



# element

## CINCH Systems

RF-CPIR-433

FCC 15.231:2021

Periodic Radio

Report: CINC0058, Issue Date: April 23, 2021



NVLAP LAB CODE: 200881-0



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# CERTIFICATE OF TEST

**Last Date of Test: February 8, 2021**  
**CINCH Systems**  
**EUT: RF-CPIR-433**

## Radio Equipment Testing

### Standards

Specification	Method
FCC 15.231:2021	ANSI C63.10:2013

### Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions (Transmitter)	No	N/A	Not required for a battery powered EUT.
6.5, 6.6	Field Strength of Fundamental	Yes	Pass	
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
6.9.2	Occupied Bandwidth	Yes	Pass	
7.4e	Periodic Operation	No	N/A	Not required to test. If applicable, this is addressed by an attestation in the equipment theory of operation.
7.5	Duty Cycle	Yes	Pass	

### Deviations From Test Standards

None

### Approved By:



Eric Brandon, Department Manager

*Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.*

# REVISION HISTORY



Revision Number	Description	Date (yyyy-mm-dd)	Page Number
00	None		

# ACCREDITATIONS AND AUTHORIZATIONS



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## United States

**FCC** - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

**A2LA** - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Element to certify transmitters to FCC and IC specifications.

**NVLAP** - Each laboratory is accredited by NVLAP to ISO 17025

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## Canada

**ISED** - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB) and as a CAB for the acceptance of test data.

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## European Union

**European Commission** – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

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## Australia/New Zealand

**ACMA** - Recognized by ACMA as a CAB for the acceptance of test data.

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## Korea

**MSIT / RRA** - Recognized by KCC's RRA as a CAB for the acceptance of test data.

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## Japan

**VCCI** - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

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## Taiwan

**BSMI** – Recognized by BSMI as a CAB for the acceptance of test data.

**NCC** - Recognized by NCC as a CAB for the acceptance of test data.

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## Singapore

**IDA** – Recognized by IDA as a CAB for the acceptance of test data.

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## Israel

**MOC** – Recognized by MOC as a CAB for the acceptance of test data.

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## Hong Kong

**OFCA** – Recognized by OFCA as a CAB for the acceptance of test data.

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## Vietnam

**MIC** – Recognized by MIC as a CAB for the acceptance of test data.

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## SCOPE

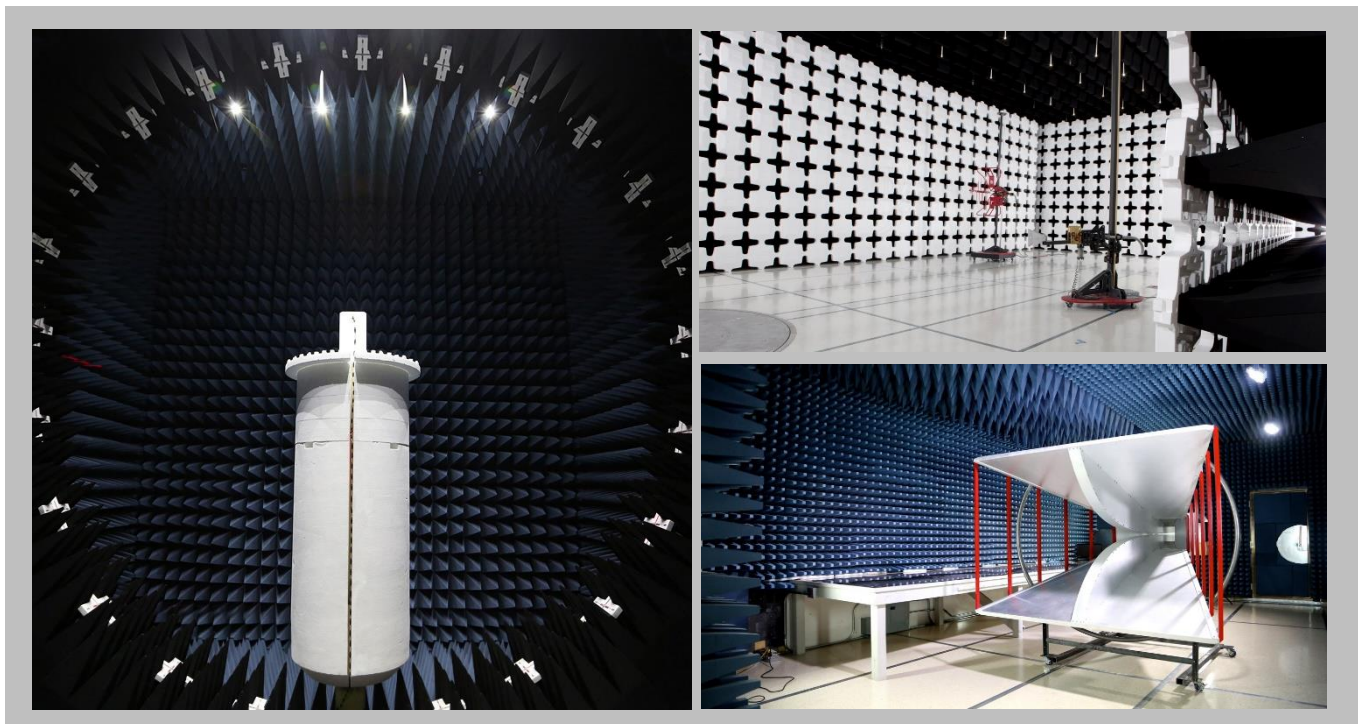
For details on the Scopes of our Accreditations, please visit:

