CINCH Systems

RF-MDWS-HP-S

FCC 15.231:2017

Low Power Transmitter

Report # CINC0007.1

NVLAP Lab Code: 200881-0

CERTIFICATE OF TEST

Last Date of Test: February 21, 2017
CINCH Systems
Model: RF-MDWS-HP-S

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:

Dean Ghizzone, General 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

2017.1.25

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 – Validated by the European Commission as a Notified Body under the R&TTE Directive.

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

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.

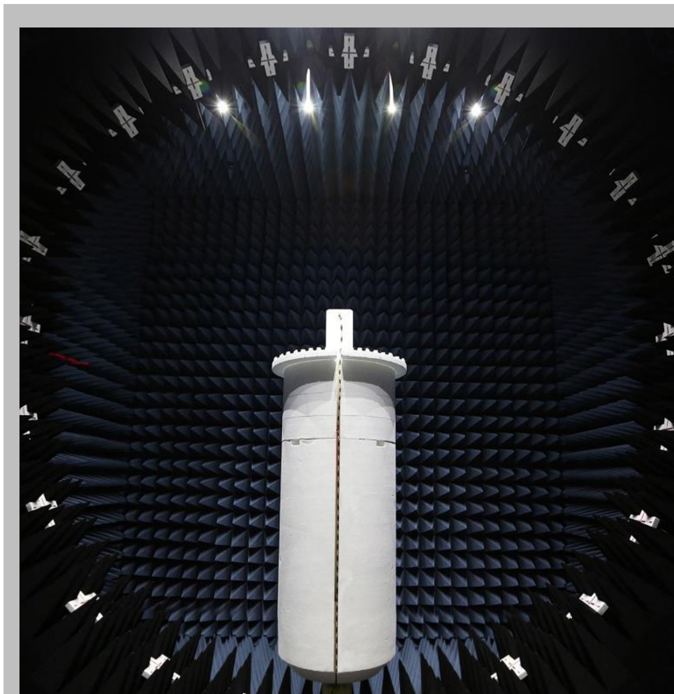
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable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

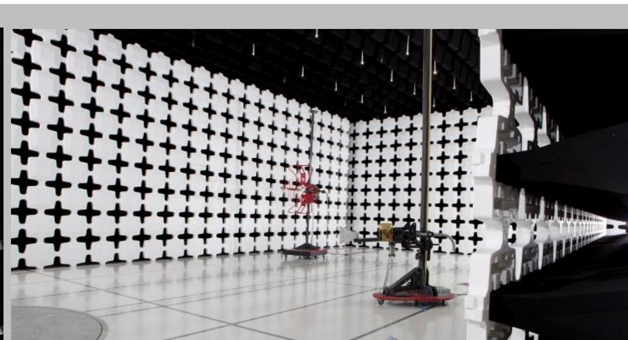
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

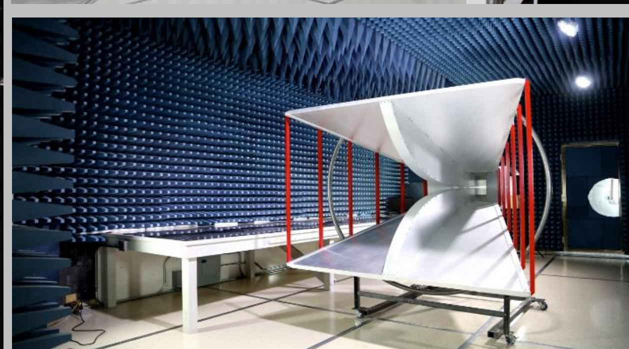
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

FACILITIES

California Labs OC01-13 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	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
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

