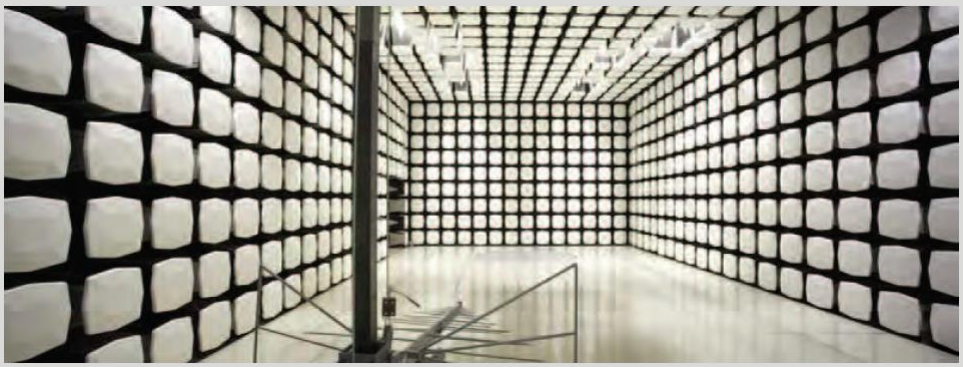
UTC Fire and Security

Shatter Pro Glassbreak

FCC 15.231:2018

Low Power 319.5 MHz Periodic Transmitter

Report # UTCF0090



NVLAP LAB CODE: 200676-0

CERTIFICATE OF TEST

Last Date of Test: March 29, 2018
UTC Fire and Security
Model: Shatter Pro Glassbreak

Radio Equipment Testing

Standards

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

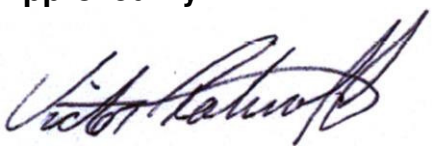
Results

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:



Victor Ratinoff, 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

2018.2.20

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

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.

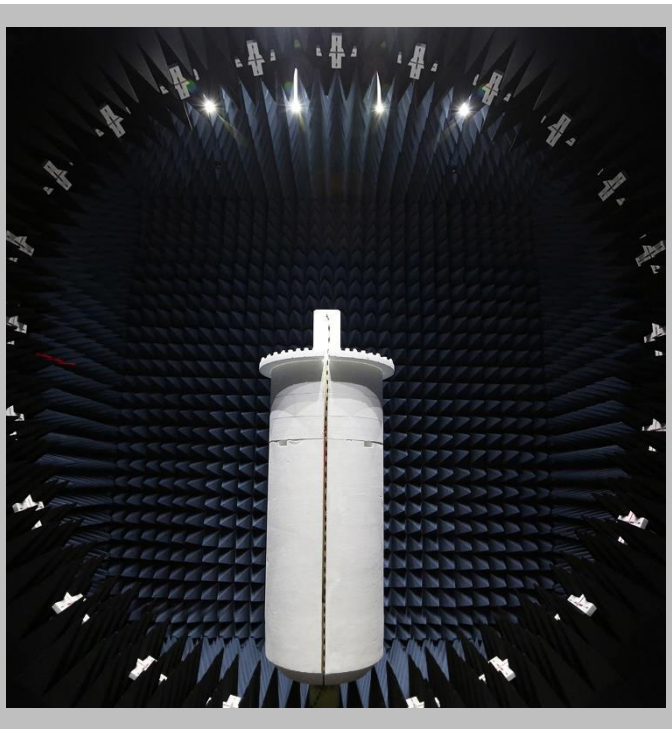
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

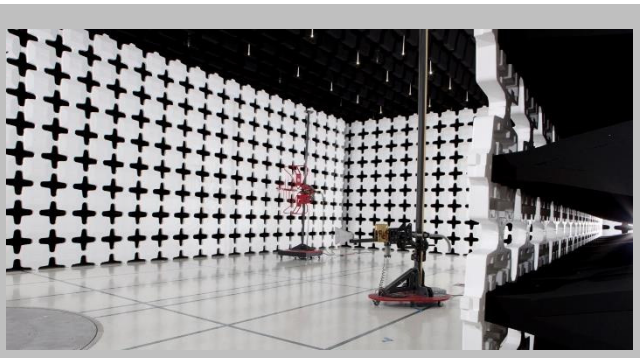
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

