



# element<sup>®</sup>

**CINCH Systems**

**RF-ARSHK**

**Periodic Transmitter**

**FCC 15.231:2017**

**Report # CINC0015**



NVLAP Lab Code: 200881-0



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# CERTIFICATE OF TEST

Last Date of Test: November 16, 2017  
CINCH Systems  
Model: RF-ARSHK

## Radio Equipment Testing

### Standards

Specification	Method
FCC 15.231:2017	ANSI C63.10:2013

### Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	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	
7.5	Duty Cycle	Yes	Pass	

### Deviations From Test Standards

None

### Approved By:

Matt Nuernberg, Operations 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.*

# REVISION HISTORY



2017.1.25

Revision Number	Description	Date	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). Certification chambers and Open Area Test Sites are filed with ISED.

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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

**MSIP / 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:

<http://portlandcustomer.element.com/ts/scope/scope.htm>

<http://gsi.nist.gov/global/docs/cabs/designations.html>

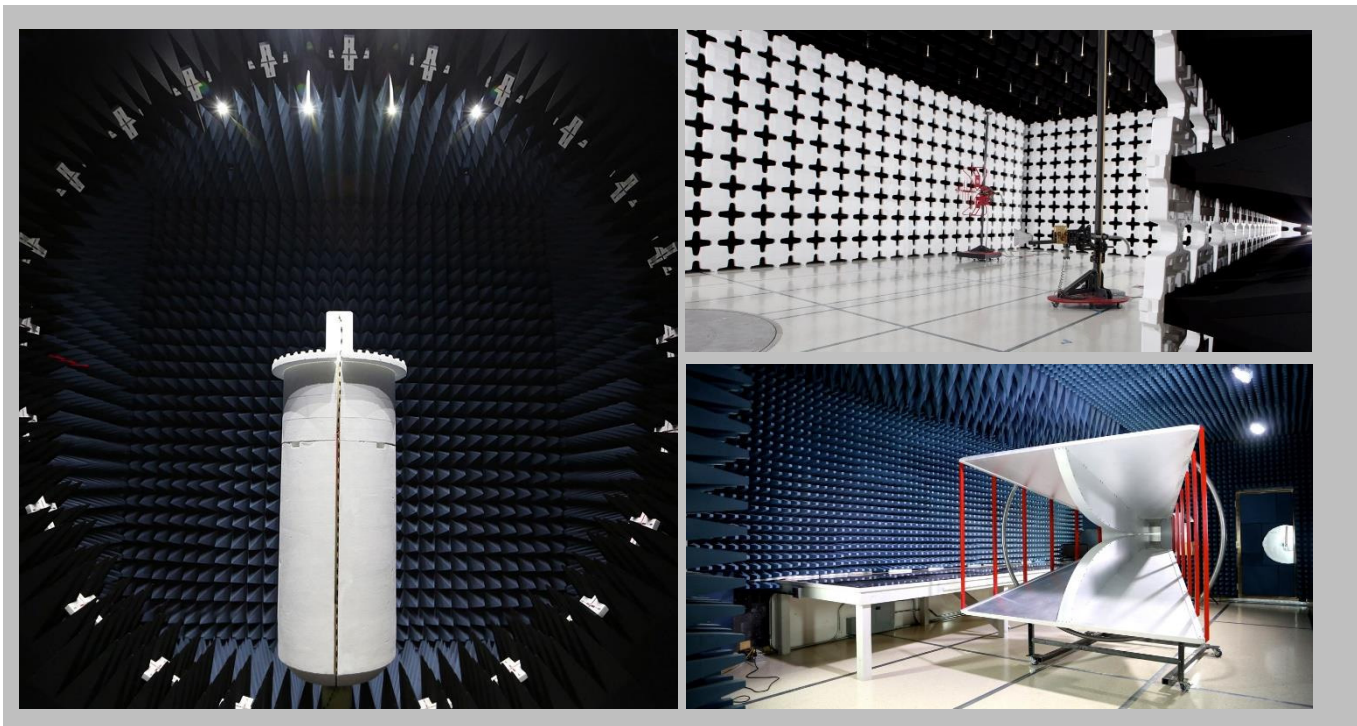
# FACILITIES



2017.9.15



California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120 <sup>th</sup> Ave NE Bothell, WA 98011 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Innovation, Science and Economic Development Canada					
2834B-1, 2834B-3	2834E-1, 2834E-3	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157

