# CINCH Systems

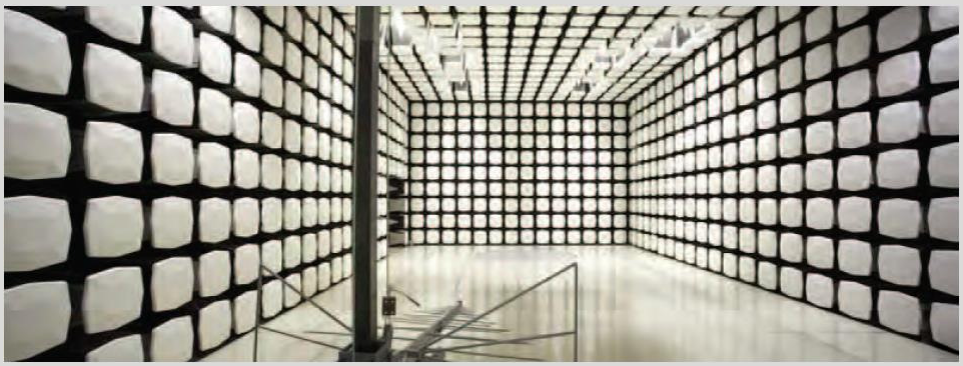
**RF-CHW-ITI-S-FIRE**

**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

**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 | ANSI C63.10:2013 |
| FCC 15.231:2018 | |

### 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:

*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.

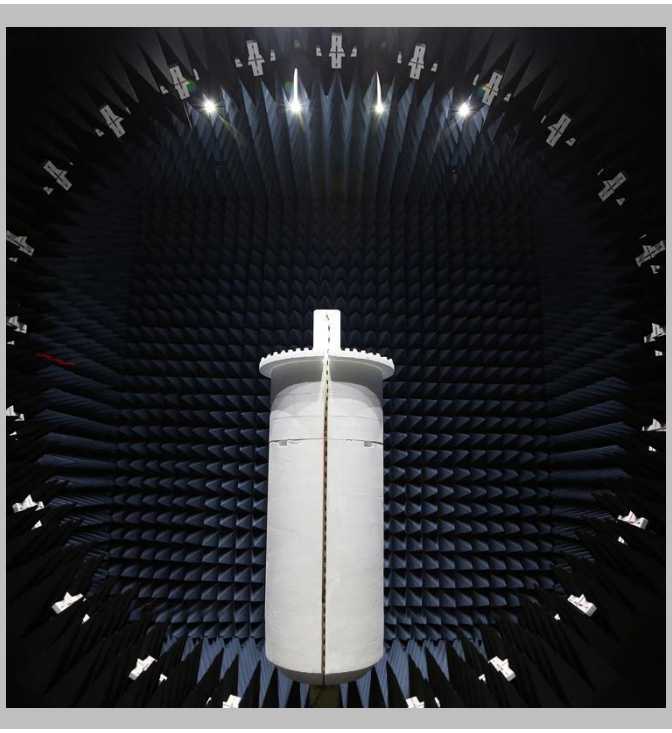
## SCOPE

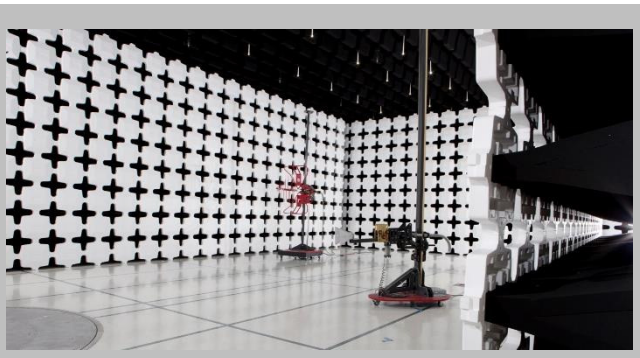
For details on the Scopes of our Accreditations, please visit:
http://portlandcustomer.element.com/ts/scope/scope.htm
http://gsi.nist.gov/global/docs/cabs/designations.html

