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

for

Wireless RAIN-CLIK

Model: WR-CLIK

Prepared for

HUNTER INDUSTRIES, INC.
1940 DIAMOND STREET
SAN MARCOS, CALIFORNIA 92078

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DATE: JUNE 15, 2023

	REPORT BODY	APPENDICES					TOTAL
		A	*B*	*C*	*D*	*E*	
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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: Wireless RAIN-CLIK
Model: WR-CLIK
S/N: N/A

Product Description: The EUT is a Wireless Rain Sensor (radio transmitter) used to communicate with a Wireless RAIN-CLIK receiver that would be connected to an irrigation controller. The EUT operates at 433.925 MHz. Dimensions: 1.5 in (L) x 1.25 in (W) x 3.75 in (H).

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

Customer: Hunter Industries Inc.
1940 Diamond Street
San Marcos, California 92078

Test Dates: March 10 and 13, 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, 15.207, 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 connected to the AC public mains.
2	Spurious Radiated RF Emissions, 9 kHz – 4.34 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 Highest reading in relation to spec limit 75.32 dBuV/m (AVG) @ 433.92 MHz (*U = 3.32 dB)
3	99% Bandwidth	This test was performed to obtain the emission designator required by Innovation, Science and Economic Development Canada.
4	-20 dB Bandwidth	Complies with limits of CFR Title 47, Part 15 Subpart C, section 15.231 (c); and the limits of RSS-210
5	Transmission Time	This test was not performed because the changes do not affect this test.

*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 Wireless RAIN-CLIK, Model: WR-CLIK (EUT). 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, 15.207, 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

Hunter Industries Inc.

Michael Abbate	Assoc. Regulatory Compliance Engineer
Nathan Escalante	Product Reliability Manager

Compatible Electronics Inc.

Kyle Fujimoto	Sr. Test Engineer
James Ross	Sr. Test Engineer

2.4 Date Test Sample was Received

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

2.5 Disposition of the Test Sample

The test sample has not been returned to Hunter Industries, 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
FCC	Federal Communications Commission
RSS	Radio Standards Specification
DoC	Declaration of Conformity
N/A	Not Applicable
Tx	Transmit
Inc.	Incorporated
ET	Evapotranspiration
DC	Direct Current

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 1	License-exempt Radio Apparatus: Category I Equipment
RSS-Gen Issue 5: 2019 + 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 Wireless RAIN-CLIK, Model: WR-CLIK (EUT) runs only on battery and was mounted on a wooden board for testing. The EUT was continuously transmitting at 433.92 MHz during the test.

The EUT was tested for emissions only in the Y-Axis. The Y orientation is when the EUT is perpendicular to the ground mounted vertically.

The EUT was loaded with a constant transmit compliance only firmware that allowed the EUT to transmit on a continuous basis for testing purposes for all tests except for time of transmission.

Note: Both a U2 and U3 versions were tested. The differences are that the layouts are different.

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

The EUT has no external cables.

5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

EQUIPMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID
WIRELESS RAIN-CLIK (EUT)	HUNTER INDUSTRIES, INC.	WR-CLIK	P/N: WR-CLIK-TR	M3UWRC IC: 2772A-WRC
CONSTANT TRANSMIT COMPLIANCE ONLY FIRMWARE	HUNTER INDUSTRIES, INC.	Version 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	September 17, 2021	September 17, 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, 2024
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 connected to 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 harmonic of the fundamental frequency, were quasi-peaked using the quasi-peak detector of the EMI Receiver.

The harmonic frequencies above 1 GHz, the fundamental frequency, and the 2nd harmonic 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.

Radiated Emissions Test (Continued)

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 4.34 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
Wireless RAIN-CLIK, Model: WR-CLIK

Frequency (MHz)	Average EMI Reading (dBµV/m)	Average Specification Limit (dBµV/m)	Delta (Cor. Reading – Spec. Limit) (dB)
433.92 (V) (U3)	75.32	80.82	-5.50
433.92 (V) (U2)	74.75	80.82	-6.07
3471.36 (V) (U2)	41.65	60.82	-19.17
3905.28 (V) (U2)	34.59	53.97	-19.38
1301.76 (V) (U2)	32.86	53.97	-21.11
1301.76 (V) (U3)	31.51	53.97	-22.46

Notes:

* The complete emissions data is given in Appendix E of this report.
(V) Vertical
(H) Horizontal

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:

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

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:

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

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:

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

Or, if the magnetic antenna factor is used:

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

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 (U2 Version)

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 *Tx*
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 = -19.61 dB

Time of One Small Pulse = 250 µs

Time of One Large Pulse = 300 µs

Number of Small Pulses = 37

Number of Large Pulses = 4

Total On Time = 10450 µs = 10.450 ms

The time between pulses is greater than 100 ms

Duty Cycle = 10.450 ms / 100 ms = 10.450 %

7.1.6 Duty Cycle Calculation (U3 Version)

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 *Tx*
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 = -19.11 dB

Time of One Small Pulse = 250 µs

Time of One Large Pulse = 455 µs

Number of Small Pulses = 37

Number of Large Pulses = 4

Total On Time = 11070 µs = 11.070 ms

The time between pulses is greater than 100 ms

Duty Cycle = 11.070 ms / 100 ms = 11.07 %

7.1.7 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.

7.1.8 -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 to at least 1 % to 5 % of the occupied bandwidth.
2. Set VBW to greater than 3 times the RBW.
3. Set the peak detector to max hold.
4. Set the sweep time to auto
5. Allow the trace to stabilize.
6. 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.

7.1.9 Transmission Time

The transmission time was measured using an EMI Receiver.

The following steps were performed for measuring transmission time:

1. Set RBW = 100 kHz.
2. Set VBW = 300 kHz
3. Span = 0 Hz
4. Set the sweep time to 10 seconds
5. Push a button on the EUT, which activated the transmitter.
6. Allow the trace to stabilize.
7. Set the 1st marker to start of the transmission
8. Set the 2nd marker for 5 seconds after the start of the transmission
9. Verify the transmission does not go beyond the 2nd marker.

Test Results:

This test was not performed because the changes made to the EUT do not affect this test.

8. CONCLUSIONS

The Wireless RAIN-CLIK, Model: WR-CLIK (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, 15.207, 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 System 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 operated generally in accordance with the principles of ISO 9001."

ISED Test Site Registration Number: 2154A

APPENDIX B

MODIFICATIONS TO THE EUT

MODIFICATIONS TO THE EUT

No modifications were made to the EUT during the testing.

APPENDIX C

MODELS COVERED

MODELS COVERED

USED FOR THE PRIMARY TEST	Wireless RAIN-CLIK Model: WR-CLIK S/N: N/A
ADDITIONAL MODEL COVERED UNDER THIS REPORT:	Wireless MINI-CLIK Model: WM-CLIK

The WM-CLIK is similar to the WR-CLIK except the WM-CLIK has a Quick Shutoff Rubber Cover to prevent the ”Quick Shutoff” feature to be activated and a Rainfall Adjustment style cap that allows the customer to shutoff the system between 1/8" to 3/4" rainfall.

APPENDIX D

DIAGRAMS, CHARTS, AND PHOTOS

FIGURE 1: CONDUCTED EMISSIONS TEST SETUP

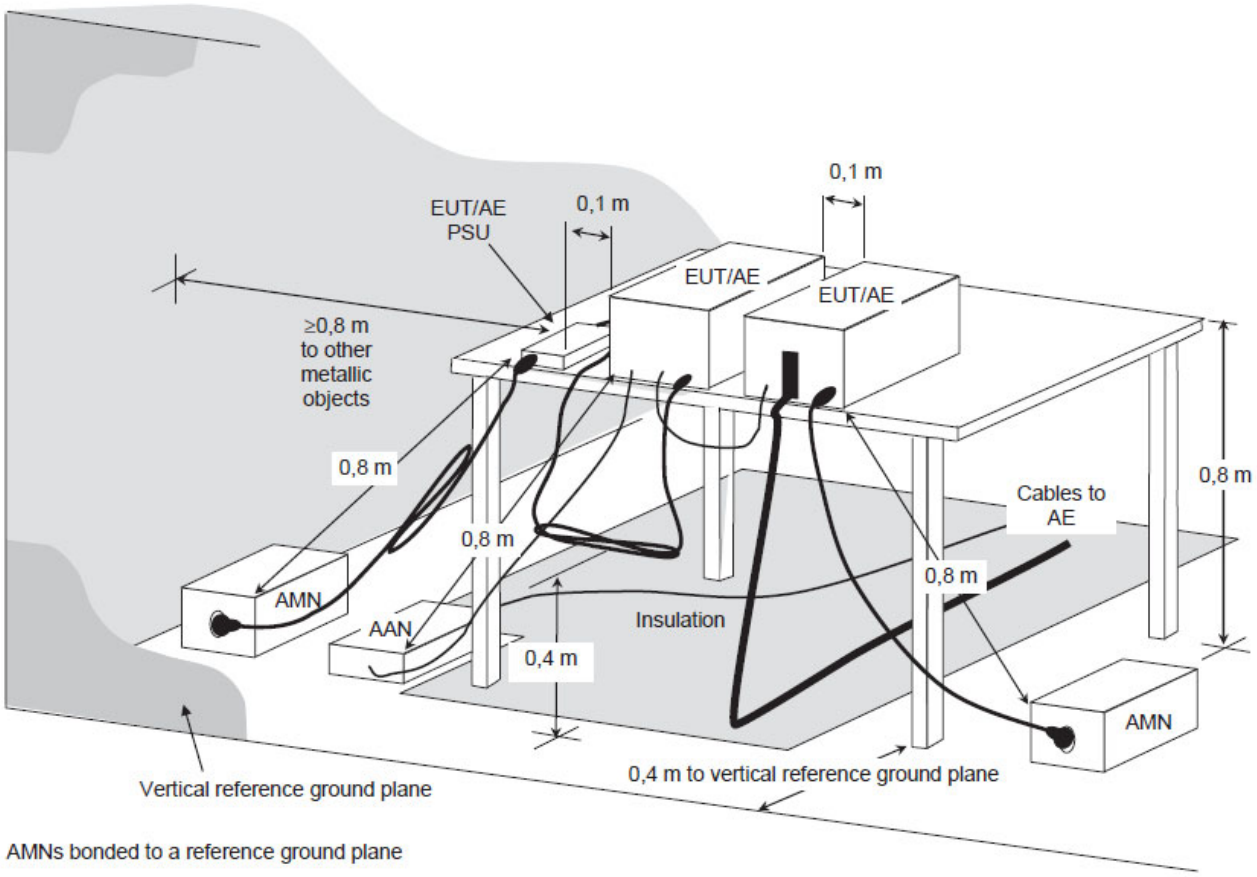
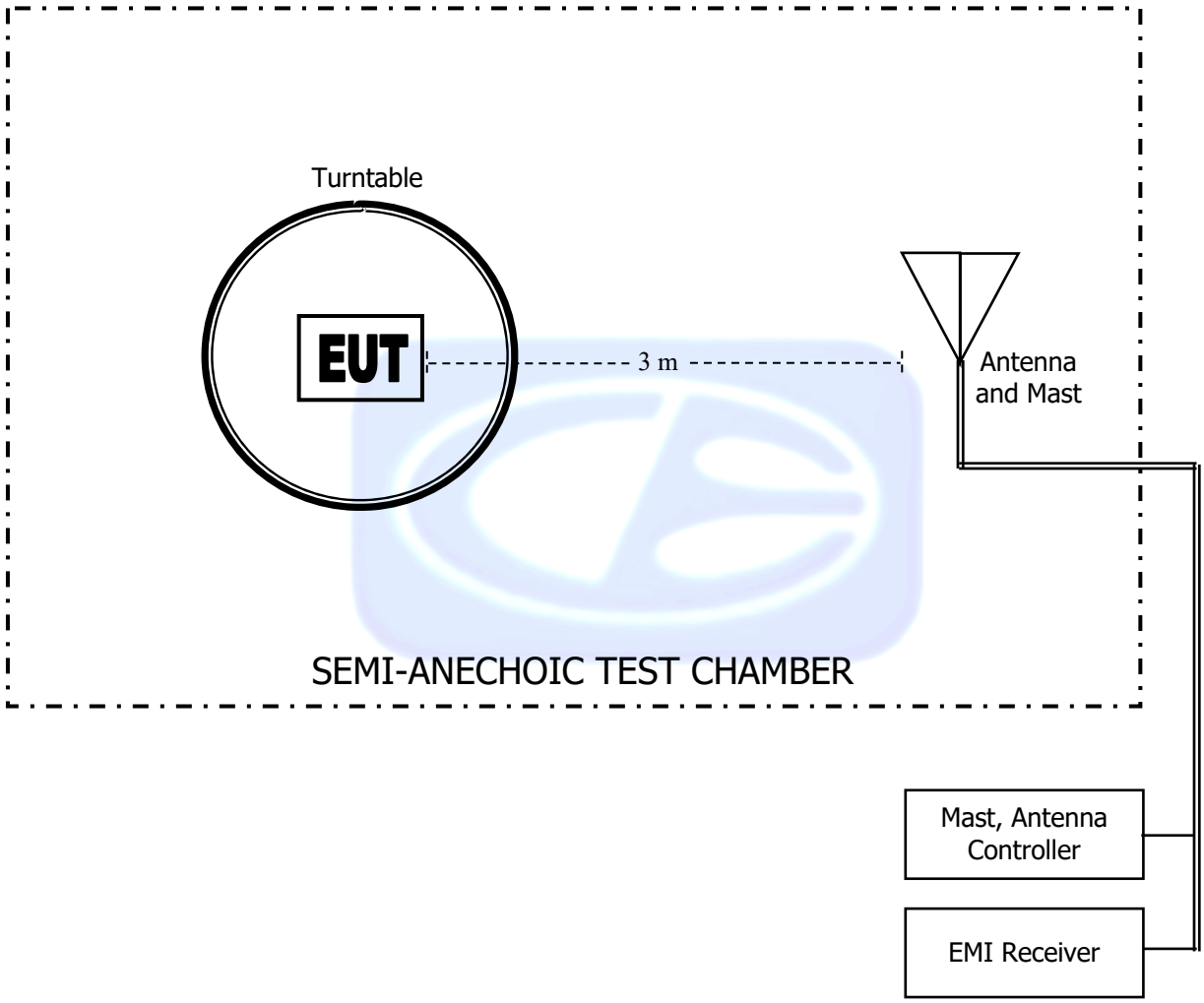


