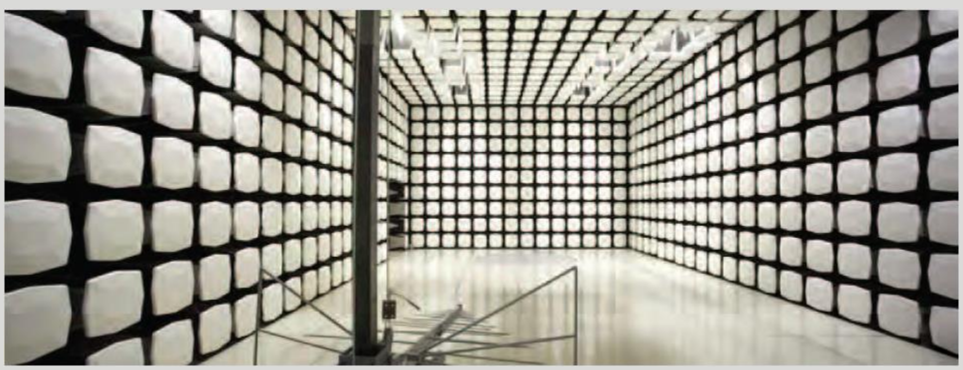
CINCH Systems

RF-ARSHK

Periodic Transmitter

FCC 15.231:2017

Report # CINC0015



NVLAP Lab Code: 200881-0

CERTIFICATE OF TEST

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

Radio Equipment Testing

Standards

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

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for a battery powered EUT.
6.5, 6.6	Field Strength of Fundamental	Yes	Pass	
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
6.9.2	Occupied Bandwidth	Yes	Pass	
7.5	Duty Cycle	Yes	Pass	

Deviations From Test Standards

None

Approved By:

Matt Nuernberg, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.

REVISION HISTORY

2017.1.25

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

2017.6.12

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

MSIP / 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.

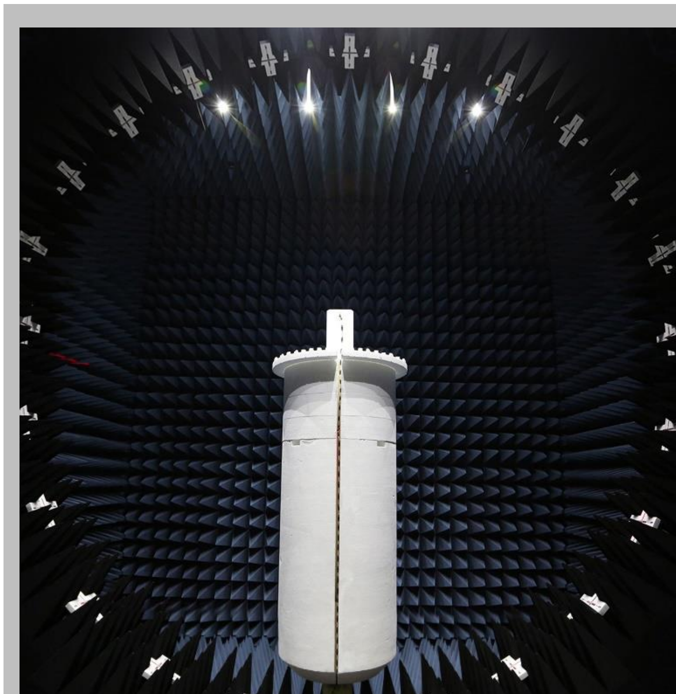
SCOPE

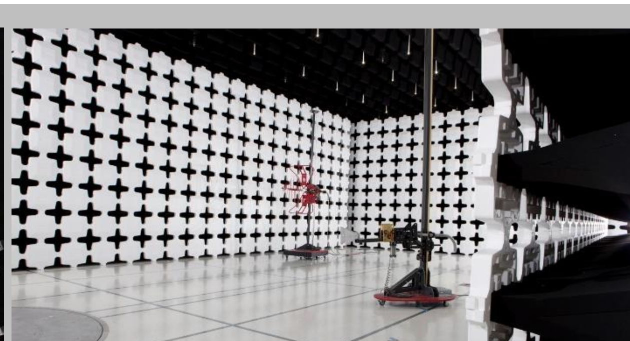
For details on the Scopes of our Accreditations, please visit:
http://portlandcustomer.element.com/ts/scope/scope.htm
http://gsi.nist.gov/global/docs/cabs/designations.html

