



**CINCH Systems**  
**RF-CHW-ITI-S-FIRE**  
**FCC 15.231:2018**  
**FCC 15.207:2018**  
**Low Power Periodic Transceiver**

**Report # CINC0020**



NVLAP LAB CODE: 200881-0

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# CERTIFICATE OF TEST



2017-1-25

Last Date of Test: March 21, 2018  
CINCH Systems  
Model: RF-CHW-ITI-S-FIRE

## Radio Equipment Testing

### Standards

Specification	Method
FCC 15.207:2018	
FCC 15.231:2018	ANSI C63.10:2013

### Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
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:

A handwritten signature in blue ink, appearing to read 'Matt Nuernberg'.

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



Revision Number	Description	Date	Page Number
00	None		

# ACCREDITATIONS AND AUTHORIZATIONS



## 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

## 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.

## European Union

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

## Australia/New Zealand

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

## Korea

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

## Japan

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

## 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.

## Singapore

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

## Israel

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

## Hong Kong

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

## Vietnam

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

## SCOPE

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

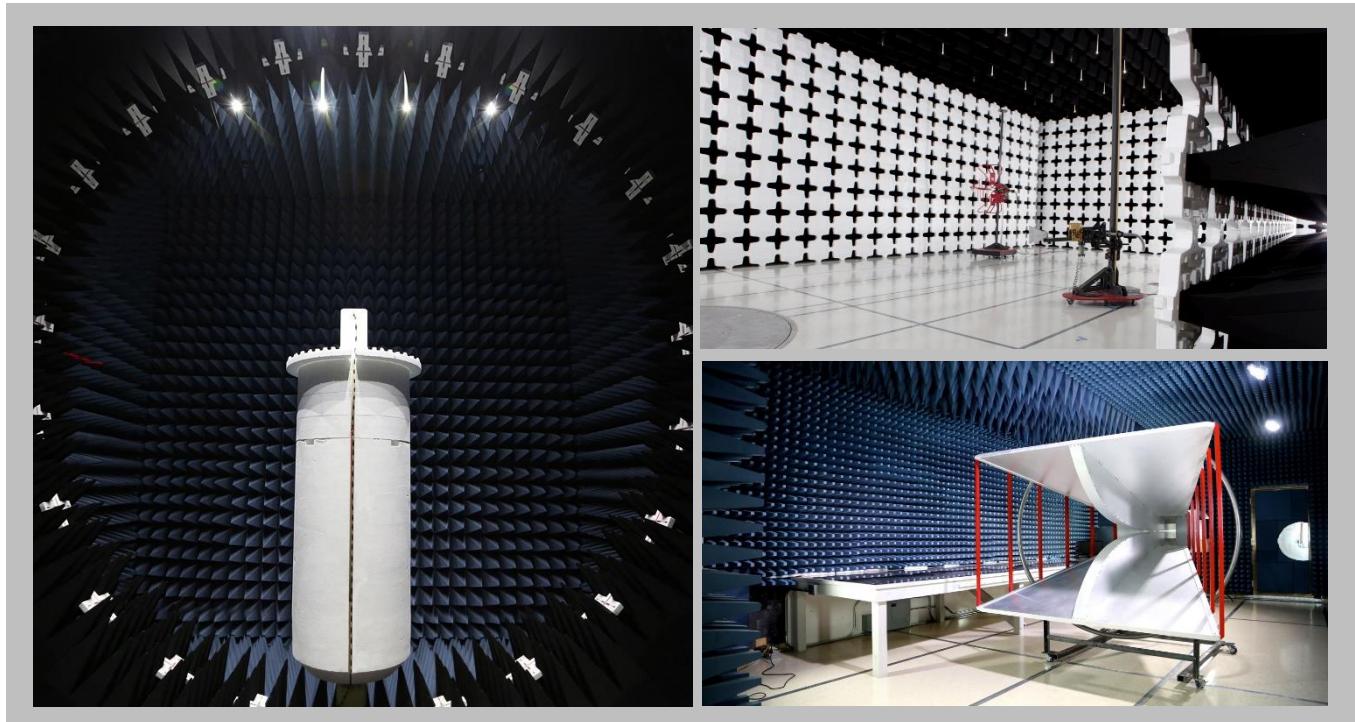
<http://portlandcustomer.element.com/ts/scope/scope.htm>

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

# FACILITIES



California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-10 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 6775 NE Evergreen Pkwy #400 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
<b>NVLAP</b>					
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
<b>Innovation, Science and Economic Development Canada</b>					
2834B-1, 2834B-3	2834E-1, 2834E-3	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
<b>BSMI</b>					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
<b>VCCI</b>					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
<b>Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA</b>					
US0158	US0175	N/A	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.

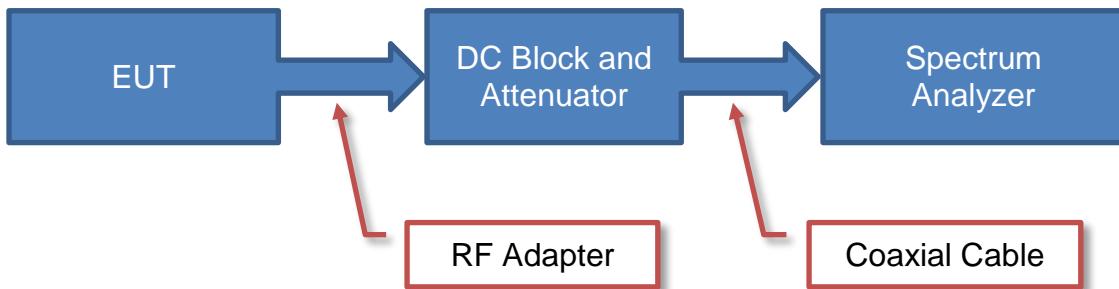
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable 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.