FIGURE 2: LAYOUT OF THE SEMI -ANECHOIC TEST CHAMBER



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		

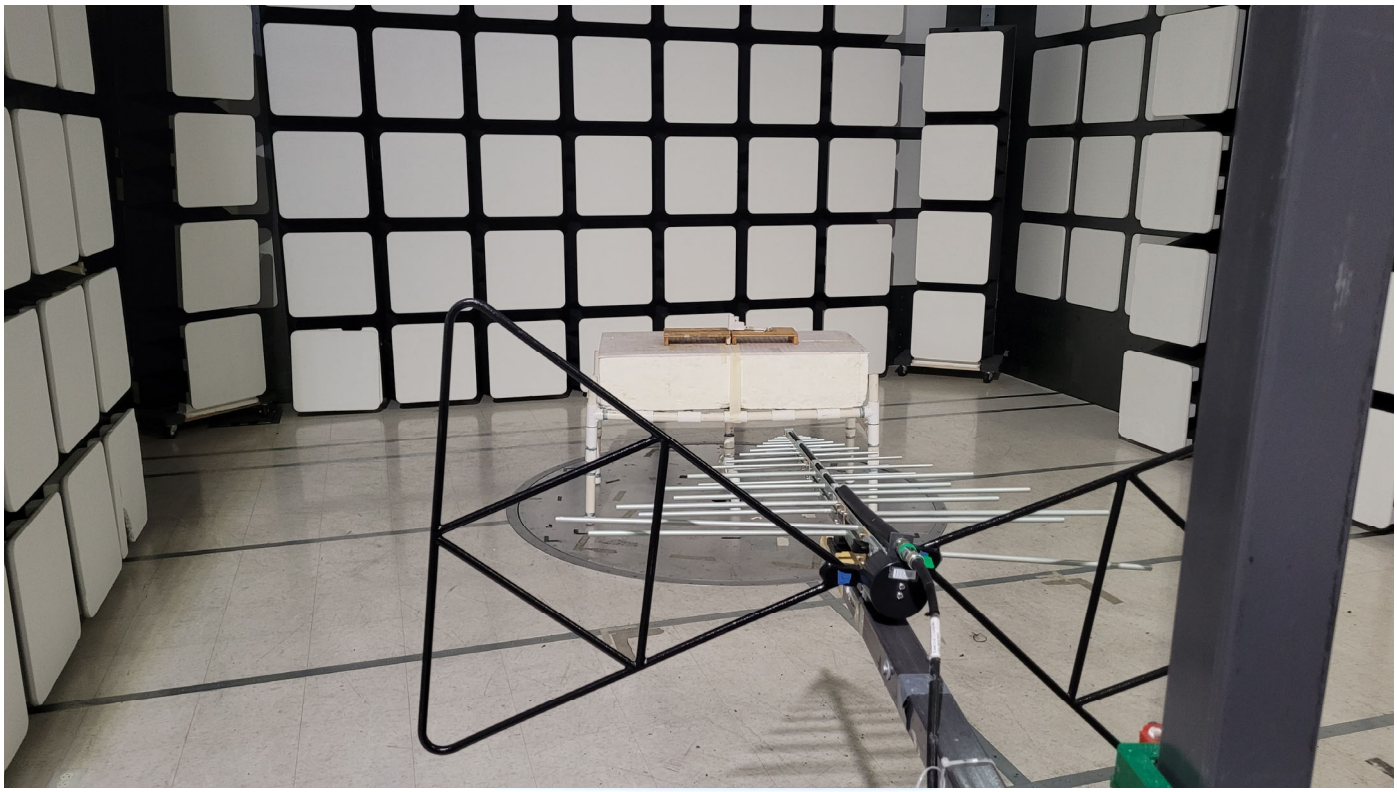
COM-POWER PA-118

PREAMPLIFIER

S/N: 181653

CALIBRATION DATE: MARCH 7, 2022

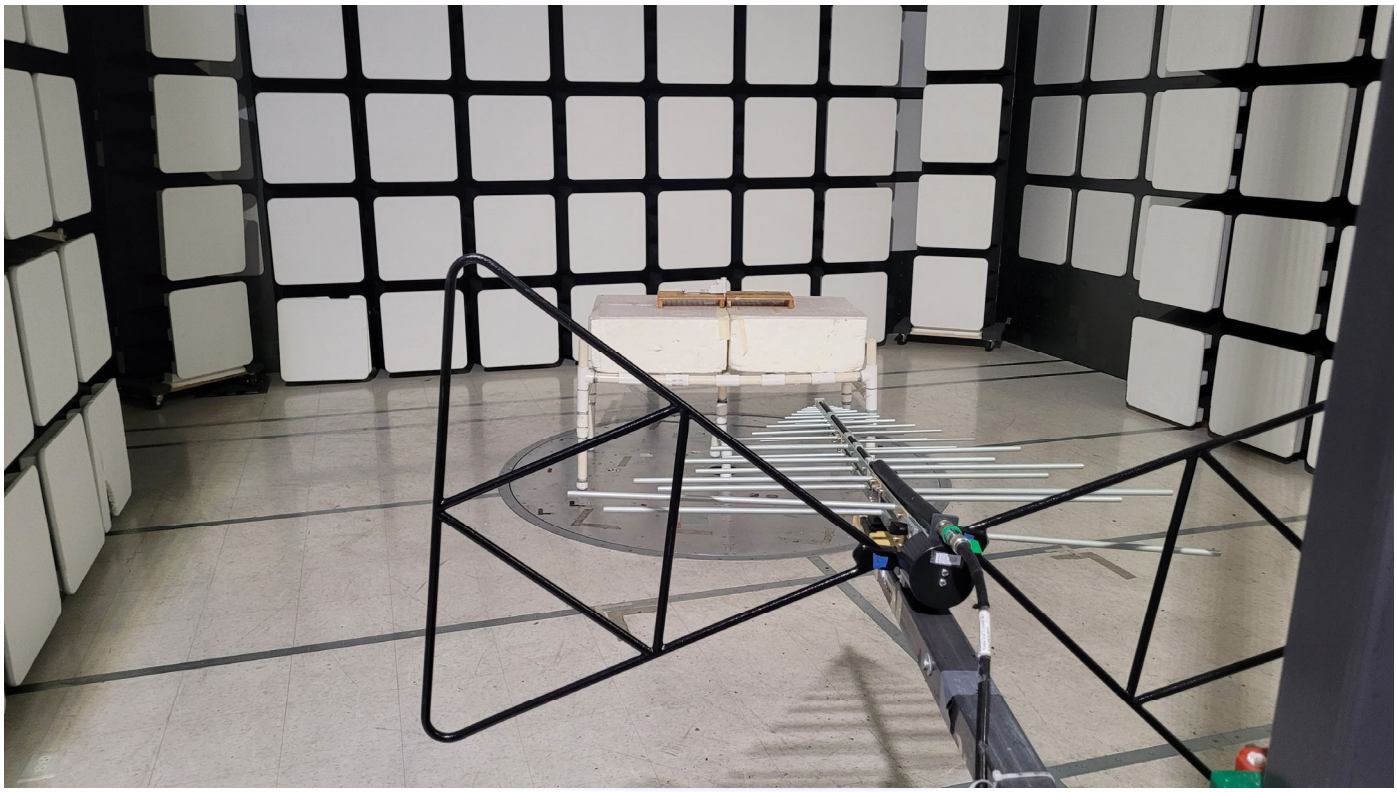
FREQUENCY (GHz)	FACTOR (dB)	FREQUENCY (GHz)	FACTOR (dB)
1.0	40.02	6.0	38.84
1.1	39.72	6.5	39.20
1.2	39.93	7.0	39.46
1.3	39.98	7.5	39.67
1.4	39.99	8.0	39.28
1.5	40.20	8.5	38.63
1.6	40.05	9.0	38.96
1.7	40.15	9.5	39.33
1.8	40.20	10.0	39.58
1.9	40.33	11.0	38.25
2.0	40.33	12.0	40.03
2.5	40.60	13.0	40.55
3.0	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

HUNTER INDUSTRIES INC.
WIRELESS RAIN-CLIK
MODEL: WR-CLIK
FCC SUBPART B AND C; RSS-210 AND RSS-GEN – RADIATED EMISSIONS – BELOW 1 GHz
U2 VERSION

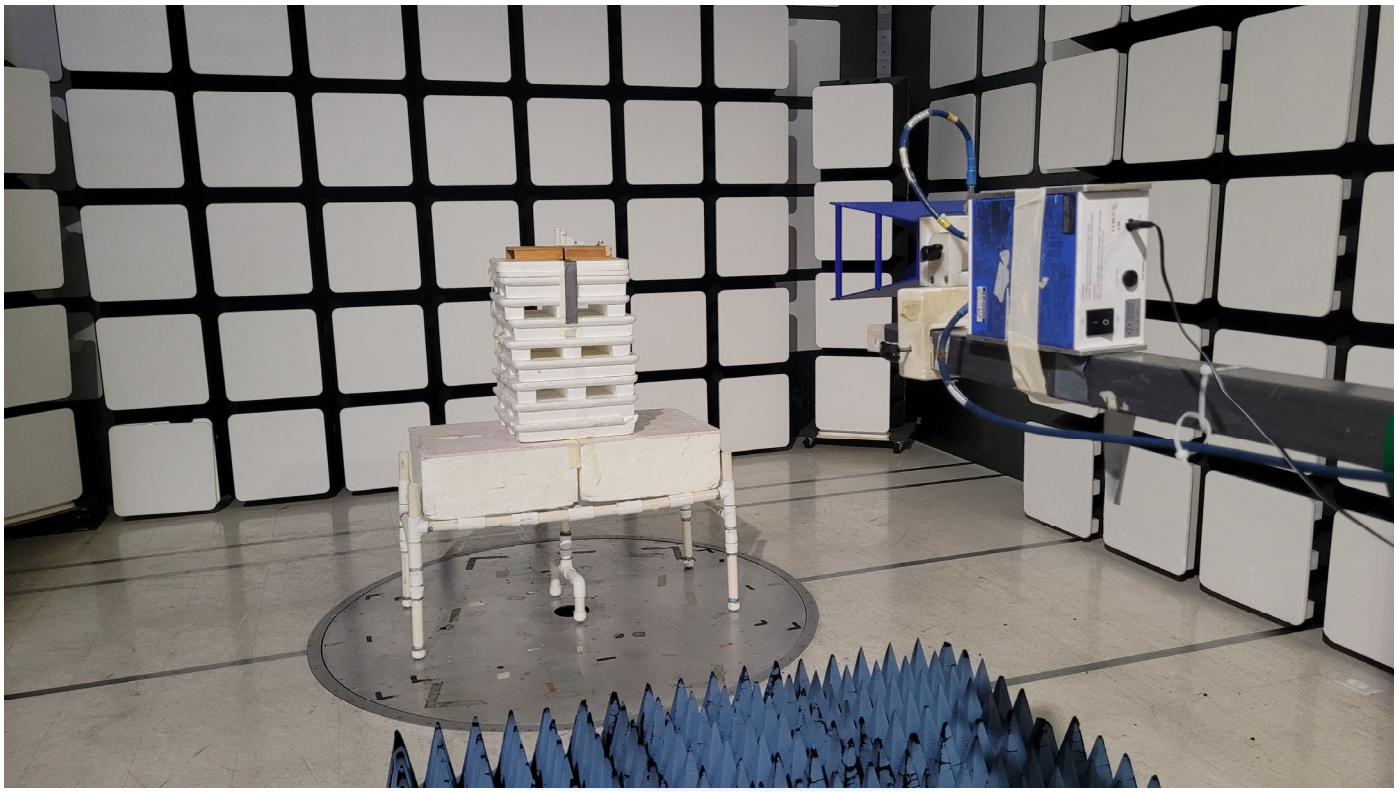
PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



REAR VIEW

HUNTER INDUSTRIES INC.
WIRELESS RAIN-CLIK
MODEL: WR-CLIK
FCC SUBPART B AND C; RSS-210 AND RSS-GEN – RADIATED EMISSIONS – BELOW 1 GHz
U2 VERSION

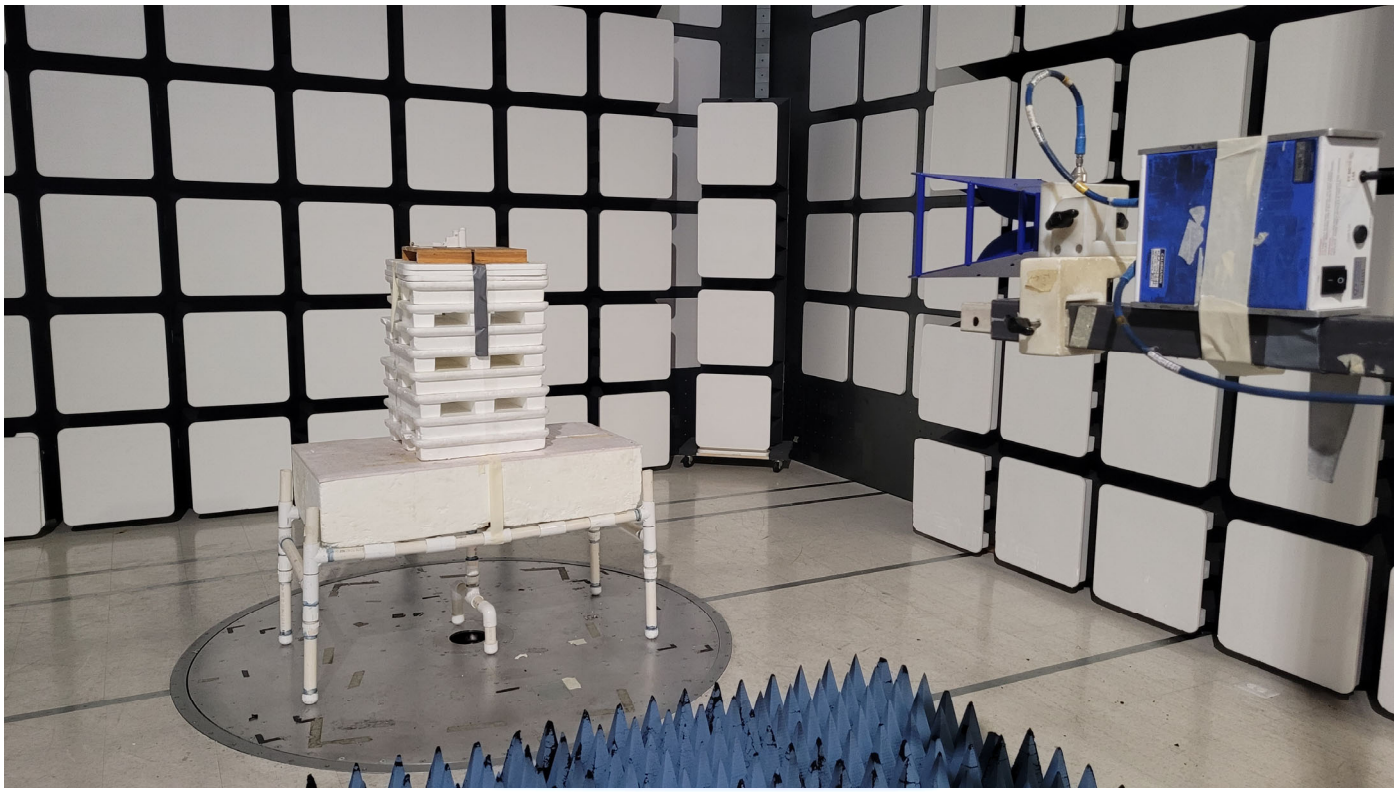
PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