<https://www.nwemc.com/emc-testing-accreditations>

# FACILITIES



<b>California</b> Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	<b>Minnesota</b> Labs MN01-11 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	<b>Oregon</b> Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	<b>Texas</b> Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	<b>Washington</b> Labs NC01-05 19201 120 <sup>th</sup> Ave NE Bothell, WA 98011 (425)984-6600
<b>NVLAP</b>				
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
<b>Innovation, Science and Economic Development Canada</b>				
2834B-1, 2834B-3	2834E-1, 2834E-3	2834D-1	2834G-1	2834F-1
<b>BSMI</b>				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
<b>VCCI</b>				
A-0029	A-0109	A-0108	A-0201	A-0110
<b>Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA</b>				
US0158	US0175	US0017	US0191	US0157



# MEASUREMENT UNCERTAINTY



## Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

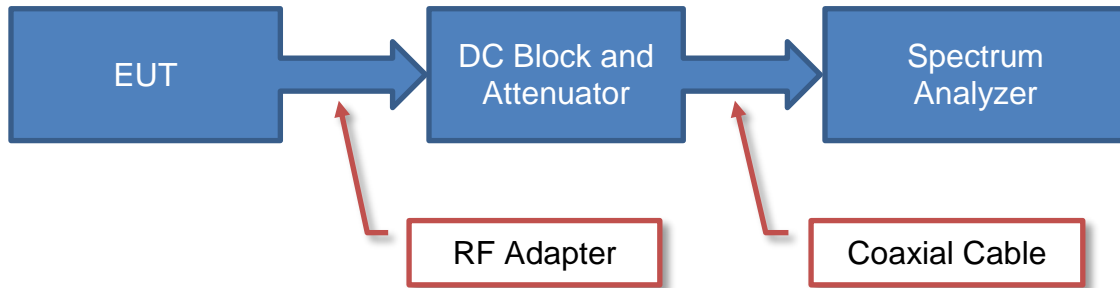
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

<b>Test</b>	<b>+ MU</b>	<b>- MU</b>
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.6 dB	-2.6 dB

# Test Setup Block Diagrams

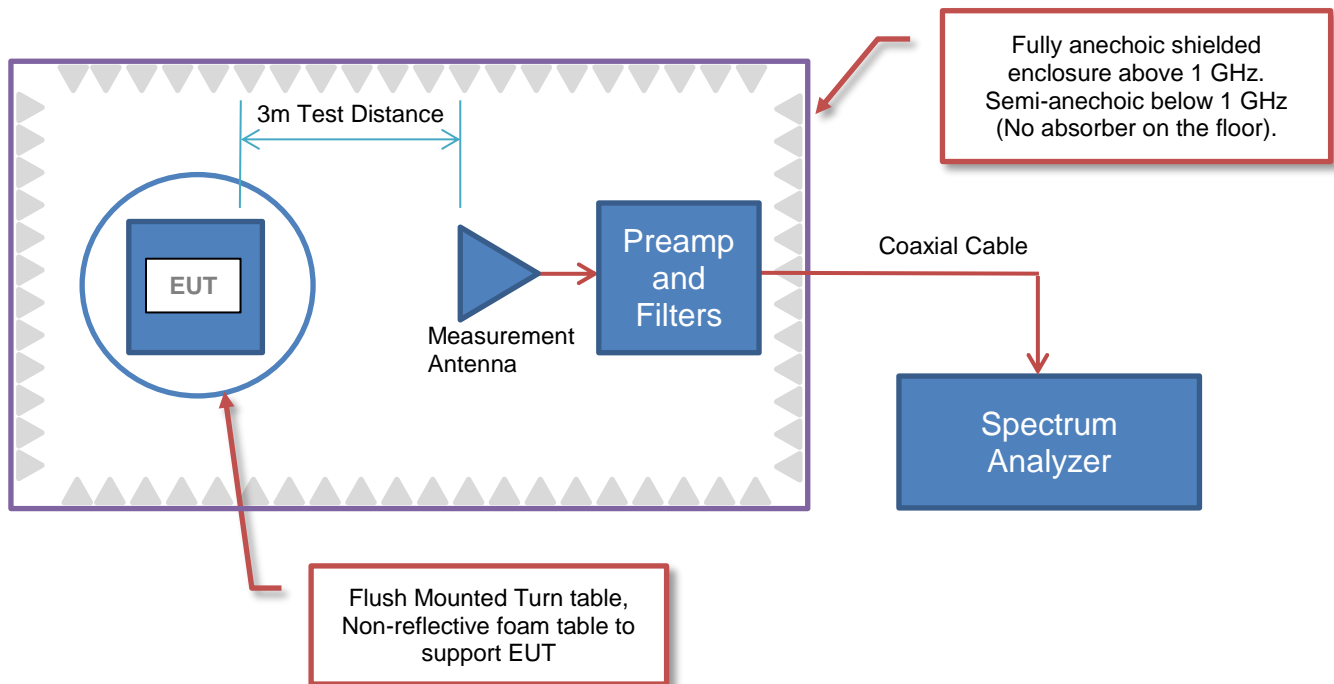
## Antenna Port Conducted Measurements



## Near Field Test Fixture Measurements



## Spurious Radiated Emissions







# PRODUCT DESCRIPTION

## Client and Equipment Under Test (EUT) Information

<b>Company Name:</b>	CINCH Systems
<b>Address:</b>	12075 43rd Street NE Suite 300
<b>City, State, Zip:</b>	St. Michael, MN 55376
<b>Test Requested By:</b>	Jibril Aga
<b>EUT:</b>	RF-CPIR-433
<b>First Date of Test:</b>	February 5, 2021
<b>Last Date of Test:</b>	February 8, 2021
<b>Receipt Date of Samples:</b>	February 5, 2021
<b>Equipment Design Stage:</b>	Production
<b>Equipment Condition:</b>	No Damage
<b>Purchase Authorization:</b>	Verified

## Information Provided by the Party Requesting the Test

<b>Functional Description of the EUT:</b>
Motion Sensor with Periodic Radio to provide property protection
<b>Testing Objective:</b>
To demonstrate compliance to FCC 15.231 specifications.