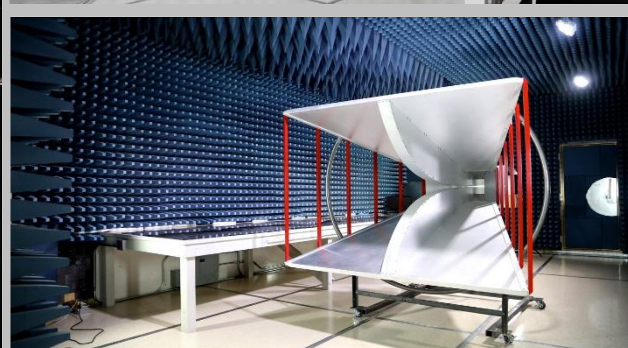
FACILITIES

2017.9.15

California Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	**Minnesota** Labs MN01-08, MN10 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 22975 NW Evergreen Pkwy 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 120th Ave NE Bothell, WA 98011 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Innovation, Science and Economic Development Canada					
2834B-1, 2834B-3	2834E-1, 2834E-3	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157

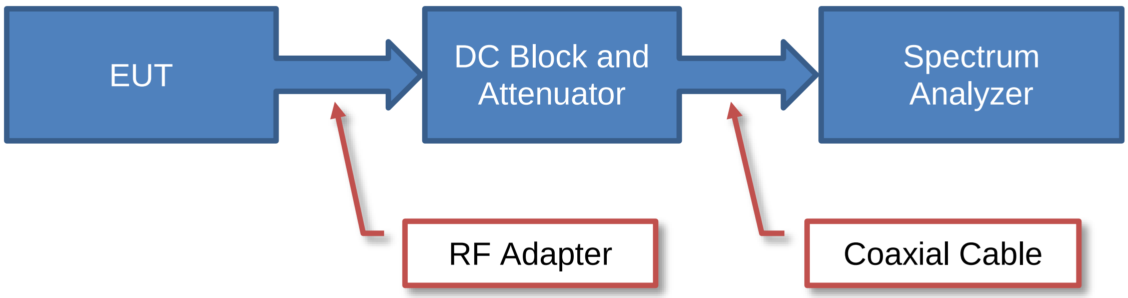




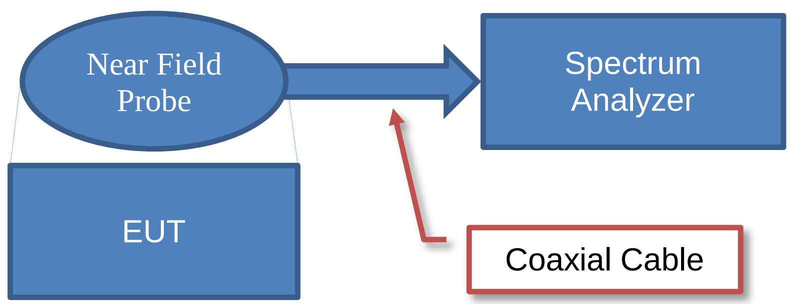


Test Setup Block Diagrams

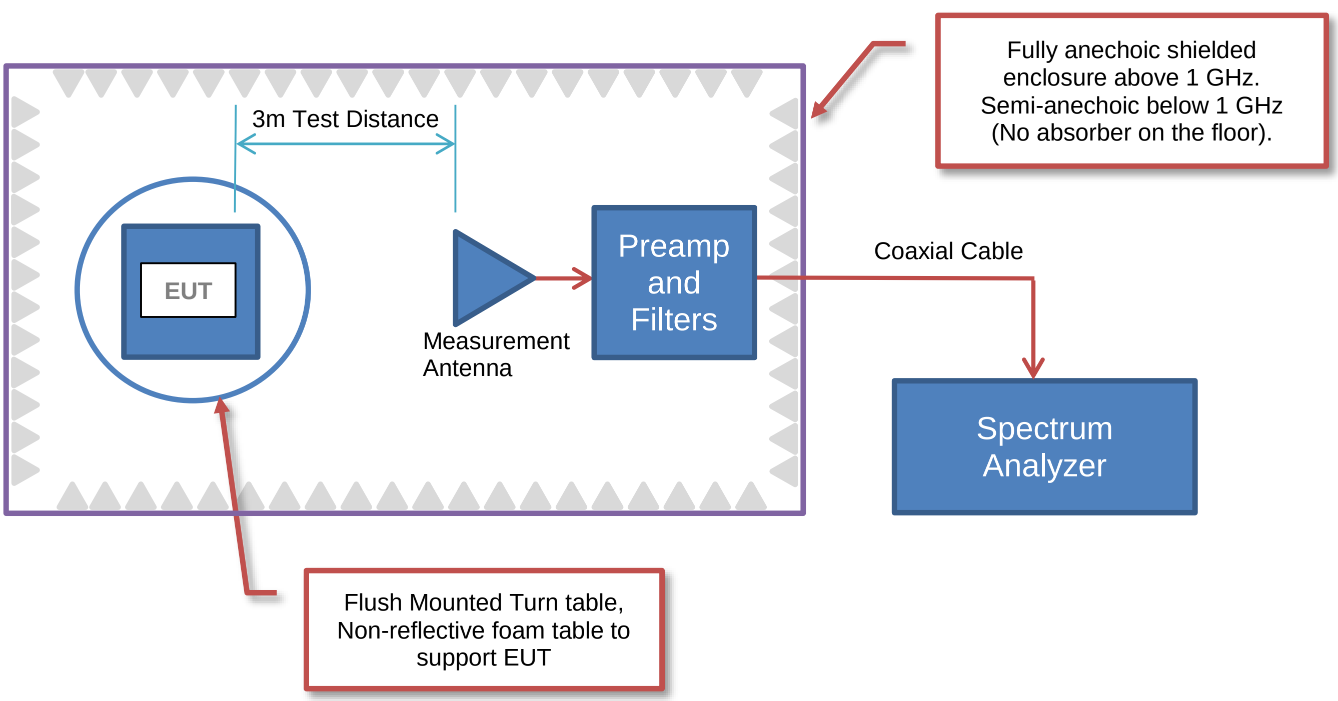
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



Measurement Uncertainty

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

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is on each data sheet. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

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

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

PRODUCT DESCRIPTION

2017-1-25

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-ARSHK
First Date of Test:	November 16, 2017
Last Date of Test:	November 16, 2017
Receipt Date of Samples:	November 16, 2017
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

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

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

CONFIGURATIONS

2017-1-25

Configuration CINC0015- 1

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

Configuration CINC0015- 2

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

Configuration CINC0015- 3

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

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	11/16/2017	Duty Cycle	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	11/16/2017	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	11/16/2017	Field Strength of Fundamental	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	11/16/2017	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

FIELD STRENGTH OF FUNDAMENTAL

PSA-ESCI 2017.06.01

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

MODES OF OPERATION

Tx unmodulated at 319.5 MHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

CINC0015 - 3

FREQUENCY RANGE INVESTIGATED

Start Frequency	319 MHz	Stop Frequency	320 MHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Cable	ESM Cable Corp.	Bilog Cables	MNH	11/9/2017	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/6/2017	12 mo

MEASUREMENT BANDWIDTHS

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

TEST DESCRIPTION

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

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

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

Where “On time” = N1L1 +N2L2 +….

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

Therefore, Duty Cycle = (N1L1 +N2L2 +…)/100mS or T, whichever is less. (Where T is the period of the pulse train.)