FRONT VIEW

HUNTER INDUSTRIES INC.
WIRELESS RAIN-CLIK
MODEL: WR-CLIK
FCC SUBPART B AND C; RSS-210 AND RSS-GEN – RADIATED EMISSIONS – ABOVE 1 GHz
U2 VERSION

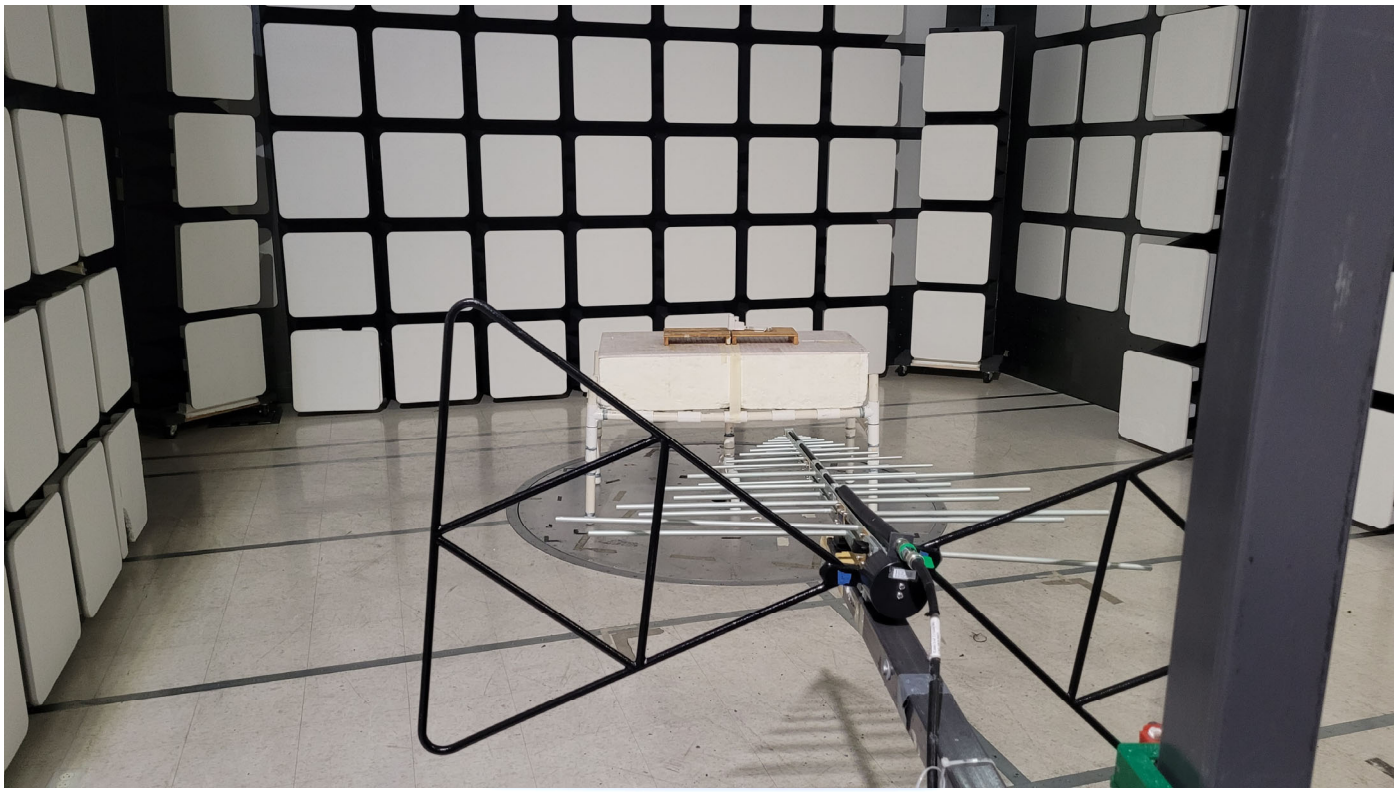
PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



REAR VIEW

HUNTER INDUSTRIES INC.
WIRELESS RAIN-CLIK
MODEL: WR-CLIK
FCC SUBPART B AND C; RSS-210 AND RSS-GEN – RADIATED EMISSIONS – ABOVE 1 GHz
U2 VERSION

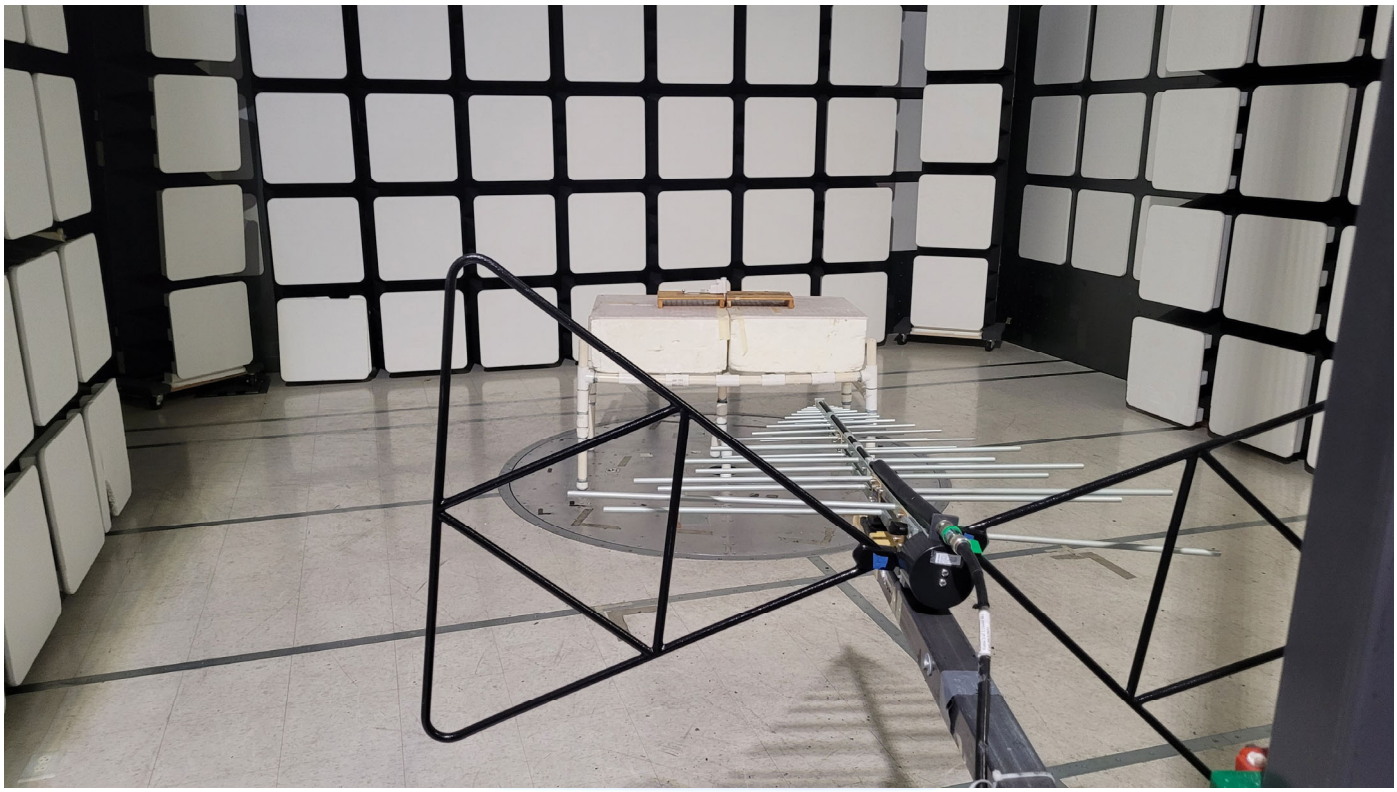
PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



FRONT VIEW

HUNTER INDUSTRIES INC.
WIRELESS RAIN-CLIK
MODEL: WR-CLIK
FCC SUBPART B AND C; RSS-210 AND RSS-GEN – RADIATED EMISSIONS – BELOW 1 GHz
U3 VERSION

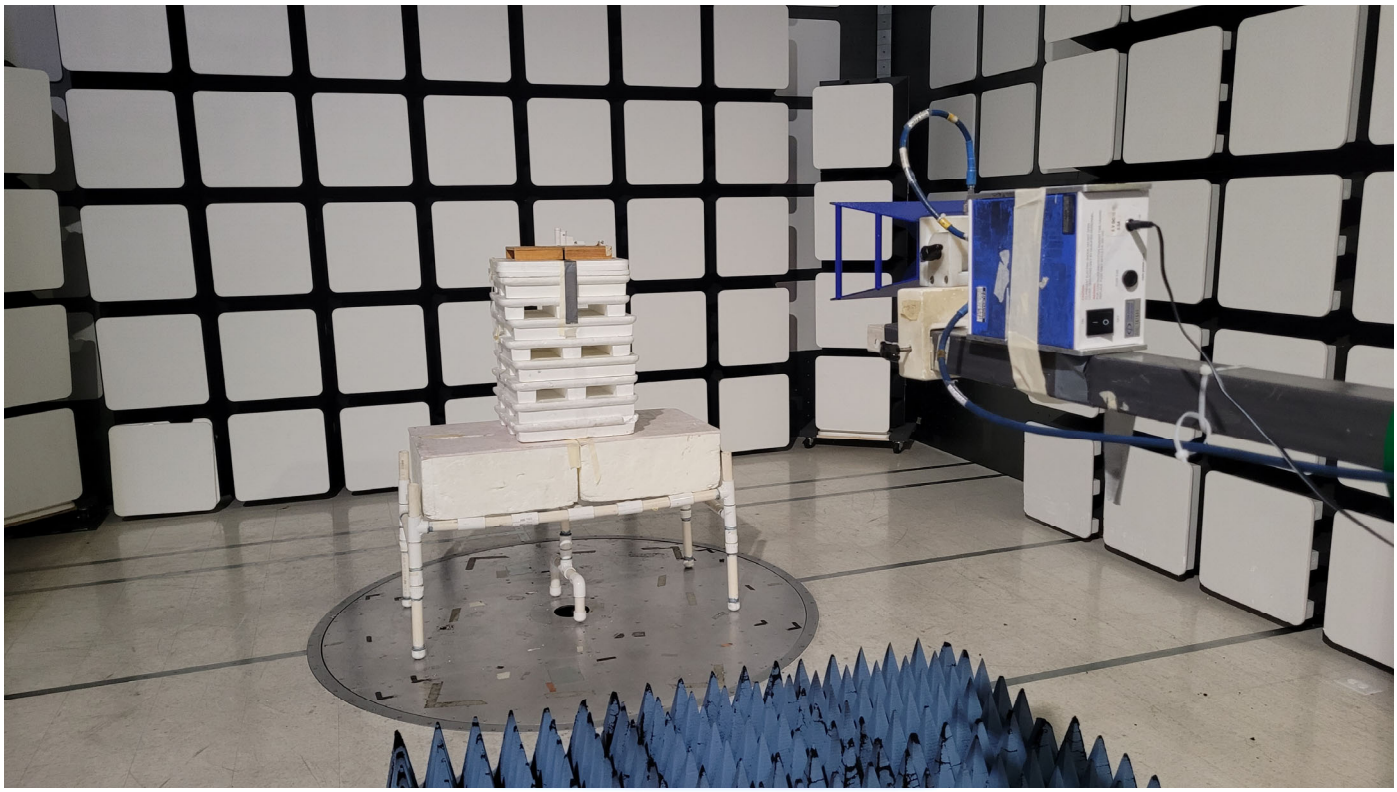
PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



REAR VIEW

HUNTER INDUSTRIES INC.
WIRELESS RAIN-CLIK
MODEL: WR-CLIK
FCC SUBPART B AND C; RSS-210 AND RSS-GEN – RADIATED EMISSIONS – BELOW 1 GHz
U3 VERSION