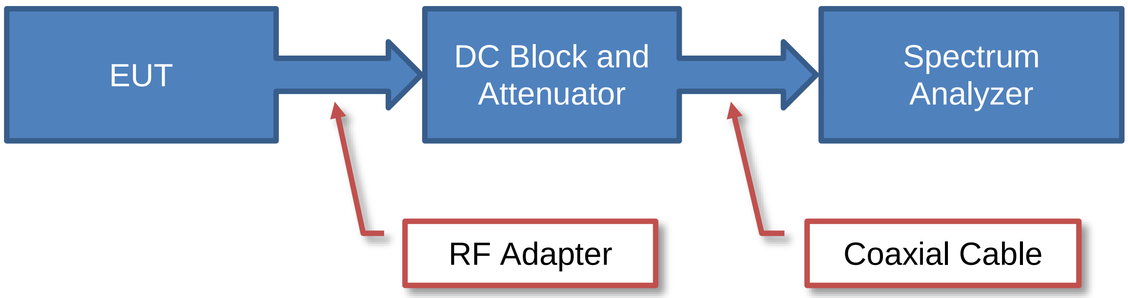




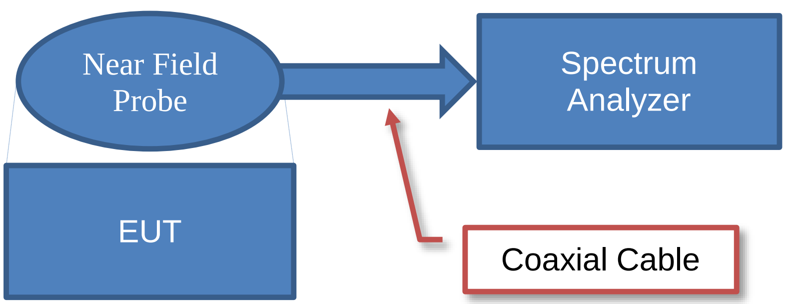


Test Setup Block Diagrams

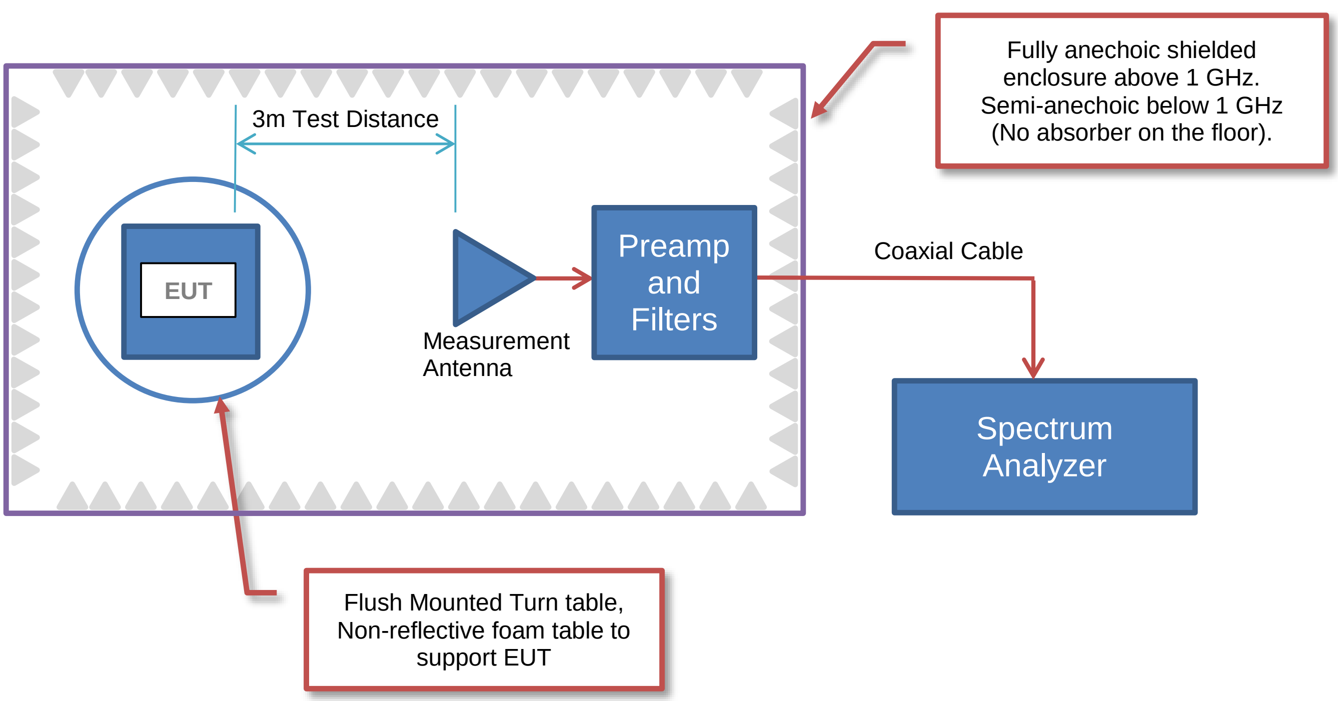
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