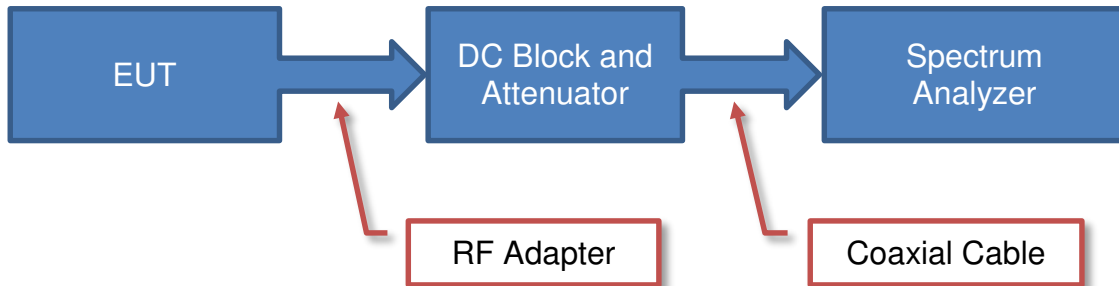


# Test Setup Block Diagrams

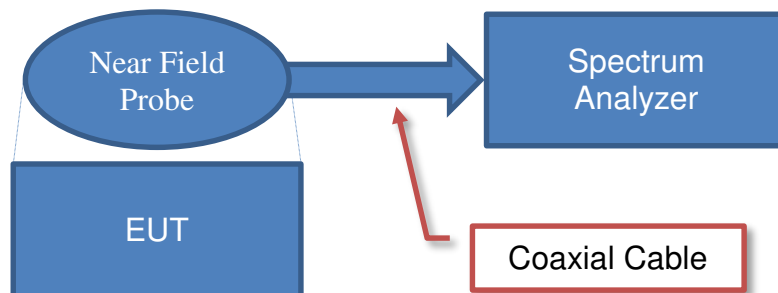


2017.1.25

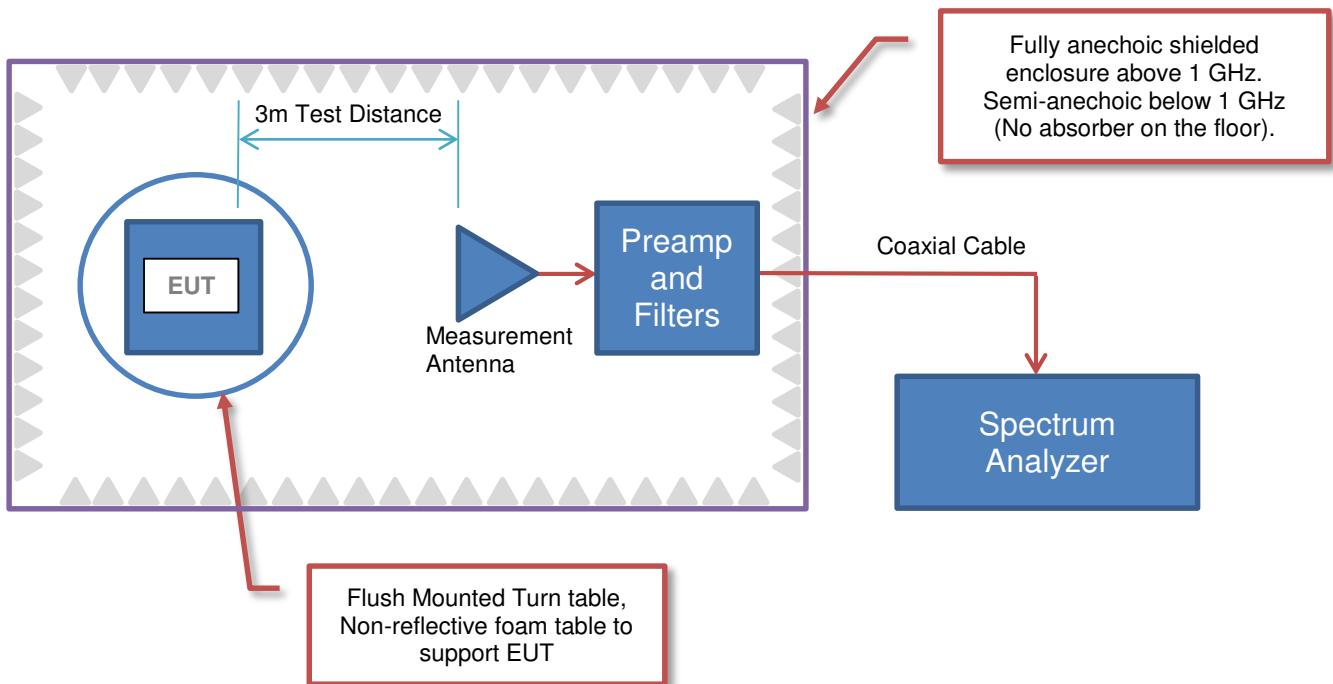
## Antenna Port Conducted Measurements



## Near Field Test Fixture Measurements



## Spurious Radiated Emissions



# MEASUREMENT UNCERTAINTY



WTD.2016.12.19

## 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 WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is on each data sheet. 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 (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 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)	2.4 dB	-2.4 dB



# PRODUCT DESCRIPTION

## Client and Equipment Under Test (EUT) Information

<b>Company Name:</b>	CINCH Systems
<b>Address:</b>	Suite 300 12075 43rd Street NE
<b>City, State, Zip:</b>	St. Michael, MN 55376
<b>Test Requested By:</b>	Jibril Aga
<b>Model:</b>	RF-ARSHK
<b>First Date of Test:</b>	November 16, 2017
<b>Last Date of Test:</b>	November 16, 2017
<b>Receipt Date of Samples:</b>	November 16, 2017
<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

### Functional Description of the EUT:

Shock sensor for window vibration / breakage detection containing a low power transmitter which operates at 319.5 MHz utilizing AM modulation (OOK).