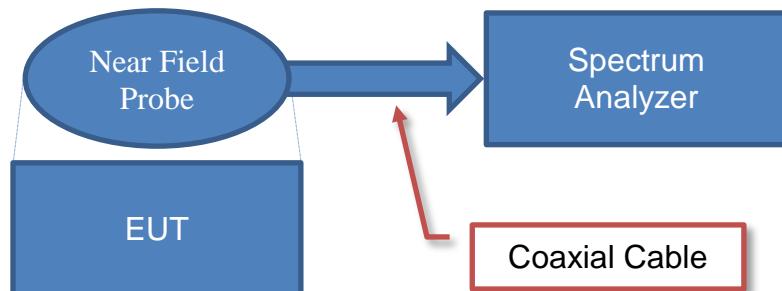
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

# Test Setup Block Diagrams

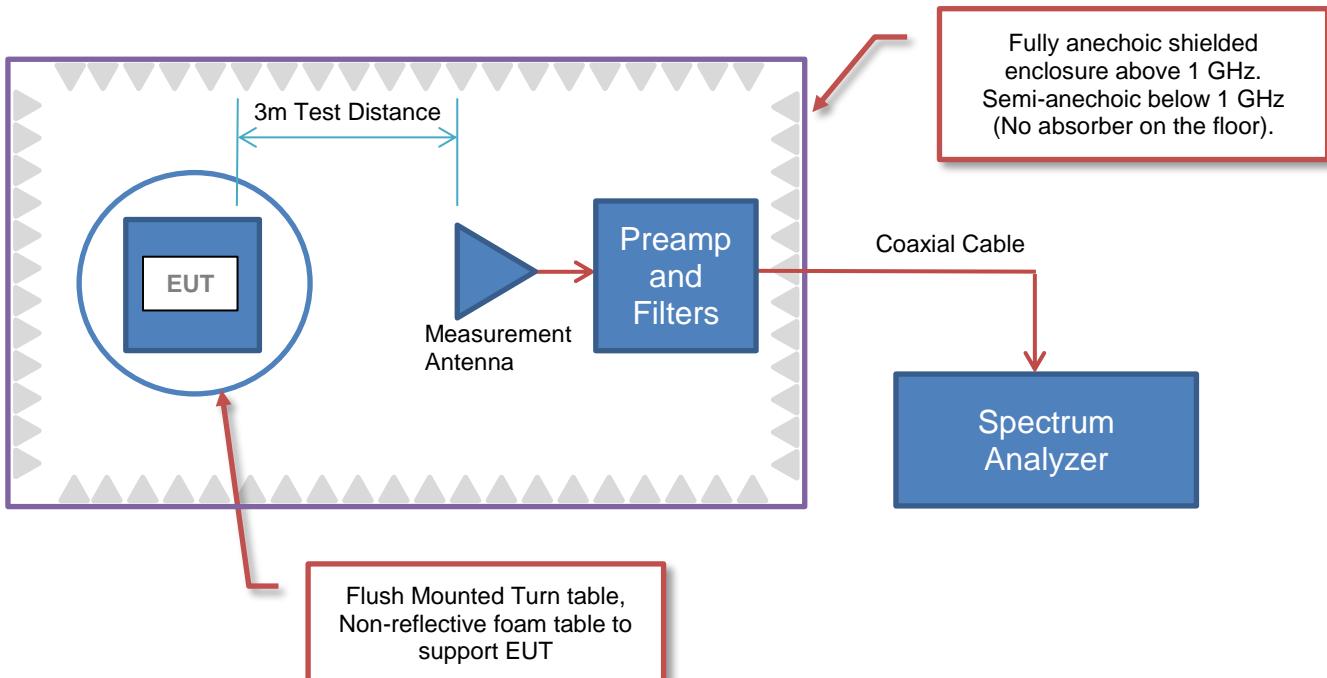
## Antenna Port Conducted Measurements



## 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>	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-CHW-ITI-S-FIRE
<b>First Date of Test:</b>	March 19, 2018
<b>Last Date of Test:</b>	March 21, 2018
<b>Receipt Date of Samples:</b>	March 19, 2018
<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:

Transceiver for alarm security industry 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 CINC0020- 2

<b>EUT</b>					
<b>Description</b>	<b>Manufacturer</b>	<b>Model/Part Number</b>	<b>Serial Number</b>		
RF-CHW-ITI-S-FIRE	CINCH Systems	N/A	F31		

<b>Peripherals in test setup boundary</b>					
<b>Description</b>	<b>Manufacturer</b>	<b>Model/Part Number</b>	<b>Serial Number</b>		
DC Adaptor	Generic	CSE1601-D	E353601		

<b>Cables</b>					
<b>Cable Type</b>	<b>Shield</b>	<b>Length (m)</b>	<b>Ferrite</b>	<b>Connection 1</b>	<b>Connection 2</b>
DC Cable	No	1 m	No	RF-CHW-ITI-S-FIRE	DC Adaptor

## Configuration CINC0020- 3

<b>EUT</b>					
<b>Description</b>	<b>Manufacturer</b>	<b>Model/Part Number</b>	<b>Serial Number</b>		
RF-CHW-ITI-S-FIRE	CINCH Systems	N/A	F32		

