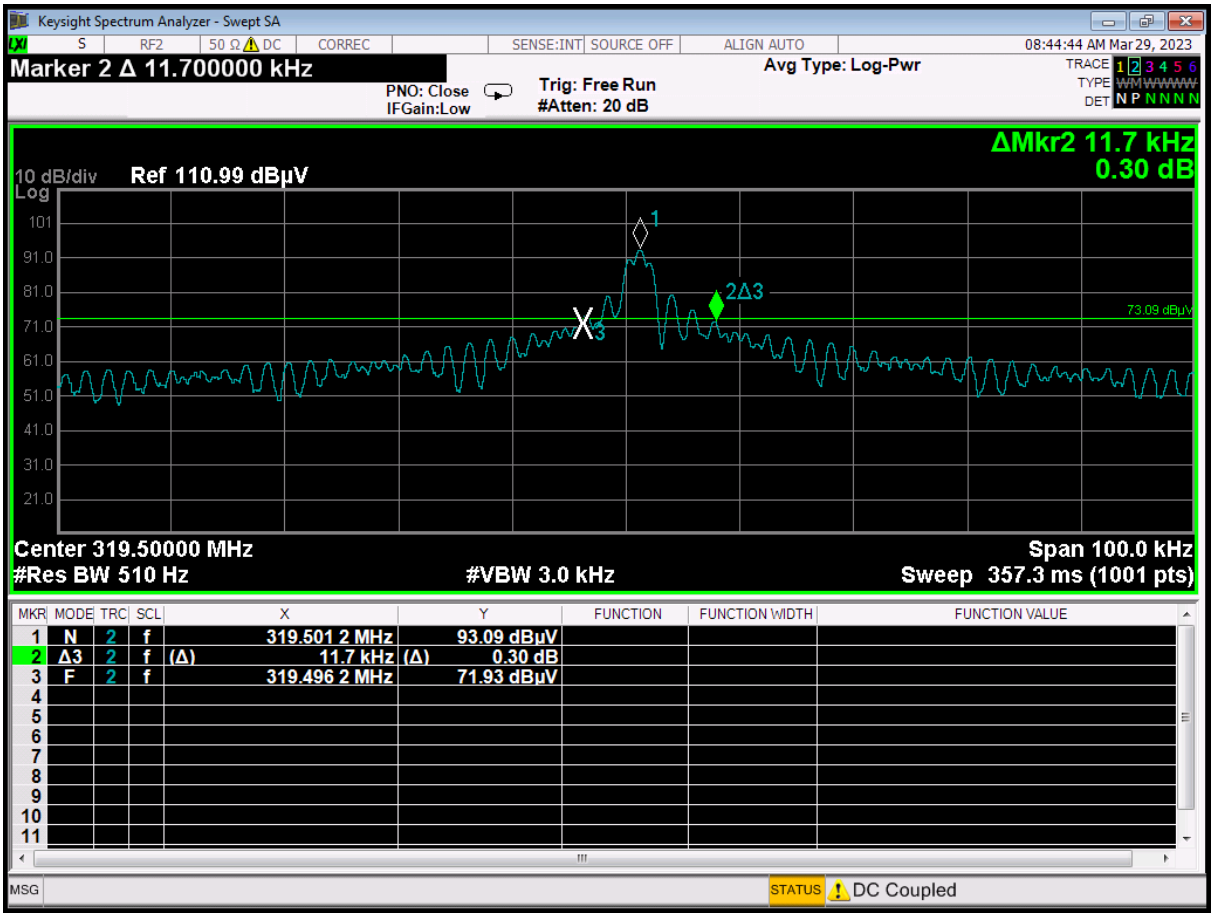
Band Edge – 322.02 MHz - Vertical Polarization - Y-Axis



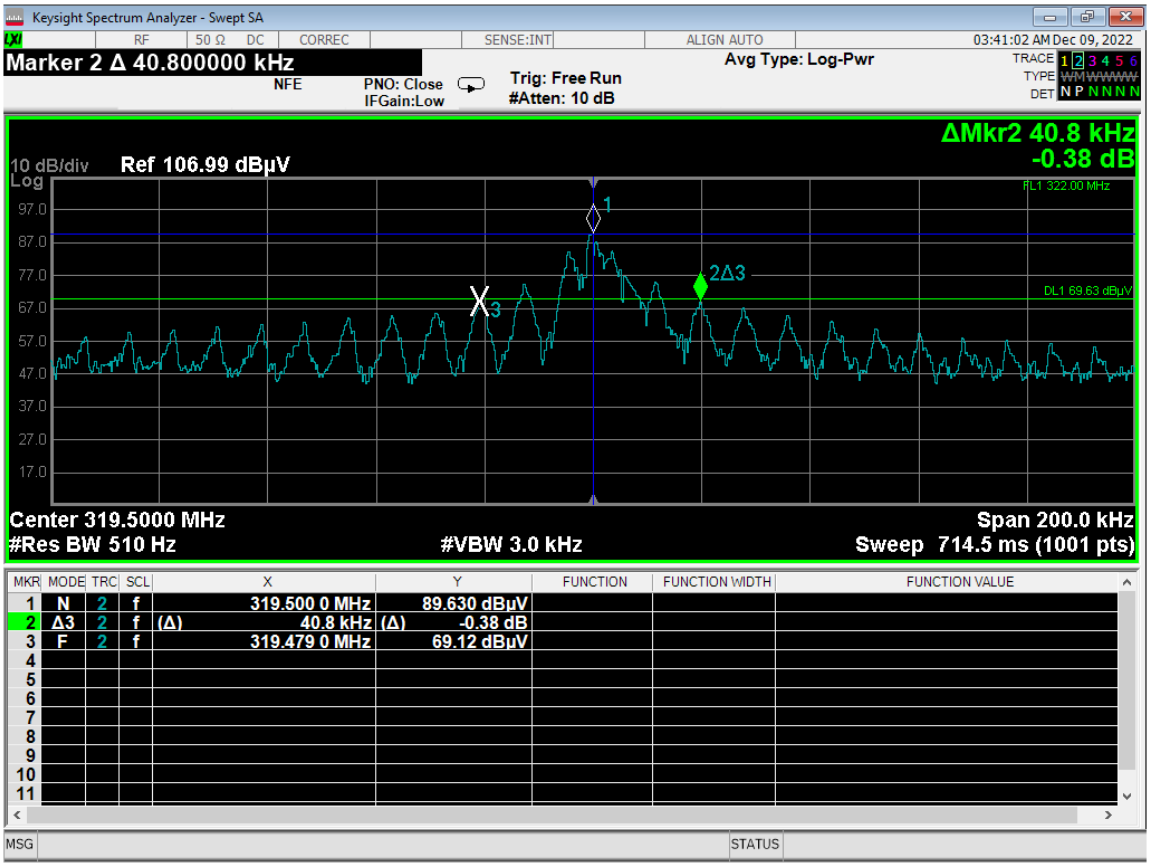
Band Edge – 322 MHz - Horizontal Polarization - X-Axis