### Testing Objective:

To demonstrate compliance of the periodic radio to FCC 15.231(b) requirements.



# CONFIGURATIONS



## Configuration CINC0015- 1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
RF-ARSHK	CINCH Systems	RF-ARSHK	1741

## Configuration CINC0015- 2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
RF-ARSHK	CINCH Systems	RF-ARSHK	1745

## Configuration CINC0015- 3

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
RF-ARSHK	CINCH Systems	RF-ARSHK	1743

# MODIFICATIONS



## Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	11/16/2017	Duty Cycle	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	11/16/2017	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.
3	11/16/2017	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	11/16/2017	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

# FIELD STRENGTH OF FUNDAMENTAL



PSA/ESCI 2017.06.01

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

Tx unmodulated at 319.5 MHz

## POWER SETTINGS INVESTIGATED

Battery

## CONFIGURATIONS INVESTIGATED

CINC0015 - 3

## FREQUENCY RANGE INVESTIGATED

Start Frequency 319 MHz Stop Frequency 320 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.	Interval
Cable	ESM Cable Corp.	Bilog Cables	MNH	11/9/2017	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/6/2017	12 mo

## 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 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).

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 + ...

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 + ...)/100mS 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 = 0.138 mSec  
 Pulsewidth of Type 2 Pulse = 0.502 mSec  
 Number of Type 1 Pulses = 79  
 Number of Type 2 Pulses = 1

Duty Cycle =  $20 \log \left[ \frac{(0.138)(79) + (0.502)(1)}{100} \right] = -18.9 \text{ dB}$