<b>Peripherals in test setup boundary</b>					
<b>Description</b>	<b>Manufacturer</b>	<b>Model/Part Number</b>	<b>Serial Number</b>		
DC Adaptor	Generic	CSE1601-D	E353601		

<b>Cables</b>					
<b>Cable Type</b>	<b>Shield</b>	<b>Length (m)</b>	<b>Ferrite</b>	<b>Connection 1</b>	<b>Connection 2</b>
DC Cable	No	1 m	No	RF-CHW-ITI-S-FIRE	DC Adaptor
2-wire Cable x8	No	1 m	No	RF-CHW-ITI-S-FIRE	Unterminated

# MODIFICATIONS



## Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	3/19/2018	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	3/19/2018	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	3/19/2018	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	3/19/2018	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.
5	3/21/2018	Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

# POWERLINE CONDUCTED EMISSIONS



## TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

## TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Cable - Conducted Cable Assembly	Element	MNC, HGN, TYK	MNCA	3/14/2018	3/14/2019
Receiver	Rohde & Schwarz	ESR7	ARI	6/4/2017	6/4/2018
LISN	Solar Electronics	9252-50-R-24-BNC	LIY	3/15/2018	3/15/2019

## MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

## CONFIGURATIONS INVESTIGATED

CINC0020-3

## MODES INVESTIGATED

Transmitting at 319.508 MHz

# POWERLINE CONDUCTED EMISSIONS



EUT:	RF-CHW-ITI-S-FIRE	Work Order:	CINC0020
Serial Number:	F32	Date:	03/21/2018
Customer:	CINCH Systems	Temperature:	22.1°C
Attendees:	Jibril Aba	Relative Humidity:	20.7%
Customer Project:	None	Bar. Pressure:	1024 mb
Tested By:	Chris Patterson	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	CINC0020-3

## TEST SPECIFICATIONS

Specification:	Method:
FCC 15.231:2018	ANSI C63.10:2013

## TEST PARAMETERS

Run #:	3	Line:	High Line	Add. Ext. Attenuation (dB):	0
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## COMMENTS

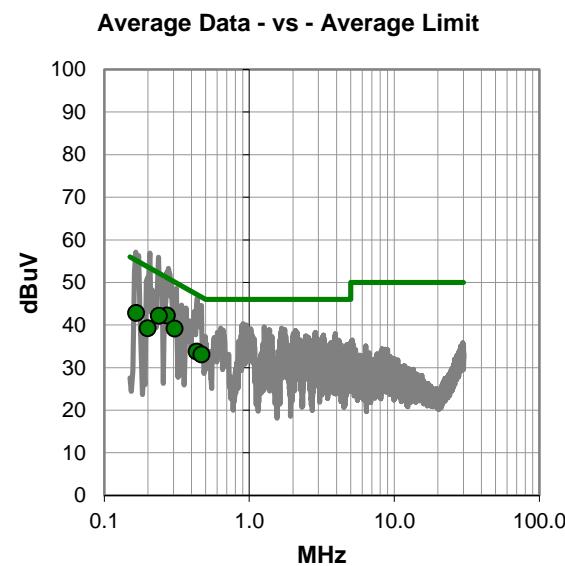
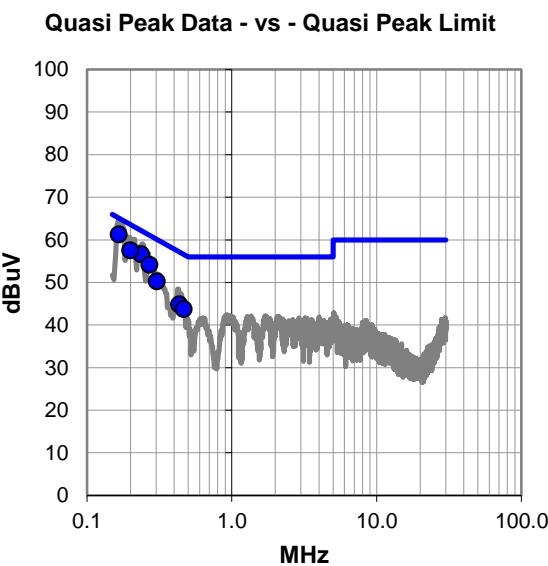
None

## EUT OPERATING MODES

Transmitting at 319.508 MHz

## DEVIATIONS FROM TEST STANDARD

None



# POWERLINE CONDUCTED EMISSIONS



## RESULTS - Run #3

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.165	40.6	20.7	61.3	65.2	-3.9
0.237	36.1	20.6	56.7	62.2	-5.5
0.199	37.0	20.6	57.6	63.7	-6.1
0.269	33.7	20.5	54.2	61.1	-6.9
0.304	29.9	20.4	50.3	60.1	-9.8
0.433	24.5	20.4	44.9	57.2	-12.3
0.466	23.4	20.4	43.8	56.6	-12.8

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.269	21.8	20.5	42.3	51.1	-8.8
0.237	21.6	20.6	42.2	52.2	-10.0
0.304	18.8	20.4	39.2	50.1	-10.9
0.165	22.2	20.7	42.9	55.2	-12.3
0.433	13.4	20.4	33.8	47.2	-13.4
0.466	12.7	20.4	33.1	46.6	-13.5
0.199	18.7	20.6	39.3	53.7	-14.4