2017-1-25

Client and Equipment Under Test (EUT) Information

Company Name:	CINCH Systems
Address:	12075 43rd Street NE, Suite 300
City, State, Zip:	St. Michael, MN 55376
Test Requested By:	Jibril Aga
Model:	RF-MDWS-HP-S
First Date of Test:	February 21, 2017
Last Date of Test:	February 21, 2017
Receipt Date of Samples:	February 21, 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:
Low power Transmitter used in Door/Window sensor. Operates at 319.5 MHz frequency and utilizes AM modulation (OOK)

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

CONFIGURATIONS

2017-1-25

Configuration CINC0007- 1

Software/Firmware Running during test	
Description	**Version**
MPLabX	Not Provided

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
RF-MDWS-HP-S (DC)	CINCH Systems	RF-MDWS-HP-S	H11

Configuration CINC0007- 2

Software/Firmware Running during test	
Description	**Version**
MPLabX	Not Provided

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
RF-MDWS-HP-S (CW)	CINCH Systems	RF-MDWS-HP-S	H9

Configuration CINC0007- 3

Software/Firmware Running during test	
Description	**Version**
MPLabX	Not Provided

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
RF-MDWS-HP-S (OB)	CINCH Systems	RF-MDWS-HP-S	H10

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2/21/2017	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.
2	2/21/2017	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.
3	2/21/2017	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.
4	2/21/2017	Duty Cycle	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 2017.01.26

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 Unmodulated 319.5 MHz.

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

CINC0007 - 2

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
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/6/2017	12 mo
Attenuator	Fairview Microwave	SA18E-10	TYA	9/23/2016	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AJA	6/23/2016	24 mo
Cable	ESM Cable Corp.	Bilog Cables	MNH	12/1/2016	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

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 = 912 uSec
Pulsewidth of Type 2 Pulse = 414 uSec
Pulsewidth of Type 3 Pulse = 98.8 uSec
Number of Type 1 Pulses = 1
Number of Type 2 Pulses = 1
Number of Type 3 Pulses = 78

Duty Cycle = 20 log [((1)(.912) + (1)(.414) + (78)(.0988))/100] = -20.88 dB

The duty cycle correction factor of -20.88 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.