# FIELD STRENGTH OF FUNDAMENTAL



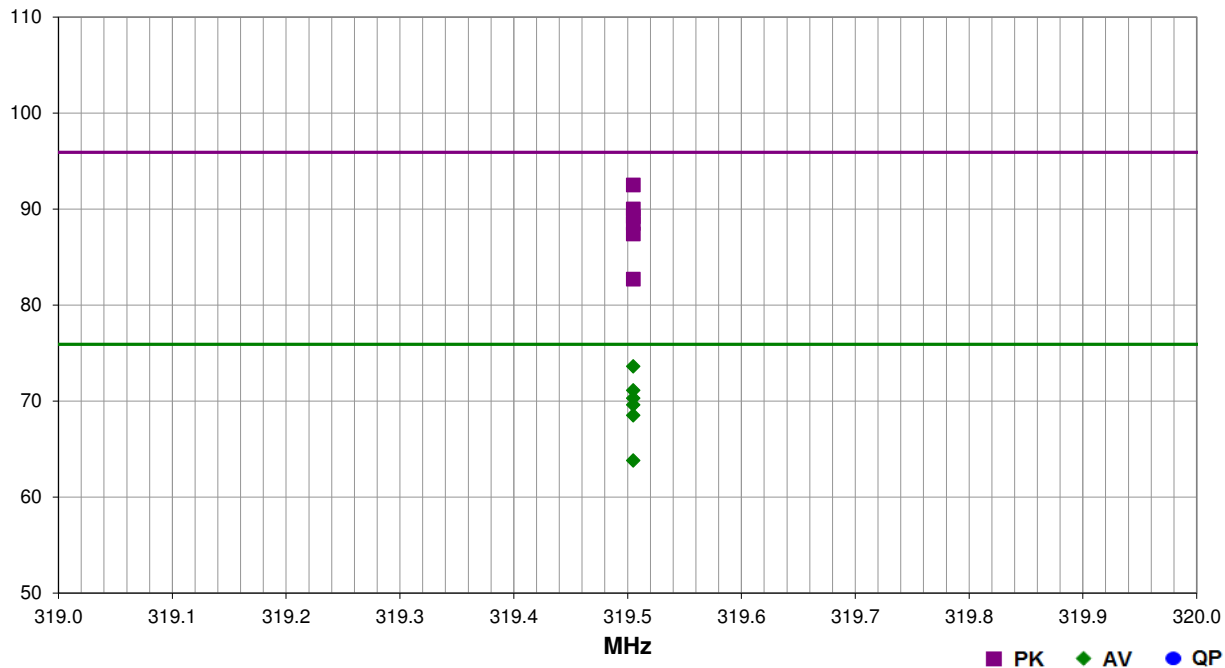
EmiR5 2017.07.11

PSA-ESCI 2017.06.01

<b>Work Order:</b>	CINC0015	<b>Date:</b>	11/16/17	<i>Kyle McMullan</i>
<b>Project:</b>	None	<b>Temperature:</b>	21.8 °C	
<b>Job Site:</b>	MN05	<b>Humidity:</b>	25.5% RH	
<b>Serial Number:</b>	1743	<b>Barometric Pres.:</b>	1026 mbar	<b>Tested by:</b> Kyle McMullan
<b>EUT:</b>	RF-ARSHK			
<b>Configuration:</b>	3			
<b>Customer:</b>	CINCH Systems			
<b>Attendees:</b>	Jibril Aba			
<b>EUT Power:</b>	Battery			
<b>Operating Mode:</b>	Tx unmodulated at 319.5 MHz			
<b>Deviations:</b>	None			
<b>Comments:</b>	None			

<b>Test Specifications</b>	FCC 15.231:2017	<b>Test Method</b>	ANSI C63.10:2013
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<b>Run #</b>	1	<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)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
319.505	72.3	20.2	1.0	340.0	-18.9	0.0	Horz	AV	0.0	73.6	75.9	-2.3	EUT Horizontal
319.505	72.3	20.2	1.0	340.0	0.0	0.0	Horz	PK	0.0	92.5	95.9	-3.4	EUT Horizontal
319.505	69.8	20.2	1.1	324.0	-18.9	0.0	Horz	AV	0.0	71.1	75.9	-4.8	EUT On Side
319.505	69.0	20.2	1.6	261.0	-18.9	0.0	Vert	AV	0.0	70.3	75.9	-5.6	EUT On Side
319.505	69.8	20.2	1.1	324.0	0.0	0.0	Horz	PK	0.0	90.0	95.9	-5.9	EUT On Side
319.505	68.3	20.2	1.8	240.9	-18.9	0.0	Vert	AV	0.0	69.6	75.9	-6.3	EUT Vertical
319.505	69.0	20.2	1.6	261.0	0.0	0.0	Vert	PK	0.0	89.2	95.9	-6.7	EUT On Side
319.505	67.2	20.2	1.0	35.0	-18.9	0.0	Horz	AV	0.0	68.5	75.9	-7.4	EUT Vertical
319.505	68.3	20.2	1.8	240.9	0.0	0.0	Vert	PK	0.0	88.5	95.9	-7.4	EUT Vertical
319.505	67.2	20.2	1.0	35.0	0.0	0.0	Horz	PK	0.0	87.4	95.9	-8.5	EUT Vertical
319.505	62.5	20.2	1.4	229.9	-18.9	0.0	Vert	AV	0.0	63.8	75.9	-12.1	EUT Horizontal
319.505	62.5	20.2	1.4	229.9	0.0	0.0	Vert	PK	0.0	82.7	95.9	-13.2	EUT Horizontal

# SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2017.06.01

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

Tx unmodulated at 319.5 MHz

## POWER SETTINGS INVESTIGATED

Battery

## CONFIGURATIONS INVESTIGATED

CINC0015 - 3

## FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	4000 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.	Interval
Attenuator	Fairview Microwave	SA18E-10	TYA	9/20/2017	12 mo
Attenuator	Fairview Microwave	SA18E-20	TWZ	9/20/2017	12 mo
Filter - High Pass	Micro-Tronics	HPM50108	LFM	9/20/2017	12 mo
Filter - Low Pass	Micro-Tronics	LPM50004	LFK	9/20/2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	11/9/2017	12 mo
Cable	ESM Cable Corp.	Bilog Cables	MNH	11/9/2017	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	24 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	2/14/2017	12 mo
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	12/1/2016	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AJA	6/23/2016	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/6/2017	12 mo

## 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 = RMS Detector

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 = 0.138 mSec  
Pulsewidth of Type 2 Pulse = 0.502 mSec  
Number of Type 1 Pulses = 79  
Number of Type 2 Pulses = 1

Duty Cycle =  $20 \log [((0.138)(79) + (0.502)(1))/100] = -18.9 \text{ dB}$

The duty cycle correction factor of -18.9 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 for measurements at or below 1GHz. Above 1GHz, a resolution bandwidth of 1MHz and a video bandwidth of 3MHz was used.