## CONCLUSION

Pass

Tested By

# POWERLINE CONDUCTED EMISSIONS



EUT:	RF-CHW-ITI-S-FIRE	Work Order:	CINC0020
Serial Number:	F32	Date:	03/21/2018
Customer:	CINCH Systems	Temperature:	22.1°C
Attendees:	Jibril Aba	Relative Humidity:	20.7%
Customer Project:	None	Bar. Pressure:	1024 mb
Tested By:	Chris Patterson	Job Site:	MN03
Power:	110VAC/60Hz	Configuration:	CINC0020-3

## TEST SPECIFICATIONS

Specification:	Method:
FCC 15.231:2018	ANSI C63.10:2013

## TEST PARAMETERS

Run #:	4	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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## COMMENTS

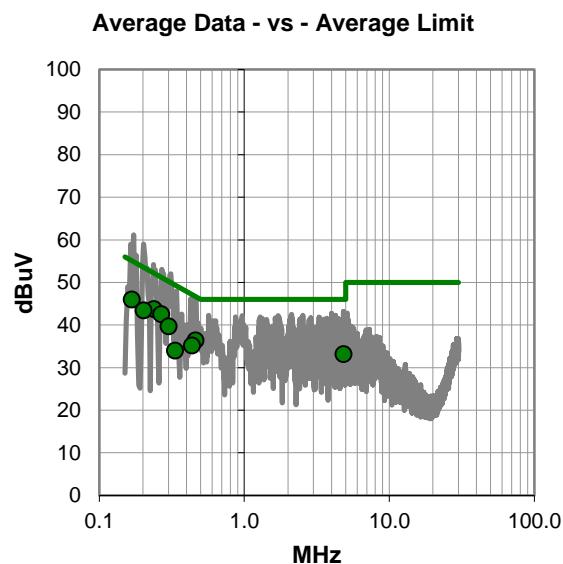
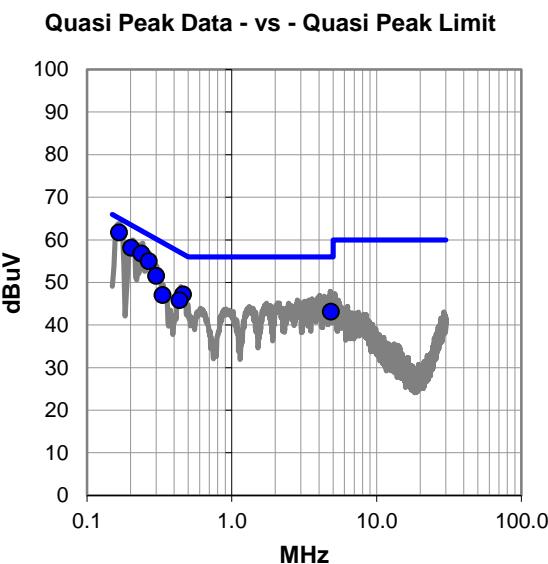
None

## EUT OPERATING MODES

Transmitting at 319.508 MHz

## DEVIATIONS FROM TEST STANDARD

None





# POWERLINE CONDUCTED EMISSIONS

## RESULTS - Run #4

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.167	41.1	20.7	61.8	65.1	-3.3
0.202	37.6	20.6	58.2	63.5	-5.3
0.238	36.2	20.6	56.8	62.2	-5.4
0.267	34.5	20.5	55.0	61.2	-6.2
0.301	31.2	20.4	51.6	60.2	-8.6
0.460	26.8	20.4	47.2	56.7	-9.5
0.436	25.5	20.4	45.9	57.1	-11.2
0.333	26.7	20.4	47.1	59.4	-12.3
4.835	22.5	20.7	43.2	56.0	-12.8

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.238	23.2	20.6	43.8	52.2	-8.4
0.267	22.1	20.5	42.6	51.2	-8.6
0.167	25.3	20.7	46.0	55.1	-9.1
0.202	22.9	20.6	43.5	53.5	-10.0
0.460	16.0	20.4	36.4	46.7	-10.3
0.301	19.3	20.4	39.7	50.2	-10.5
0.436	14.8	20.4	35.2	47.1	-11.9
4.835	12.5	20.7	33.2	46.0	-12.8
0.333	13.6	20.4	34.0	49.4	-15.4

## CONCLUSION

Pass

Tested By

# FIELD STRENGTH OF FUNDAMENTAL



PSA-ESCI 2017.12.19

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

Transmitting at 319.508 MHz, Modulated

## POWER SETTINGS INVESTIGATED

Battery

## CONFIGURATIONS INVESTIGATED

CINC0020 - 3

## FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	1000 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
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-2017	12 mo
Cable	ESM Cable Corp.	Bilog Cables	MNH	9-Nov-2017	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYD	25-Jan-2018	24 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

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" =  $N1L1 + N2L2 + \dots$

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 = 0.78 mSec

Pulsewidth of Type 2 Pulse = 0.47 mSec

Pulsewidth of Type 3 Pulse = 0.1 mSec

Number of Type 1 Pulses = 1

Number of Type 2 Pulses = 1

Number of Type 3 Pulses = 78

Duty Cycle =  $20 \log [((1)(.78) + (1)(.47) + (78)(.1))/100] = -20.87 \text{ dB}$

The duty cycle correction factor of  $-20.87 \text{ dB}$  was added to the peak readings to mathematically derive the average levels. Peak measurements were made with a resolution bandwidth of 100 kHz and a video bandwidth of 300 kHz.