-20 dB BANDWIDTH PLOT

DATA SHEET



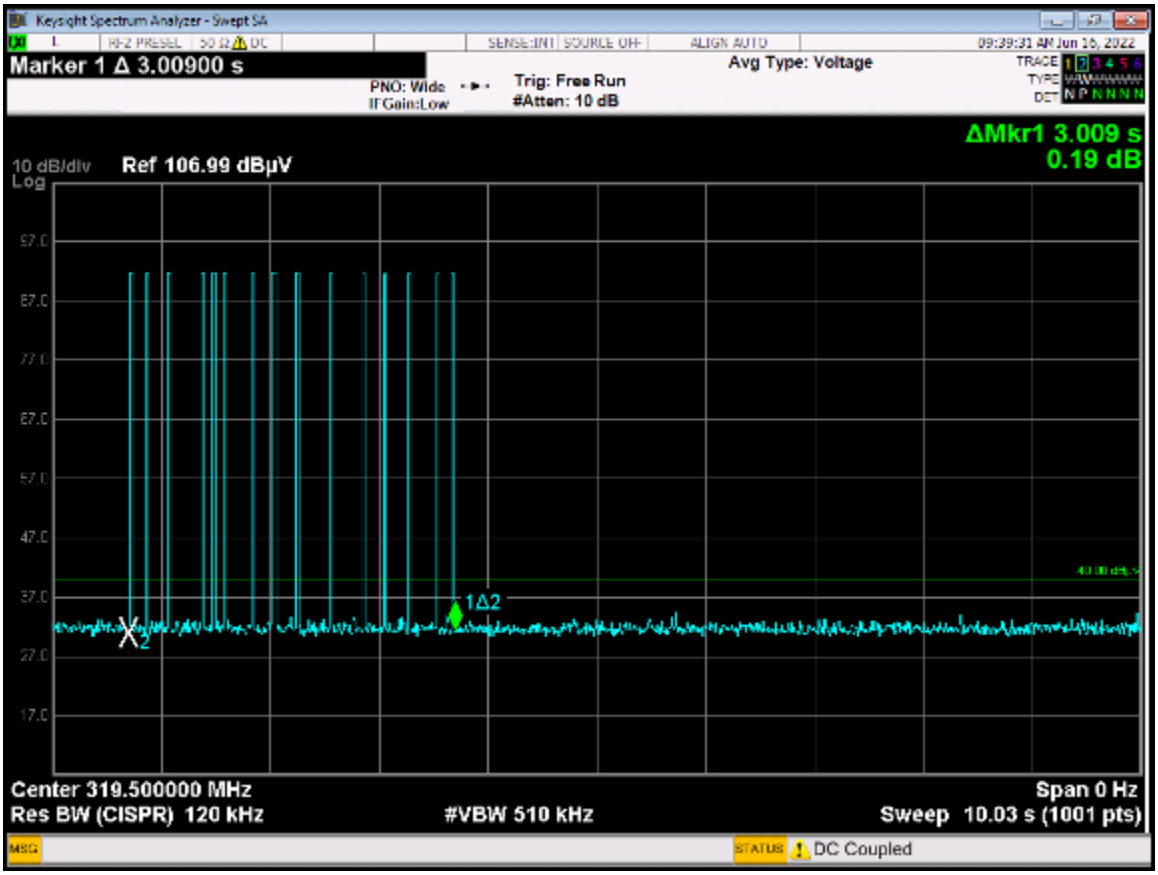
-20 dB Bandwidth Plot – 510 Hz RBW – No External Sensor Adapter