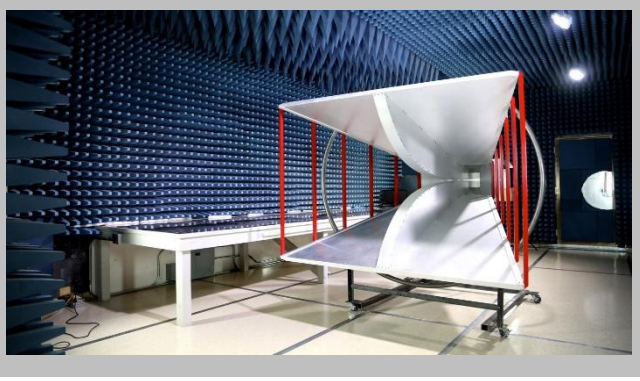
# FACILITIES

2017.9.15

| California | Minnesota | New York | Oregon | Texas | Washington |
|---|---|---|---|---|---|
| Labs OC01-17<br>41 Tesla<br>Irvine, CA 92618<br>(949) 861-8918 | Labs MN01-10<br>9349 W Broadway Ave.<br>Brooklyn Park, MN 55445<br>(612)-638-5136 | Labs NY01-04<br>4939 Jordan Rd.<br>Elbridge, NY 13060<br>(315) 554-8214 | Labs EV01-12<br>6775 NE Evergreen Pkwy #400<br>Hillsboro, OR 97124<br>(503) 844-4066 | Labs TX01-09<br>3801 E Plano Pkwy<br>Plano, TX 75074<br>(469) 304-5255 | Labs NC01-05<br>19201 120th Ave NE<br>Bothell, WA 98011<br>(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 |







# MEASUREMENT UNCERTAINTY

TMU.2015.07.10

## 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.

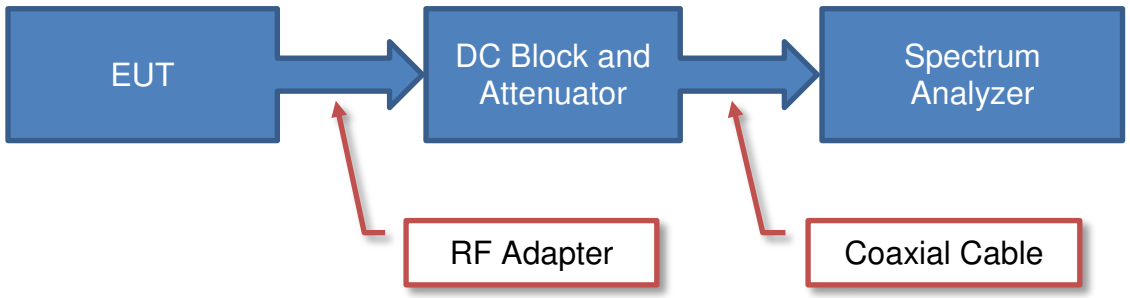
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable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

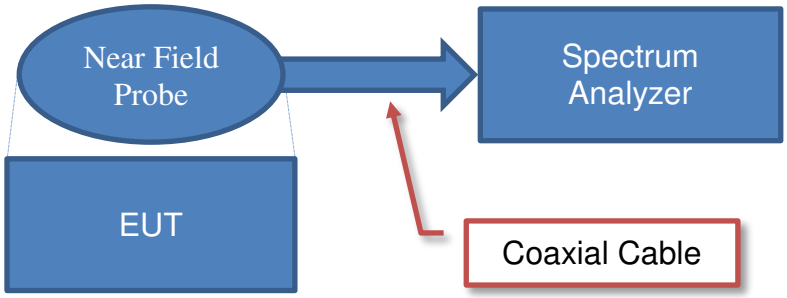
| Test | + MU | - MU |
|---|---|---|
| Frequency Accuracy (Hz) | 0.0007% | -0.0007% |
| Amplitude Accuracy (dB) | 1.2 dB | -1.2 dB |
| Conducted Power (dB) | 0.3 dB | -0.3 dB |
| Radiated Power via Substitution (dB) | 0.7 dB | -0.7 dB |
| Temperature (degrees C) | 0.7°C | -0.7°C |
| Humidity (% RH) | 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