# CONFIGURATIONS



## Configuration CINC0058- 2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Sensor	CINCH Systems	RF-CPIR-433	04195F3

## Configuration CINC0058- 8

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Sensor	CINCH Systems	RF-CPIR-433	042D4CE

## Configuration CINC0058- 9

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Sensor	CINCH Systems	RF-CPIR-433	0480FF2

# MODIFICATIONS



## Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2021-02-05	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2021-02-05	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2021-02-05	Field Strength of Fundamental	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2021-02-08	Duty Cycle	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

# POWER SETTINGS AND ANTENNAS



The power settings, antenna gain value(s) and cable loss (if applicable) used for the testing contained in this report were provided by the customer and will affect the validity of the results. Element assumes no responsibility for the accuracy of this information.

## ANTENNA GAIN (dBi)

Type	Provided by:	Frequency Range (MHz)	Gain (dBi)
Monopole	Manufacturer	430-436 MHz	-7.7

The EUT was tested using the power settings provided by the manufacturer:

## SETTINGS FOR ALL TESTS IN THIS REPORT

RF-CPIR-433	Power Setting
Periodic	+13 dBm (maximum power)

# FIELD STRENGTH OF FUNDAMENTAL



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

## MODES OF OPERATION

Transmit at 433.92 MHz, CW 100% duty cycle

## POWER SETTINGS INVESTIGATED

Battery

## CONFIGURATIONS INVESTIGATED

CINC0058 - 2

## FREQUENCY RANGE INVESTIGATED

Start Frequency | 433 MHz | Stop Frequency | 435 MHz

## SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

## TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	2020-12-27	2021-12-27
Antenna - Biconilog	ETS Lindgren	3142D	AXO	2019-09-03	2021-09-03
Cable	ESM Cable Corp.	Bilog Cables	MNH	2020-10-06	2021-10-06
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	2020-10-06	2021-10-06

## TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was configured for continuous un-modulated CW operation at its single transmit frequency. The field strength of the transmit frequency was maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT in 3 orthogonal planes (per ANSI C63.10:2013).

Peak measurements were made with a resolution bandwidth of 100 kHz and a video bandwidth of 300 kHz for measurements at or below 1 GHz. A duty cycle correction factor was added to the peak readings to mathematically derive the average levels. The supporting screen captures and duty cycle calculation is contained in the "Duty Cycle" module in this report.