# SPURIOUS RADIATED EMISSIONS

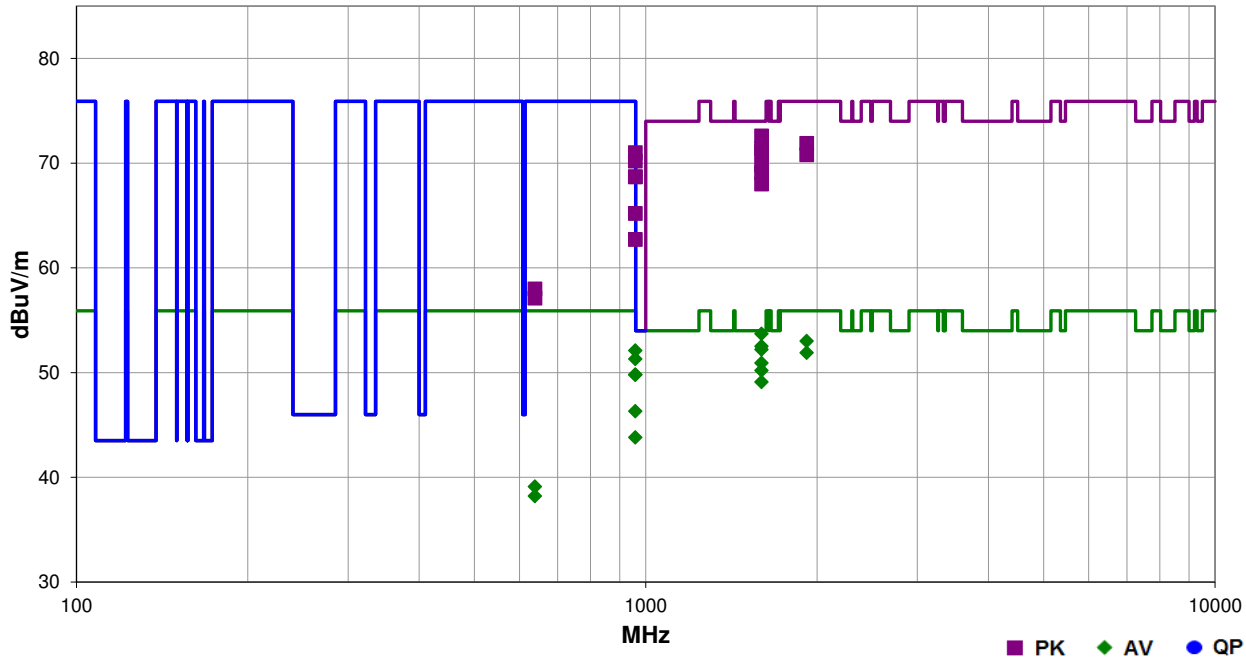


EmiR5 2017.07.11      PSA-ESCI 2017.06.01

<b>Work Order:</b>	CINC0015	<b>Date:</b>	11/16/17	<i>Kyle McMullan</i>
<b>Project:</b>	None	<b>Temperature:</b>	21.8 °C	
<b>Job Site:</b>	MN05	<b>Humidity:</b>	25.5% RH	
<b>Serial Number:</b>	1743	<b>Barometric Pres.:</b>	1026 mbar	
<b>EUT:</b>	RF-ARSHK			<b>Tested by:</b> Kyle McMullan
<b>Configuration:</b>	3			
<b>Customer:</b>	CINCH Systems			
<b>Attendees:</b>	Jibril Aba			
<b>EUT Power:</b>	Battery			
<b>Operating Mode:</b>	Tx unmodulated at 319.5 MHz			
<b>Deviations:</b>	None			
<b>Comments:</b>	None			

<b>Test Specifications</b>	FCC 15.231:2017	<b>Test Method</b>	ANSI C63.10:2013
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<b>Run #</b>	2	<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)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
1597.517	77.7	-5.1	1.0	83.1	-18.9	0.0	Horz	AV	0.0	53.7	54.0	-0.3	EUT Horizontal
1597.517	77.7	-5.1	1.0	83.1	-18.9	0.0	Horz	PK	0.0	72.6	74.0	-1.4	EUT Horizontal
1597.492	76.5	-5.1	1.0	169.0	-18.9	0.0	Vert	AV	0.0	52.5	54.0	-1.5	EUT Vertical
1597.525	76.2	-5.1	1.0	144.0	-18.9	0.0	Horz	AV	0.0	52.2	54.0	-1.8	EUT On Side
1597.492	76.5	-5.1	1.0	169.0	-18.9	0.0	Vert	PK	0.0	71.4	74.0	-2.6	EUT Vertical
1917.000	75.4	-3.5	1.0	226.0	-18.9	0.0	Vert	AV	0.0	53.0	55.9	-2.9	EUT Vertical
1597.525	76.2	-5.1	1.0	144.0	-18.9	0.0	Horz	PK	0.0	71.1	74.0	-2.9	EUT On Side
1597.508	74.9	-5.1	4.0	7.0	-18.9	0.0	Vert	AV	0.0	50.9	54.0	-3.1	EUT Horizontal
958.516	47.0	14.0	2.2	179.0	-18.9	10.0	Horz	AV	0.0	52.1	55.9	-3.8	EUT Vertical
1597.533	74.2	-5.1	1.0	77.1	-18.9	0.0	Vert	AV	0.0	50.2	54.0	-3.8	EUT On Side
1917.008	74.3	-3.5	1.0	136.0	-18.9	0.0	Horz	AV	0.0	51.9	55.9	-4.0	EUT Horizontal
1917.000	75.4	-3.5	1.0	226.0	-18.9	0.0	Vert	PK	0.0	71.9	75.9	-4.0	EUT Vertical
1597.508	74.9	-5.1	4.0	7.0	-18.9	0.0	Vert	PK	0.0	69.8	74.0	-4.2	EUT Horizontal
958.512	46.2	14.0	1.2	215.0	-18.9	10.0	Vert	AV	0.0	51.3	55.9	-4.6	EUT On Side

