



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



This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America. This Report shall not be reproduced, except in full without written approval of the laboratory.



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:

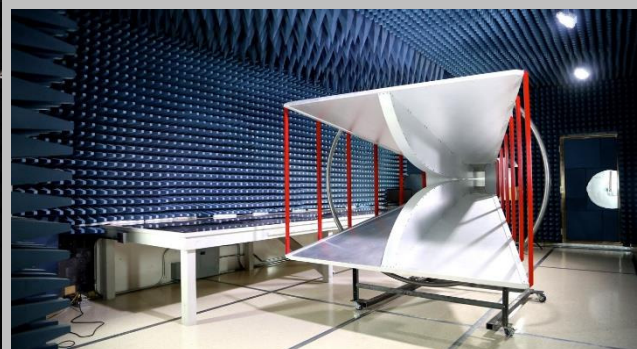
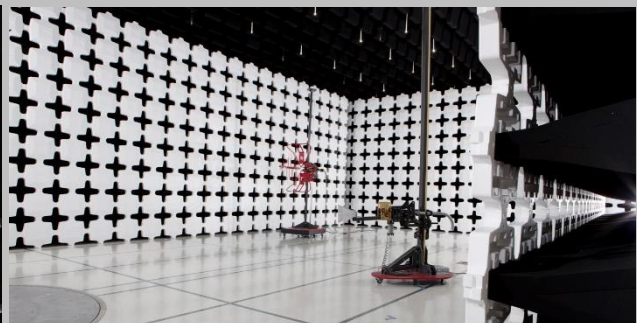
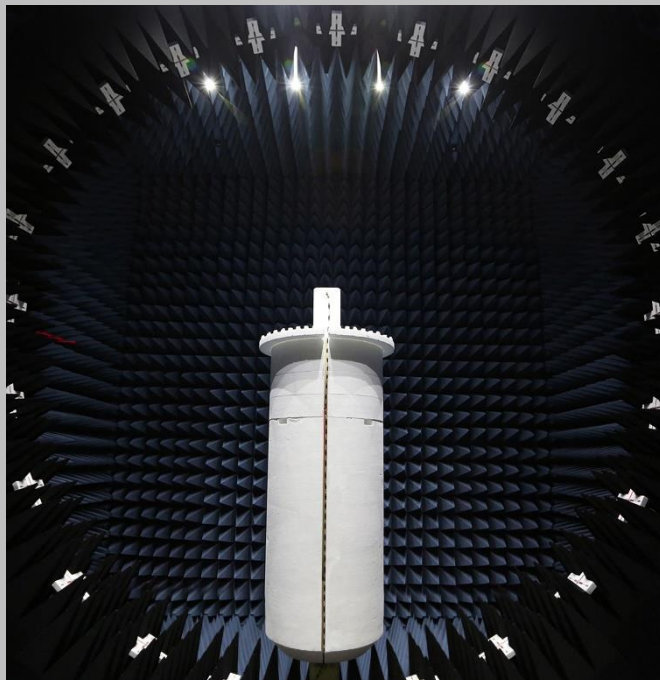
<http://portlandcustomer.element.com/ts/scope/scope.htm>

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

FACILITIES



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

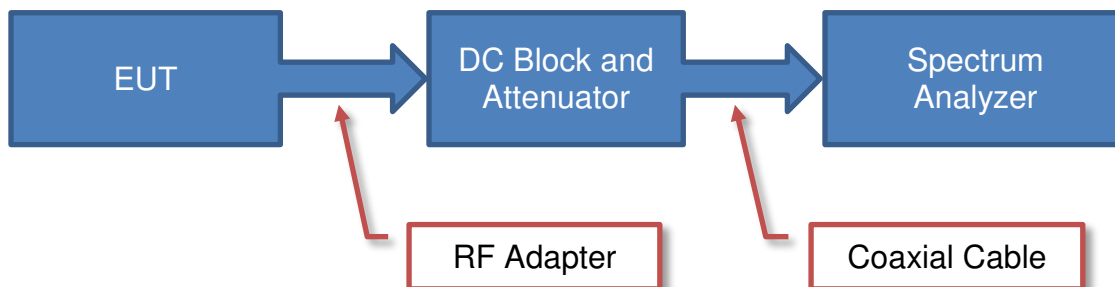
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable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