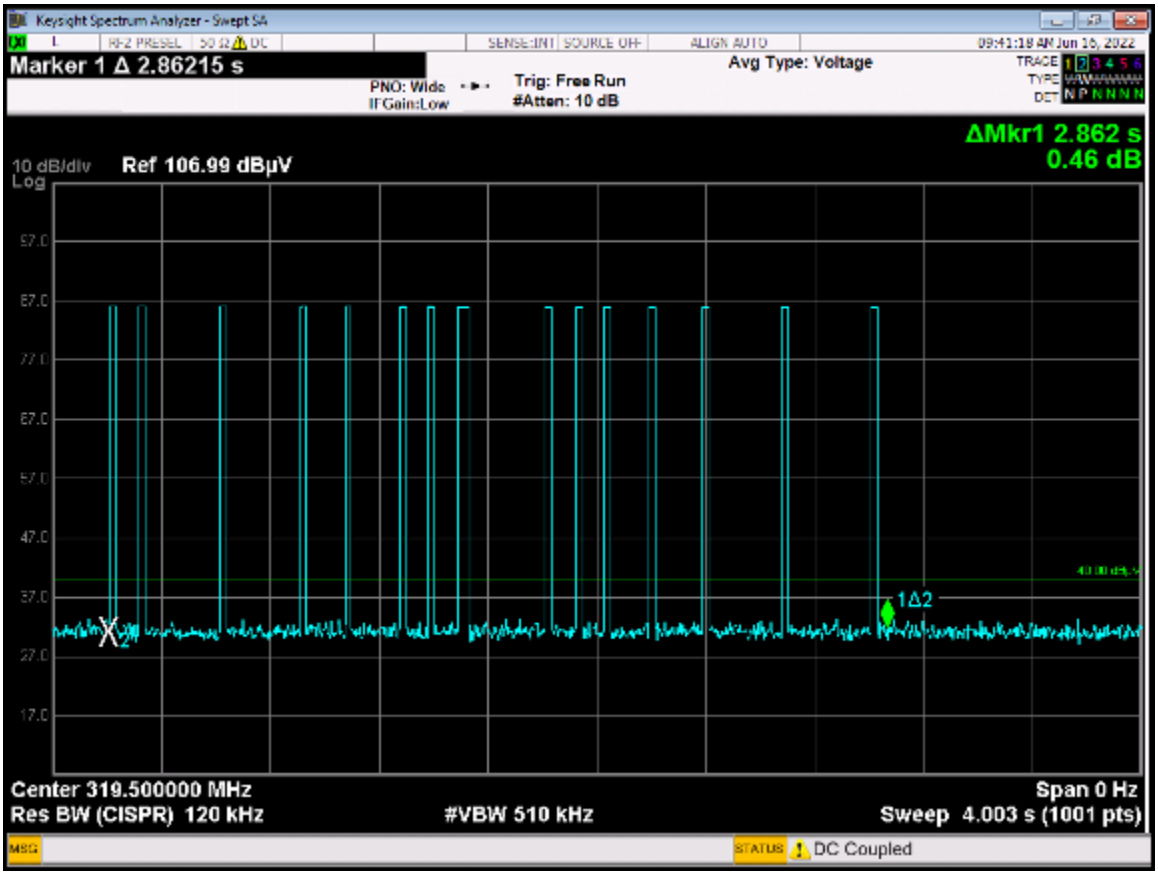
-20 dB Bandwidth Plot – 510 Hz RBW – With External Sensor Adapter

TRANSMISSION TIME

DATA SHEET



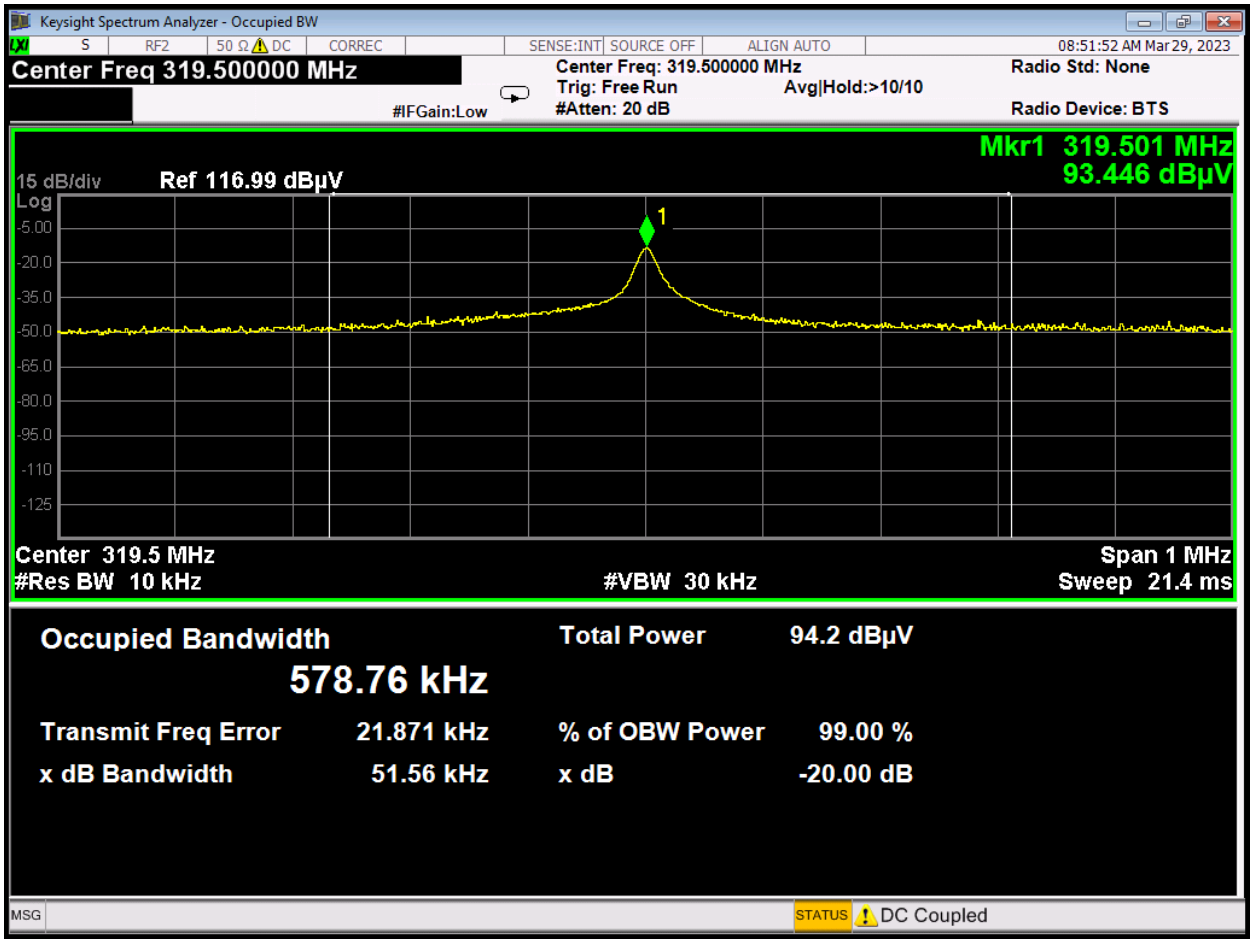
Plot Showing Time of Full Transmission – 3 Seconds