FIELD STRENGTH OF FUNDAMENTAL

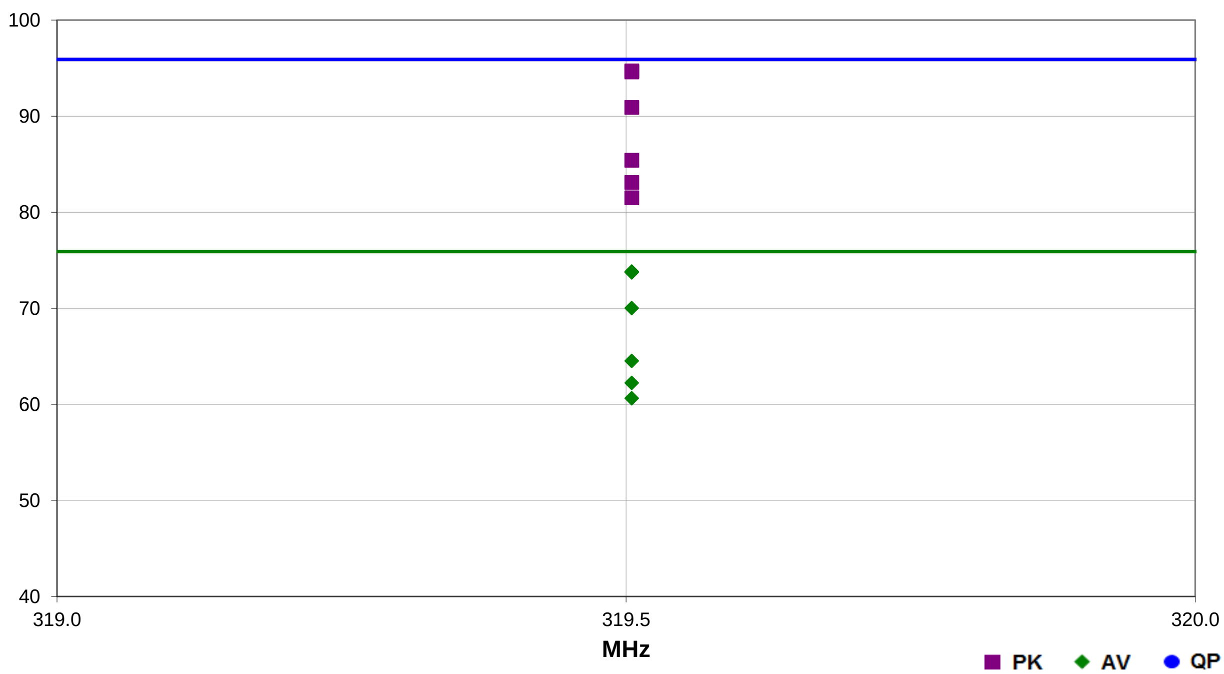
EmiR5 2017.01.25 PSA-ESCI 2017.01.26

Work Order:	CINC0007	**Date:**	02/21/17	Trevor Buls
Project:	None	**Temperature:**	23.5 °C	
Job Site:	MN05	**Humidity:**	31.6% RH	
Serial Number:	H9	**Barometric Pres.:**	1015 mbar	**Tested by:** Trevor Buls, Chris Patterson, Kyle McMullan

EUT:	RF-MDWS-HP-S
Configuration:	2
Customer:	CINCH Systems
Attendees:	Jibirl Aga
EUT Power:	Battery
Operating Mode:	Transmitting Unmodulated 319.5 MHz.
Deviations:	None
Comments:	None

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

Run #	3	**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	74.8	19.9	1.0	179.0		0.0	Horz	PK	0.0	94.7	95.9	-1.2	EUT Horizontal
319.505	74.7	19.9	1.0	86.0		0.0	Horz	PK	0.0	94.6	95.9	-1.3	EUT On Side
319.505	74.8	19.9	1.0	179.0	-20.9	0.0	Horz	AV	0.0	73.8	75.9	-2.1	EUT Horizontal
319.505	74.7	19.9	1.0	86.0	-20.9	0.0	Horz	AV	0.0	73.7	75.9	-2.2	EUT On Side
319.505	71.0	19.9	1.6	80.1		0.0	Vert	PK	0.0	90.9	95.9	-5.0	EUT Vert
319.505	71.0	19.9	1.6	80.1	-20.9	0.0	Vert	AV	0.0	70.0	75.9	-5.9	EUT Vert
319.505	65.5	19.9	1.4	346.0		0.0	Vert	PK	0.0	85.4	95.9	-10.5	EUT On Side
319.505	65.5	19.9	1.4	346.0	-20.9	0.0	Vert	AV	0.0	64.5	75.9	-11.4	EUT On Side
319.505	63.2	19.9	3.5	258.9		0.0	Vert	PK	0.0	83.1	95.9	-12.8	EUT Horizontal
319.505	63.2	19.9	3.5	258.9	-20.9	0.0	Vert	AV	0.0	62.2	75.9	-13.7	EUT Horizontal
319.505	61.6	19.9	1.0	358.0		0.0	Horz	PK	0.0	81.5	95.9	-14.4	EUT Vert
319.505	61.6	19.9	1.0	358.0	-20.9	0.0	Horz	AV	0.0	60.6	75.9	-15.3	EUT Vert

SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2017.01.26

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 Unmodulated 319.5MHz.

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

CINC0007 - 2

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
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	3/1/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	12/1/2016	12 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/6/2017	12 mo
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	12/1/2016	12 mo
Cable	ESM Cable Corp.	Bilog Cables	MNH	12/1/2016	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AJA	6/23/2016	24 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	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 = 912 uSec
Pulsewidth of Type 2 Pulse = 414 uSec
Pulsewidth of Type 3 Pulse = 98.8 uSec
Number of Type 1 Pulses = 1
Number of Type 2 Pulses = 1
Number of Type 3 Pulses = 78

Duty Cycle = 20 log [((1)(.912) + (1)(.414) + (78)(.0988))/100] = -20.88 dB

The duty cycle correction factor of -20.88 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.