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
1597.583	73.1	-5.1	1.0	94.1	-18.9	0.0	Horz	AV	0.0	49.1	54.0	-4.9	EUT Vertical
958.516	47.0	14.0	2.2	179.0		10.0	Horz	PK	0.0	71.0	75.9	-4.9	EUT Vertical
1597.533	74.2	-5.1	1.0	77.1		0.0	Vert	PK	0.0	69.1	74.0	-4.9	EUT On Side
1917.008	74.3	-3.5	1.0	136.0		0.0	Horz	PK	0.0	70.8	75.9	-5.1	EUT Horizontal
958.512	46.2	14.0	1.2	215.0		10.0	Vert	PK	0.0	70.2	75.9	-5.7	EUT On Side
1597.583	73.1	-5.1	1.0	94.1		0.0	Horz	PK	0.0	68.0	74.0	-6.0	EUT Vertical
958.509	44.7	14.0	1.0	265.9	-18.9	10.0	Horz	AV	0.0	49.8	55.9	-6.1	EUT Horizontal
958.511	44.7	14.0	1.3	275.9	-18.9	10.0	Vert	AV	0.0	49.8	55.9	-6.1	EUT Vertical
958.509	44.7	14.0	1.0	265.9		10.0	Horz	PK	0.0	68.7	75.9	-7.2	EUT Horizontal
958.511	44.7	14.0	1.3	275.9		10.0	Vert	PK	0.0	68.7	75.9	-7.2	EUT Vertical
958.514	41.2	14.0	2.8	180.0	-18.9	10.0	Vert	AV	0.0	46.3	55.9	-9.6	EUT Horizontal
958.514	41.2	14.0	2.8	180.0		10.0	Vert	PK	0.0	65.2	75.9	-10.7	EUT Horizontal
958.507	38.7	14.0	2.7	41.1	-18.9	10.0	Horz	AV	0.0	43.8	55.9	-12.1	EUT On Side
958.507	38.7	14.0	2.7	41.1		10.0	Horz	PK	0.0	62.7	75.9	-13.2	EUT On Side
639.010	40.6	7.4	1.0	117.0	-18.9	10.0	Vert	AV	0.0	39.1	55.9	-16.8	EUT On Side
639.005	39.7	7.4	1.2	6.0	-18.9	10.0	Horz	AV	0.0	38.2	55.9	-17.7	EUT Vertical
639.010	40.6	7.4	1.0	117.0		10.0	Vert	PK	0.0	58.0	75.9	-17.9	EUT On Side
639.005	39.7	7.4	1.2	6.0		10.0	Horz	PK	0.0	57.1	75.9	-18.8	EUT Vertical



# OCCUPIED BANDWIDTH



XMI 2017.02.08

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
Cable	Element	Biconilog Cable	MNH	11/9/2017	11/9/2018
Antenna - Biconilog	ETS Lindgren	CBL 6141B	AYD	1/6/2016	1/6/2018
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFI	1/6/2017	1/6/2018

## TEST DESCRIPTION

The measurement was made in a radiated configuration of the fundamental with the carrier fully maximized for its highest radiated power. 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