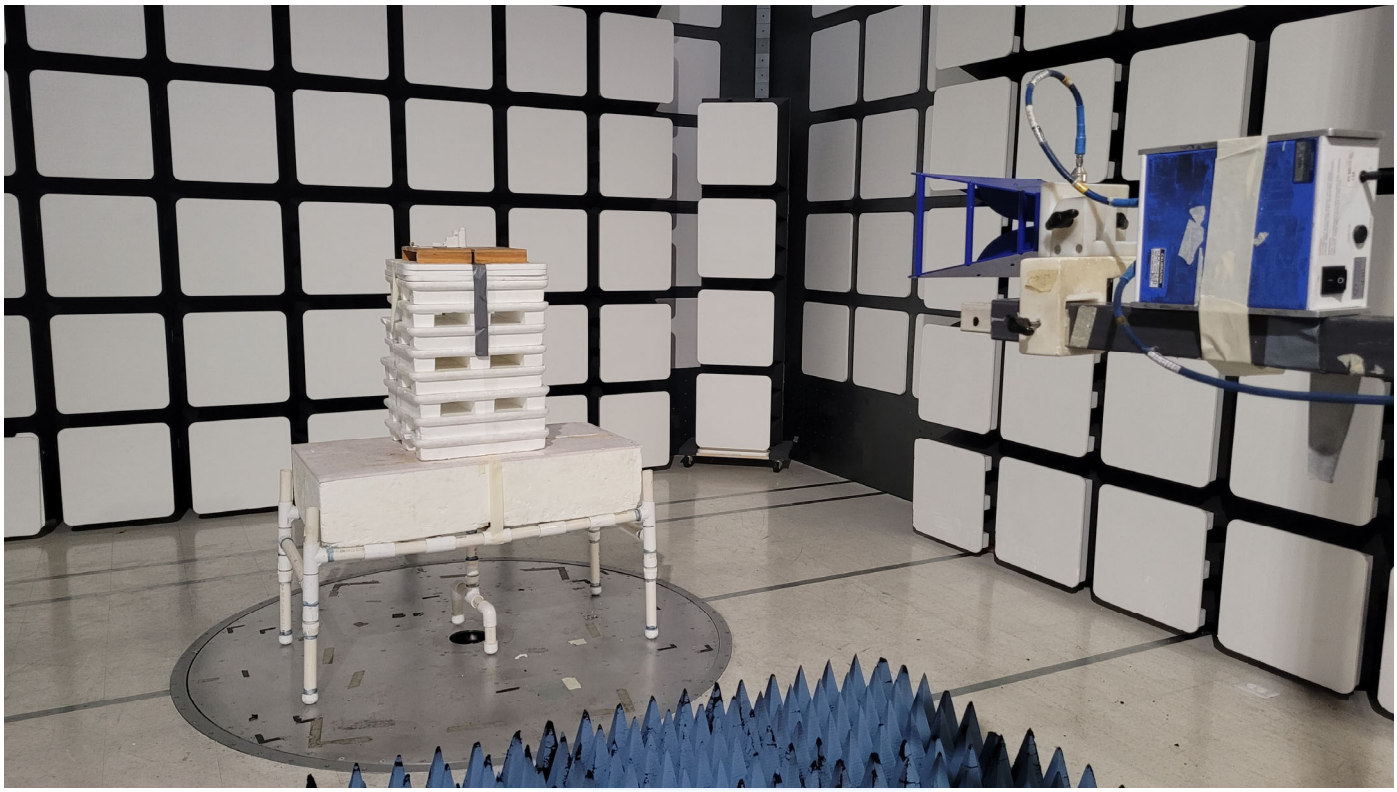
PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



FRONT VIEW

HUNTER INDUSTRIES INC.
WIRELESS RAIN-CLIK
MODEL: WR-CLIK
FCC SUBPART B AND C; RSS-210 AND RSS-GEN – RADIATED EMISSIONS – ABOVE 1 GHz
U3 VERSION

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



REAR VIEW

HUNTER INDUSTRIES INC.
WIRELESS RAIN-CLIK
MODEL: WR-CLIK
FCC SUBPART B AND C; RSS-210 AND RSS-GEN – RADIATED EMISSIONS – ABOVE 1 GHz
U3 VERSION

PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

APPENDIX E

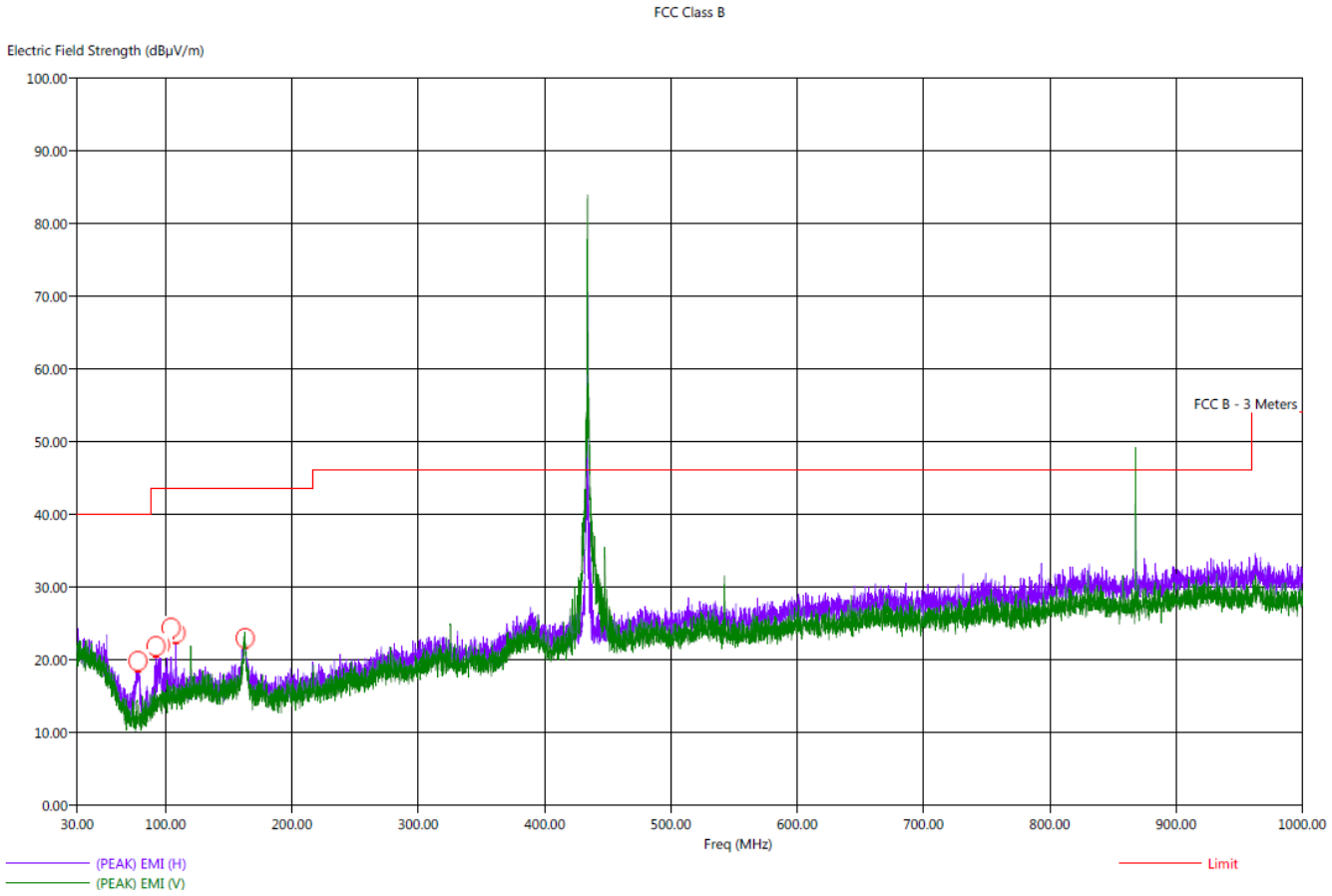
DATA SHEETS

RADIATED EMISSIONS

DATA SHEETS

Title: Pre-Scan - FCC Class B
File: 1 - Pre-Scan - FCC Class B - 30 MHz to 1000 MHz - U3 - 03-10-2023.set
Operator: Kyle Fujimoto
EUT Type: Wireless RAIN-CLIK
EUT Condition: The EUT is constantly transmitting - U3 Version
Company: Hunter Industries, Inc.
Model: WR-CLIK
S/N: N/A
Note: The frequencies at 433.92 MHz and 867.84 MHz are subject to the limits of FCC 15.231 instead

3/10/2023 8:49:12 AM
Sequence: Preliminary Scan



Title: Final Scan - FCC Class B
File: 1 - Final Scan - FCC Class B - 30 MHz to 1000 MHz - U3 - 03-10-2023.set
Operator: Kyle Fujimoto
EUT Type: Wireless RAIN-CLIK
EUT Condition: The EUT is contantly transmitting - U3 Version
Company: Hunter Industries, Inc.
Model: WR-CLIK
S/N: N/A

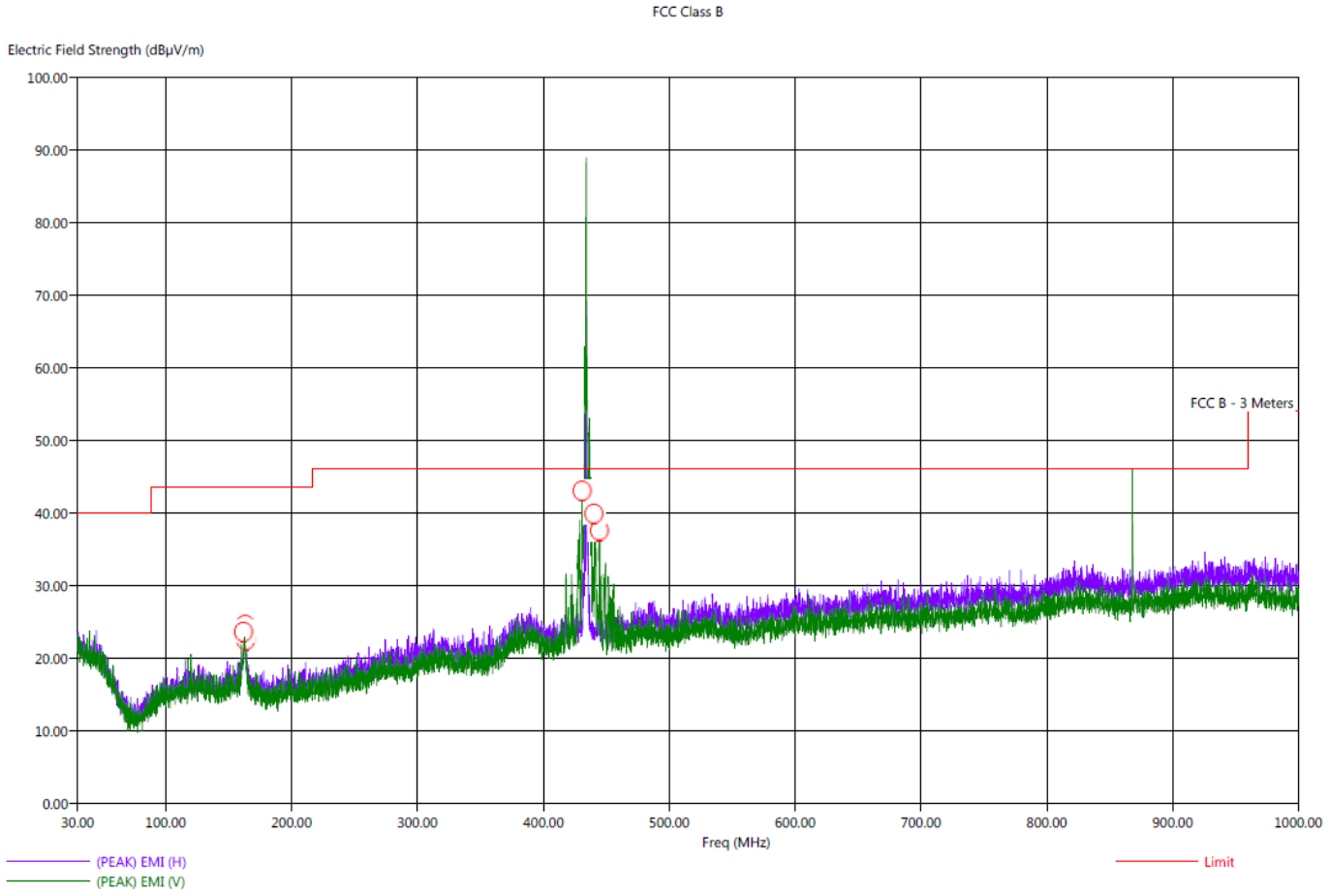
3/10/2023 1:15:42 PM
Sequence: Final Measurements

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)
78.10	H	15.27	9.84	-24.73	-30.16	40.00	12.32	0.65	215.50	398.61
92.30	H	17.95	12.00	-25.55	-31.50	43.50	14.53	0.67	175.00	302.79
95.90	H	18.06	12.43	-25.44	-31.07	43.50	14.99	0.68	210.75	206.85
104.30	H	18.39	13.07	-25.11	-30.43	43.50	15.60	0.71	255.25	288.10
108.10	H	18.66	13.16	-24.84	-30.34	43.50	15.70	0.73	263.25	159.02
162.90	H	25.73	20.18	-17.77	-23.32	43.50	22.53	0.94	177.75	254.85

Title: Pre-Scan - FCC Class B
File: 1 - Pre-Scan - FCC Class B - 30 MHz to 1000 MHz - U2 - 03-10-2023.set
Operator: Kyle Fujimoto
EUT Type: Wireless RAIN-CLIK
EUT Condition: The EUT is constantly transmitting - U2 Version
Company: Hunter Industries, Inc.
Model: WR-CLIK
S/N: N/A
Note: The frequencies at 433.92 MHz and 867.84 MHz are subject to the limits of FCC 15.231 instead

3/10/2023 12:31:03 PM
Sequence: Preliminary Scan



Title: Final Scan - FCC Class B
File: 1 - Final Scan - FCC Class B - 30 MHz to 1000 MHz - U2 - 03-10-2023.set
Operator: Kyle Fujimoto
EUT Type: Wireless RAIN-CLIK
EUT Condition: The EUT is contantly transmitting - U2 Version
Company: Hunter Industries, Inc.
Model: WR-CLIK
S/N: N/A

3/10/2023 12:53:03 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)
161.80	H	24.96	19.79	-18.54	-23.71	43.50	22.11	0.93	73.00	111.38
163.10	H	24.98	19.69	-18.52	-23.81	43.50	21.91	0.94	345.00	334.79
163.50	H	25.27	18.84	-18.23	-24.66	43.50	21.14	0.94	85.00	255.26
430.80	V	44.10	35.11	-1.90	-10.89	46.00	22.60	1.60	357.00	240.46
440.20	V	48.60	38.27	2.60	-7.73	46.00	22.40	1.61	216.75	111.26
444.60	V	40.22	32.44	-5.78	-13.56	46.00	22.40	1.62	229.50	159.20