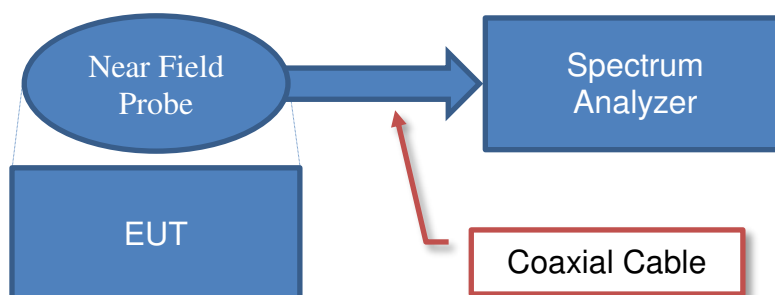
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

Test Setup Block Diagrams

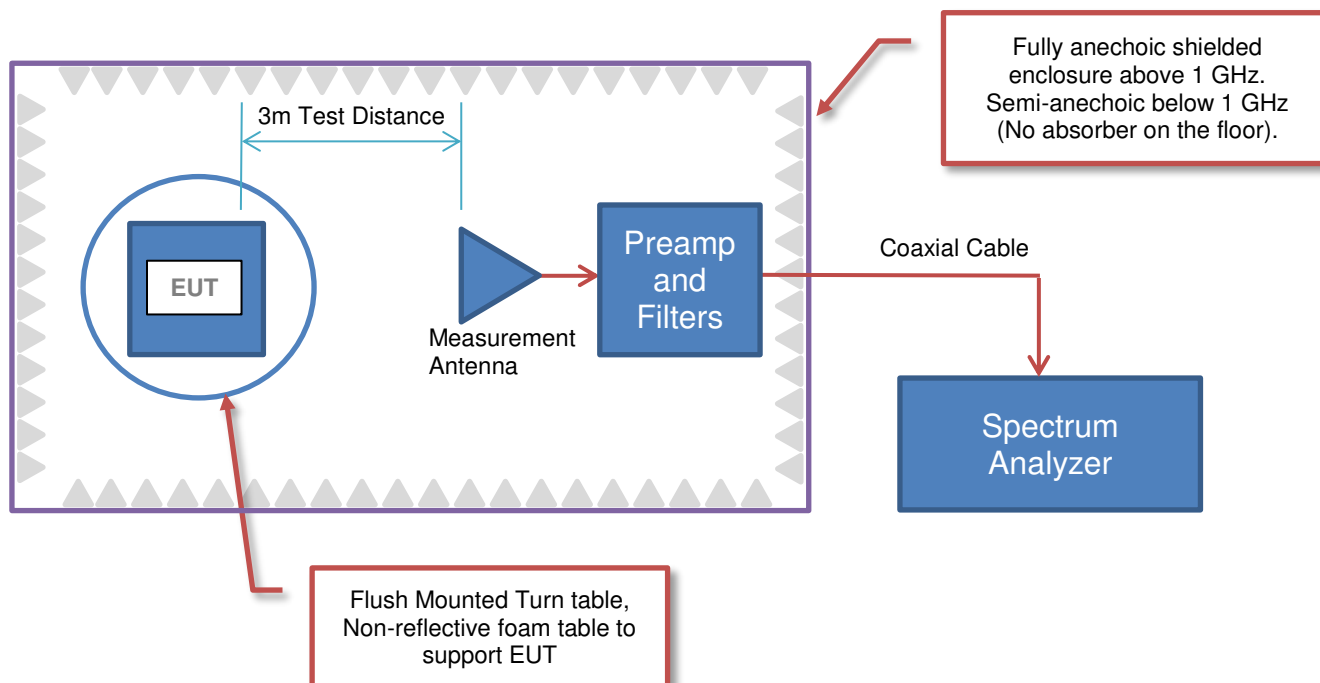
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions





PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

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



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
--------	---	-------	-----------	-----------------------------	---

COMMENTS

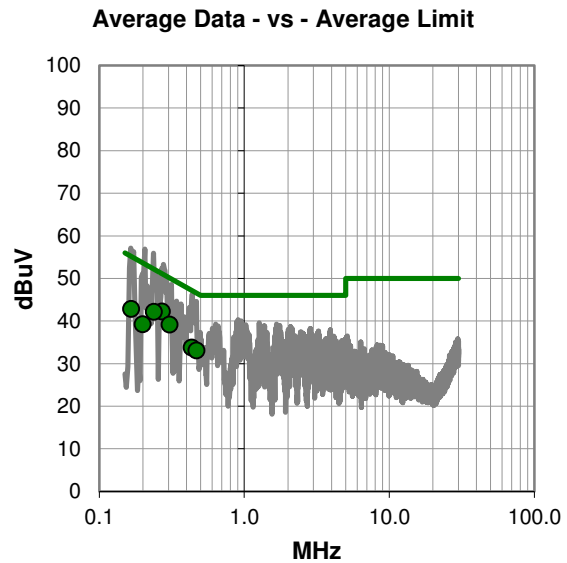
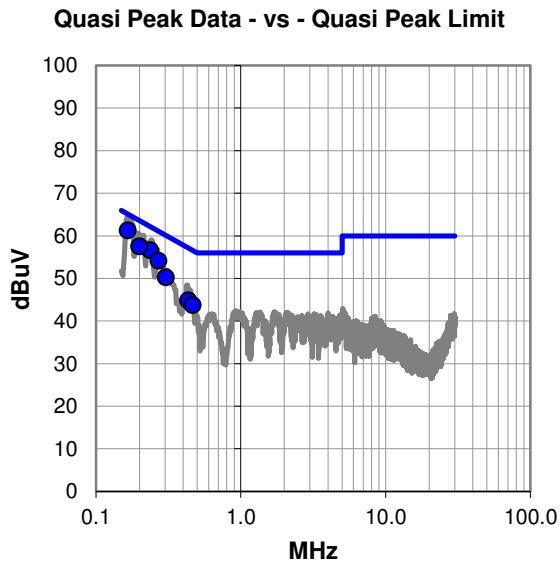
None

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
--------	---	-------	---------	-----------------------------	---