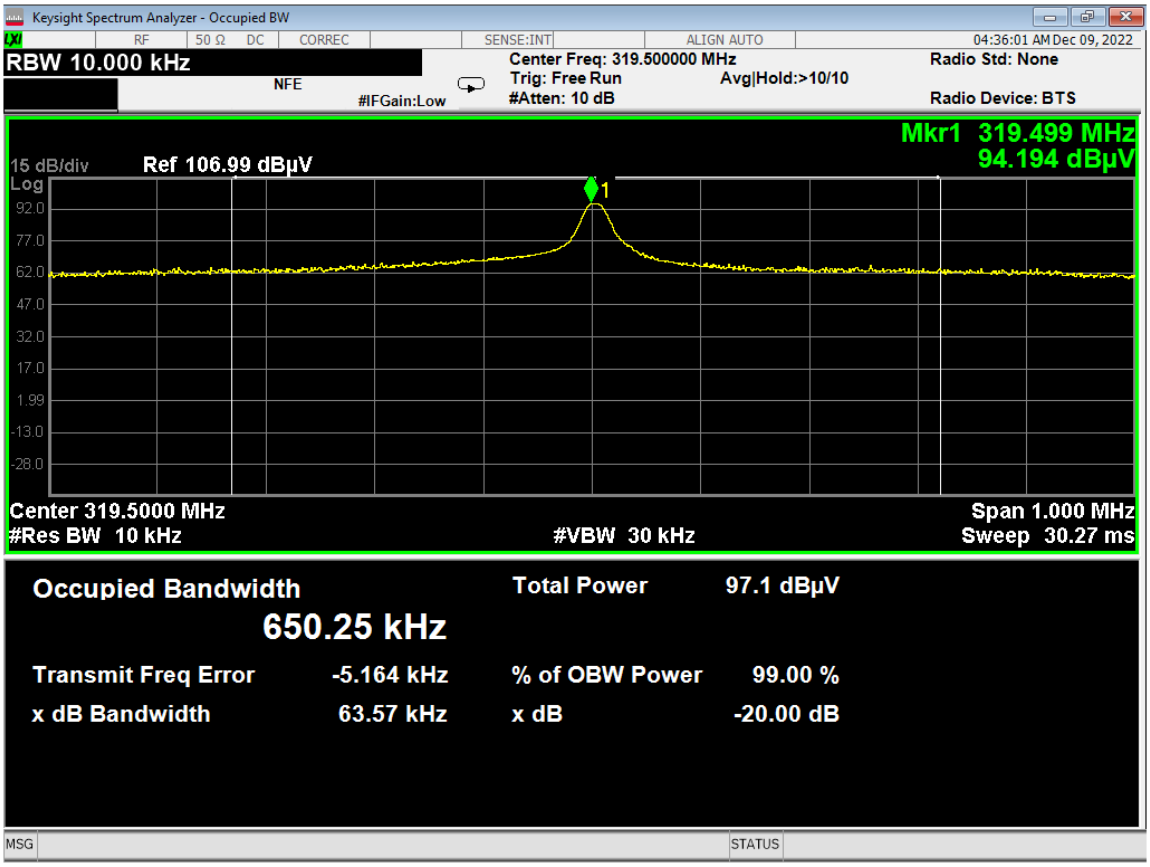
Plot Showing Time of Full Transmission – 4 Seconds Scale