# FIELD STRENGTH OF FUNDAMENTAL

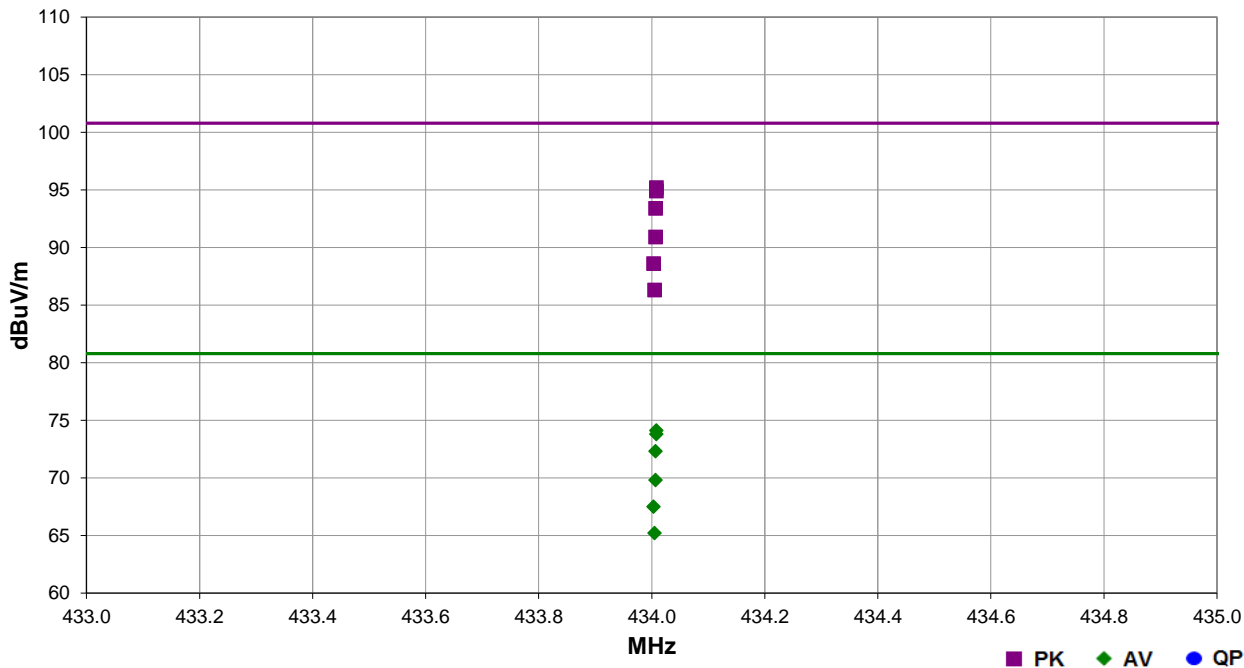


EmiR5 2020.12.09.0 PSA-ESCI 2021.01.22.0

<b>Work Order:</b>	CINC0058	<b>Date:</b>	2021-02-05	<i>Andrew Rogstad</i>
<b>Project:</b>	None	<b>Temperature:</b>	22.2 °C	
<b>Job Site:</b>	MN05	<b>Humidity:</b>	17.7% RH	
<b>Serial Number:</b>	04195F3	<b>Barometric Pres.:</b>	1006 mbar	<b>Tested by:</b> Andrew Rogstad
<b>EUT:</b>	RF-CPIR-433			
<b>Configuration:</b>	2			
<b>Customer:</b>	CINCH Systems			
<b>Attendees:</b>	Jibril Aga			
<b>EUT Power:</b>	Battery			
<b>Operating Mode:</b>	Transmit at 433.92 MHz, CW 100% duty cycle			
<b>Deviations:</b>	None			
<b>Comments:</b>	None			

<b>Test Specifications</b>	FCC 15.231:2021	<b>Test Method</b>	ANSI C63.10:2013
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<b>Run #</b>	9	<b>Test Distance (m)</b>	3	<b>Antenna Height(s)</b>	1 to 4(m)	<b>Results</b>	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Duty Cycle Correction Factor (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
433.958	70.5	24.7	1.29	243.9	3.0	0.0	Vert	PK	0.0	95.2	100.8	-5.6	EUT on side
433.958	70.2	24.7	1.23	252.0	3.0	0.0	Vert	PK	0.0	94.9	100.8	-5.9	EUT vert
433.958	70.5	24.7	1.29	243.9	3.0	0.0	Vert	AV	-21.1	74.1	80.8	-6.7	EUT on side
433.958	70.2	24.7	1.23	252.0	3.0	0.0	Vert	AV	-21.1	73.8	80.8	-7.0	EUT vert
433.957	68.7	24.7	1.0	153.9	3.0	0.0	Horz	PK	0.0	93.4	100.8	-7.4	EUT horz
433.957	68.7	24.7	1.0	153.9	3.0	0.0	Horz	AV	-21.1	72.3	80.8	-8.5	EUT horz
433.957	66.2	24.7	1.0	325.9	3.0	0.0	Horz	PK	0.0	90.9	100.8	-9.9	EUT vert
433.957	66.2	24.7	1.0	325.9	3.0	0.0	Horz	AV	-21.1	69.8	80.8	-11.0	EUT vert
433.953	63.9	24.7	3.25	333.0	3.0	0.0	Horz	PK	0.0	88.6	100.8	-12.2	EUT on side
433.953	63.9	24.7	3.25	333.0	3.0	0.0	Horz	AV	-21.1	67.5	80.8	-13.3	EUT on side
433.955	61.6	24.7	1.42	59.0	3.0	0.0	Vert	PK	0.0	86.3	100.8	-14.5	EUT horz
433.955	61.6	24.7	1.42	59.0	3.0	0.0	Vert	AV	-21.1	65.2	80.8	-15.6	EUT horz

# SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2021.01.22.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

## MODES OF OPERATION

Transmit at 433.95 MHz, CW 100% duty cycle

## POWER SETTINGS INVESTIGATED

Battery

## CONFIGURATIONS INVESTIGATED

CINC0058 - 2

## FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	8200 MHz
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## SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

## TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	2021-01-15	2022-01-15
Attenuator	Fairview Microwave	SA18E-10	TYA	2020-09-14	2021-09-14
Attenuator	Fairview Microwave	SA18E-20	TWZ	2020-09-14	2021-09-14
Cable	ESM Cable Corp.	Bilog Cables	MNH	2020-10-06	2021-10-06
Antenna - Biconilog	ETS Lindgren	3142D	AXO	2019-09-03	2021-09-03
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	2020-10-06	2021-10-06
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	2020-12-27	2021-12-27
Antenna - Double Ridge	ETS Lindgren	3115	AJA	2019-08-28	2021-08-28
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	2021-01-15	2022-01-15

## MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

## TEST DESCRIPTION

The highest gain antenna of each type to be used with the EUT was tested. The EUT was configured for the required transmit frequency in each operational band and the modes as showed in the data sheets.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These "pre-scans" are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector  
 PK = Peak Detector  
 AV = Calculated Average based on Peak and Duty Cycle Correction Factor

Peak measurements were made with a resolution bandwidth of 100 kHz and a video bandwidth of 300 kHz for measurements at or below 1 GHz. Above 1 GHz, a resolution bandwidth of 1 MHz and a video bandwidth of 3 MHz was used.

A duty cycle correction factor was added to the peak readings to mathematically derive the average levels. The supporting screen captures and duty cycle calculation is contained in the "Duty Cycle" module in this report.