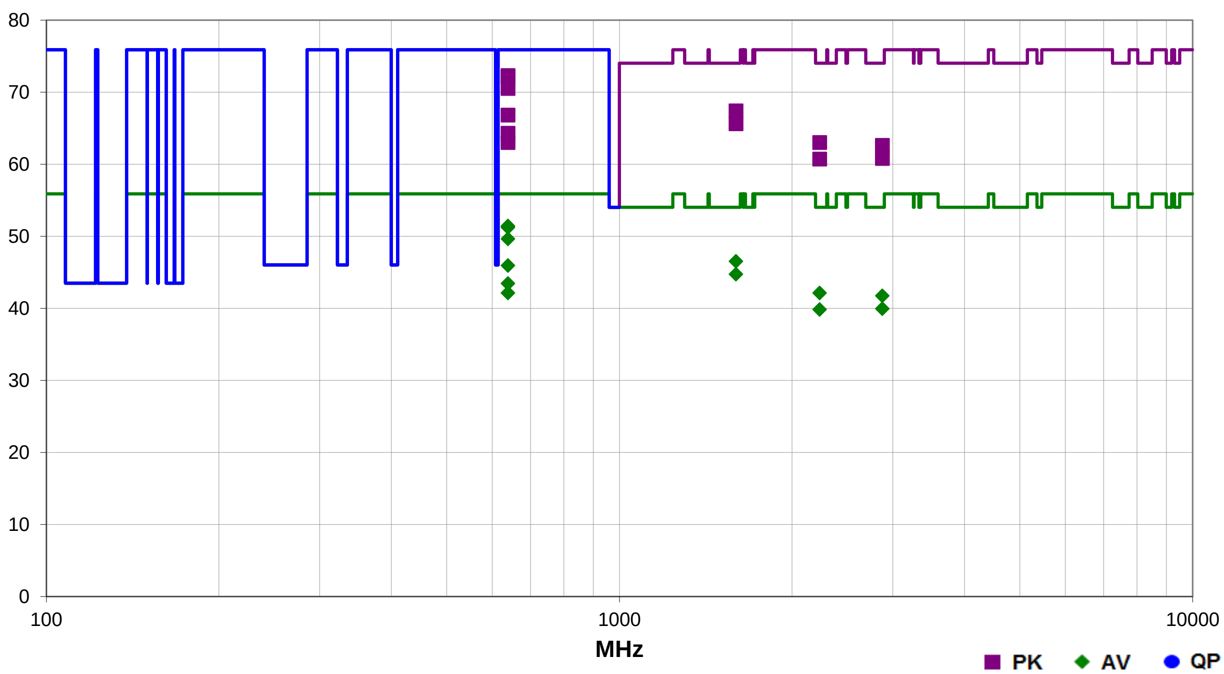
SPURIOUS RADIATED EMISSIONS

EmiR5 2017.01.25 PSA-ESCI 2017.01.26

Work Order:	CINC0007	**Date:**	02/21/17	Trevor Buls
Project:	None	**Temperature:**	23.4 °C	
Job Site:	MN05	**Humidity:**	31.5% RH	
Serial Number:	H9	**Barometric Pres.:**	1015 mbar	**Tested by:** Trevor Buls, Chris Patterson, Kyle McMullan
EUT:	RF-MDWS-HP-S			
Configuration:	2			
Customer:	CINCH Systems			
Attendees:	Jibirl Aga			
EUT Power:	Battery			
Operating Mode:	Transmitting Unmodulated 319.5MHz.			
Deviations:	None			
Comments:	None			