# FIELD STRENGTH OF FUNDAMENTAL



EmiR5 2018.02.06

PSA-ESCI 2017.12.19

Work Order:	CINC0020	Date:	19-Mar-2018	EmIR5 2018.02.06	PSA-ESCI 2017.12.01
Project:	None	Temperature:	21.8 °C		
Job Site:	MN05	Humidity:	23.4% RH		
Serial Number:	F32	Barometric Pres.:	1018 mbar	Tested by:	Chris Patterson
EUT:	RF-CHW-ITI-S-FIRE				
Configuration:	3				
Customer:	CINCH Systems				
Attendees:	Jibril Aba				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting at 319.508 MHz, Modulated				
Deviations:	None				
Comments:	None				
Test Specifications			Test Method		

Test Specifications	Test Method
FCC 15.231:2018	ANSI C63.10:2013

Run #	5	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Detailed description: This is a scatter plot with a grid background. The x-axis is labeled 'MHz' and has major ticks at 10, 100, and 1000. The y-axis is labeled 'dB' and has major ticks from 0 to 100 in increments of 10. There are two horizontal reference lines: a purple line at approximately 96 dB and a green line at approximately 76 dB. Data points are represented by purple squares for 'PK' and green diamonds for 'AV'. The PK data points are located at approximately 150, 200, and 300 MHz with values around 95, 96, and 97 dB respectively. The AV data points are located at approximately 300, 350, 400, and 450 MHz with values around 65, 70, 72, and 73 dB respectively.

Series	Frequency (MHz)	Power (dB)
PK	150	95
	200	96
	300	97
AV	300	65
	350	70
	400	72
	450	73

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	73.1	20.2	1.0	300.9		0.0	Horz	PK	0.0	93.3	95.9	-2.6	EUT Horz, CW
319.505	73.1	20.2	1.0	300.9	-20.9	0.0	Horz	AV	0.0	72.4	75.9	-3.5	EUT Horz, CW
319.505	71.7	20.2	1.5	89.0		0.0	Vert	PK	0.0	91.9	95.9	-4.0	EUT Horz, CW
319.505	71.2	20.2	1.3	224.1		0.0	Vert	PK	0.0	91.4	95.9	-4.5	EUT Vert, CW
319.505	71.7	20.2	1.5	89.0	-20.9	0.0	Vert	AV	0.0	71.0	75.9	-4.9	EUT Horz, CW
319.505	71.2	20.2	1.3	224.1	-20.9	0.0	Vert	AV	0.0	70.5	75.9	-5.4	EUT Vert, CW
319.505	70.0	20.2	1.0	270.0		0.0	Horz	PK	0.0	90.2	95.9	-5.7	EUT On Side, CW

# SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2017.12.19

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

Transmitting

None

## POWER SETTINGS INVESTIGATED

Battery

## CONFIGURATIONS INVESTIGATED

CINC0020 - 3

## FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	8000 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
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	13-Feb-2018	12 mo
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	21-Nov-2017	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AJA	23-Jun-2016	24 mo
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-2017	12 mo
Cable	ESM Cable Corp.	Bilog Cables	MNH	9-Nov-2017	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYD	25-Jan-2018	24 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 =  $(N1L1 + N2L2 + \dots)/100mS$  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 = 0.78 mSec

Pulsewidth of Type 2 Pulse = 0.47 mSec

Pulsewidth of Type 3 Pulse = 0.1 mSec

Number of Type 1 Pulses = 1

Number of Type 2 Pulses = 1

Number of Type 3 Pulses = 78

Duty Cycle =  $20 \log [((1)(.78) + (1)(.47) + (78)(.1))/100] = -20.87 \text{ dB}$

The duty cycle correction factor of  $-20.87 \text{ dB}$  was added to the peak readings to mathematically derive the average levels. Peak measurements were made with a resolution bandwidth of 100 kHz and a video bandwidth of 300 kHz.