# SPURIOUS RADIATED EMISSIONS

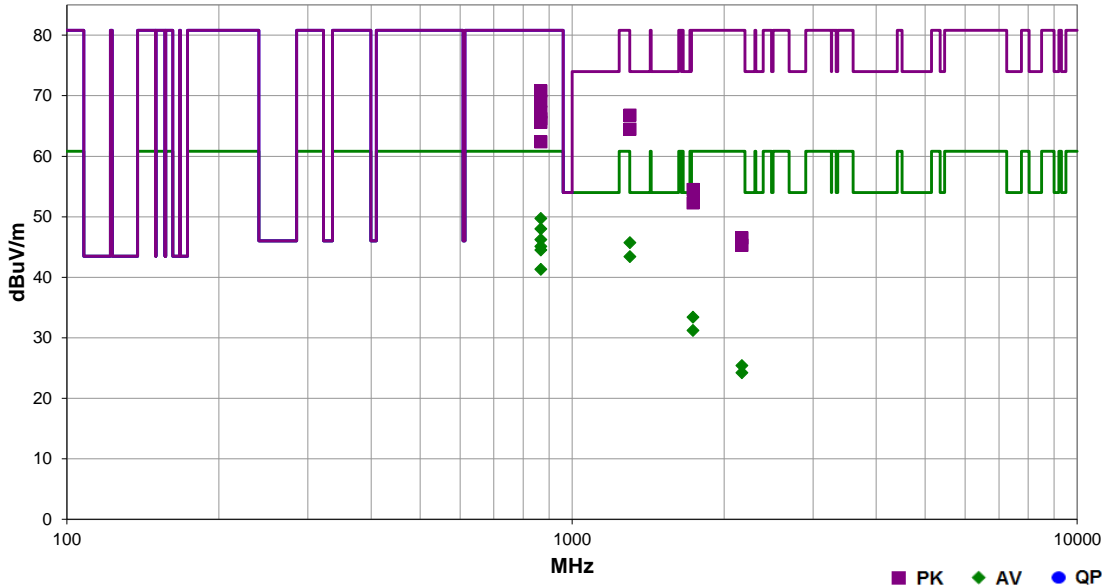


EmiRS 2020.12.09.0 PSA-ESCI 2021.01.22.0

<b>Work Order:</b>	CINC0058	<b>Date:</b>	2021-02-05	 Tested by: Andrew Rogstad, Christopher Heintzelman
<b>Project:</b>	None	<b>Temperature:</b>	22.4 °C	
<b>Job Site:</b>	MN05	<b>Humidity:</b>	18.9% RH	
<b>Serial Number:</b>	04195F3	<b>Barometric Pres.:</b>	1007 mbar	
<b>EUT:</b>	RF-CPIR-433			
<b>Configuration:</b>	2			
<b>Customer:</b>	CINCH Systems			
<b>Attendees:</b>	Jibril Aga			
<b>EUT Power:</b>	Battery			
<b>Operating Mode:</b>	Transmit at 433.95 MHz, CW 100% duty cycle			
<b>Deviations:</b>	None			
<b>Comments:</b>	None			

<b>Test Specifications</b>	<b>Test Method</b>
FCC 15.231:2021	ANSI C63.10:2013

<b>Run #</b>	14	<b>Test Distance (m)</b>	3	<b>Antenna Height(s)</b>	1 to 4(m)	<b>Results</b>	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Duty Cycle Correction Factor (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
1301.892	74.8	-8.0	3.6	245.0	3.0	0.0	Vert	PK	0.0	66.8	74.0	-7.2	EUT Vert
1301.892	74.8	-8.0	3.6	245.0	3.0	0.0	Vert	AV	-21.1	45.7	54.0	-8.3	EUT Vert
1301.725	72.5	-8.0	2.7	198.0	3.0	0.0	Horz	PK	0.0	64.5	74.0	-9.5	EUT Horz
867.917	46.9	13.9	1.0	16.9	3.0	10.0	Horz	PK	0.0	70.8	80.8	-10.0	EUT on side
1301.725	72.5	-8.0	2.7	198.0	3.0	0.0	Horz	AV	-21.1	43.4	54.0	-10.6	EUT Horz
867.917	46.9	13.9	1.0	16.9	3.0	10.0	Horz	AV	-21.1	49.7	60.8	-11.1	EUT on side
867.907	45.2	13.9	1.6	171.9	3.0	10.0	Vert	PK	0.0	69.1	80.8	-11.7	EUT vert
867.907	45.2	13.9	1.6	171.9	3.0	10.0	Vert	AV	-21.1	48.0	60.8	-12.8	EUT vert
867.905	43.4	13.9	1.0	87.0	3.0	10.0	Horz	PK	0.0	67.3	80.8	-13.5	EUT vert
867.905	43.4	13.9	1.0	87.0	3.0	10.0	Horz	AV	-21.1	46.2	60.8	-14.6	EUT vert
867.915	42.3	13.9	2.5	23.9	3.0	10.0	Vert	PK	0.0	66.2	80.8	-14.6	EUT horz
867.912	41.7	13.9	1.0	319.9	3.0	10.0	Horz	PK	0.0	65.6	80.8	-15.2	EUT horz
867.915	42.3	13.9	2.5	23.9	3.0	10.0	Vert	AV	-21.1	45.1	60.8	-15.7	EUT horz
867.912	41.7	13.9	1.0	319.9	3.0	10.0	Horz	AV	-21.1	44.5	60.8	-16.3	EUT horz
867.913	38.5	13.9	3.1	314.0	3.0	10.0	Vert	PK	0.0	62.4	80.8	-18.4	EUT on side
867.913	38.5	13.9	3.1	314.0	3.0	10.0	Vert	AV	-21.1	41.3	60.8	-19.5	EUT on side
1735.800	61.7	-7.2	1.5	1.0	3.0	0.0	Horz	PK	0.0	54.5	80.8	-26.3	EUT Horz
1735.800	61.7	-7.2	1.5	1.0	3.0	0.0	Horz	AV	-21.1	33.4	60.8	-27.4	EUT Horz
1736.008	59.5	-7.2	3.6	199.0	3.0	0.0	Vert	PK	0.0	52.3	80.8	-28.5	EUT Vert
1736.008	59.5	-7.2	3.6	199.0	3.0	0.0	Vert	AV	-21.1	31.2	60.8	-29.6	EUT Vert
2169.500	48.6	-2.1	1.1	210.9	3.0	0.0	Vert	PK	0.0	46.5	80.8	-34.3	EUT Vert
2169.500	48.6	-2.1	1.1	210.9	3.0	0.0	Vert	AV	-21.1	25.4	60.8	-35.4	EUT Vert
2169.375	47.4	-2.1	3.8	184.0	3.0	0.0	Horz	PK	0.0	45.3	80.8	-35.5	EUT Horz
2169.375	47.4	-2.1	3.8	184.0	3.0	0.0	Horz	AV	-21.1	24.2	60.8	-36.6	EUT Horz