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

Period = 100 mSec
Pulsewidth of Type 1 Pulse = 0.138 mSec
Pulsewidth of Type 2 Pulse = 0.502 mSec
Number of Type 1 Pulses = 79
Number of Type 2 Pulses = 1

Duty Cycle = 20 log [((0.138)(79) + (0.502)(1))/100] = -18.9 dB

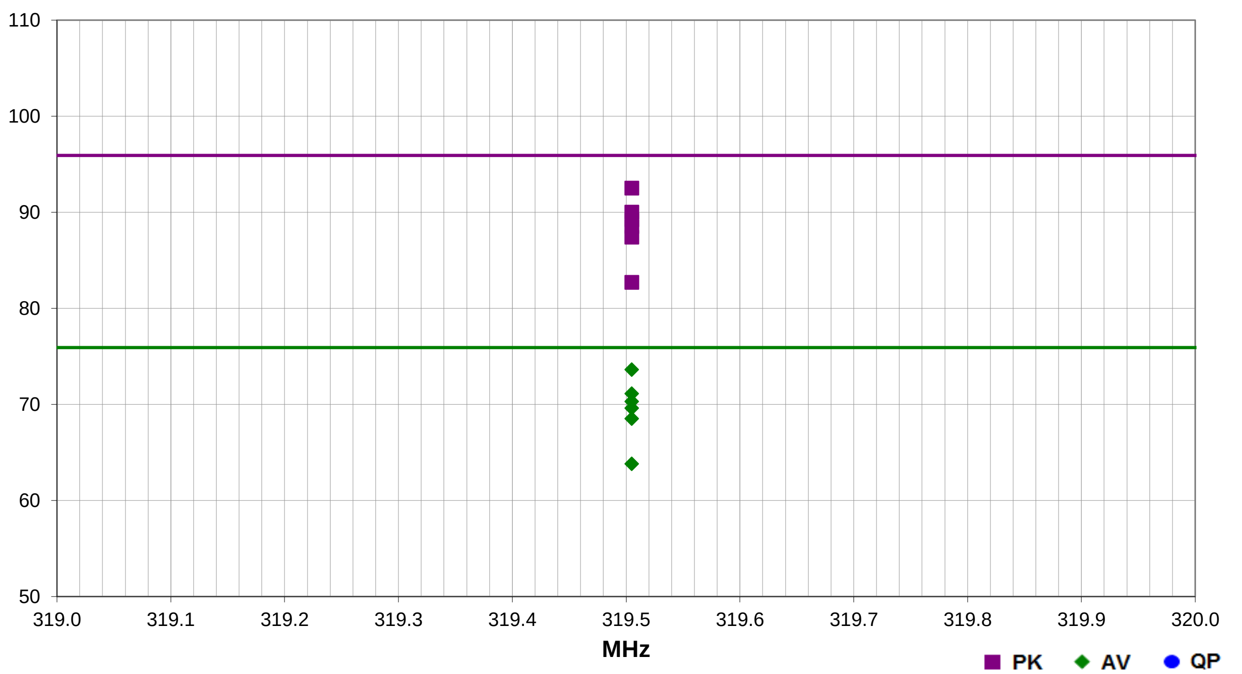
FIELD STRENGTH OF FUNDAMENTAL

EmiR5 2017.07.11 PSA-ESCI 2017.06.01

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

Test Specifications	**Test Method**
FCC 15.231:2017	ANSI C63.10:2013

Run #	1	**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	72.3	20.2	1.0	340.0	-18.9	0.0	Horz	AV	0.0	73.6	75.9	-2.3	EUT Horizontal
319.505	72.3	20.2	1.0	340.0		0.0	Horz	PK	0.0	92.5	95.9	-3.4	EUT Horizontal
319.505	69.8	20.2	1.1	324.0	-18.9	0.0	Horz	AV	0.0	71.1	75.9	-4.8	EUT On Side
319.505	69.0	20.2	1.6	261.0	-18.9	0.0	Vert	AV	0.0	70.3	75.9	-5.6	EUT On Side
319.505	69.8	20.2	1.1	324.0		0.0	Horz	PK	0.0	90.0	95.9	-5.9	EUT On Side
319.505	68.3	20.2	1.8	240.9	-18.9	0.0	Vert	AV	0.0	69.6	75.9	-6.3	EUT Vertical
319.505	69.0	20.2	1.6	261.0		0.0	Vert	PK	0.0	89.2	95.9	-6.7	EUT On Side
319.505	67.2	20.2	1.0	35.0	-18.9	0.0	Horz	AV	0.0	68.5	75.9	-7.4	EUT Vertical
319.505	68.3	20.2	1.8	240.9		0.0	Vert	PK	0.0	88.5	95.9	-7.4	EUT Vertical
319.505	67.2	20.2	1.0	35.0		0.0	Horz	PK	0.0	87.4	95.9	-8.5	EUT Vertical
319.505	62.5	20.2	1.4	229.9	-18.9	0.0	Vert	AV	0.0	63.8	75.9	-12.1	EUT Horizontal
319.505	62.5	20.2	1.4	229.9		0.0	Vert	PK	0.0	82.7	95.9	-13.2	EUT Horizontal

SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2017.06.01

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

MODES OF OPERATION

Tx unmodulated at 319.5 MHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

CINC0015 - 3

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	4000 MHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

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

MEASUREMENT BANDWIDTHS

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

TEST DESCRIPTION

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

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

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

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

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

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

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

Where "On time" = N1L1 +N2L2 +….

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

Therefore, Duty Cycle = (N1L1 +N2L2 +…)/100mS or T, whichever is less. Where T is the period of the pulse train.

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

Period = 100 mSec
Pulsewidth of Type 1 Pulse = 0.138 mSec
Pulsewidth of Type 2 Pulse = 0.502 mSec
Number of Type 1 Pulses = 79
Number of Type 2 Pulses = 1

Duty Cycle = 20 log [((0.138)(79) + (0.502)(1))/100] = -18.9 dB

The duty cycle correction factor of -18.9 dB was added to the peak readings to mathematically derive the average levels. Peak measurements were made with a resolution bandwidth of 100kHz and a video bandwidth of 300kHz for measurements at or below 1GHz. Above 1GHz, a resolution bandwidth of 1MHz and a video bandwidth of 3MHz was used.

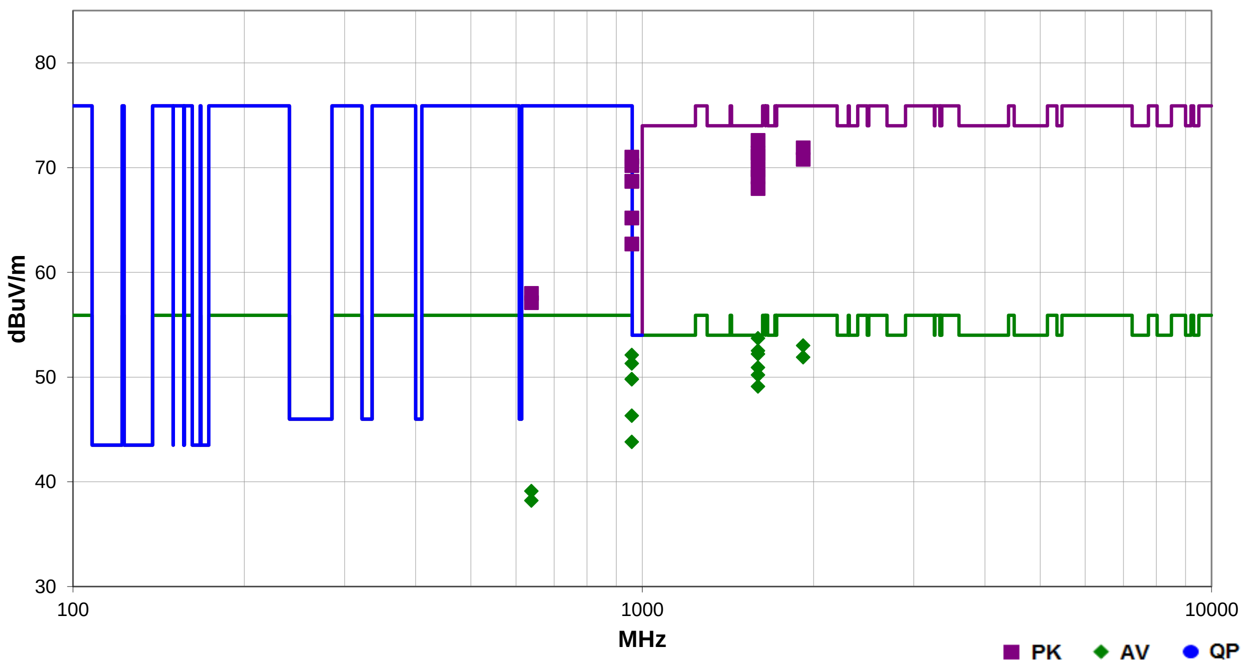
SPURIOUS RADIATED EMISSIONS

EmiR5 2017.07.11 PSA-ESCI 2017.06.01

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

Test Specifications	**Test Method**
FCC 15.231:2017	ANSI C63.10:2013

Run #	2	**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