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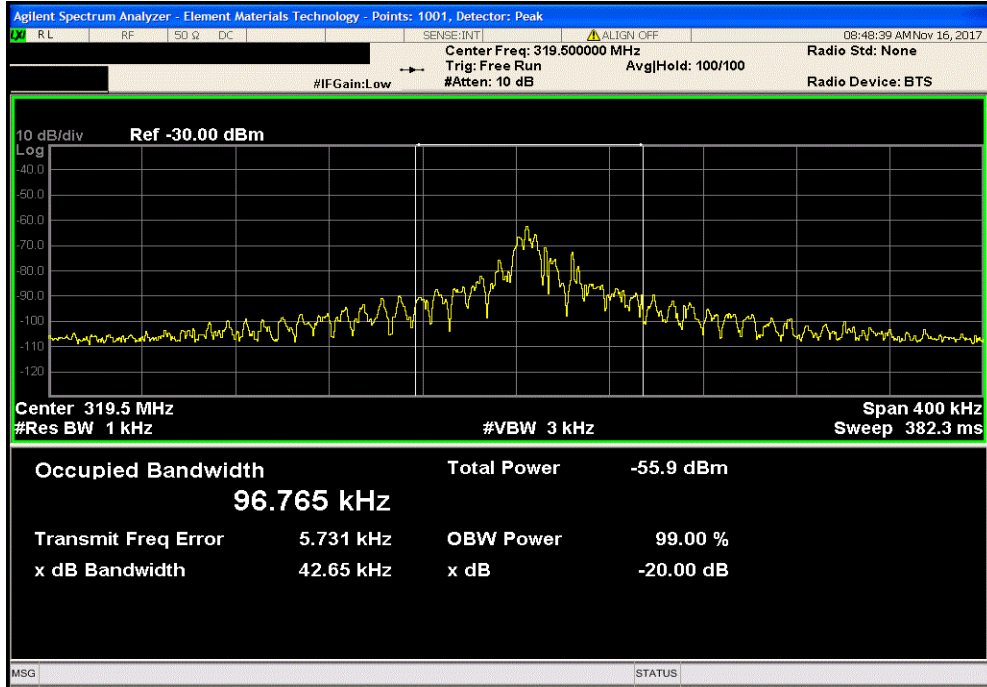
EUT: RF-ARSHK		Work Order: CINC0015	
Serial Number: 1741		Date: 11/16/17	
Customer: CINCH Systems		Temperature: 22.1 °C	
Attendees: Jibril Aba		Humidity: 26.5% RH	
Project: None		Barometric Pres.: 1024.7 mbar	
Tested by: Kyle McMullan		Power: Battery	
Job Site: MN05			
<b>TEST SPECIFICATIONS</b>			
FCC 15.231:2017		Test Method	
		ANSI C63.10:2013	
<b>COMMENTS</b>			
None			
<b>DEVIATIONS FROM TEST STANDARD</b>			
None			
Configuration #	1	Signature <i>Kyle McMullan</i>	
		-20 dB	
319.5 MHz		OB (kHz)	Limit (kHz) Result
		42.65	798 Pass

# OCCUPIED BANDWIDTH



XMI 2017.02.08

319.5 MHz				-20 dB		
	OB (kHz)	Limit (kHz)	Result			
	42.65	798	Pass			



# DUTY CYCLE



XMI 2017.02.08

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
Cable	Element	Biconilog Cable	MNH	11/9/2017	11/9/2018
Antenna - Biconilog	ETS Lindgren	CBL 6141B	AYD	1/6/2016	1/6/2018
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFI	1/6/2017	1/6/2018

## TEST DESCRIPTION

The measurement was made in a radiated configuration of the fundamental with the carrier fully maximized for its highest radiated power. 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 = 0.138 mSec  
Pulsewidth of Type 2 Pulse = 0.502 mSec  
Number of Type 1 Pulses = 79  
Number of Type 2 Pulses = 1

Duty Cycle =  $20 \log [(0.138)(79) + (0.502)(1)]/100 = -18.9 \text{ dB}$

The duty cycle correction factor of -18.9 dB was added to the peak readings to mathematically derive the average levels. Peak measurements were made with a resolution bandwidth of 120kHz and a video bandwidth of 300kHz.