# OCCUPIED BANDWIDTH



XMH 2020.12.30.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

## TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	2020-10-06	2021-10-06
Cable	ESM Cable Corp.	Bilog Cables	MNH	2020-10-06	2021-10-06
Antenna - Biconilog	ETS Lindgren	3142D	AXO	2019-09-03	2021-09-03
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	2020-12-27	2021-12-27

## TEST DESCRIPTION

The EUT was transmitting at its maximum data rate.

The 20 dB occupied bandwidth is required to be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz.

# OCCUPIED BANDWIDTH



XMI 2020.12.30.0

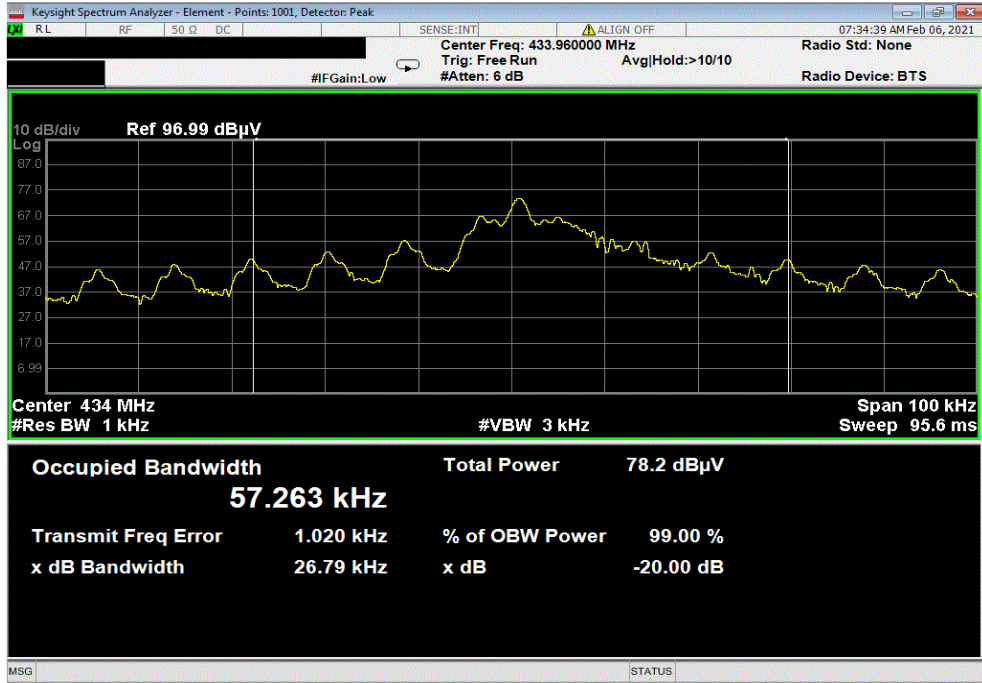
EUT: RF-CPIR-433		Work Order: CINC0058	
Serial Number: 042D4CE		Date: 5-Feb-21	
Customer: CINCH Systems		Temperature: 22.3 °C	
Attendees: Jibril Aga		Humidity: 18.6% RH	
Project: None		Barometric Pres.: 1007 mbar	
Tested by: Andrew Rogstad		Power: Battery	
Job Site: MN05			
TEST SPECIFICATIONS		Test Method	
FCC 15.231:2021		ANSI C63.10:2013	
COMMENTS			
OBW limit = 433.95 MHz * 0.0025 = 1084.88 kHz			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	8	Signature <i>Andrew Rogstad</i>	
		Measured OBW (kHz)	Limit (kHz) Result
433.95 MHz	Occupied Bandwidth	26.79	1084.88 Pass

# OCCUPIED BANDWIDTH



XMI 2020.12.30.0

433.95 MHz, Occupied Bandwidth			
	Measured OBW (kHz)	Limit (kHz)	Result
	26.79	1084.88	Pass



# DUTY CYCLE

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

## TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	2020-12-27	2021-12-27
Antenna - Biconilog	ETS Lindgren	3142D	AXO	2019-09-03	2021-09-03
Cable	ESM Cable Corp.	Bilog Cables	MNH	2020-10-06	2021-10-06
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	2020-10-06	2021-10-06

## TEST DESCRIPTION

For software controlled or pre-programmed devices, the manufacturer shall declare the duty cycle class or classes for the equipment under test. For manually operated or event dependant devices, with or without software controlled functions, the manufacturer shall declare whether the device once triggered, follows a pre-programmed cycle, or whether the transmission is constant until the trigger is released or manually reset. The manufacturer shall also give a description of the application for the device and include a typical usage pattern. The typical usage pattern as declared by the manufacturer shall be used to determine the duty cycle and hence the duty class.