1597.517	77.7	-5.1	1.0	83.1	-18.9	0.0	Horz	AV	0.0	53.7	54.0	-0.3	EUT Horizontal
1597.517	77.7	-5.1	1.0	83.1		0.0	Horz	PK	0.0	72.6	74.0	-1.4	EUT Horizontal
1597.492	76.5	-5.1	1.0	169.0	-18.9	0.0	Vert	AV	0.0	52.5	54.0	-1.5	EUT Vertical
1597.525	76.2	-5.1	1.0	144.0	-18.9	0.0	Horz	AV	0.0	52.2	54.0	-1.8	EUT On Side
1597.492	76.5	-5.1	1.0	169.0		0.0	Vert	PK	0.0	71.4	74.0	-2.6	EUT Vertical
1917.000	75.4	-3.5	1.0	226.0	-18.9	0.0	Vert	AV	0.0	53.0	55.9	-2.9	EUT Vertical
1597.525	76.2	-5.1	1.0	144.0		0.0	Horz	PK	0.0	71.1	74.0	-2.9	EUT On Side
1597.508	74.9	-5.1	4.0	7.0	-18.9	0.0	Vert	AV	0.0	50.9	54.0	-3.1	EUT Horizontal
958.516	47.0	14.0	2.2	179.0	-18.9	10.0	Horz	AV	0.0	52.1	55.9	-3.8	EUT Vertical
1597.533	74.2	-5.1	1.0	77.1	-18.9	0.0	Vert	AV	0.0	50.2	54.0	-3.8	EUT On Side
1917.008	74.3	-3.5	1.0	136.0	-18.9	0.0	Horz	AV	0.0	51.9	55.9	-4.0	EUT Horizontal
1917.000	75.4	-3.5	1.0	226.0		0.0	Vert	PK	0.0	71.9	75.9	-4.0	EUT Vertical
1597.508	74.9	-5.1	4.0	7.0		0.0	Vert	PK	0.0	69.8	74.0	-4.2	EUT Horizontal
958.512	46.2	14.0	1.2	215.0	-18.9	10.0	Vert	AV	0.0	51.3	55.9	-4.6	EUT On Side

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

OCCUPIED BANDWIDTH

XMit 2017.02.08

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Cable	Element	Biconilog Cable	MNH	11/9/2017	11/9/2018
Antenna - Biconilog	ETS Lindgren	CBL 6141B	AYD	1/6/2016	1/6/2018
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFI	1/6/2017	1/6/2018

TEST DESCRIPTION

The measurement was made in a radiated configuration of the fundamental with the carrier fully maximized for its highest radiated power. The EUT was transmitting at its maximum data rate.

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

OCCUPIED BANDWIDTH

XMit 2017.02.08

EUT:	RF-ARSHK			Work Order:	CINC0015
Serial Number:	1741			Date:	11/16/17
Customer:	CINCH Systems			Temperature:	22.1 °C
Attendees:	Jibril Aba			Humidity:	26.5% RH
Project:	None			Barometric Pres.:	1024.7 mbar
Tested by:	Kyle McMullan	Power:	Battery	Job Site:	MN05