FUNDAMENTAL AND HARMONICS

DATA SHEETS

FCC 15.231 and RSS-210

Hunter Industries, Inc.
Wireless RAIN-CLIK
Model: WR-CLIK

Date: 03/10/2023
Lab: D
Tested By: Kyle Fujimoto

Fundamental and Harmonics - U2
Duty Cycle = 10.45%

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (cm)	Table Angle (deg)	Comments
433.92	94.36	V	100.82	-6.46	Peak	7.00	117.05	
433.92	74.75	V	80.82	-6.07	Avg	7.00	117.05	
867.84	51.53	V	80.82	-29.29	Peak	172.75	111.92	
867.84	31.92	V	60.82	-28.90	Avg	172.75	111.92	
1301.76	52.47	V	73.97	-21.50	Peak	294.50	128.40	
1301.76	32.86	V	53.97	-21.11	Avg	294.50	128.40	
1735.68	54.22	V	80.82	-26.60	Peak	155.00	148.88	
1735.68	34.61	V	60.82	-26.21	Avg	155.00	148.88	
2169.60	45.36	V	80.82	-35.47	Peak	174.75	212.94	
2169.60	25.75	V	60.82	-35.08	Avg	174.50	212.94	
2603.52	49.14	V	80.82	-31.68	Peak	129.25	202.49	
2603.52	29.53	V	60.82	-31.29	Avg	129.25	202.49	
3037.44	57.58	V	80.82	-23.24	Peak	243.00	188.10	
3037.44	37.97	V	60.82	-22.85	Avg	243.00	188.10	
3471.36	61.26	V	80.82	-19.56	Peak	91.50	221.47	
3471.36	41.65	V	60.82	-19.17	Avg	91.50	221.47	
3905.28	54.20	V	73.97	-19.77	Peak	232.50	210.73	
3905.28	34.59	V	53.97	-19.38	Avg	232.50	210.73	
4339.20	48.26	V	73.97	-25.71	Peak	10.00	215.25	
4339.20	28.65	V	53.97	-25.32	Avg	10.00	215.25	

FCC 15.231 and RSS-210

Hunter Industries, Inc.
Wireless RAIN-CLIK
Model: WR-CLIK

Date: 03/13/2023
Lab: D
Tested By: Kyle Fujimoto

Fundamental and Harmonics - U2
Duty Cycle = 10.45%

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (cm)	Table Angle (deg)	Comments
433.92	74.30	H	100.82	-26.52	Peak	243.00	112.16	
433.92	54.69	H	80.82	-26.13	Avg	243.00	112.16	
867.84	45.91	H	80.82	-34.91	Peak	9.00	114.97	
867.84	26.30	H	60.82	-34.52	Avg	9.00	114.97	
1301.76	46.02	H	73.97	-27.95	Peak	218.75	132.58	
1301.76	26.41	H	53.97	-27.56	Avg	218.75	132.58	
1735.68	50.21	H	80.82	-30.61	Peak	188.25	167.98	
1735.68	30.60	H	60.82	-30.22	Avg	188.25	167.98	
2169.60	46.71	H	80.82	-34.11	Peak	48.75	128.88	
2169.60	27.10	H	60.82	-33.72	Avg	48.75	128.88	
2603.52	44.11	H	80.82	-36.71	Peak	168.25	142.25	
2603.52	24.50	H	60.82	-36.32	Avg	168.25	142.25	
3037.44	51.14	H	80.82	-29.68	Peak	273.00	148.88	
3037.44	31.53	H	60.82	-29.29	Avg	273.00	148.88	
3471.36	49.01	H	80.82	-31.81	Peak	350.00	148.88	
3471.36	29.40	H	60.82	-31.42	Avg	350.00	148.88	
3905.28	44.57	H	73.97	-29.40	Peak	156.75	127.62	
3905.28	24.96	H	53.97	-29.01	Avg	156.75	127.62	
4339.20	41.79	H	73.97	-32.18	Peak	120.50	119.80	
4339.20	22.18	H	53.97	-31.79	Avg	120.50	119.80	

FCC Class B and RSS-GEN

Hunter Industries, Inc.
Wireless RAIN-CLIK
Model: WR-CLIK

Date: 03/13/2023
Lab: D
Tested By: Kyle Fujimoto

Digital Portion and Non-Harmonic Emissions – U2

Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
								No Emissions Detected
								from the Digital Portion
								from 9 kHz to 30 MHz
								No Emissions Detected
								from the non-harmonic
								emissions of the Transmitter
								from 9 kHz to 30 MHz
								No Emissions Detected
								from the Digital Portion
								from 1 GHz to 4.4 GHz
								No Emissions Detected
								from the non-harmonic
								emissions of the Transmitter
								from 1 GHz to 4.4 GHz

FCC 15.231 and RSS-210

Hunter Industries, Inc.
Wireless RAIN-CLIK
Model: WR-CLIK

Date: 03/10/2023
Lab: D
Tested By: Kyle Fujimoto

Fundamental and Harmonics - U3
Duty Cycle = 11.07 %

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (cm)	Table Angle (deg)	Comments
433.92	76.36	H	100.82	-24.46	Peak	246.50	100.01	
433.92	57.25	H	80.82	-23.57	Avg	246.50	100.01	
867.84	50.66	H	80.82	-30.16	Peak	53.25	101.25	
867.84	31.55	H	60.82	-29.27	Avg	53.25	101.25	
1301.76	41.99	H	73.97	-31.98	Peak	203.50	134.55	
1301.76	22.88	H	53.97	-31.09	Avg	203.50	134.55	
1735.68	46.28	H	80.82	-34.54	Peak	197.75	134.55	
1735.68	27.17	H	60.82	-33.65	Avg	197.75	134.55	
2169.60	41.60	H	80.82	-39.22	Peak	1.00	100.25	
2169.60	22.49	H	60.82	-38.33	Avg	1.00	100.25	
2603.52	41.80	H	80.82	-39.02	Peak	171.75	138.18	
2603.52	22.69	H	60.82	-38.13	Avg	171.75	138.18	
3037.44	47.13	H	80.82	-33.69	Peak	282.00	147.80	
3037.44	28.02	H	60.82	-32.80	Avg	282.00	147.80	
3471.36	44.12	H	80.82	-36.70	Peak	154.50	169.41	
3471.36	25.01	H	60.82	-35.81	Avg	154.50	169.41	
3905.28	41.46	H	73.97	-32.51	Peak	64.25	139.62	
3905.28	22.35	H	53.97	-31.62	Avg	64.25	139.62	
4339.20	38.89	H	73.97	-35.08	Peak	251.25	145.25	
4339.20	19.78	H	53.97	-34.19	Avg	251.25	145.25	

FCC 15.231 and RSS-210

Hunter Industries, Inc.
Wireless RAIN-CLIK
Model: WR-CLIK

Date: 03/10/2023
Lab: D
Tested By: Kyle Fujimoto

Fundamental and Harmonics - U3
Duty Cycle = 11.07 %

Freq. (MHz)	Level (dBuV/m)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (cm)	Table Angle (deg)	Comments
433.92	94.43	V	100.82	-6.39	Peak	30.25	143.14	
433.92	75.32	V	80.82	-5.50	Avg	30.25	143.14	
867.84	52.30	V	80.82	-28.52	Peak	37.00	174.55	
867.84	33.19	V	60.82	-27.63	Avg	37.00	174.55	
1301.76	50.62	V	73.97	-23.35	Peak	22.50	119.44	
1301.76	31.51	V	53.97	-22.46	Avg	22.50	119.44	
1735.68	54.63	V	80.82	-26.19	Peak	177.25	146.55	
1735.68	35.52	V	60.82	-25.30	Avg	177.25	146.55	
2169.60	44.36	V	80.82	-36.46	Peak	350.00	159.38	
2169.60	25.25	V	60.82	-35.57	Avg	350.00	159.38	
2603.52	46.79	V	80.82	-34.03	Peak	350.00	165.59	
2603.52	27.68	V	60.82	-33.14	Avg	350.00	165.59	
3037.44	53.53	V	80.82	-27.29	Peak	185.25	185.05	
3037.44	34.42	V	60.82	-26.40	Avg	185.25	185.05	
3471.36	57.20	V	80.82	-23.62	Peak	11.75	177.29	
3471.36	38.09	V	60.82	-22.73	Avg	11.75	177.29	
3905.28	49.52	V	73.97	-24.45	Peak	84.00	219.50	
3905.28	30.41	V	53.97	-23.56	Avg	84.00	219.50	
4339.20	44.82	V	73.97	-29.15	Peak	10.00	215.50	
4339.20	25.71	V	53.97	-28.26	Avg	10.00	215.50	

COMPATIBLE ELECTRONICS

FCC Class B and RSS-GEN

Hunter Industries, Inc.
Wireless RAIN-CLIK
Model: WR-CLIK

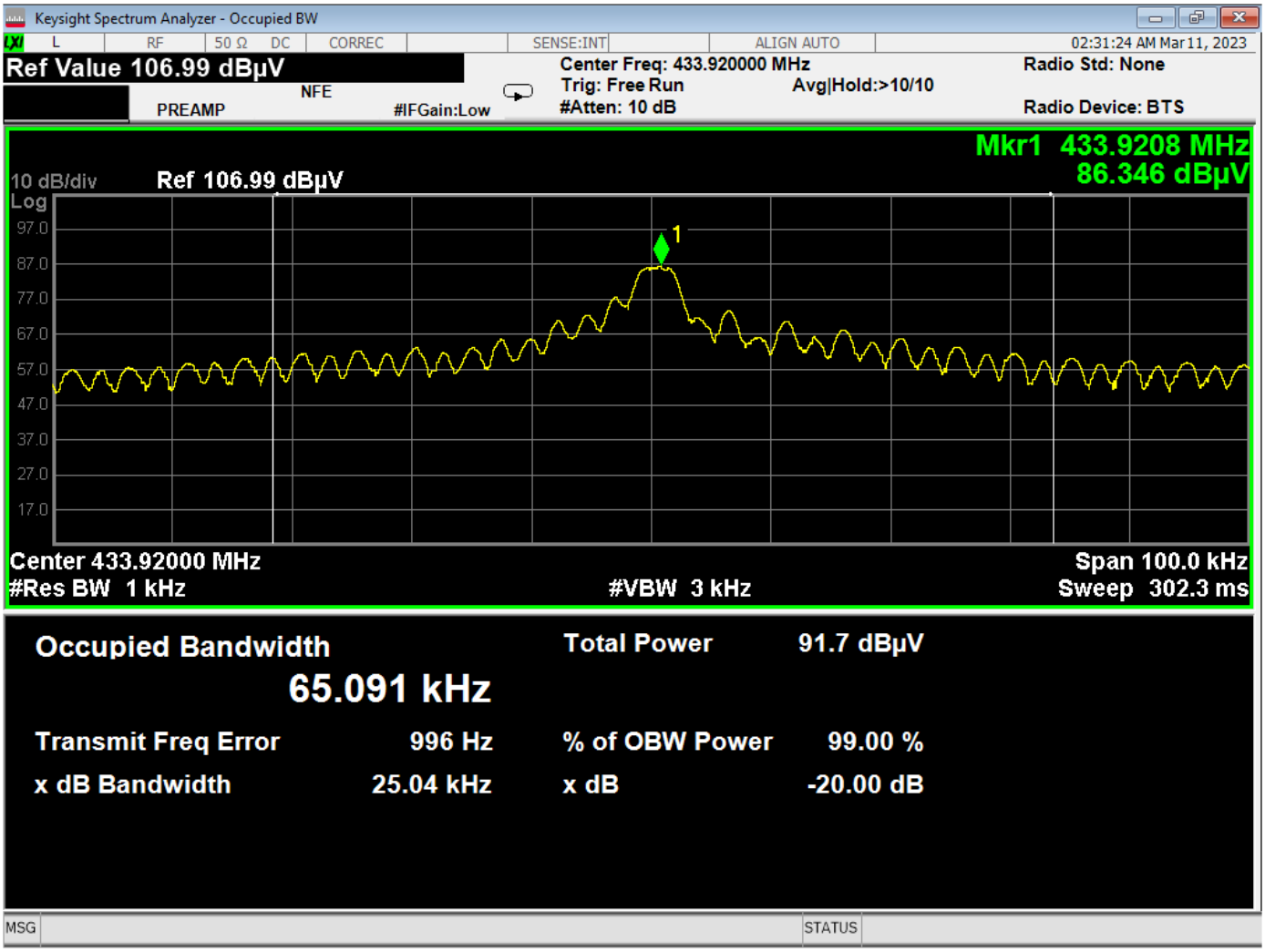
Date: 03/13/2023
Lab: D
Tested By: Kyle Fujimoto