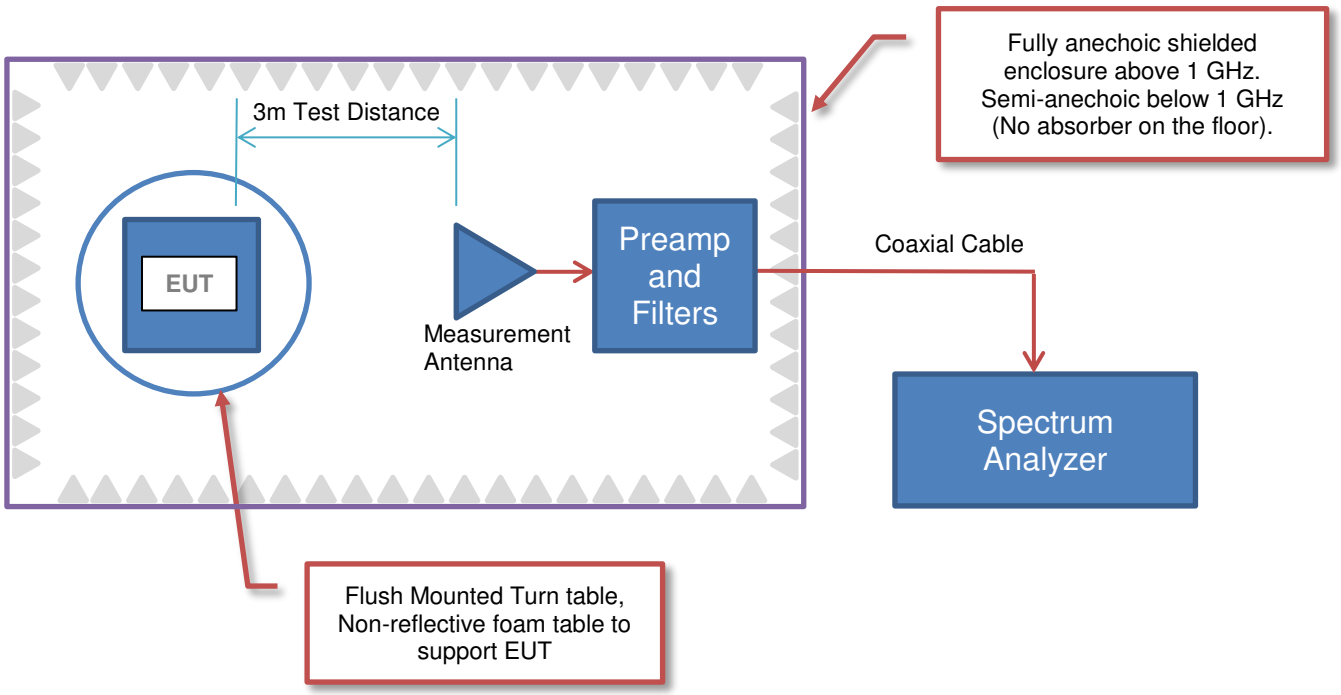
## Antenna Port Conducted Measurements




## Near Field Test Fixture Measurements




## Spurious Radiated Emissions



# PRODUCT DESCRIPTION

## Client and Equipment Under Test (EUT) Information

| | |
|---|---|
| **Company Name:** | CINCH Systems |
| **Address:** | Suite 300 12075 43rd Street NE |
| **City, State, Zip:** | St. Michael, MN 55376 |
| **Test Requested By:** | Jibril Aga |
| **Model:** | RF-CHW-ITI-S-FIRE |
| **First Date of Test:** | March 19, 2018 |
| **Last Date of Test:** | March 21, 2018 |
| **Receipt Date of Samples:** | March 19, 2018 |
| **Equipment Design Stage:** | Production |
| **Equipment Condition:** | No Damage |
| **Purchase Authorization:** | 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

| EUT | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model/Part Number** | **Serial Number** |
| RF-CHW-ITI-S-FIRE | CINCH Systems | N/A | F31 |

| Peripherals in test setup boundary | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model/Part Number** | **Serial Number** |
| DC Adaptor | Generic | CSE1601-D | E353601 |

| Cables | | | | | |
|---|---|---|---|---|---|
| **Cable Type** | **Shield** | **Length (m)** | **Ferrite** | **Connection 1** | **Connection 2** |
| DC Cable | No | 1 m | No | RF-CHW-ITI-S-FIRE | DC Adaptor |