COMMENTS

None

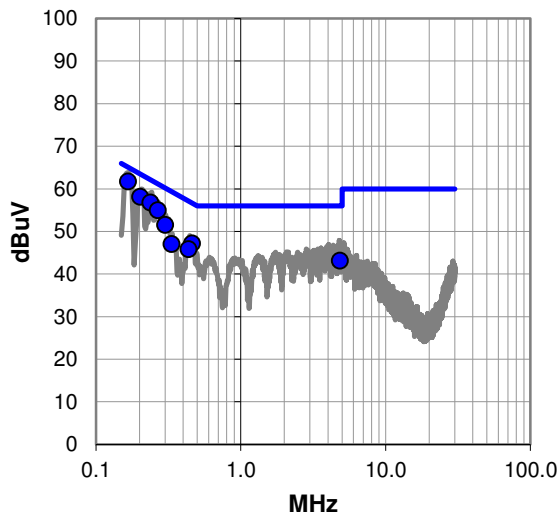
EUT OPERATING MODES

Transmitting at 319.508 MHz

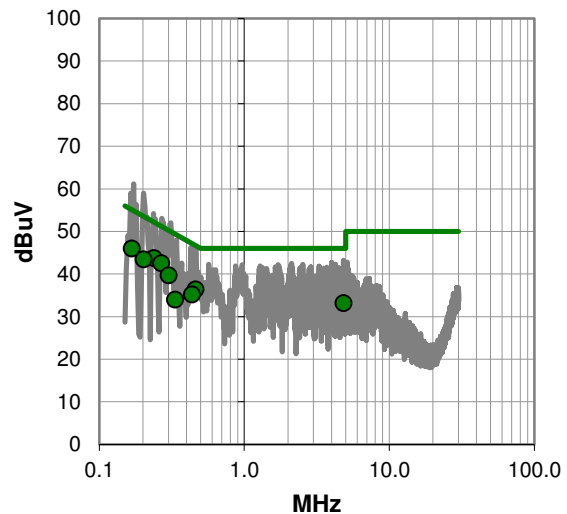
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS



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" = $N1L1 + N2L2 + \dots$

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

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

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.

FIELD STRENGTH OF FUNDAMENTAL



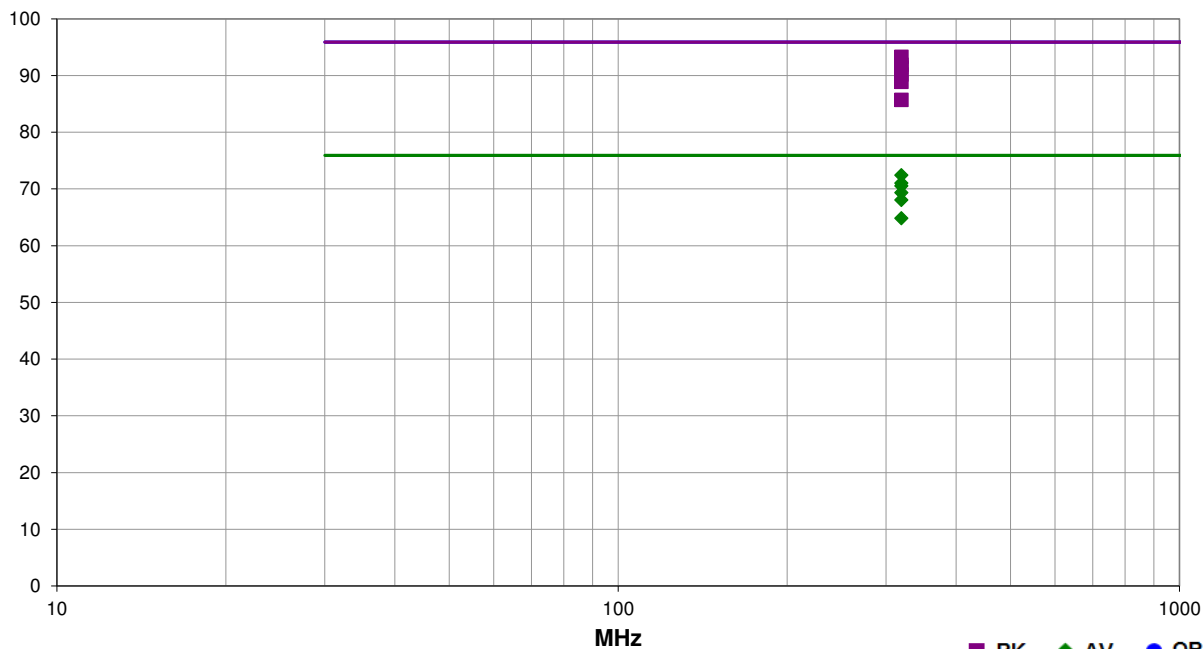
EmiRS 2018.02.06

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	
EUT: RF-CHW-ITI-S-FIRE				Tested by: Chris Patterson
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" = $N_1L_1 + N_2L_2 + \dots$

Where N_1 is the number of type 1 pulses, L_1 is length of type 1 pulses, N_2 is the number of type 2 pulses, L_2 is the length of type 2 pulses, etc.