Digital Portion and Non-Harmonic Emissions - U3

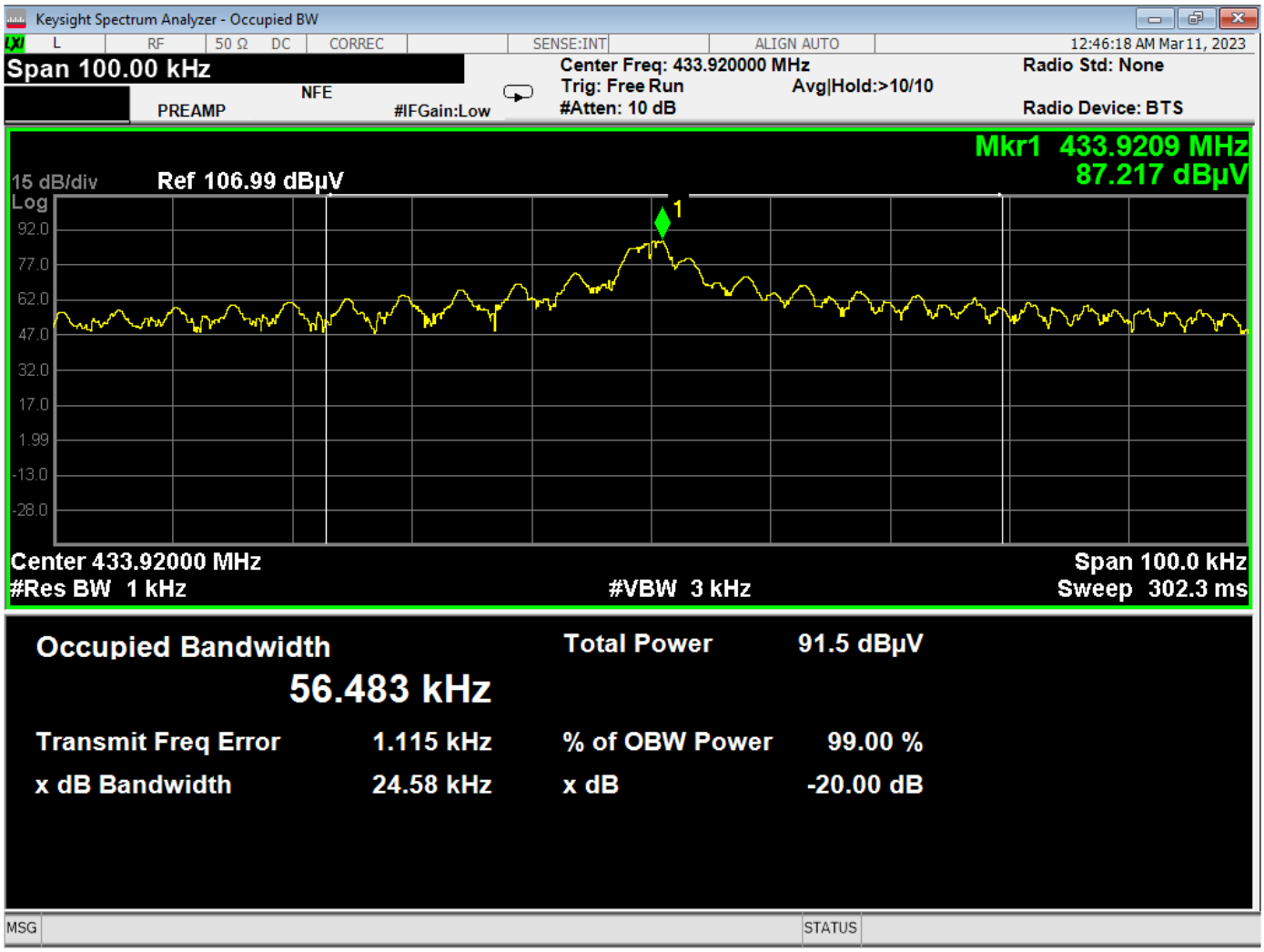
Freq. (MHz)	Level (dBuV)	Pol (v/h)	Limit	Margin	Peak / QP / Avg	Ant. Height (m)	Table Angle (deg)	Comments
								No Emissions Detected
								from the Digital Portion
								from 9 kHz to 30 MHz
								No Emissions Detected
								from the non-harmonic
								emissions of the Transmitter
								from 9 kHz to 30 MHz
								No Emissions Detected
								from the Digital Portion
								from 1 GHz to 4.4 GHz
								No Emissions Detected
								from the non-harmonic
								emissions of the Transmitter
								from 1 GHz to 4.4 GHz