99% BANDWIDTH

DATA SHEET



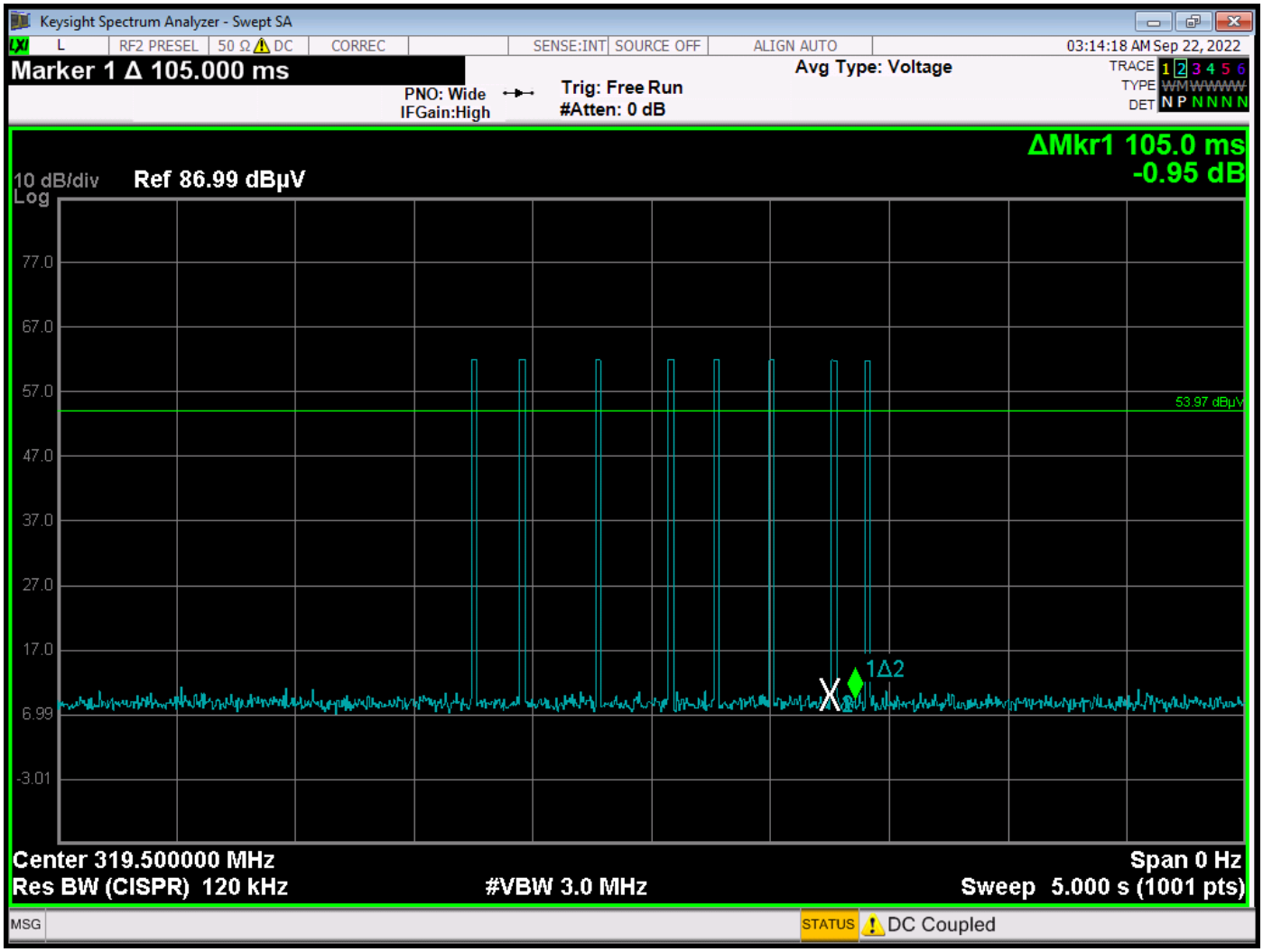
99% Bandwidth Plot – No External Sensor Adapter



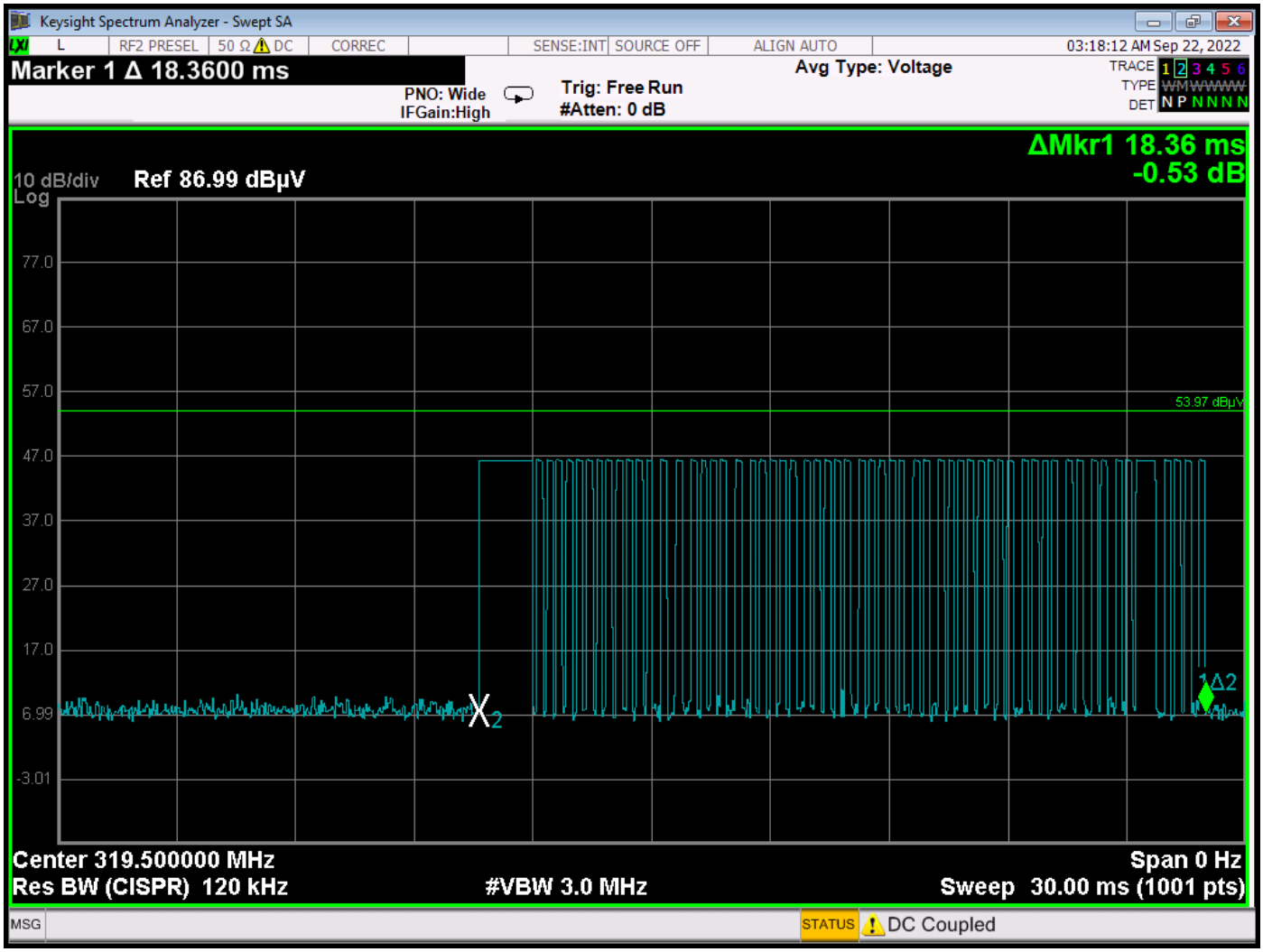
99% Bandwidth Plot – With External Sensor Adapter