Therefore, Duty Cycle = $(N_1L_1 + N_2L_2 + \dots)/100\text{mS}$ 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 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



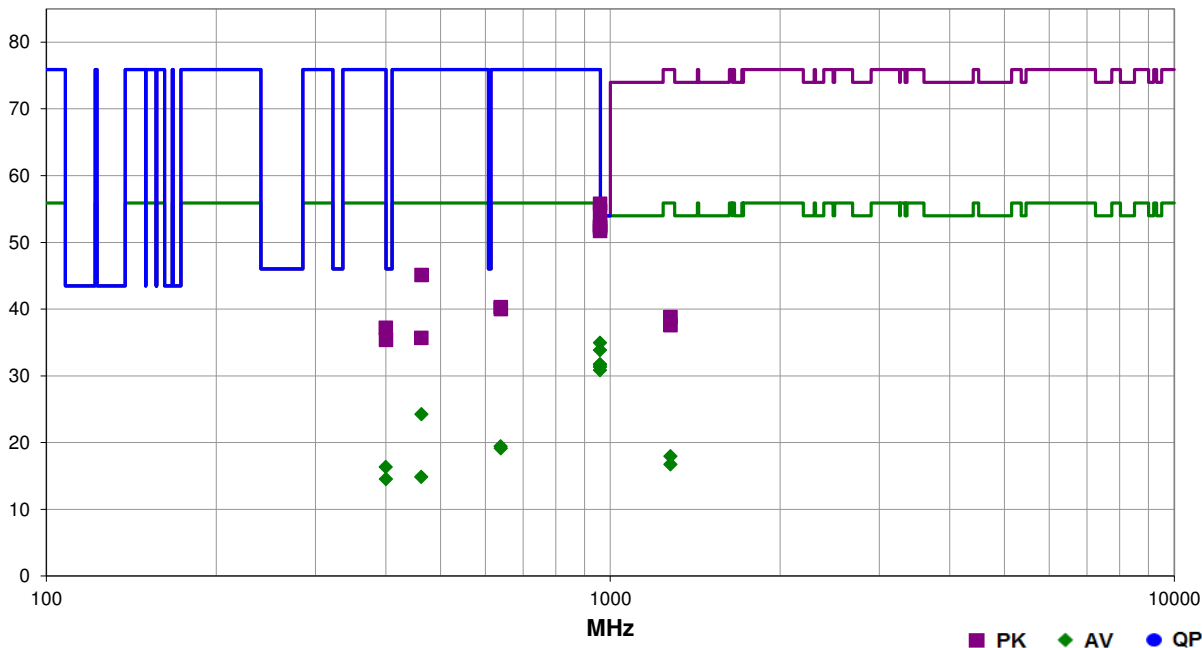
EmiRS 2018.02.06

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	
EUT:	RF-CHW-ITI-S-FIRE			Tested by: Chris Patterson
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