# SPURIOUS RADIATED EMISSIONS



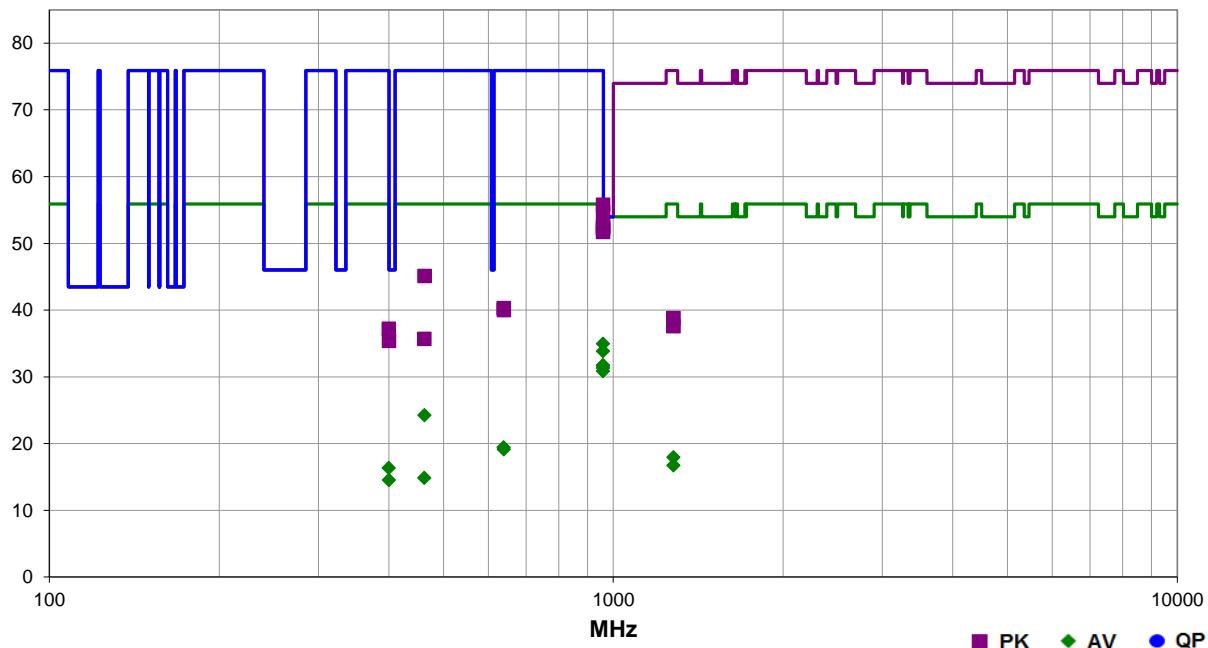
EmiR5 2018.02.06

PSA-ESCI 2017.12.19

Work Order:	CINC0020	Date:	19-Mar-2018	 <b>Tested by:</b> Chris Patterson	
Project:	None	Temperature:	21.8 °C		
Job Site:	MN05	Humidity:	23.4% RH		
Serial Number:	F32	Barometric Pres.:	1018 mbar		
EUT:	RF-CHW-ITI-S-FIRE				
Configuration:	3				
Customer:	CINCH Systems				
Attendees:	Jibril Aba				
EUT Power:	Battery				
Operating Mode:	Transmitting at 319.508 MHz, Modulated				
Deviations:	None				
Comments:	None				

Test Specifications	Test Method
FCC 15.231:2018	ANSI C63.10:2013

Run #	6	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass



Freq (MHz)	Amplitude (dB $\mu$ V)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dB $\mu$ V/m)	Spec. Limit (dB $\mu$ V/m)	Compared to Spec. (dB)	Comments
399.910	25.3	1.9	1.4	45.0		10.0	Vert	PK	0.0	37.2	46.0	-8.8	EUT Horz, CW
399.985	23.5	1.9	1.0	152.1		10.0	Horz	PK	0.0	35.4	46.0	-10.6	EUT Vert, CW
958.510	31.7	14.1	1.1	192.1		10.0	Horz	PK	0.0	55.8	75.9	-20.1	EUT Vert, CW
958.510	31.7	14.1	1.1	192.1	-20.9	10.0	Horz	AV	0.0	34.9	55.9	-21.0	EUT Vert, CW
958.515	30.6	14.1	1.1	24.0		10.0	Vert	PK	0.0	54.7	75.9	-21.2	EUT Horz, CW
958.515	30.6	14.1	1.1	24.0	-20.9	10.0	Vert	AV	0.0	33.8	55.9	-22.1	EUT Horz, CW
958.505	28.5	14.1	1.0	190.0		10.0	Horz	PK	0.0	52.6	75.9	-23.3	EUT On Side, CW
958.510	28.4	14.1	1.0	199.1		10.0	Horz	PK	0.0	52.5	75.9	-23.4	EUT Horz, CW
958.510	28.1	14.1	1.0	339.0		10.0	Vert	PK	0.0	52.2	75.9	-23.7	EUT On Side, CW
958.505	28.5	14.1	1.0	190.0	-20.9	10.0	Horz	AV	0.0	31.7	55.9	-24.2	EUT On Side, CW
958.505	27.6	14.1	1.0	228.1		10.0	Vert	PK	0.0	51.7	75.9	-24.2	EUT Vert, CW
958.510	28.4	14.1	1.0	199.1	-20.9	10.0	Horz	AV	0.0	31.6	55.9	-24.3	EUT Horz, CW
958.510	28.1	14.1	1.0	339.0	-20.9	10.0	Vert	AV	0.0	31.3	55.9	-24.6	EUT On Side, CW
958.505	27.6	14.1	1.0	228.1	-20.9	10.0	Vert	AV	0.0	30.8	55.9	-25.1	EUT Vert, CW
399.910	25.3	1.9	1.4	45.0	-20.9	10.0	Vert	AV	0.0	16.3	46.0	-29.7	EUT Horz, CW

# OCCUPIED BANDWIDTH



XMit 2017.12.13

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	19-Dec-17	19-Dec-18
Cable	ESM Cable Corp.	Bilog Cables	MNH	9-Nov-17	9-Nov-18
Antenna - Biconilog	Teseq	CBL 6141B	AYD	25-Jan-18	25-Jan-20

## TEST DESCRIPTION

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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 99% 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