Where an acknowledgement is required, the additional transmitter on-time shall be included and declared by the manufacturer.

To derive average emission measurements, a duty cycle correction factor was utilized:

Duty Cycle = On time/100 milliseconds (or the period, whichever is less)

Where "On time" =  $N1L1 + N2L2 + \dots$

Where N1 is the number of type 1 pulses, L1 is length of type 1 pulses, N2 is the number of type 2 pulses, L2 is the length of type 2 pulses, etc.

Therefore, Duty Cycle =  $(N1L1 + N2L2 + \dots)/100\text{mS}$  or T, whichever is less. (Where T is the period of the pulse train.)

The measured values for the EUT's pulse train are as follows:

Period = **100** mSec

Pulsewidth of Type 1 Pulse = **0.05953** mSec

Pulsewidth of Type 2 Pulse = **0.1943** mSec

Pulsewidth of Type 3 Pulse = **0.093** mSec

Number of Type 1 Pulses = **1**

Number of Type 2 Pulses = **18**

Number of Type 3 Pulses = **56**

Duty Cycle Correction Factor =  $20 \log \left[ \frac{(1)(0.05953) + (18)(0.1943) + (56)(0.093)}{100} \right] = -21.1 \text{ dB}$

The duty cycle correction factor of **-21.1 dB** was added to the peak readings to mathematically derive the average levels. Peak measurements were made with a resolution bandwidth of 100kHz and a video bandwidth of 300kHz.

# DUTY CYCLE



XMI: 2020.12.30.0

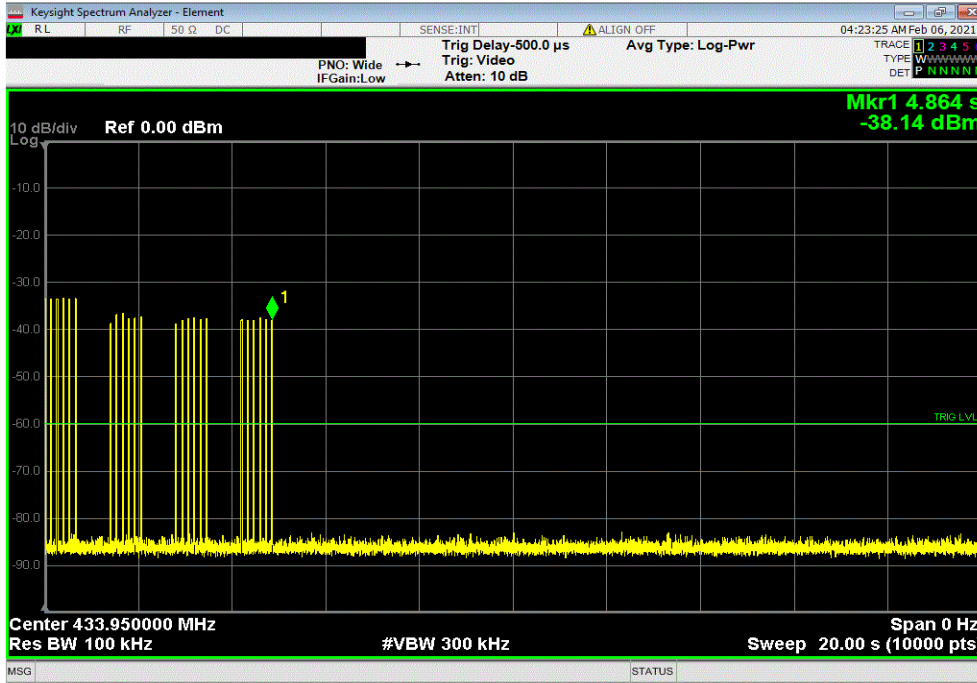
EUT: RF-CPIR-433		Work Order: CINC0058	
Serial Number: 0480FF2		Date: 8-Feb-21	
Customer: CINCH Systems		Temperature: 22.5 °C	
Attendees: Jibril Aga		Humidity: 15.1% RH	
Project: None		Barometric Pres.: 1029 mbar	
Tested by: Andrew Rogstad		Power: Battery	
		Job Site: MN05	
TEST SPECIFICATIONS			
FCC 15.231:2021		Test Method	
		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	9	Signature <i>Andrew Rogstad</i>	
		Type 1	Type 1
		Pulse Width (us)	Pulse Count
		Type 2	Type 2
		Pulse Width (us)	Pulse Count
		Type 3	Type 3
		Pulse Width (us)	Pulse Count
			On Time
			in 100 ms
20 s		N/A	N/A
3 s		N/A	N/A
100 ms		N/A	N/A
20 ms		59.53	1
		194.3	18
			93
			56
			8.76