DUTY CYCLE

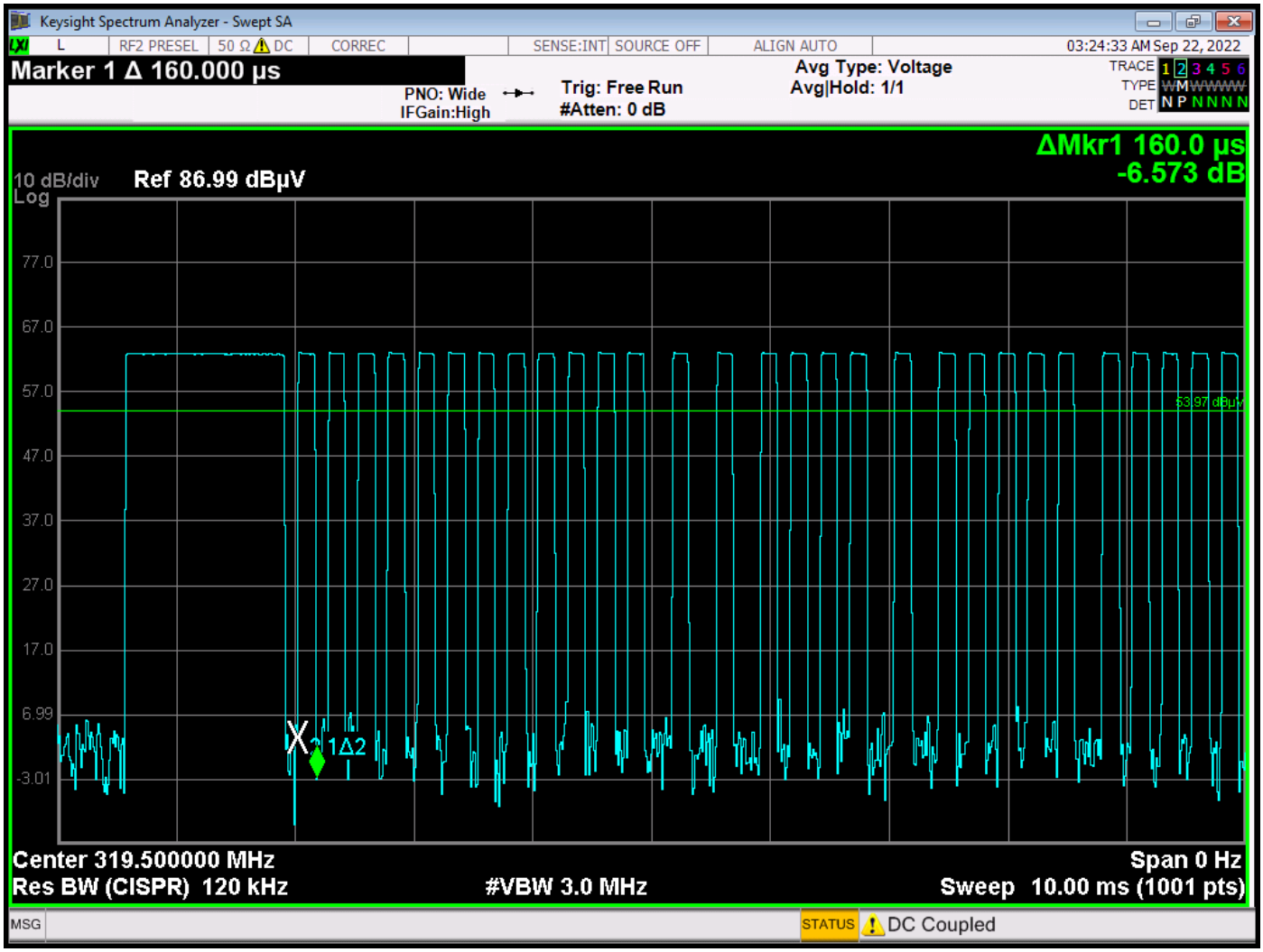
DATA SHEETS



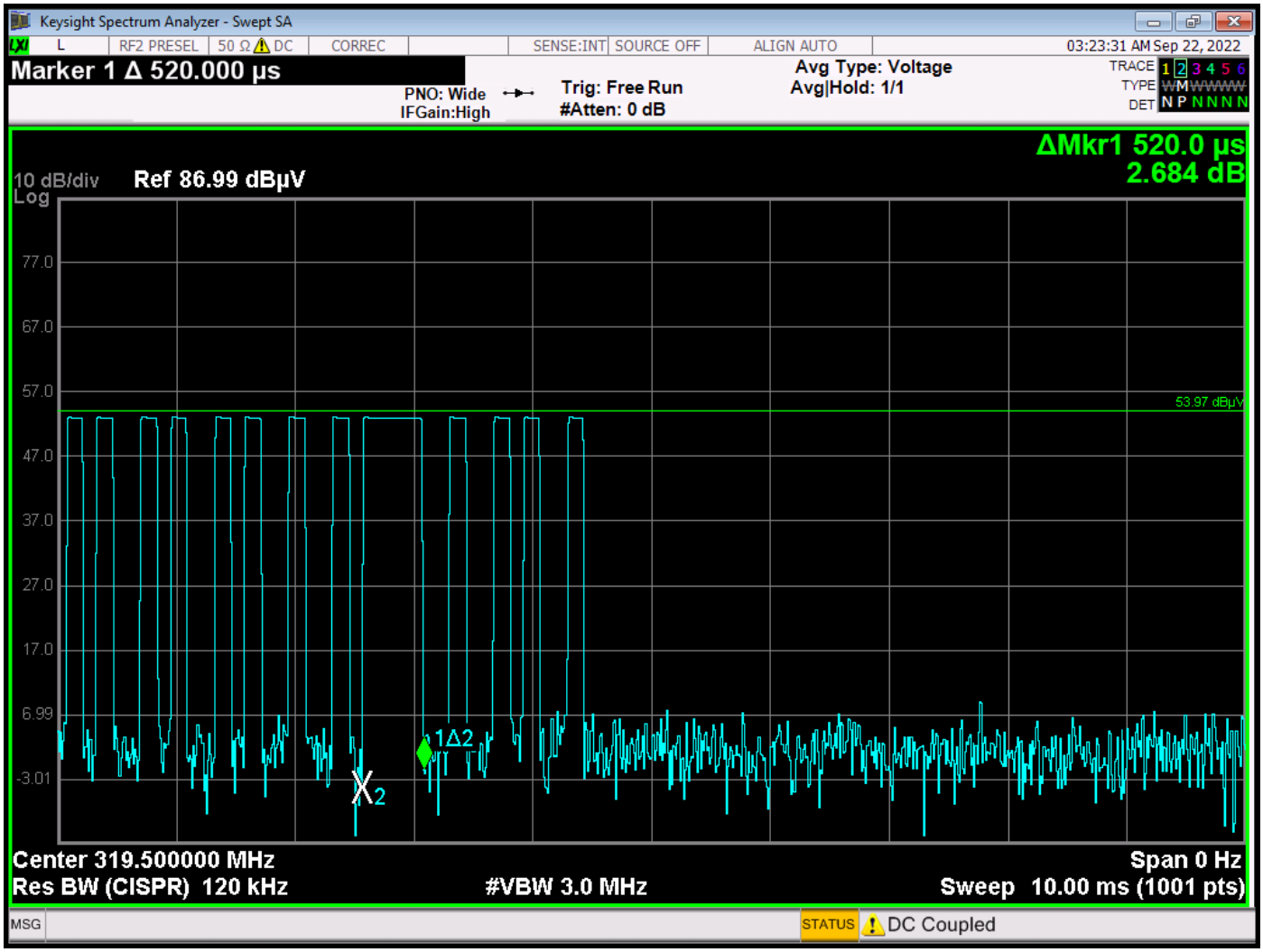
The worst case where the pulse train repeats itself will always be at least 100 ms