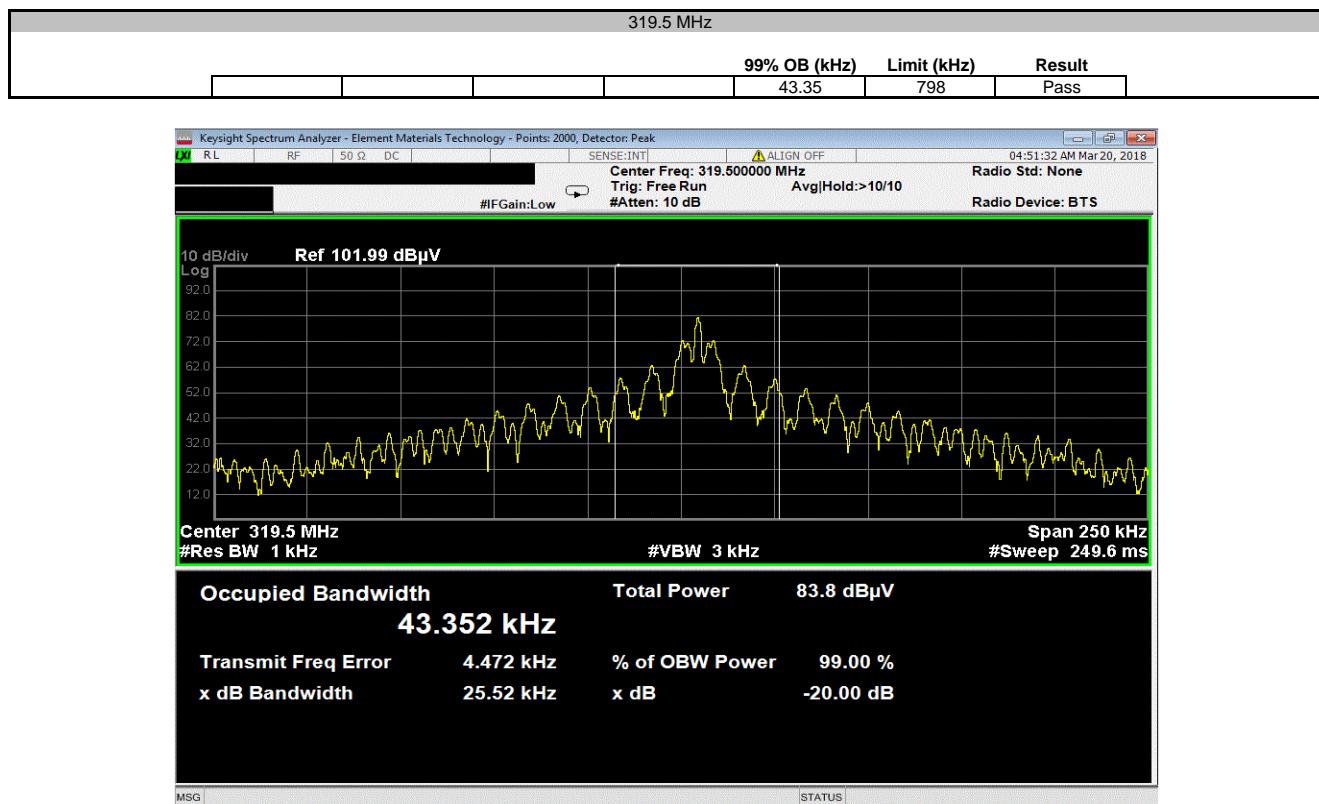
XMit 2017.12.13

EUT:	RF-CHW-ITI-S-FIRE		Work Order:	CINC0020	
Serial Number:	F31		Date:	19-Mar-18	
Customer:	CINCH Systems		Temperature:	22.9 °C	
Attendees:	Jibril Aba		Humidity:	24.7% RH	
Project:	None		Barometric Pres.:	1018 mbar	
Tested by:	Chris Patterson	Power:	110VAC/60Hz	Job Site:	MN05
TEST SPECIFICATIONS			Test Method		
FCC 15.231:2018			ANSI C63.10:2013		
COMMENTS					
Transmitting at 319.508 MHz modulated					
DEVIATIONS FROM TEST STANDARD					
None					
Configuration #	2	Signature			
			99% OB (kHz)	Limit (kHz)	Result
			43.35	798	Pass
319.5 MHz					

# OCCUPIED BANDWIDTH



XMI 2017.12.13



# DUTY CYCLE



XMIT 2017.12.13

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	19-Dec-17	19-Dec-18
Cable	ESM Cable Corp.	Bilog Cables	MNH	9-Nov-17	9-Nov-18
Antenna - Biconilog	Teseq	CBL 6141B	AYD	25-Jan-18	25-Jan-20

## 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 = 0.78 mSec

Pulsewidth of Type 2 Pulse = 0.47 mSec

Pulsewidth of Type 3 Pulse = 0.1 mSec

Number of Type 1 Pulses = 1

Number of Type 2 Pulses = 1

Number of Type 3 Pulses = 78

Duty Cycle =  $20 \log [((1)(.78) + (1)(.47) + (78)(.1))/100] = -20.87 \text{ dB}$

The duty cycle correction factor of  $-20.87 \text{ dB}$  was added to the peak readings to mathematically derive the average levels. Peak measurements were made with a resolution bandwidth of 100 kHz and a video bandwidth of 300 kHz.