# DUTY CYCLE

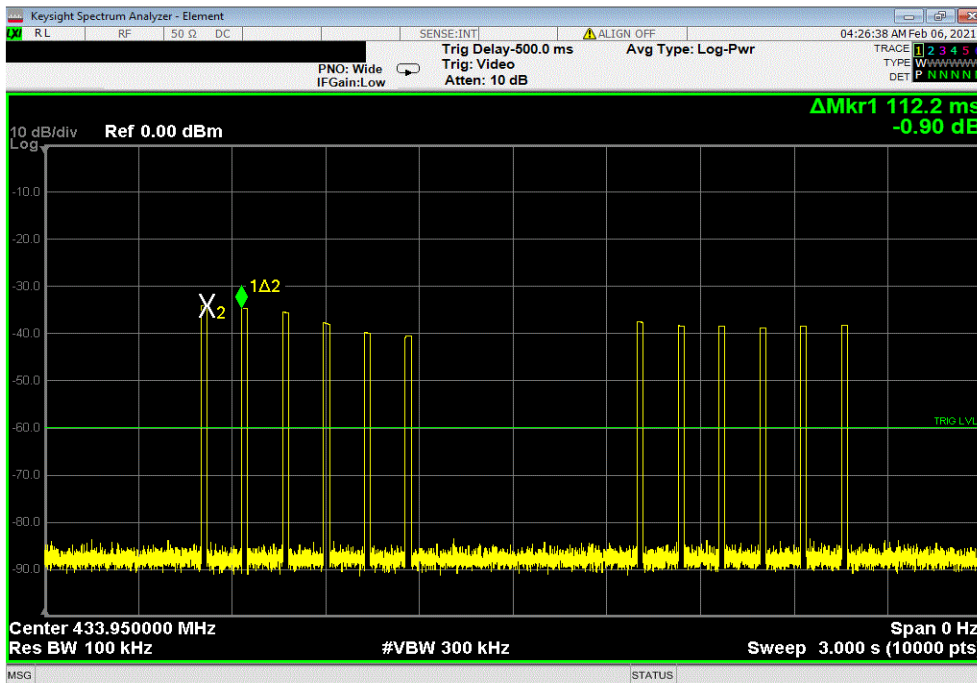


XMII 2020.12.30.0

							20 s
Type 1	Type 1	Type 2	Type 2	Type 3	Type 3	On Time	
Pulse Width (us)	Pulse Count	Pulse Width (us)	Pulse Count	Pulse Width (us)	Pulse Count	in 100 ms	
N/A	N/A	N/A	N/A	N/A	N/A	N/A	



							3 s
Type 1	Type 1	Type 2	Type 2	Type 3	Type 3	On Time	
Pulse Width (us)	Pulse Count	Pulse Width (us)	Pulse Count	Pulse Width (us)	Pulse Count	in 100 ms	
N/A	N/A	N/A	N/A	N/A	N/A	N/A	

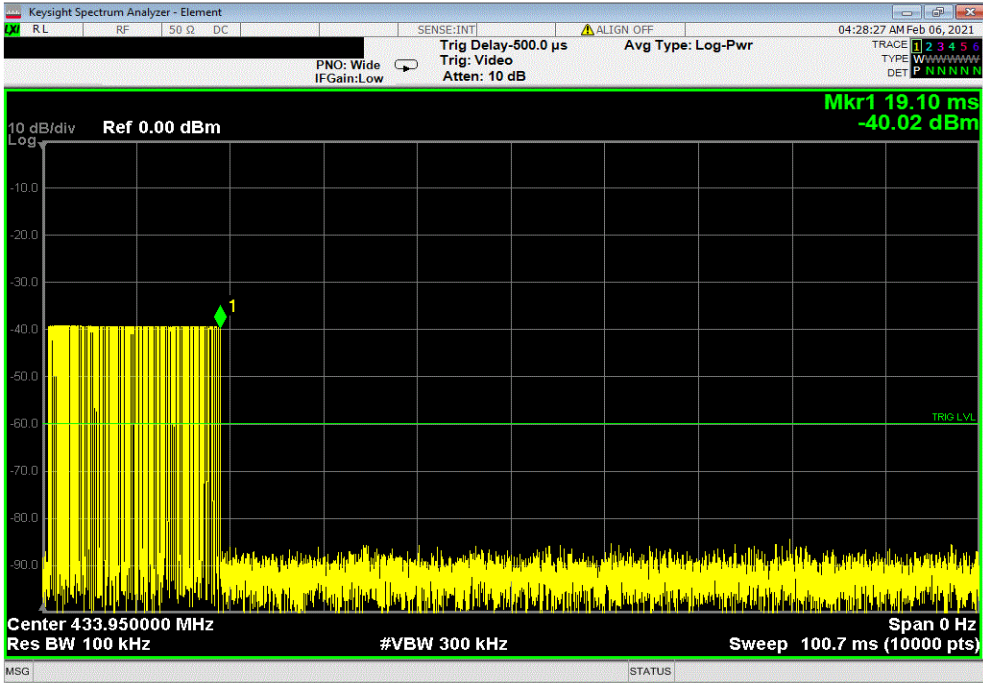


# DUTY CYCLE



XMII 2020.12.30.0

100 ms						
Type 1	Type 1	Type 2	Type 2	Type 3	Type 3	On Time
Pulse Width (us)	Pulse Count	Pulse Width (us)	Pulse Count	Pulse Width (us)	Pulse Count	in 100 ms
N/A	N/A	N/A	N/A	N/A	N/A	N/A



20 ms						
Type 1	Type 1	Type 2	Type 2	Type 3	Type 3	On Time
Pulse Width (us)	Pulse Count	Pulse Width (us)	Pulse Count	Pulse Width (us)	Pulse Count	in 100 ms
59.53	1	194.3	18	93	56	8.76