99 % BANDWIDTH

DATA SHEET



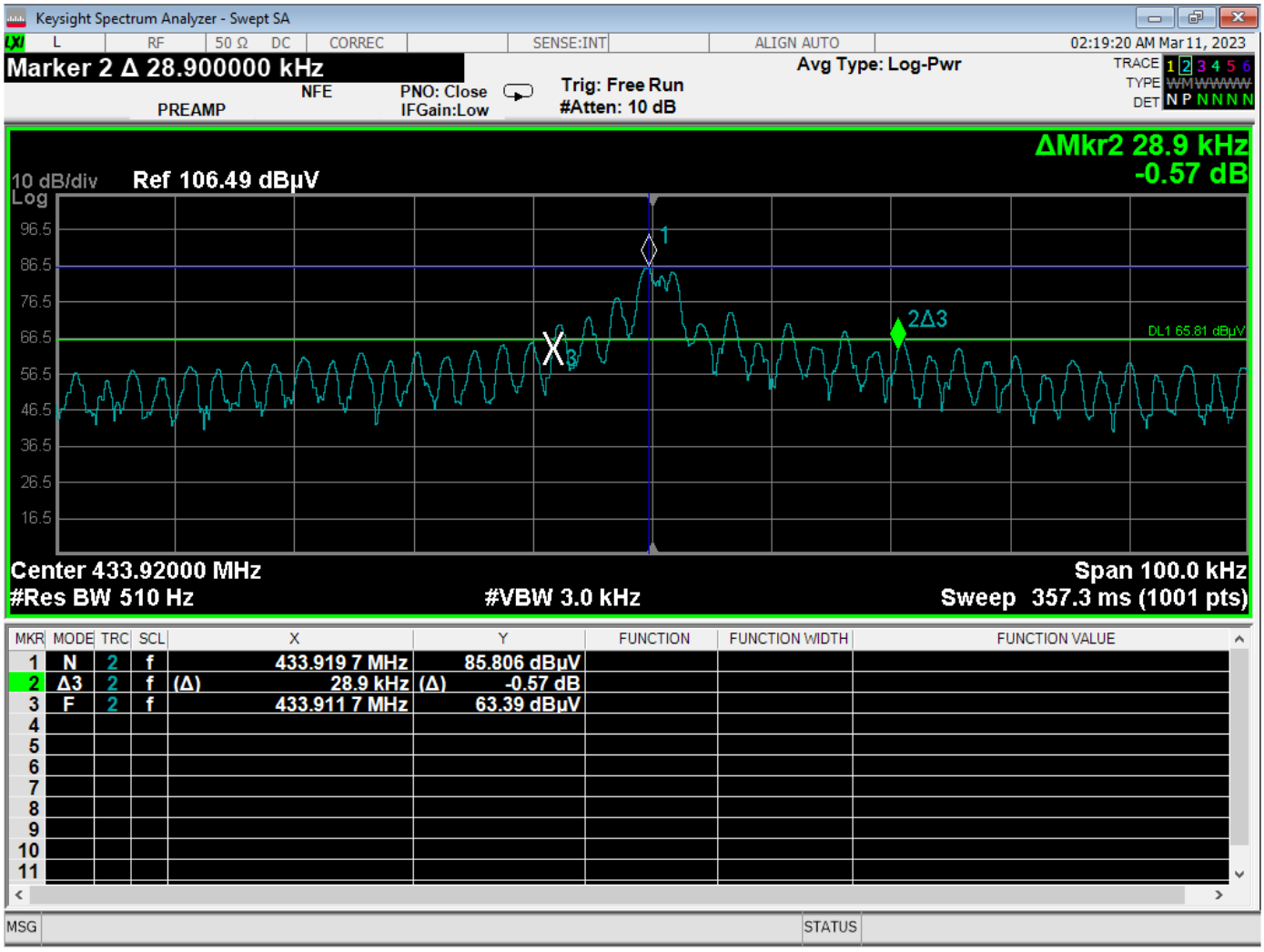
99 Percent Bandwidth Plot – U2 Version



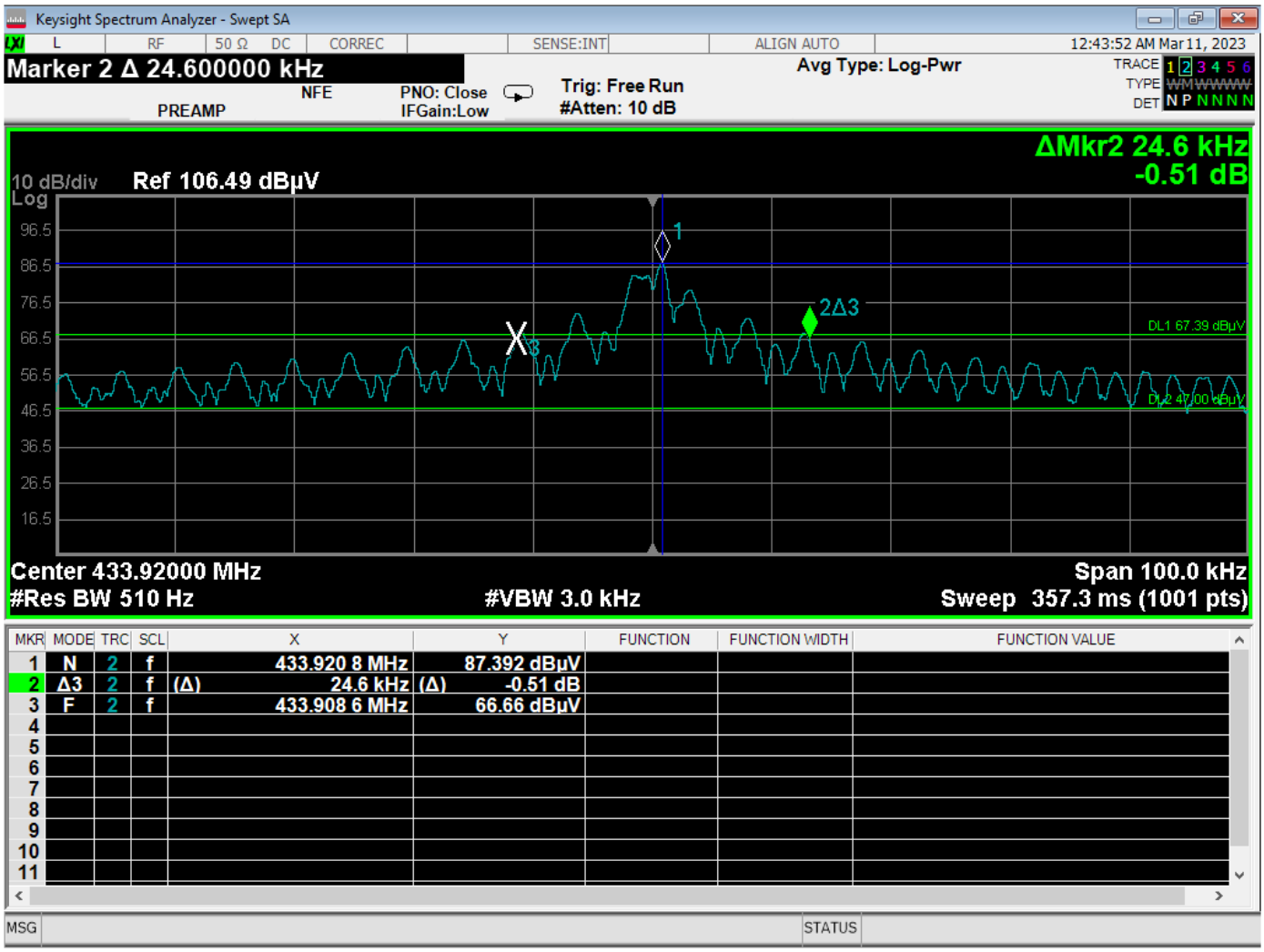
99 Percent Bandwidth Plot – U3 Version

-20 dB BANDWIDTH PLOT

DATA SHEET



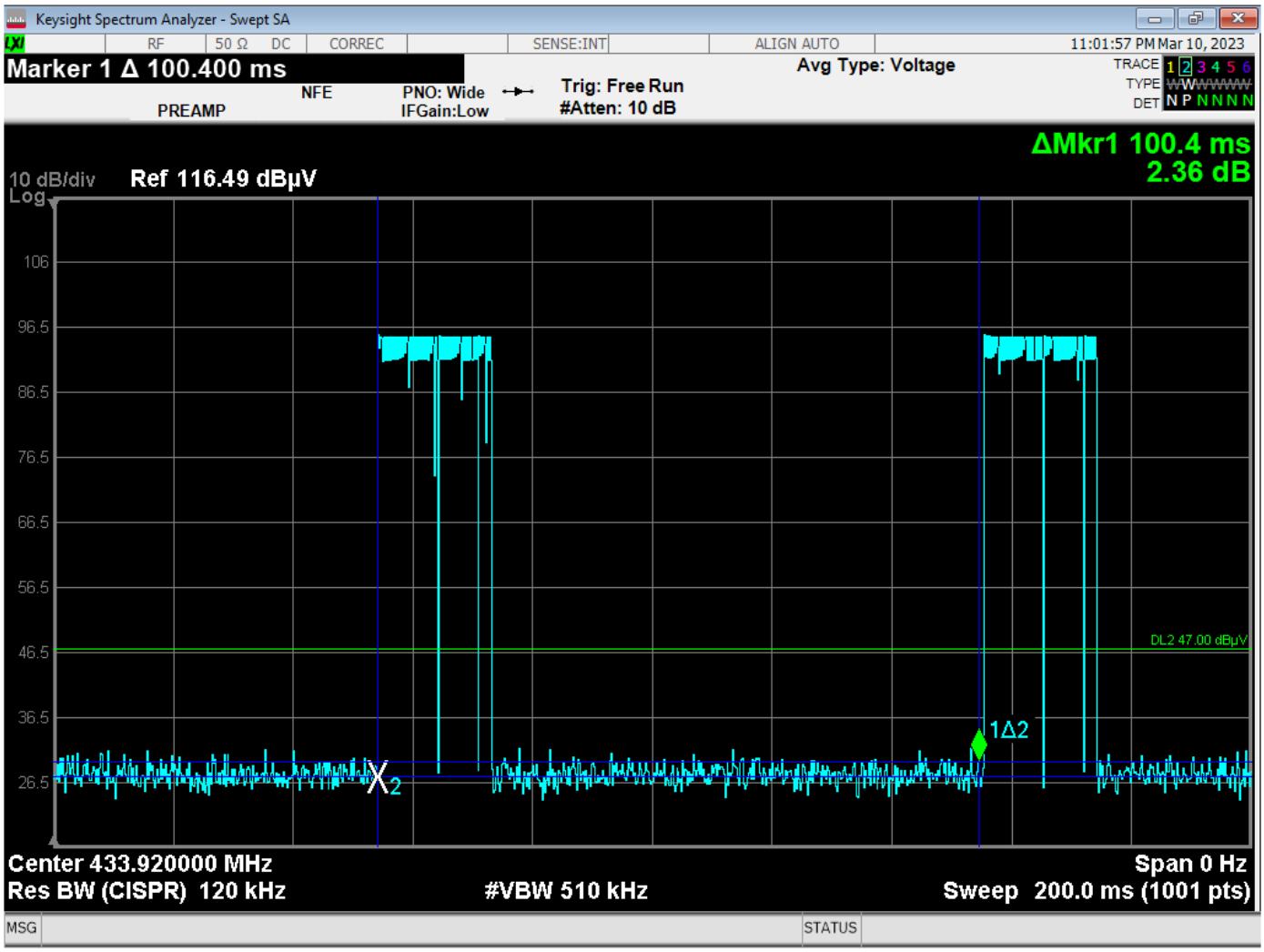
-20 dB Bandwidth Plot – U2 Version



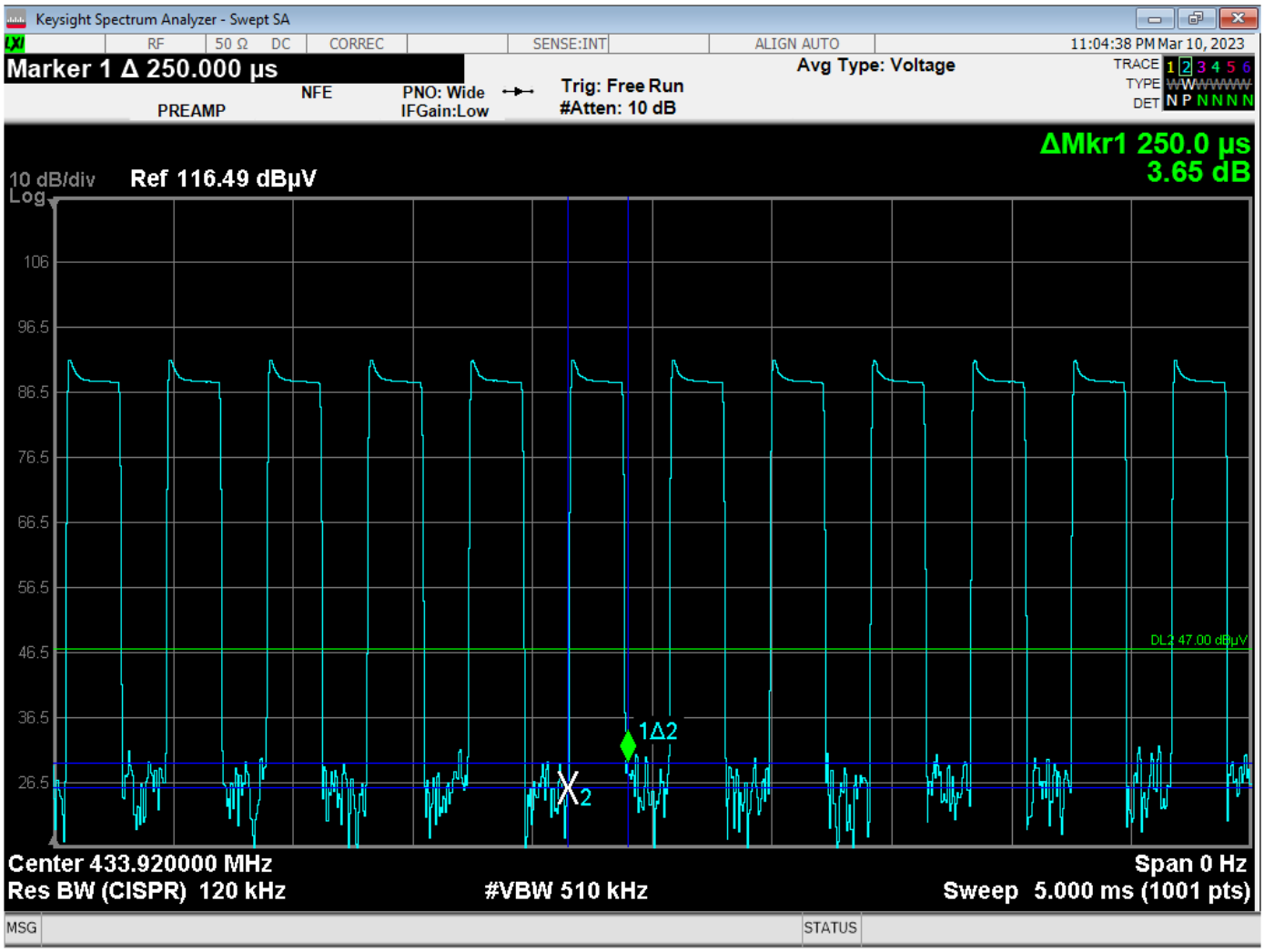
-20 dB Bandwidth Plot – U3 Version

DUTY CYCLE

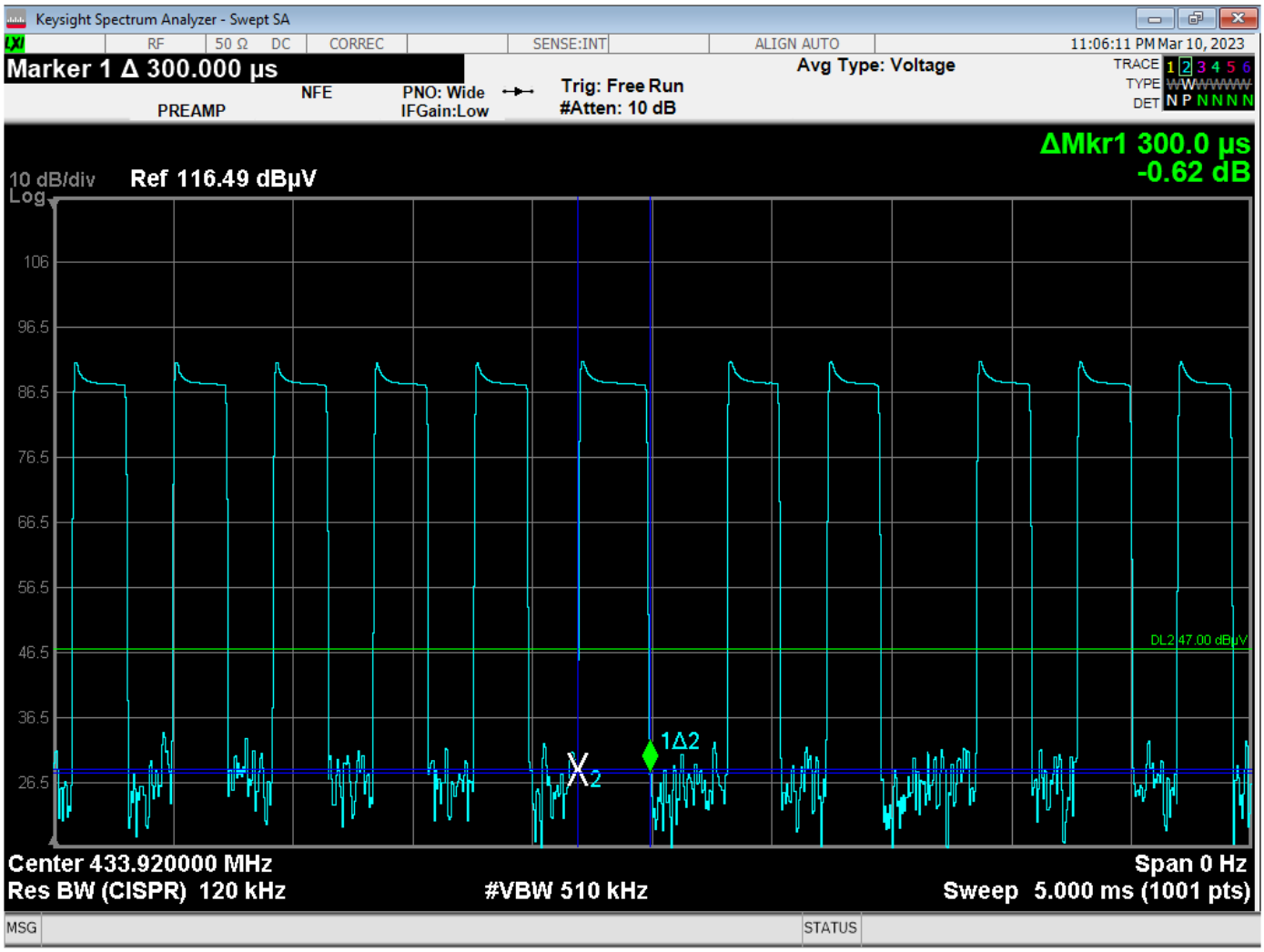
DATA SHEETS



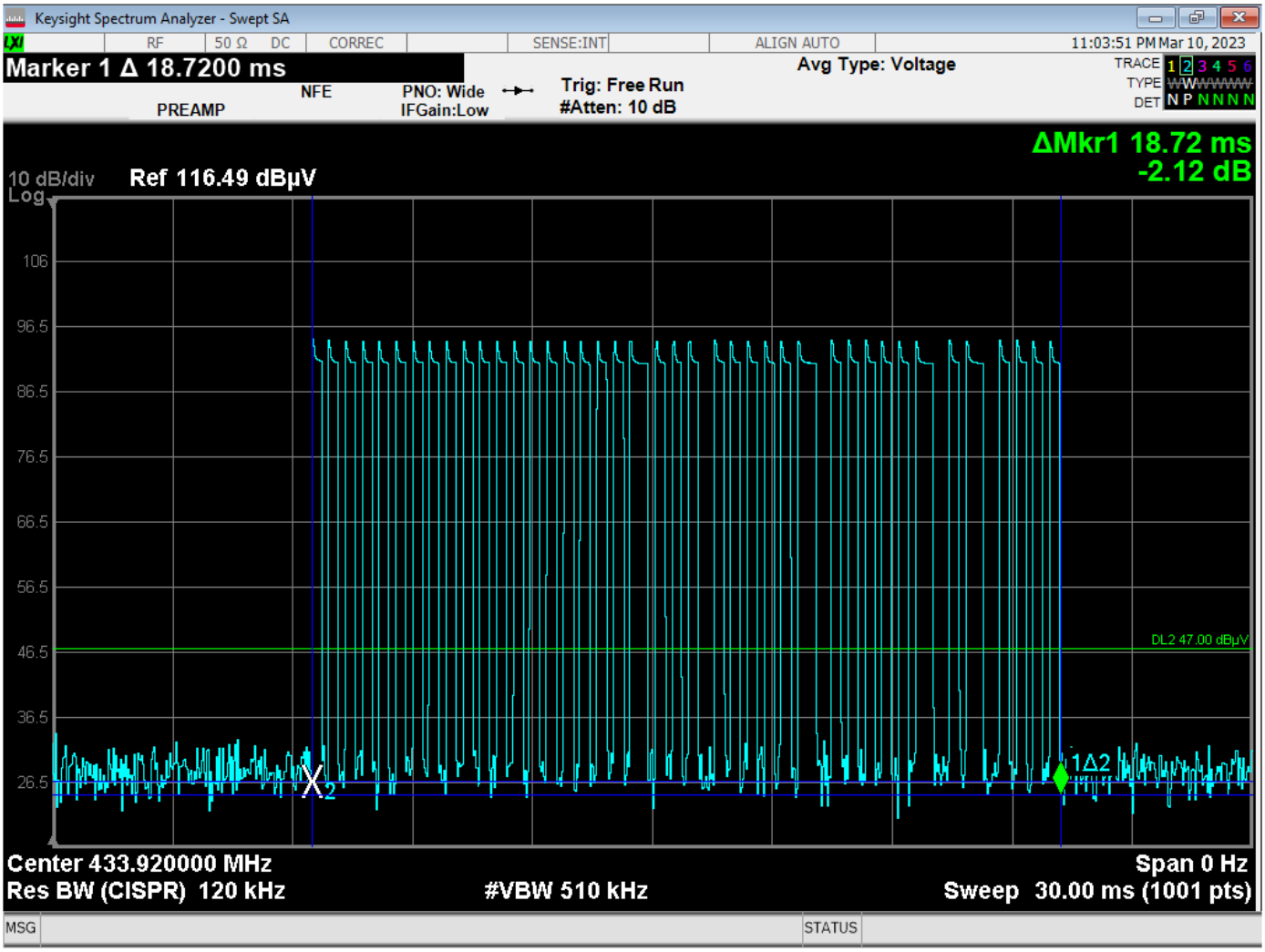
The pulse train only appears once every 100 ms – U2 Version