Test Specifications	**Test Method**
FCC 15.231:2017	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
639.010	55.3	7.0	1.4	173.1		10.0	Horz	PK	0.0	72.3	75.9	-3.6	EUT Horizontal
639.010	55.1	7.0	1.3	169.0		10.0	Horz	PK	0.0	72.1	75.9	-3.8	EUT On Side
639.010	55.3	7.0	1.4	173.1	-20.9	10.0	Horz	AV	0.0	51.4	55.9	-4.5	EUT Horizontal
639.010	55.1	7.0	1.3	169.0	-20.9	10.0	Horz	AV	0.0	51.2	55.9	-4.7	EUT On Side
639.010	53.5	7.0	1.0	174.1		10.0	Vert	PK	0.0	70.5	75.9	-5.4	EUT Vert
639.010	53.5	7.0	1.0	174.1	-20.9	10.0	Vert	AV	0.0	49.6	55.9	-6.3	EUT Vert
1597.550	72.5	-5.1	1.0	155.1		0.0	Vert	PK	0.0	67.4	74.0	-6.6	EUT Vert
1597.550	72.5	-5.1	1.0	155.1	-20.9	0.0	Vert	AV	0.0	46.5	54.0	-7.5	EUT Vert
1597.467	70.7	-5.1	1.0	286.0		0.0	Horz	PK	0.0	65.6	74.0	-8.4	EUT Horizontal
639.010	49.8	7.0	1.0	301.9		10.0	Vert	PK	0.0	66.8	75.9	-9.1	EUT On Side
1597.467	70.7	-5.1	1.0	286.0	-20.9	0.0	Horz	AV	0.0	44.7	54.0	-9.3	EUT Horizontal
639.010	49.8	7.0	1.0	301.9	-20.9	10.0	Vert	AV	0.0	45.9	55.9	-10.0	EUT On Side
2236.533	65.2	-2.2	1.0	153.0		0.0	Vert	PK	0.0	63.0	74.0	-11.0	EUT Vert
2875.583	63.7	-1.1	1.0	155.1		0.0	Vert	PK	0.0	62.6	74.0	-11.4	EUT Vert

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
639.005	47.3	7.0	1.0	43.0		10.0	Vert	PK	0.0	64.3	75.9	-11.6	EUT Horizontal
2236.533	65.2	-2.2	1.0	153.0	-20.9	0.0	Vert	AV	0.0	42.1	54.0	-11.9	EUT Vert
2875.583	63.7	-1.1	1.0	155.1	-20.9	0.0	Vert	AV	0.0	41.7	54.0	-12.3	EUT Vert
639.005	47.3	7.0	1.0	43.0	-20.9	10.0	Vert	AV	0.0	43.4	55.9	-12.5	EUT Horizontal
639.005	46.0	7.0	1.2	232.0		10.0	Horz	PK	0.0	63.0	75.9	-12.9	EUT Vert
2875.425	61.9	-1.1	1.0	254.9		0.0	Horz	PK	0.0	60.8	74.0	-13.2	EUT Horizontal
2236.492	62.9	-2.2	1.0	277.9		0.0	Horz	PK	0.0	60.7	74.0	-13.3	EUT Horizontal
639.005	46.0	7.0	1.2	232.0	-20.9	10.0	Horz	AV	0.0	42.1	55.9	-13.8	EUT Vert
2875.425	61.9	-1.1	1.0	254.9	-20.9	0.0	Horz	AV	0.0	39.9	54.0	-14.1	EUT Horizontal
2236.492	62.9	-2.2	1.0	277.9	-20.9	0.0	Horz	AV	0.0	39.8	54.0	-14.2	EUT Horizontal

OCCUPIED BANDWIDTH

XMit 2017.01.26

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	ESM Cable Corp.	Bilog Cables	MNH	12/1/2016	12/1/2017
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	1/6/2018
Analyzer - Spectrum Analyzer	Agilent	N9010A	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 2017.01.26

EUT:	RF-MDWS-HP-S			Work Order:	CINC0007
Serial Number:	H10			Date:	02/21/17
Customer:	CINCH Systems			Temperature:	23.3 °C
Attendees:	Jibirl Aga			Humidity:	32.2% RH
Project:	None			Barometric Pres.:	1015 mbar
Tested by:	Trevor Buls, Chris Patterson, Kyle McMullan	Power:	Battery	Job Site:	MN05