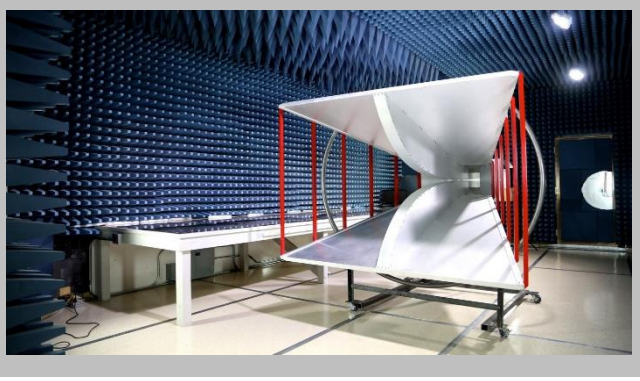
FACILITIES

2017.9.15

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



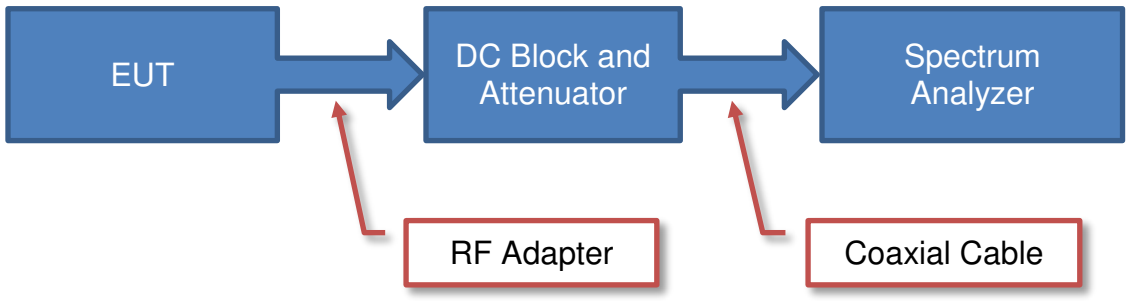




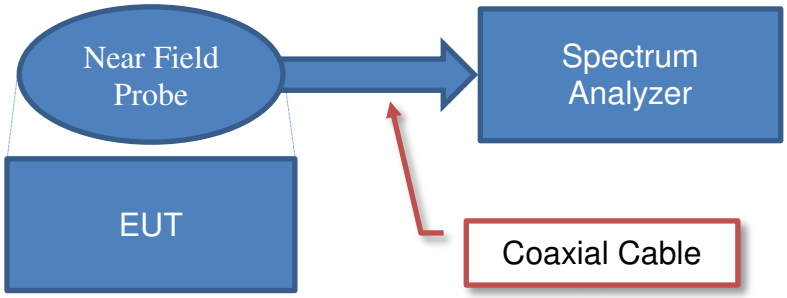
Test Setup Block Diagrams

2017.1.25

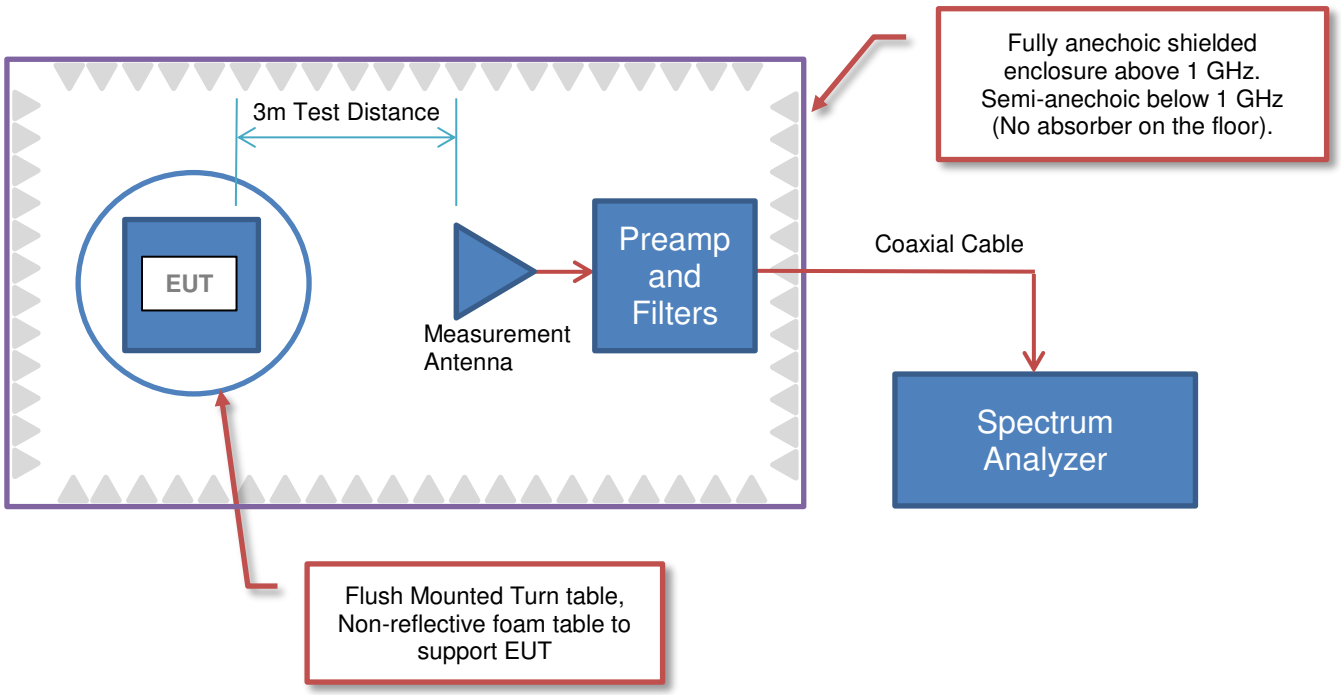
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	UTC Fire and Security
Address:	9 Farm Springs Road
City, State, Zip:	Farmington, CT 06034
Test Requested By:	Konstantin Khrustov
Model:	Shatter Pro Glassbreak
First Date of Test:	March 29, 2018
Last Date of Test:	March 29, 2018
Receipt Date of Samples:	March 29, 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:
Window Break Sensor with a low power periodic transmitter which operates at 319.5 MHz utilizing OOK modulation.

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

CONFIGURATIONS

Configuration UTCF0090- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Shatter Pro Glassbreak	UTC Fire and Security	60-873-95	09E4794

Configuration UTCF0090- 2

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Shatter Pro Glassbreak	UTC Fire and Security	60-873-95	099CB27

MODIFICATIONS

2017-1-25

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	3/29/2018	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	3/29/2018	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	3/29/2018	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	3/29/2018	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 2017.12.19

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

Continuously Transmitting Unmodulated (CW) at 319.5 MHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

UTCF0090 - 2

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
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	1-Aug-2017	12 mo
Antenna - Biconilog	Teseq	CBL 6141A	AYE	7-Nov-2017	24 mo
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	21-Nov-2017	12 mo

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 = 0.9794 mSec
Pulsewidth of Type 2 Pulse = 0.1251 mSec
Pulsewidth of Type 3 Pulse = 0.4907 mSec
Number of Type 1 Pulses = 1
Number of Type 2 Pulses = 58
Number of Type 3 Pulses = 1

Duty Cycle = 20 log [((1)(0.9794) + (58)(0.1251) + (1)(0.4907))/100] = -21.18 dB

The duty cycle correction factor of –21.18 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.