## Configuration CINC0020- 3

| EUT | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model/Part Number** | **Serial Number** |
| RF-CHW-ITI-S-FIRE | CINCH Systems | N/A | F32 |

| Peripherals in test setup boundary | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model/Part Number** | **Serial Number** |
| DC Adaptor | Generic | CSE1601-D | E353601 |

| Cables | | | | | |
|---|---|---|---|---|---|
| **Cable Type** | **Shield** | **Length (m)** | **Ferrite** | **Connection 1** | **Connection 2** |
| 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

2017-1-25

## 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

WTD.2017.11.22.1

## 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 |

## COMMENTS

None

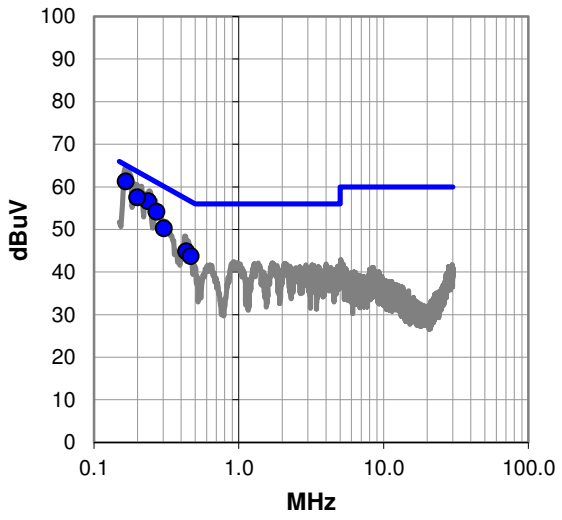
## EUT OPERATING MODES

Transmitting at 319.508 MHz

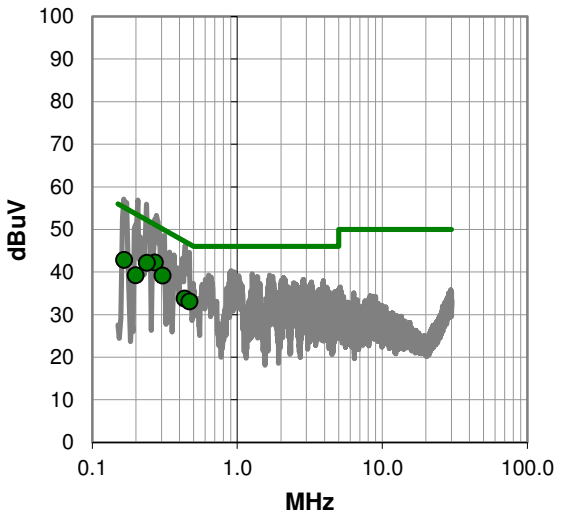
## DEVIATIONS FROM TEST STANDARD

None

**Quasi Peak Data - vs - Quasi Peak Limit**




**Average Data - vs - Average Limit**



# POWERLINE CONDUCTED EMISSIONS

WTD.2017.11.22.1

## 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

WTD.2017.11.22.1

| | | | |
|---|---|---|---|
| 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 |