TEST SPECIFICATIONS	Test Method
FCC 15.231:2017	ANSI C63.10:2013

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

None

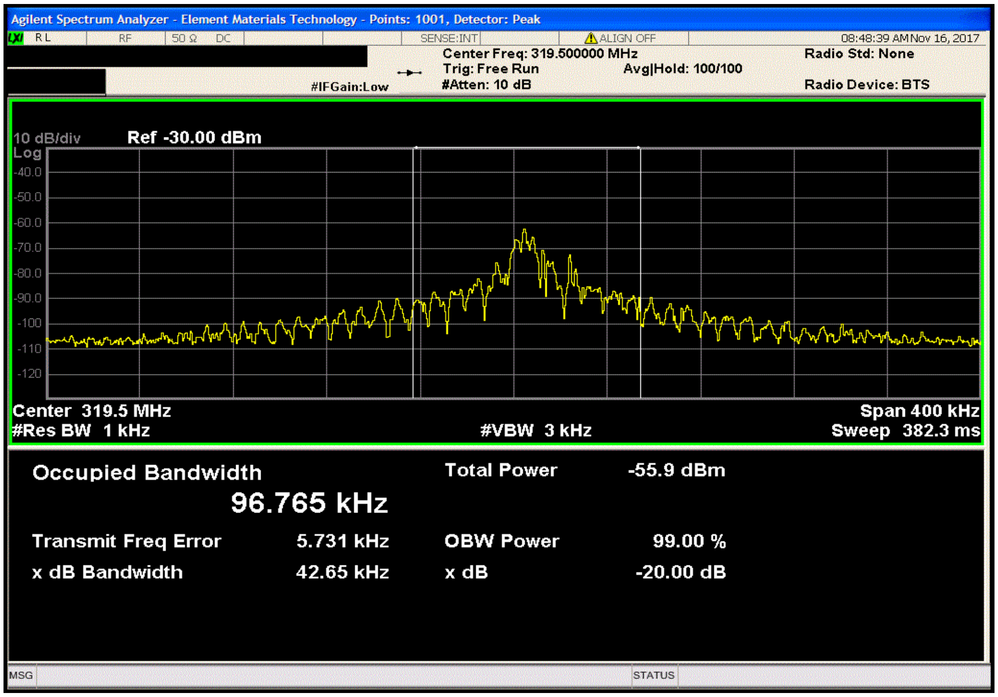
Configuration #	1	*Signature*

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

OCCUPIED BANDWIDTH

XMit 2017.02.08

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



DUTY CYCLE

XMit 2017.02.08

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Cable	Element	Biconilog Cable	MNH	11/9/2017	11/9/2018
Antenna - Biconilog	ETS Lindgren	CBL 6141B	AYD	1/6/2016	1/6/2018
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFI	1/6/2017	1/6/2018

TEST DESCRIPTION

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

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

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

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

Where “On time” = N1L1 +N2L2 +….

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

Therefore, Duty Cycle = (N1L1 +N2L2 +…)/100mS or T, whichever is less. (Where T is the period of the pulse train.)

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

Period = 100 mSec
Pulsewidth of Type 1 Pulse = 0.138 mSec
Pulsewidth of Type 2 Pulse = 0.502 mSec
Number of Type 1 Pulses = 79
Number of Type 2 Pulses = 1

Duty Cycle = 20 log [((0.138)(79) + (0.502)(1))/100] = -18.9 dB

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

DUTY CYCLE

XMit 2017.02.08

EUT:	**RF-ARSHK**			**Work Order:**	**CINC0015**
Serial Number:	**1745**			**Date:**	**11/16/17**
Customer:	**CINCH Systems**			**Temperature:**	**22.1 °C**
Attendees:	**Jibril Aba**			**Humidity:**	**26.5% RH**
Project:	**None**			**Barometric Pres.:**	**1024.7 mbar**
Tested by:	**Kyle McMullan**	**Power:**	**Battery**	**Job Site:**	**MN05**