# DUTY CYCLE



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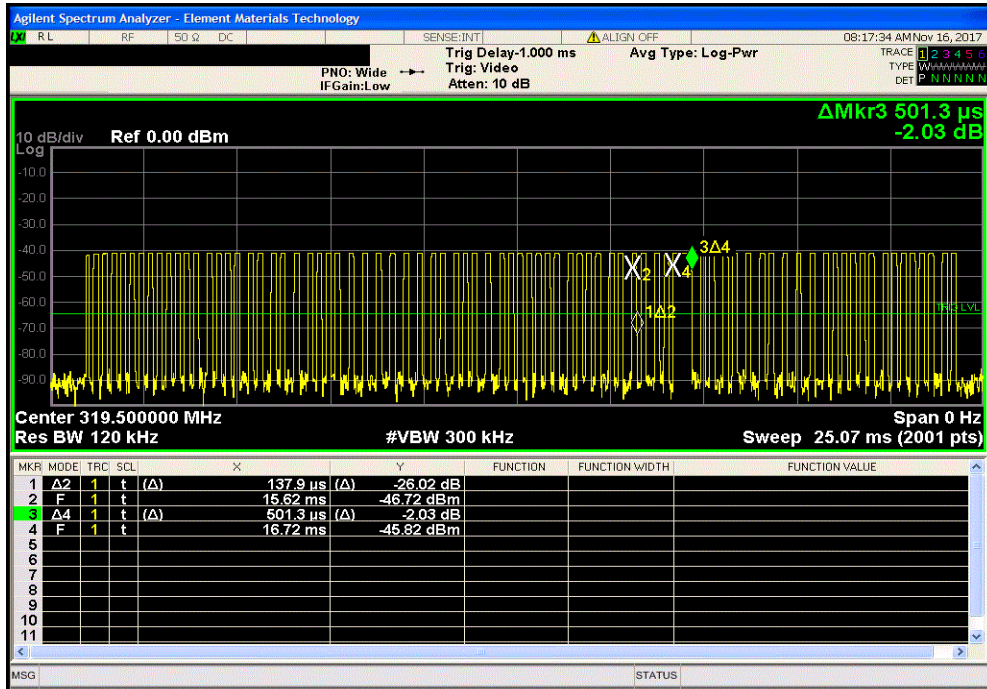
EUT: RF-ARSHK		Work Order: CINC0015						
Serial Number: 1745		Date: 11/16/17						
Customer: CINCH Systems		Temperature: 22.1 °C						
Attendees: Jibril Aba		Humidity: 26.5% RH						
Project: None		Barometric Pres.: 1024.7 mbar						
Tested by: Kyle McMullan		Power: Battery						
Job Site: MN05								
<b>TEST SPECIFICATIONS</b>								
FCC 15.231:2017		Test Method						
		ANSI C63.10:2013						
<b>COMMENTS</b>								
None								
<b>DEVIATIONS FROM TEST STANDARD</b>								
None								
Configuration #	2	Signature <i>Kyle McMullan</i>						
		Number of Type 1 Pulses	Type 1 Pulse Length (ms)	Number of Type 2 Pulses	Type 2 Pulse Length (ms)	DCCF	Limit	Result
25 milliseconds		79	0.138	1	0.502	-18.9	N/A	N/A
5 seconds		N/A	N/A	N/A	N/A	N/A	N/A	N/A
10 seconds		N/A	N/A	N/A	N/A	N/A	N/A	N/A

# DUTY CYCLE

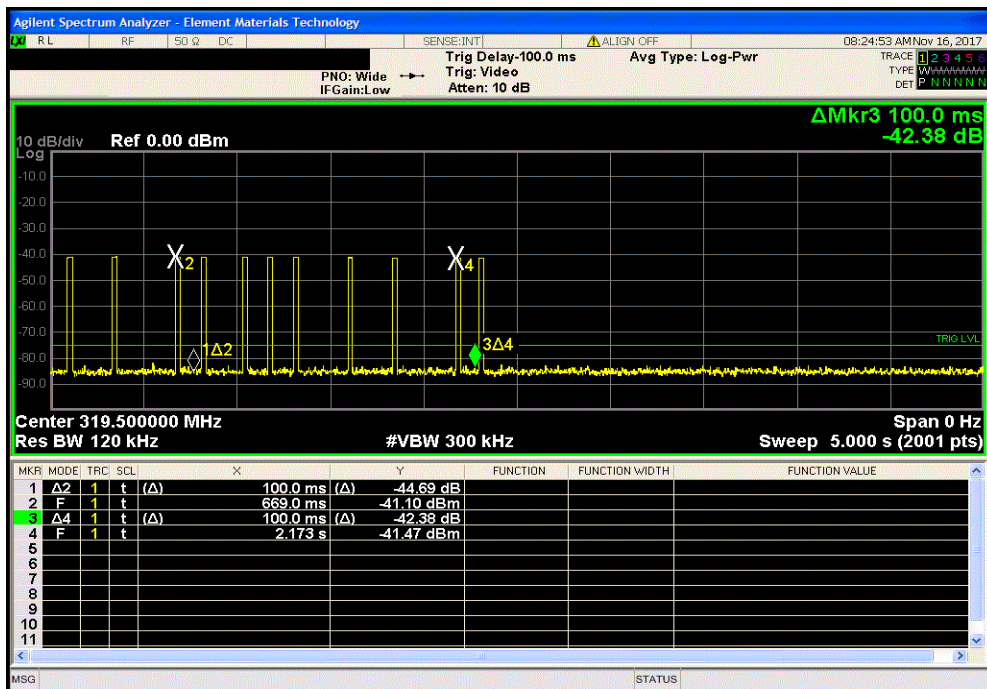


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25 milliseconds						
Number of Type 1 Pulses	Type 1 Pulse Length (ms)	Number of Type 2 Pulses	Type 2 Pulse Length (ms)	DCCF	Limit	Result
79	0.138	1	0.502	-18.9	N/A	N/A



5 seconds						
Number of Type 1 Pulses	Type 1 Pulse Length (ms)	Number of Type 2 Pulses	Type 2 Pulse Length (ms)	DCCF	Limit	Result
N/A	N/A	N/A	N/A	N/A	N/A	N/A



# DUTY CYCLE



XMI 2017.02.08

10 seconds						
Number of Type 1 Pulses	Type 1 Pulse Length (ms)	Number of Type 2 Pulses	Type 2 Pulse Length (ms)	DCCF	Limit	Result
N/A	N/A	N/A	N/A	N/A	N/A	N/A