## COMMENTS

None

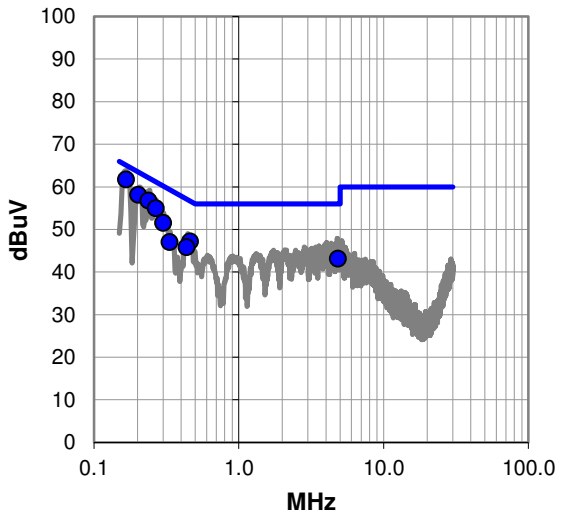
## EUT OPERATING MODES

Transmitting at 319.508 MHz

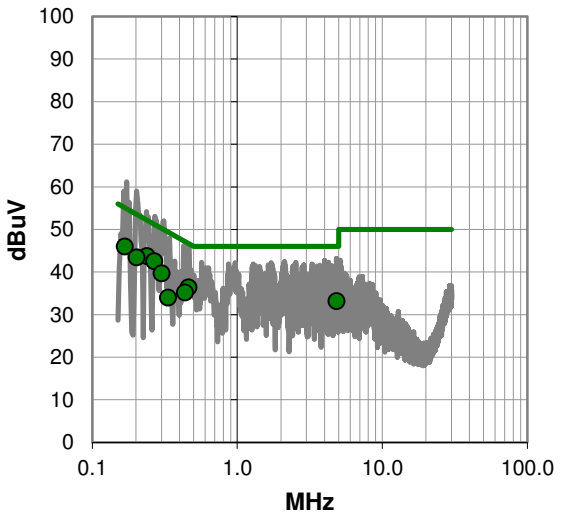
## DEVIATIONS FROM TEST STANDARD

None

**Quasi Peak Data - vs - Quasi Peak Limit**




**Average Data - vs - Average Limit**



# POWERLINE CONDUCTED EMISSIONS

WTD.2017.11.22.1

## 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 |

**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 +….

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 = 0.78 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] = -20.87dB

The duty cycle correction factor of –20.87 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.