Time of Small Pulse = 250 us – U2 Version



Time of Large Pulse = 300 us – U2 Version



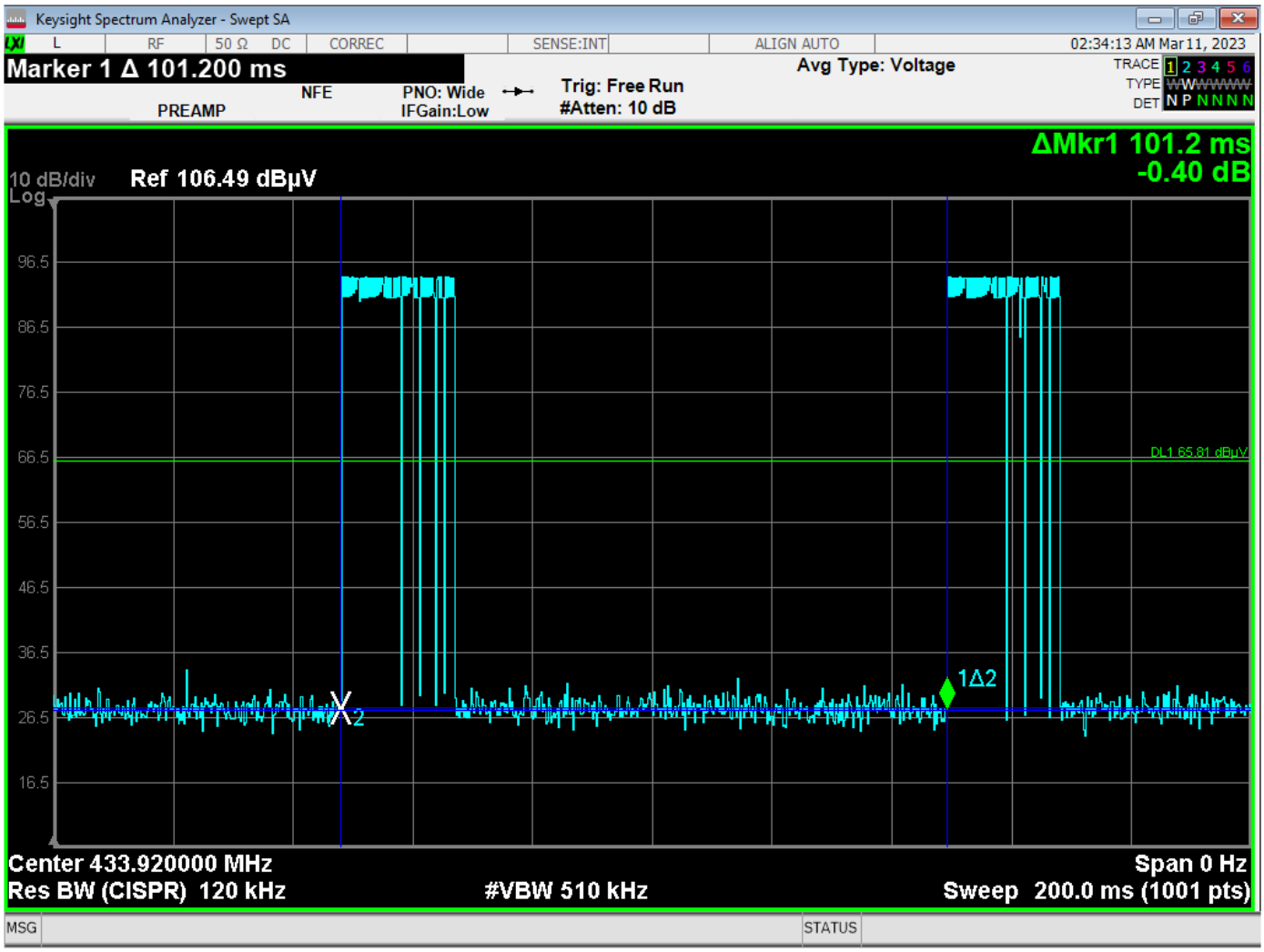
Number of Small Pulses = 37 = (37*250 us) = 9250 us
Number of Large Pulses = 4 = (4*300 us) = 1200 us

Total On Time = 10450 us = 10.450 ms

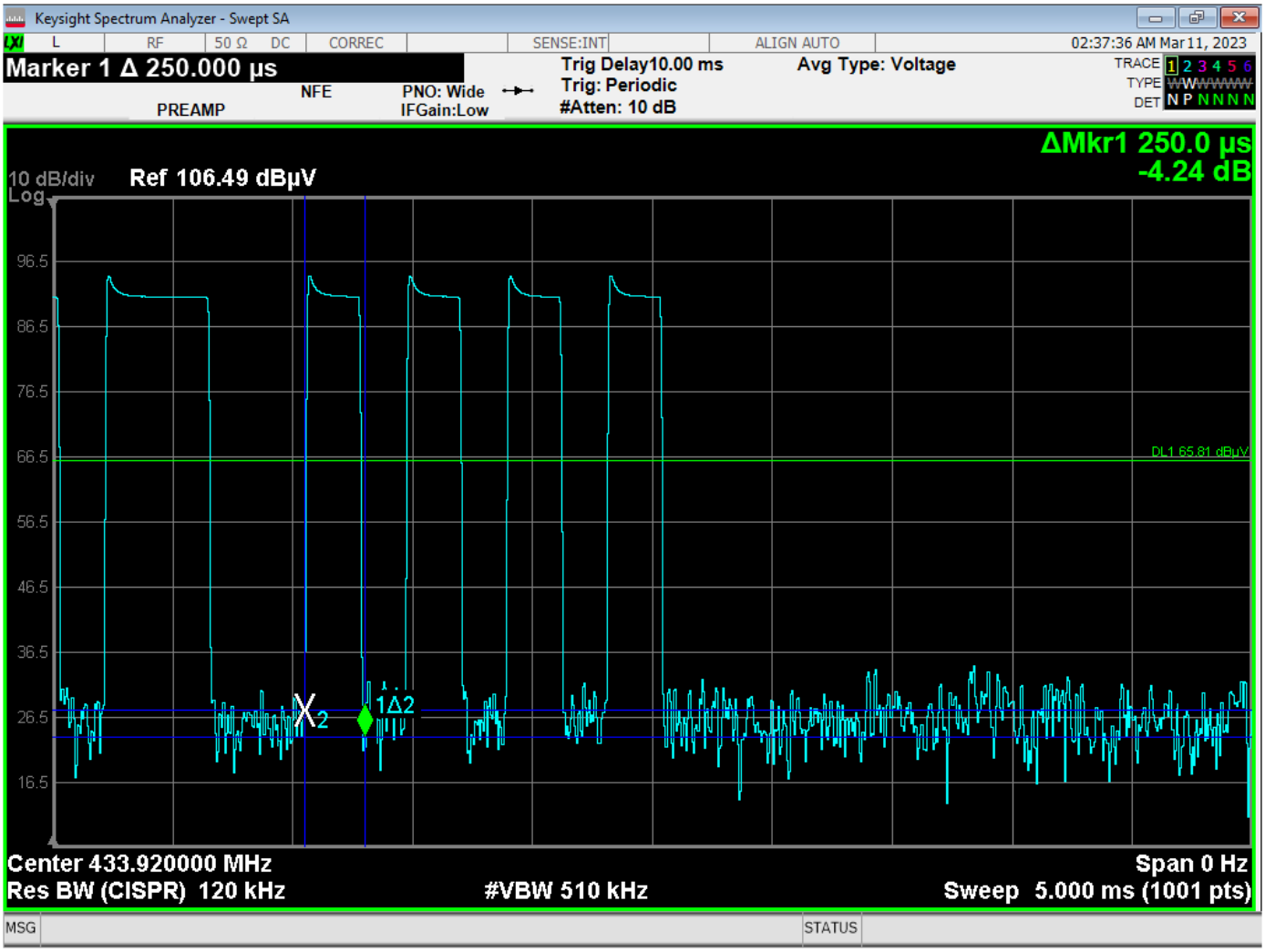
Duty Cycle = 10.450 ms / 100 ms = 10.45%

The peak to average ratio is -19.61 dB

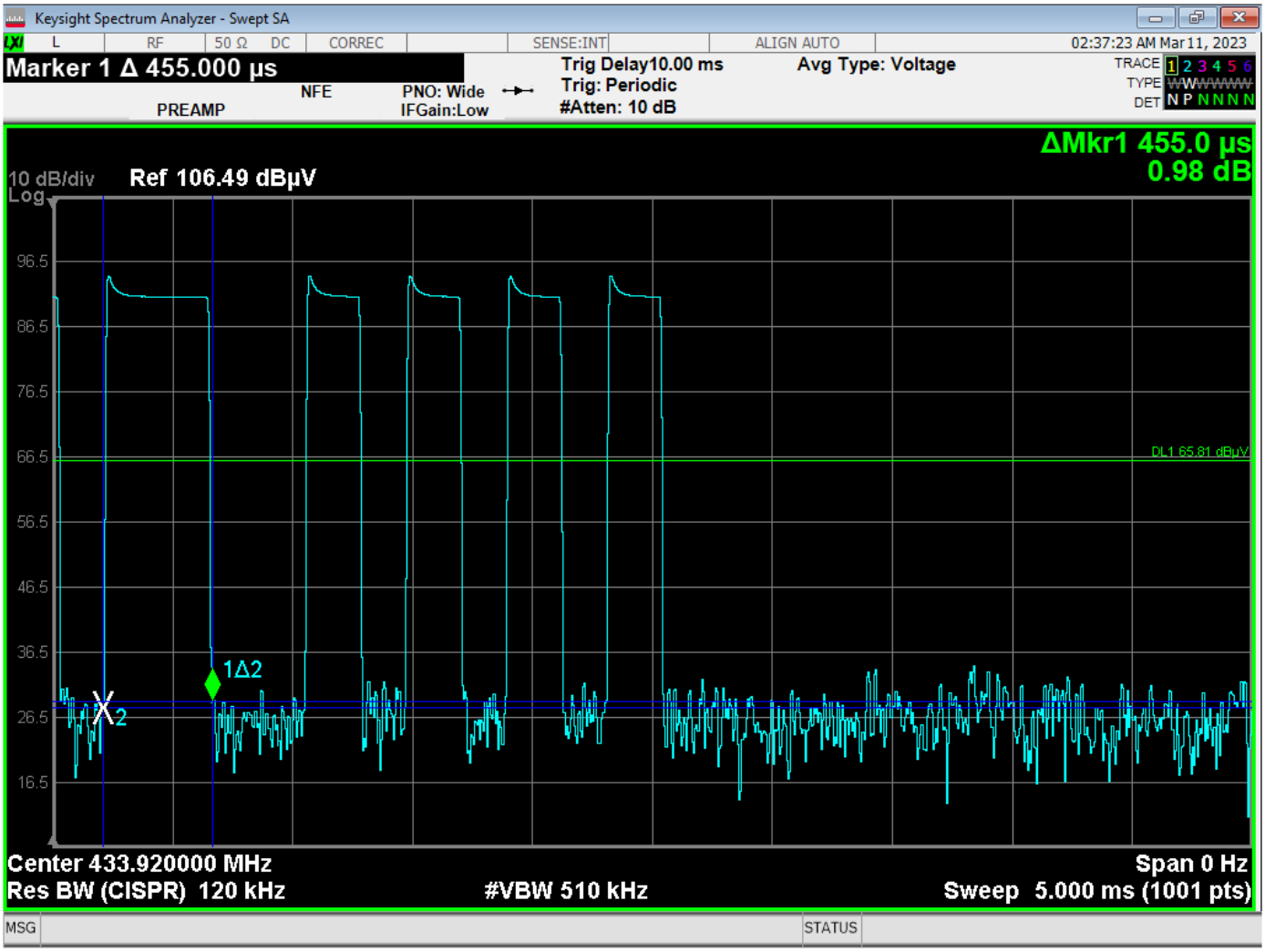
U2 Version



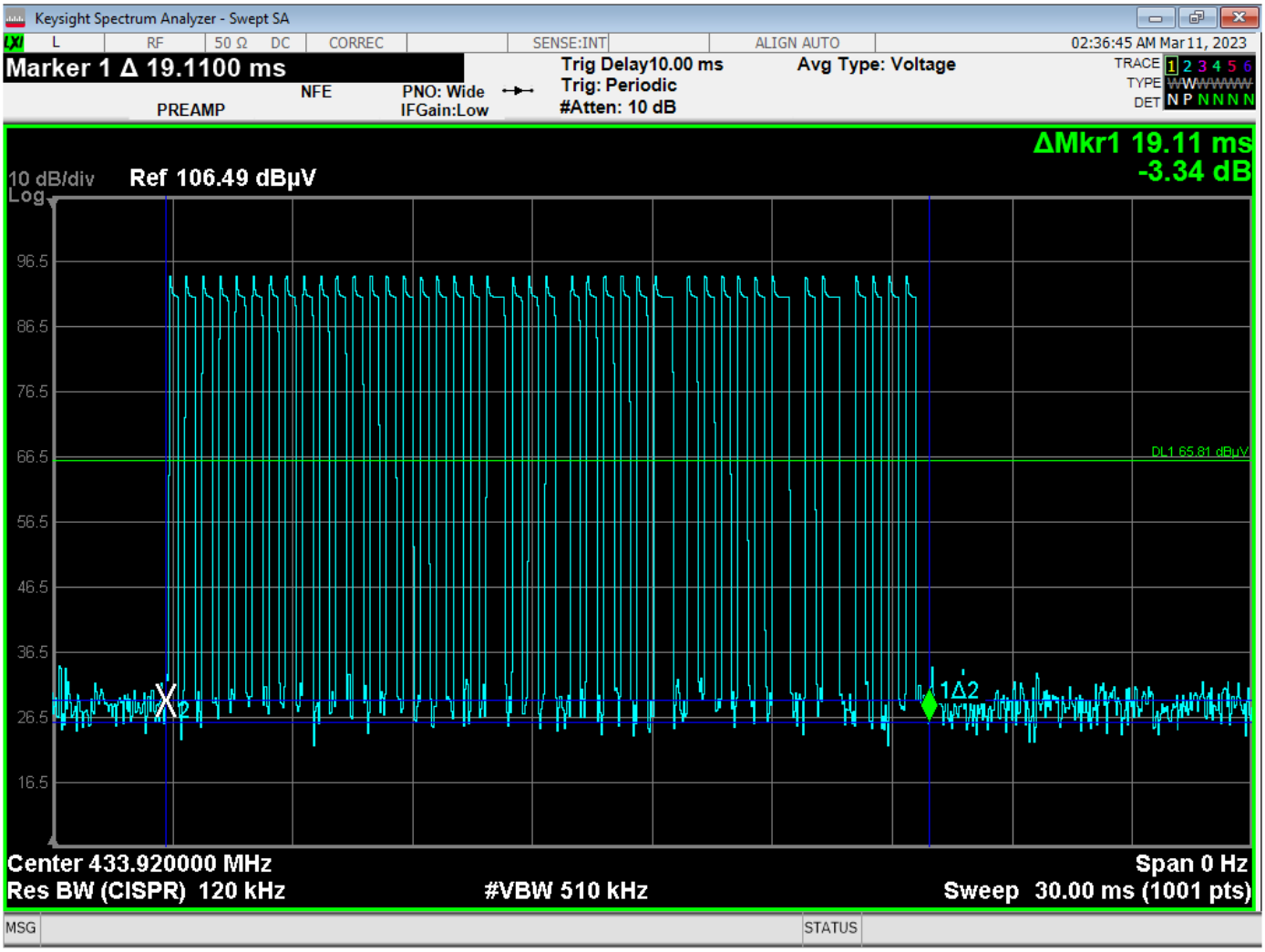
The pulse train only appears once every 100 ms – U3 Version



Time of Small Pulse = 250 us – U3 Version



Time of Large Pulse = 455 us – U3 Version



Number of Small Pulses = 37 = (37*250 us) = 9250 us
Number of Large Pulses = 4 = (4*455 us) = 1820 us

Total On Time = 11070 us = 11.070 ms

Duty Cycle = 11.070 ms / 100 ms = 11.07%

The peak to average ratio is -19.11 dB

U3 Version