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

COMMENTS

Transmitting 319.5MHz

DEVIATIONS FROM TEST STANDARD

None

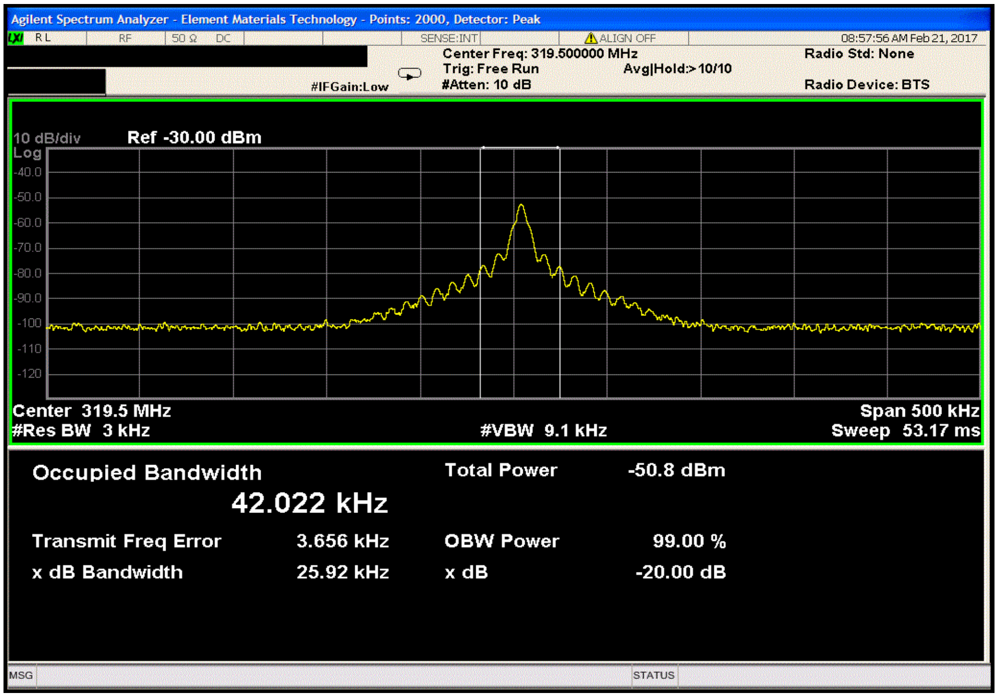
Configuration #	3	*Signature* Trevor Buls

	Value	Limit	Result
319.5MHZ	25.92	798.7	Pass

OCCUPIED BANDWIDTH

XMit 2017.01.26

319.5MHZ							
					Value (kHz)	Limit <(kHz)	Result
					25.92	798.7	Pass



DUTY CYCLE

XMit 2017.01.26

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	12/22/2016	12/22/2017
Probe - Near Field Set	ETS Lindgren	7405	IPO	NCR	NCR
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	1/6/2018
Cable	ESM Cable Corp.	Bilog Cables	MNH	12/1/2016	12/1/2017
Analyzer - Spectrum Analyzer	Agilent	N9010A	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 = 912 uSec
Pulsewidth of Type 2 Pulse = 414 uSec
Pulsewidth of Type 3 Pulse = 98.8 uSec
Number of Type 1 Pulses = 1
Number of Type 2 Pulses = 1
Number of Type 3 Pulses = 78

Duty Cycle = 20 log [((1)(.912) + (1)(.414) + (78)(.0988))/100] = -20.88 dB

The duty cycle correction factor of -20.88 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.

DUTY CYCLE

XMit 2017.01.26

EUT:	RF-MDWS-HP-S			Work Order:	CINC0007
Serial Number:	H11			Date:	02/21/17
Customer:	CINCH Systems			Temperature:	23.3 °C
Attendees:	Jibirl Aga			Humidity:	31.9% RH
Project:	None			Barometric Pres.:	1015 mbar
Tested by:	Trevor Buls, Chris Patterson, Kyle McMullan	Power:	Battery	Job Site:	MN05