# DUTY CYCLE



XMIT 2017.12.13

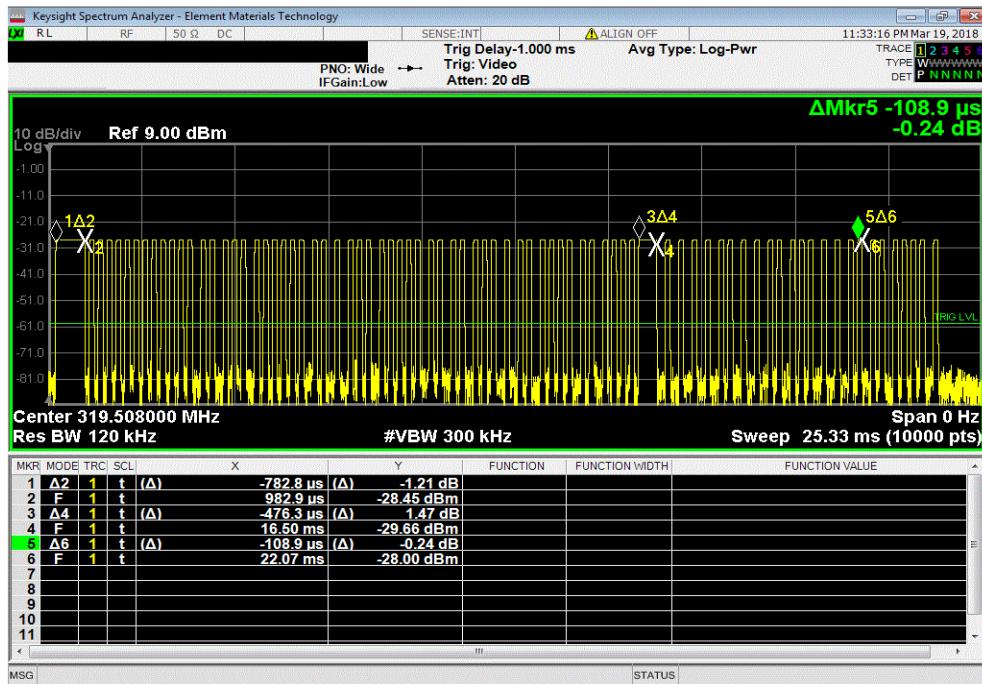
EUT:	RF-CHW-ITI-S-FIRE	Work Order:	CINC0020						
Serial Number:	F31	Date:	19-Mar-18						
Customer:	CINCH Systems	Temperature:	23.1 °C						
Attendees:	Jibril Aba	Humidity:	24.5% RH						
Project:	None	Barometric Pres.:	1019 mbar						
Tested by:	Chris Patterson	Power:	110VAC/60Hz						
TEST SPECIFICATIONS		Test Method							
FCC 15.231:2018		ANSI C63.10:2013							
COMMENTS									
Transmitting at 319.5 MHz									
DEVIATIONS FROM TEST STANDARD									
None									
Configuration #	2	Signature							
		Number of Type 1	Type 1 Pulse length (ms)	Number of Type 2 Pulses	Type 2 Pulse length (ms)	Number of Type 3 Pulses	Type 3 Pulse length (ms)	DCCF	Result
100 ms		1	0.78	1	0.47	78	0.1	-20.87	N/A
5 s		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10 s		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

# DUTY CYCLE

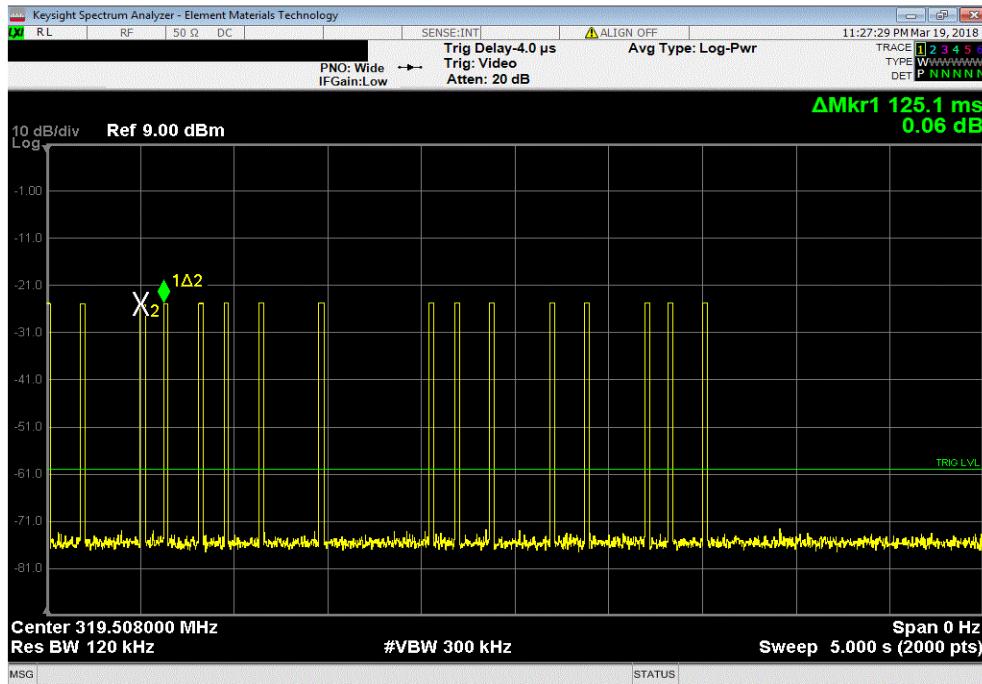


XMI 2017.12.13

100 ms						
Number of Type 1 Pulses	Type 1 Pulse length (ms)	Number of Type 2 Pulses	Type 2 Pulse length (ms)	Number of Type 3 Pulses	Type 3 Pulse length (ms)	DCCF
1	0.78	1	0.47	78	0.1	-20.87



5 s						
Number of Type 1 Pulses	Type 1 Pulse length (ms)	Number of Type 2 Pulses	Type 2 Pulse length (ms)	Number of Type 3 Pulses	Type 3 Pulse length (ms)	DCCF
N/A	N/A	N/A	N/A	N/A	N/A	N/A



# DUTY CYCLE



XMI 2017.12.13

10 s						
Number of Type 1 Pulses	Type 1 Pulse length (ms)	Number of Type 2 Pulses	Type 2 Pulse length (ms)	Number of Type 3 Pulses	Type 3 Pulse length (ms)	DCCF
N/A	N/A	N/A	N/A	N/A	N/A	N/A