TEST SPECIFICATIONS	**Test Method**
FCC 15.231:2017	**ANSI C63.10:2013**

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

None

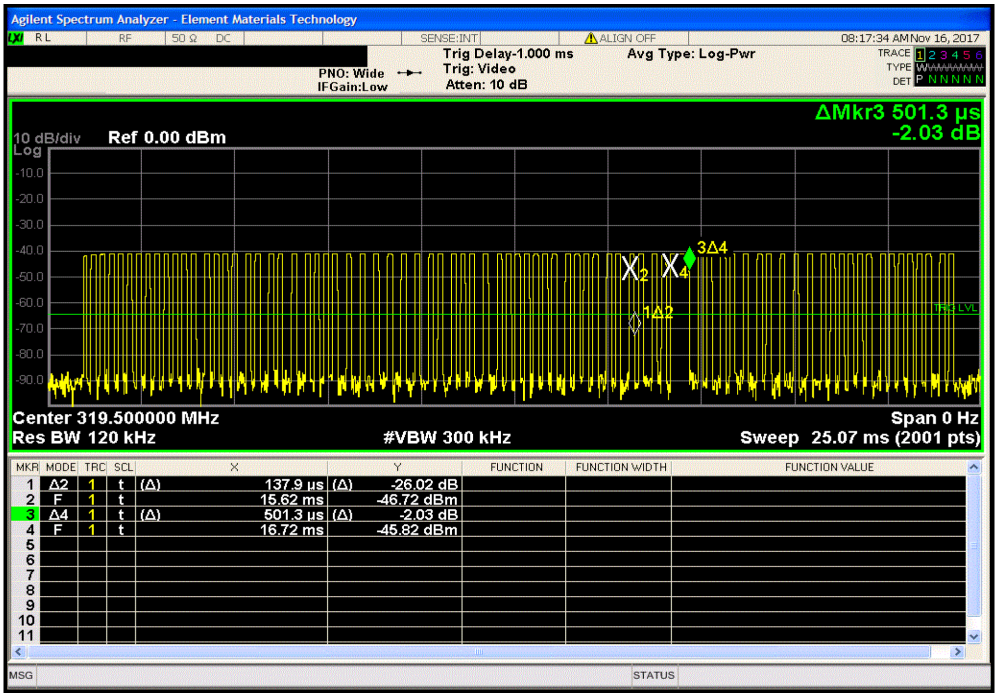
Configuration #	**2**	*Signature*

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

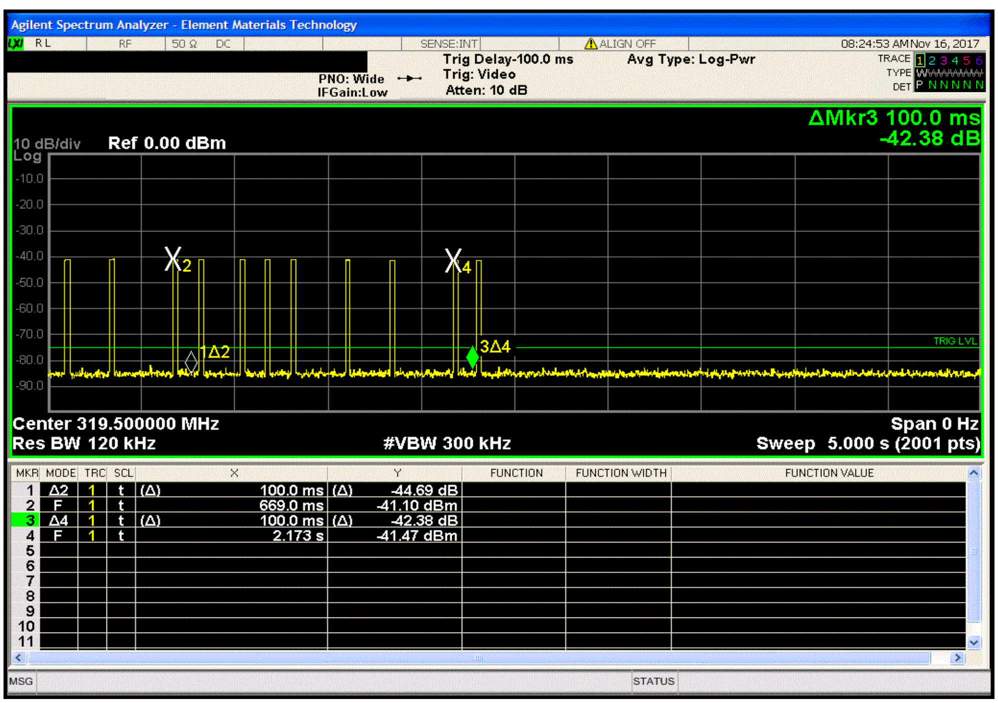
DUTY CYCLE

XMit 2017.02.08

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



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



DUTY CYCLE

XMit 2017.02.08

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