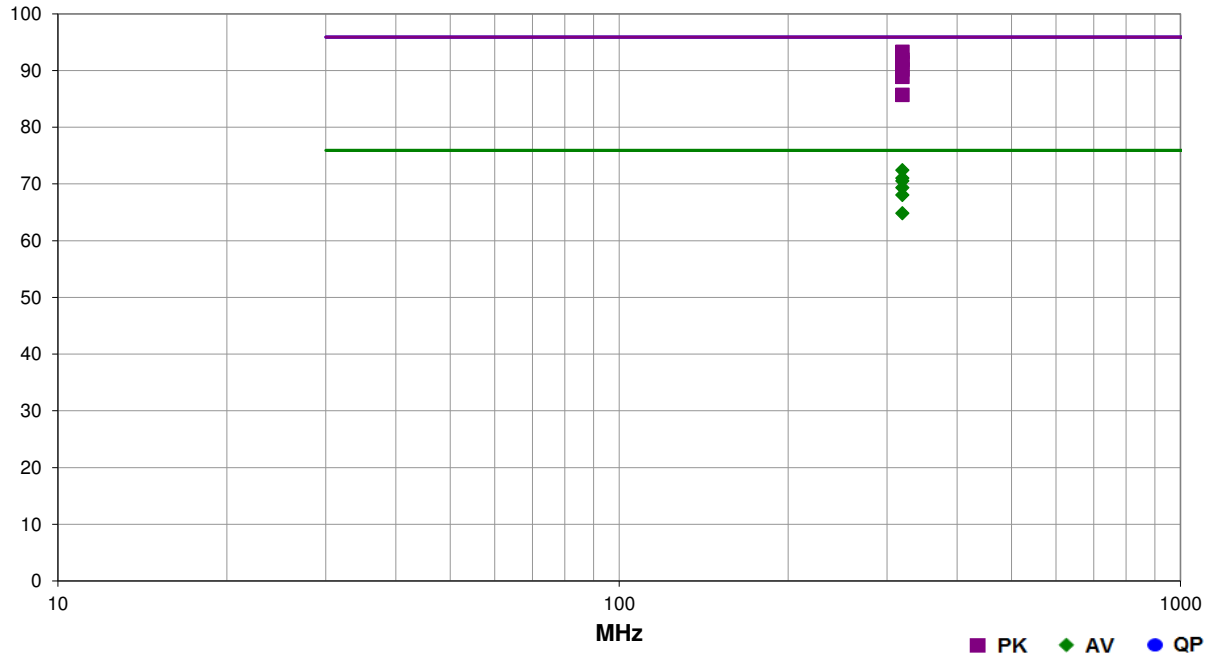
# FIELD STRENGTH OF FUNDAMENTAL

EmiR5 2018.02.06 PSA-ESCI 2017.12.19

| | | | | | |
|---|---|---|---|---|---|
| **Work Order:** | CINC0020 | **Date:** | 19-Mar-2018 | | |
| **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** |
|---|---|
| FCC 15.231:2018 | ANSI C63.10:2013 |

| **Run #** | 5 | **Test Distance (m)** | 3 | **Antenna Height(s)** | 1 to 4(m) | **Results** | Pass |
|---|---|---|---|---|---|---|---|




| 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 |

**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 +….

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 = 0.78 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 dB

The duty cycle correction factor of –20.87 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.

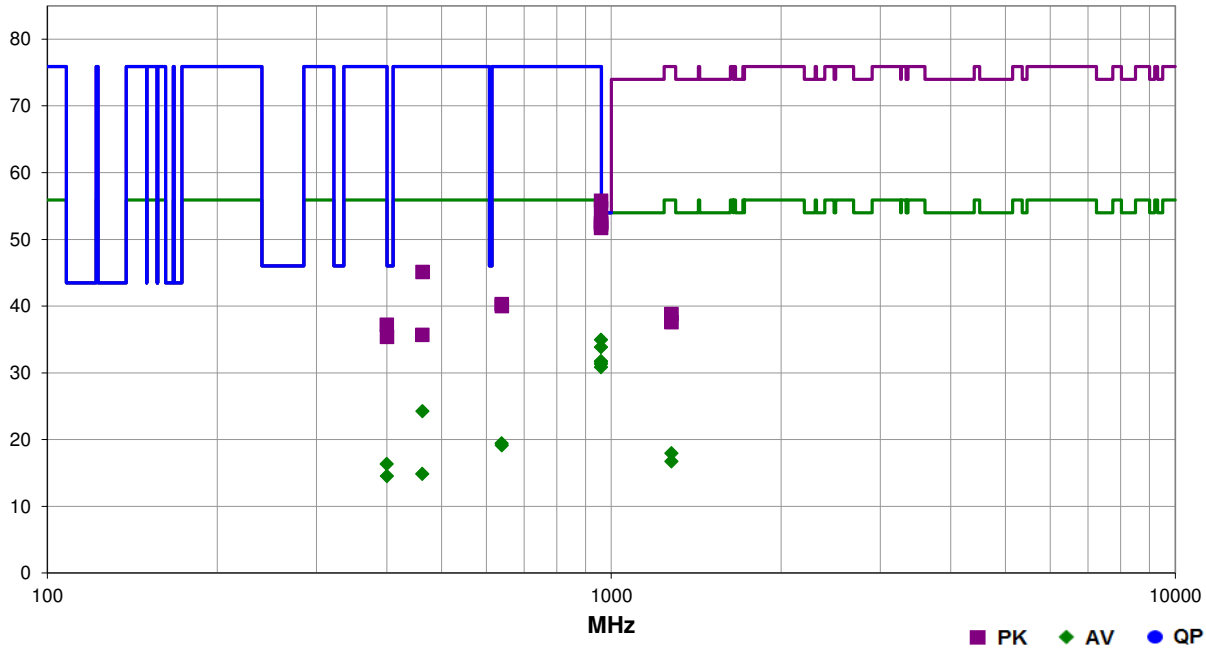
# SPURIOUS RADIATED EMISSIONS

EmiR5 2018.02.06 PSA-ESCI 2017.12.19

| | | | | | |
|---|---|---|---|---|---|
| **Work Order:** | CINC0020 | **Date:** | 19-Mar-2018 | | |
| **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:** | 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 (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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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**