XMI 2017.12.13

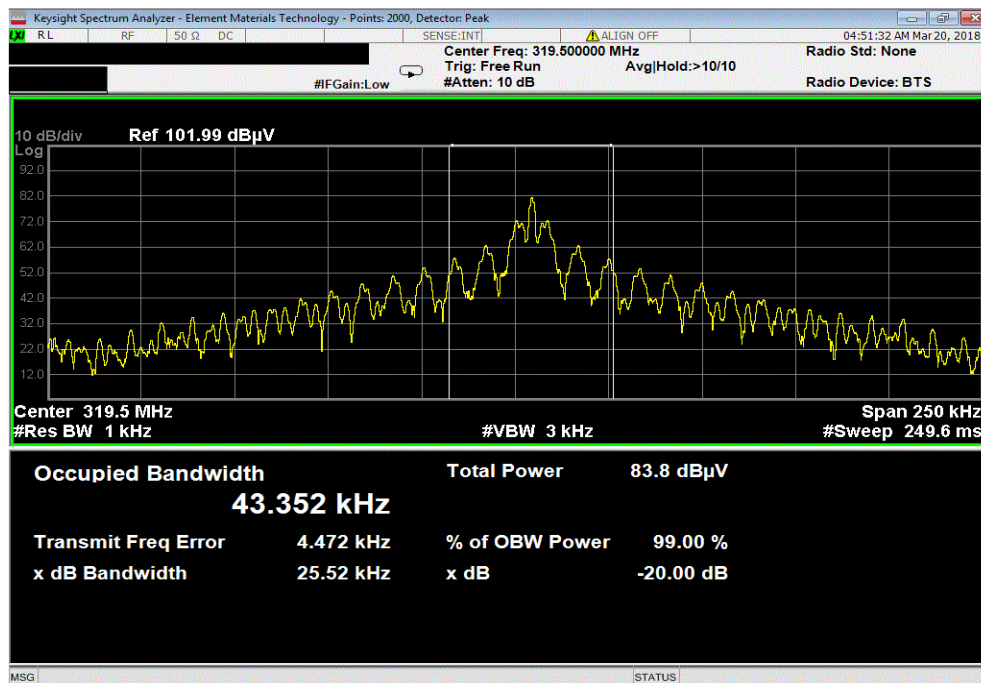
EUT: RF-CHW-ITI-S-FIRE		Work Order: CINC0020	
Serial Number: F31		Date: 19-Mar-18	
Customer: CINCH Systems		Temperature: 22.9 °C	
Attendees: Jibril Aba		Humidity: 24.7% RH	
Project: None		Barometric Pres.: 1018 mbar	
Tested by: Chris Patterson		Power: 110VAC/60Hz	Job Site: MN05
TEST SPECIFICATIONS		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

OCCUPIED BANDWIDTH



XMI 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" = $N1L1 + N2L2 + \dots$

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 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



XMt 2017.12.13

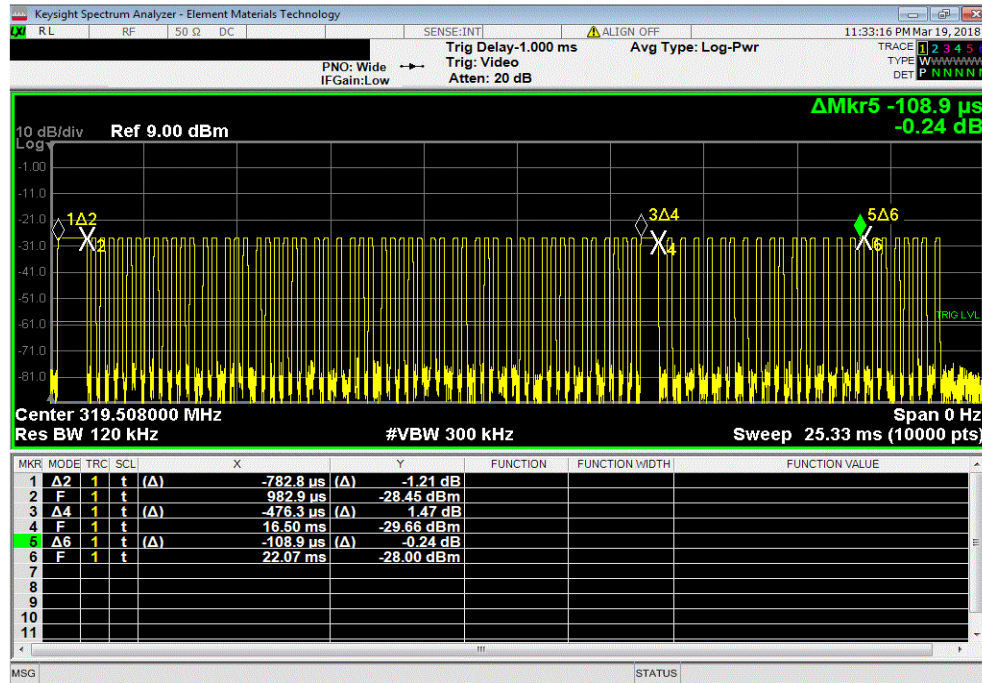
EUT: RF-CHW-ITI-S-FIRE		Work Order: CINC0020	
Serial Number: F31		Date: 19-Mar-18	
Customer: CINCH Systems		Temperature: 23.1 °C	
Attendees: Jibril Aba		Humidity: 24.5% RH	
Project: None		Barometric Pres.: 1019 mbar	
Tested by: Chris Patterson		Power: 110VAC/60Hz	
Job Site: MN05			
TEST SPECIFICATIONS			
FCC 15.231:2018		Test Method	
		ANSI C63.10:2013	
COMMENTS			
Transmitting at 319.5 MHz			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature <i>CE P.A.</i>	
		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
5 s	N/A	N/A	0.47
10 s	N/A	N/A	78
			0.1
			-20.87
			N/A
			N/A
			N/A
			N/A