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

COMMENTS

Transmitting 319.5MHz

DEVIATIONS FROM TEST STANDARD

None

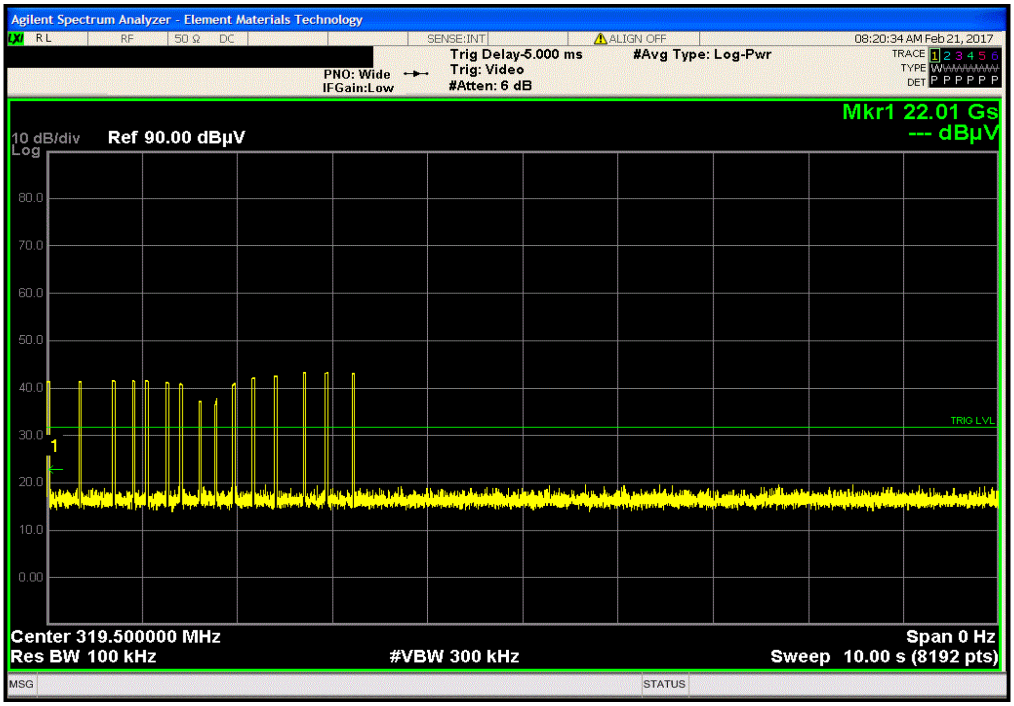
Configuration #	1	*Signature* Trevor Buls

	Value	Limit	Result
10 seconds	See Test Description	N/A	N/A
1 second	See Test Description	N/A	N/A
30 milliseconds	See Test Descritption	N/A	N/A

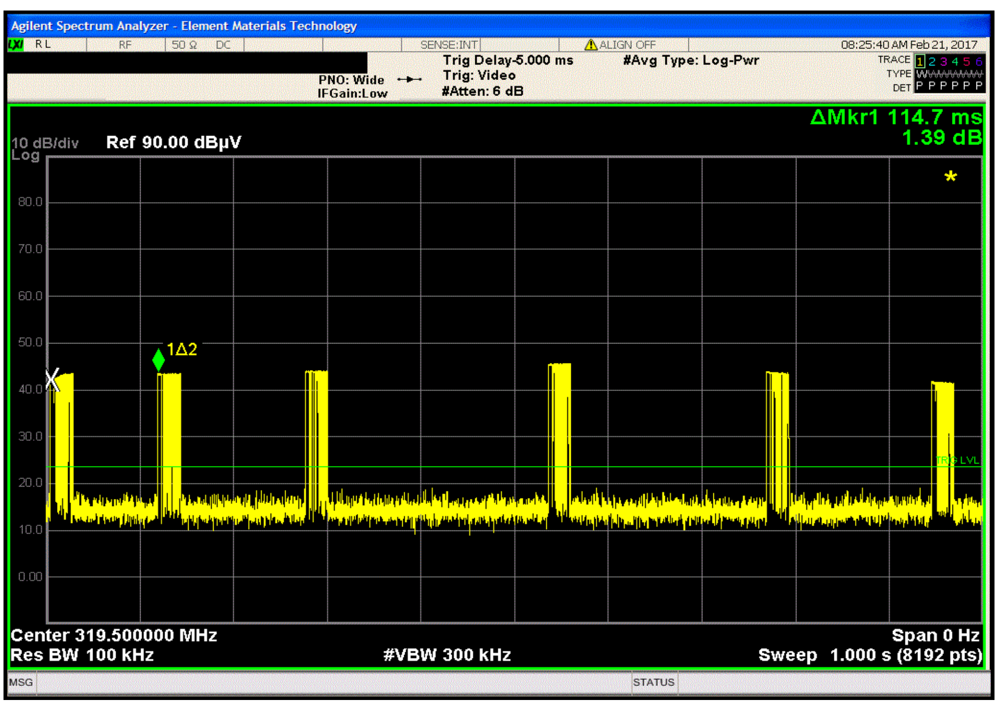
DUTY CYCLE

XMit 2017.01.26

10 seconds					
			Value	Limit	Result
			See Test Description	N/A	N/A



1 second					
			Value	Limit	Result
			See Test Description	N/A	N/A



30 milliseconds					
			Value	Limit	Result
			See Test Descritption	N/A	N/A