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

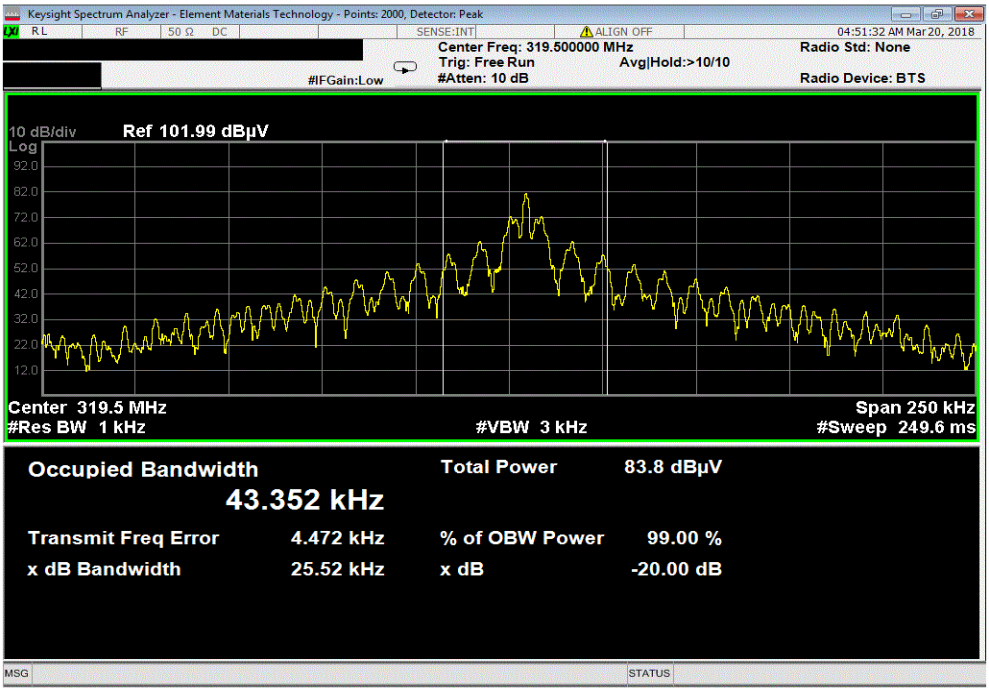
| **Configuration #** | **2** | *Signature* |
|---|---|---|

| | **99% OB (kHz)** | **Limit (kHz)** | **Result** |
|---|---|---|---|
| 319.5 MHz | 43.35 | 798 | Pass |

# OCCUPIED BANDWIDTH

XMit 2017.12.13

| 319.5 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | 99% OB (kHz) | Limit (kHz) | Result |
| | | | | 43.35 | 798 | Pass |



# 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 +….

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 = 0.78 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 dB

The duty cycle correction factor of –20.87 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 | **Job Site:** | MN05 |

| TEST SPECIFICATIONS | Test Method |
|---|---|
| FCC 15.231:2018 | ANSI C63.10:2013 |
| | |