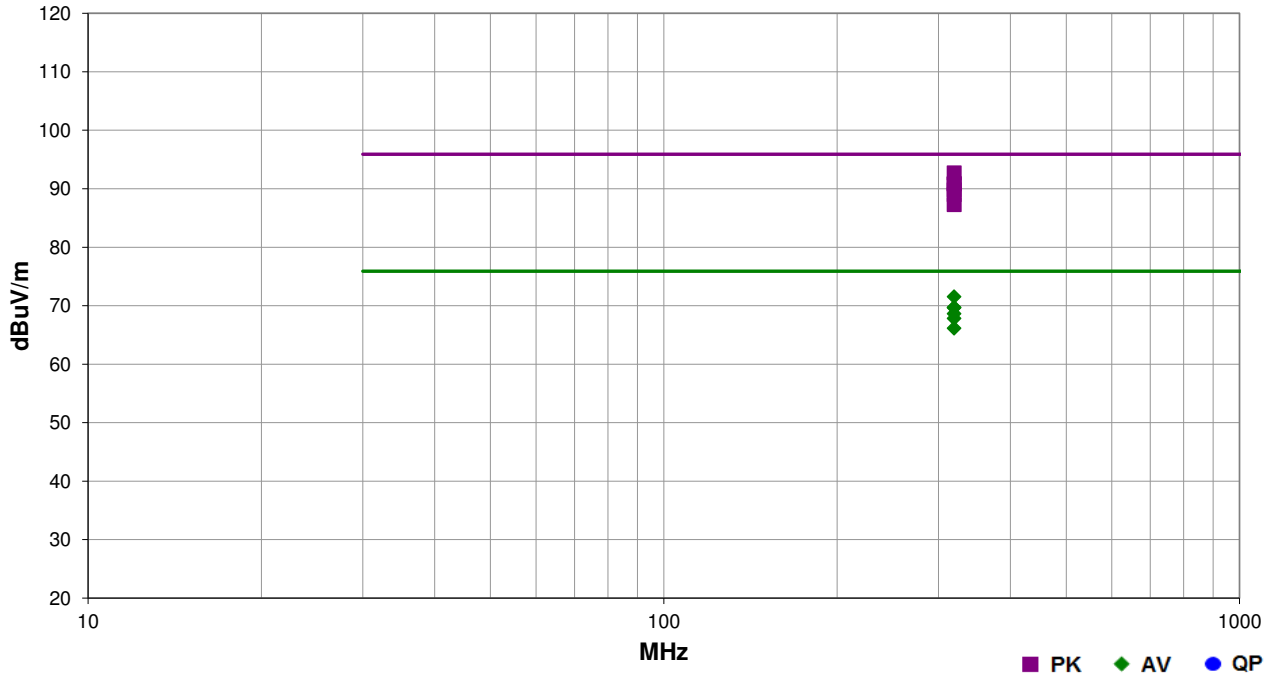
FIELD STRENGTH OF FUNDAMENTAL

EmiR5 2018.02.06 PSA-ESCI 2017.12.19

Work Order:	UTCF0090	**Date:**	29-Mar-2018		
Project:	None	**Temperature:**	20.4 °C		
Job Site:	OC10	**Humidity:**	39.4% RH		
Serial Number:	099CB27	**Barometric Pres.:**	1021 mbar	**Tested by:**	Johnny Candelas
EUT:	Shatter Pro Glassbreak				
Configuration:	2				
Customer:	UTC Fire and Security				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	Continuously Transmitting Unmodulated (CW) at 319.5 MHz				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.231:2018	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	69.9	22.8	1.0	101.0		0.0	Horz	PK	0.0	92.7	95.9	-3.2	EUT Horiz
319.505	69.9	22.8	1.0	101.0	-21.18	0.0	Horz	AV	0.0	71.5	75.9	-4.4	EUT Horiz
319.505	68.1	22.8	1.0	225.0		0.0	Horz	PK	0.0	90.9	95.9	-5.0	EUT Vert
319.505	68.0	22.8	2.1	63.0		0.0	Vert	PK	0.0	90.8	95.9	-5.1	EUT on Side
319.505	67.0	22.8	2.2	97.0		0.0	Vert	PK	0.0	89.8	95.9	-6.1	EUT Vert
319.505	68.1	22.8	1.0	225.0	-21.18	0.0	Horz	AV	0.0	69.7	75.9	-6.2	EUT Vert
319.505	68.0	22.8	2.1	63.0	-21.18	0.0	Vert	AV	0.0	69.6	75.9	-6.3	EUT on Side
319.503	66.2	22.8	1.2	5.0		0.0	Horz	PK	0.0	89.0	95.9	-6.9	EUT on Side
319.505	67.0	22.8	2.2	97.0	-21.18	0.0	Vert	AV	0.0	68.6	75.9	-7.3	EUT Vert
319.503	66.2	22.8	1.2	5.0	-21.18	0.0	Horz	AV	0.0	67.8	75.9	-8.1	EUT on Side
319.505	64.5	22.8	2.3	298.0		0.0	Vert	PK	0.0	87.3	95.9	-8.6	EUT Horiz
319.505	64.5	22.8	2.3	298.0	-21.18	0.0	Vert	AV	0.0	66.1	75.9	-9.8	EUT Horiz

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

Continuously Transmitting Unmodulated (CW) at 319.5 MHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