DUTY CYCLE

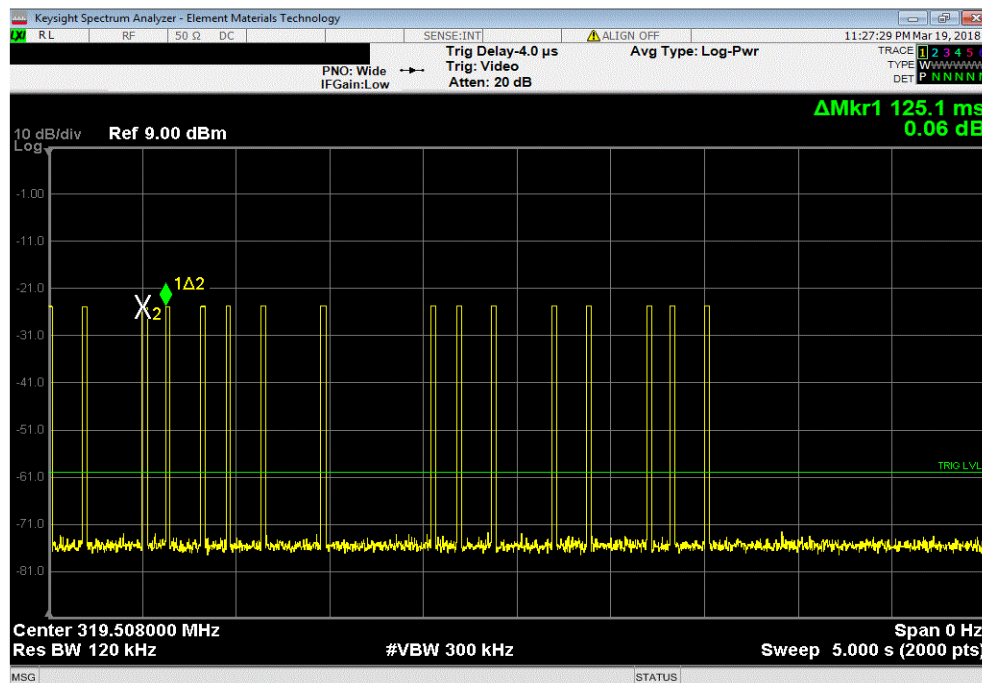


XMI 2017.12.13

100 ms							DCCF
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)		
1	0.78	1	0.47	78	0.1		-20.87



5 s							DCCF
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)		
N/A	N/A	N/A	N/A	N/A	N/A		N/A



DUTY CYCLE



XMM 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