**COMMENTS**

Transmitting at 319.5 MHz

**DEVIATIONS FROM TEST STANDARD**

None

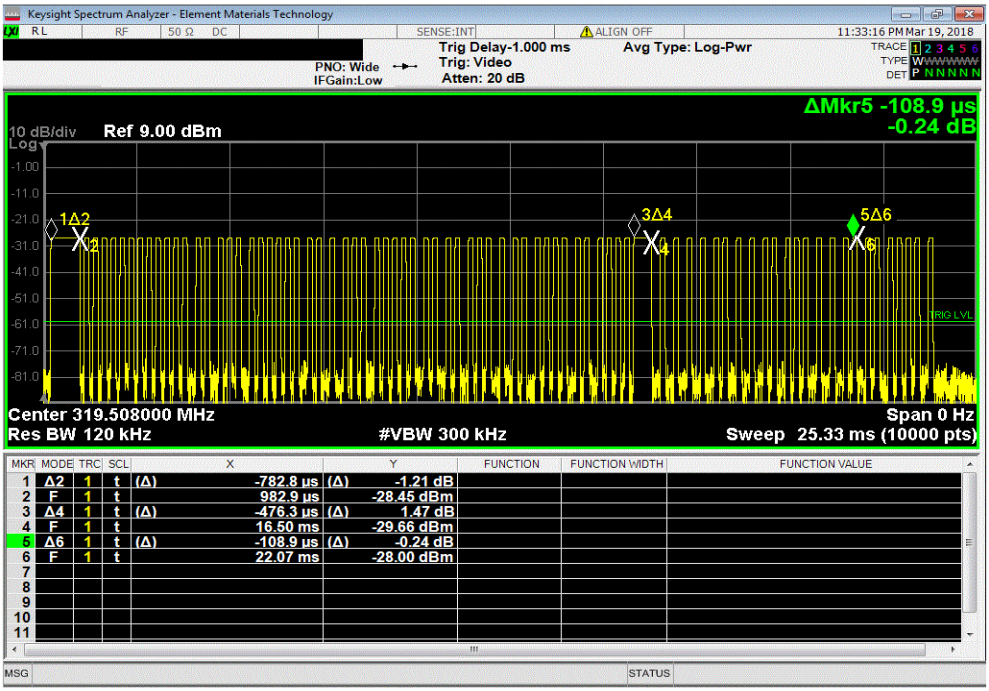
| Configuration # | 2 | Signature |
|---|---|---|

| | 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 |

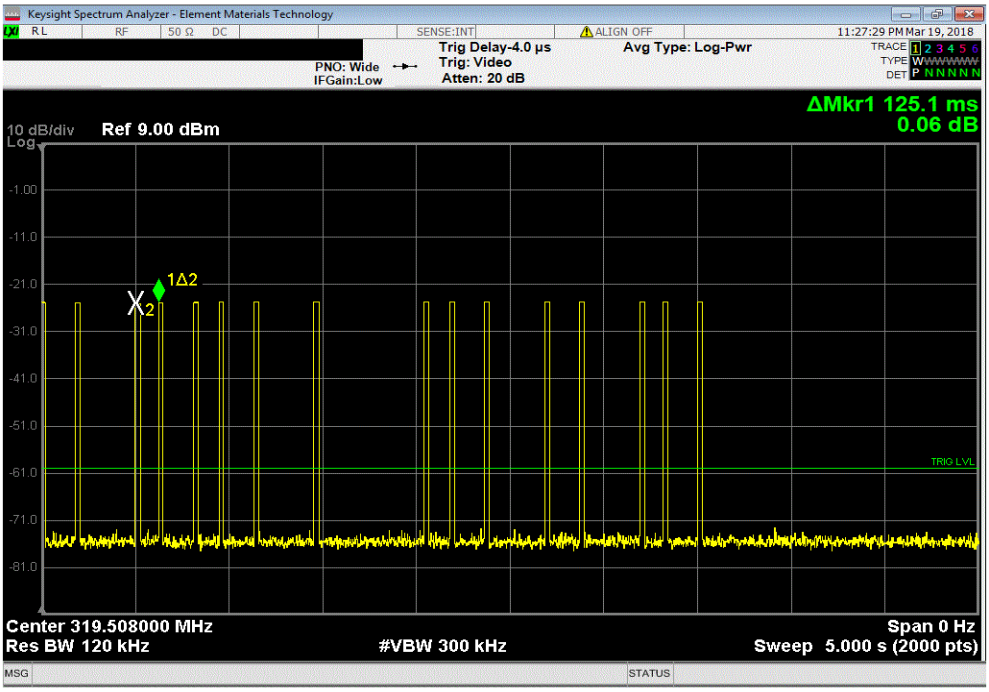
# DUTY CYCLE

XMit 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

XMit 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 |