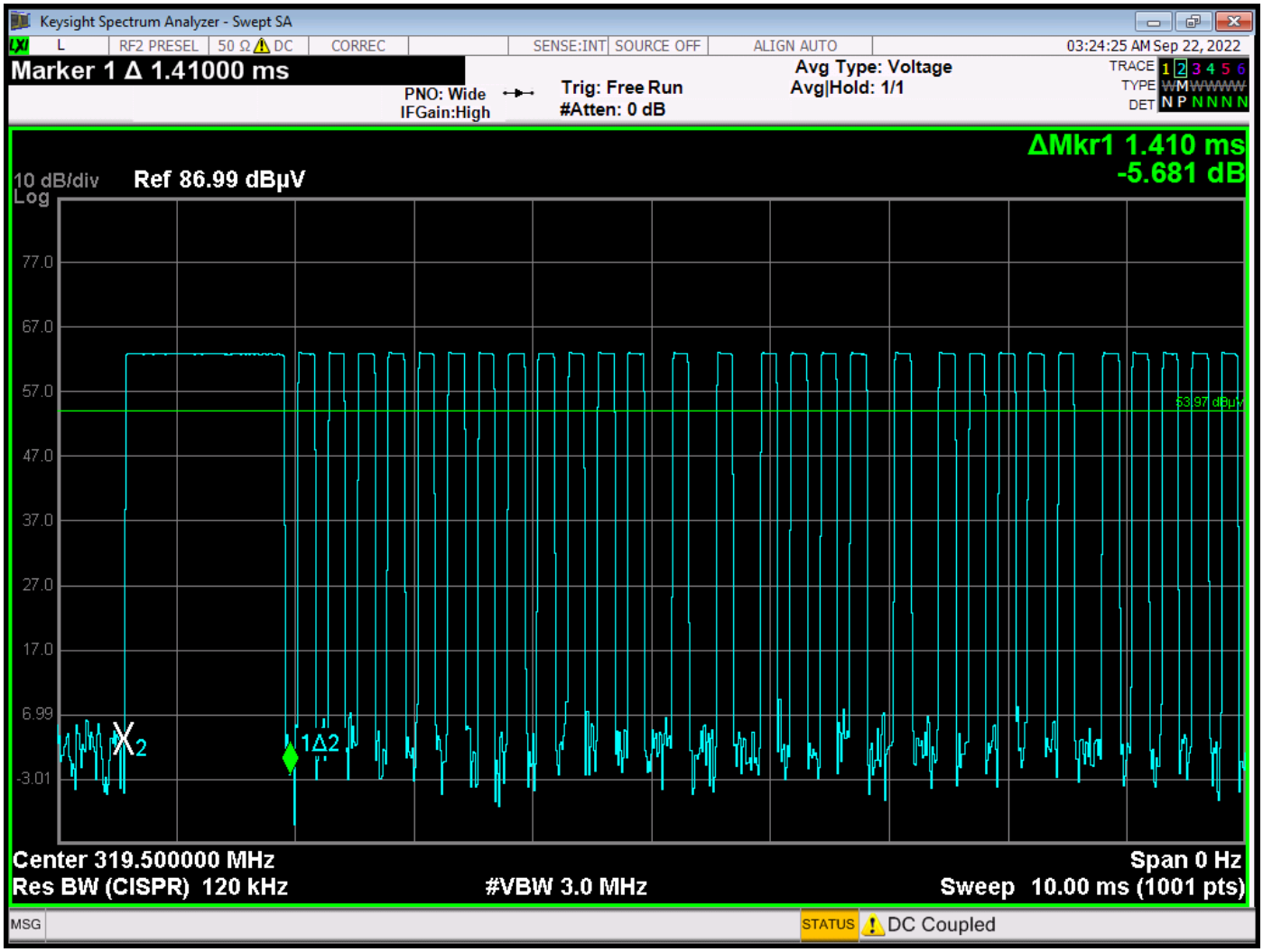
Time of One Complete Pulse Train



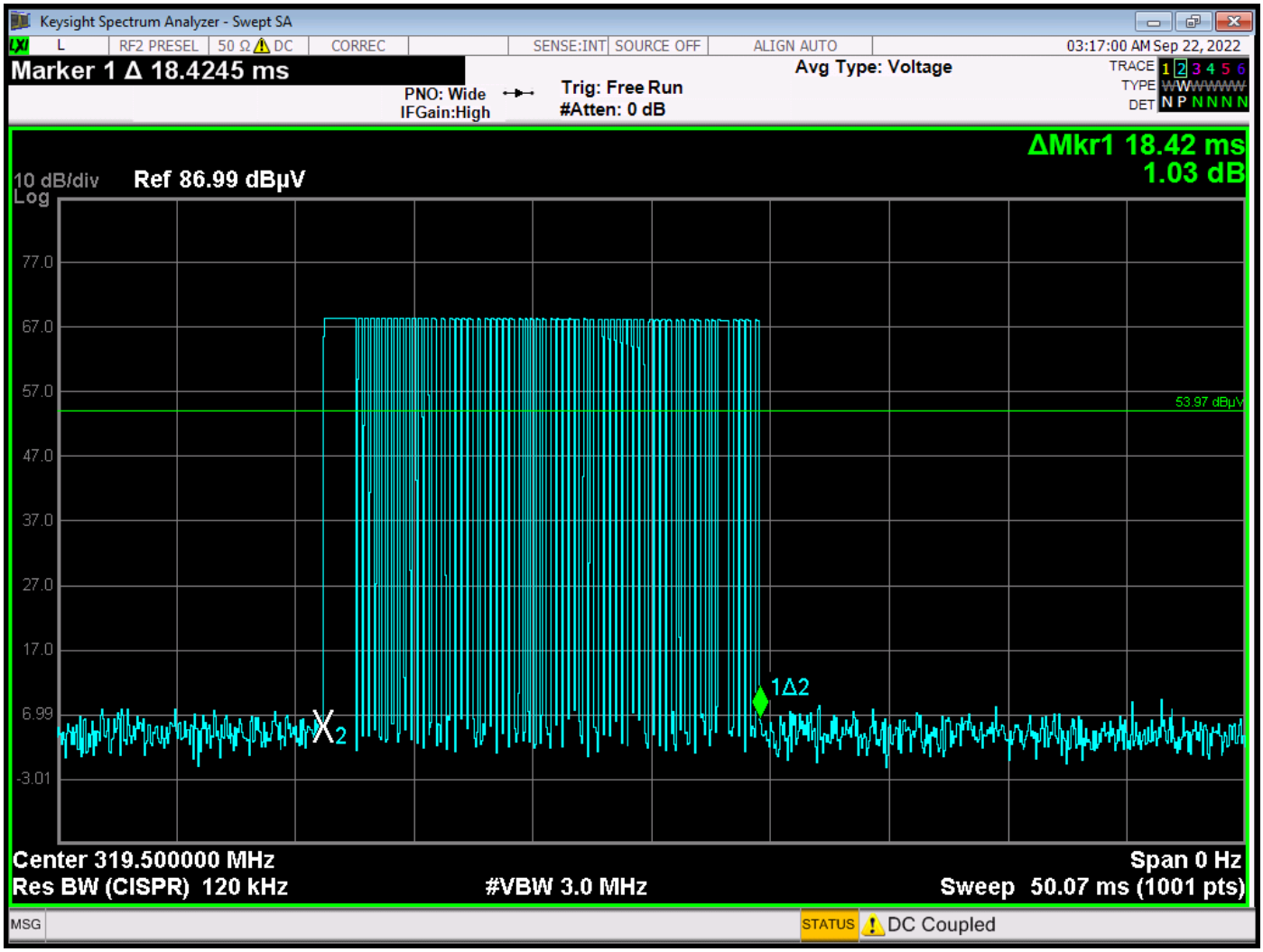
Time of One Small Pulse = 160 us



Time of One Medium Pulse = 520 us



Time of One Large Pulse = 1.410 ms



Number of Small Pulses = 58 = (58*160 us) = 9280 us
Number of Medium Pulses = 1 = (1*520 us) = 520 us
Number of Large Pulses = 1 = (1 * 1410 us) = 1410 us

Total On Time = 11210 us = 11.210 ms

Duty Cycle = 11.210 ms / 100 ms = 11.210%

The peak to average ratio is -19.00 dB