UTCF0090 - 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
Attenuator	Fairview Microwave	SA18H-10	TKP	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	1-Aug-2017	12 mo
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	1-Aug-2017	12 mo
Antenna - Biconilog	Teseq	CBL 6141A	AYE	7-Nov-2017	24 mo
Amplifier - Pre-Amplifier	Miteq	AMF-4D-010120-30-10P-1	AOP	13-Jul-2017	12 mo
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	13-Jul-2017	12 mo
Antenna - Double Ridge	ETS Lindgren	3117	AHQ	28-Sep-2017	24 mo
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	21-Nov-2017	12 mo

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 = 0.9794 mSec
Pulsewidth of Type 2 Pulse = 0.1251 mSec
Pulsewidth of Type 3 Pulse = 0.4907 mSec
Number of Type 1 Pulses = 1
Number of Type 2 Pulses = 58
Number of Type 3 Pulses = 1

Duty Cycle = 20 log [((1)(0.9794) + (58)(0.1251) + (1)(0.4907))/100] -21.18 dB

The duty cycle correction factor of -21.18 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.

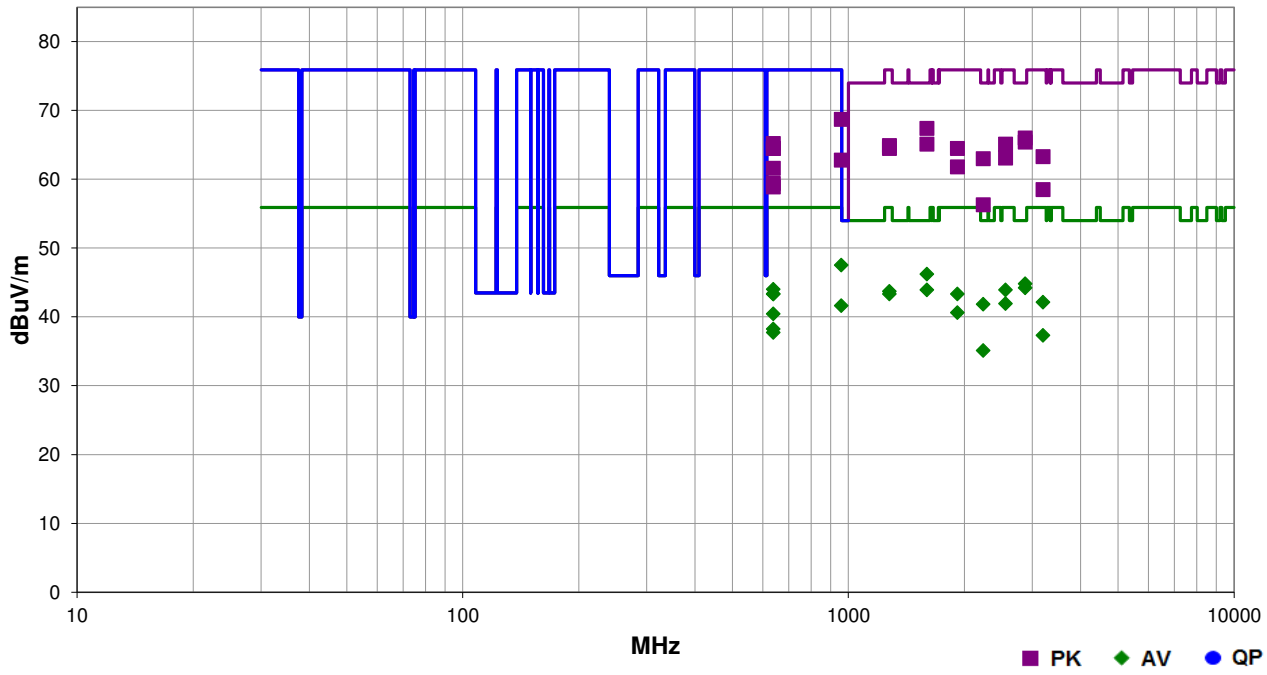
SPURIOUS RADIATED EMISSIONS

EmiR5 2018.02.06 PSA-ESCI 2017.12.19

Work Order:	UTCF0090	**Date:**	29-Mar-2018		
Project:	None	**Temperature:**	20.4 °C		
Job Site:	OC10	**Humidity:**	39.4% RH		
Serial Number:	099CB27	**Barometric Pres.:**	1021 mbar	**Tested by:**	Johnny Candelas
EUT:	Shatter Pro Glassbreak				
Configuration:	2				
Customer:	UTC Fire and Security				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	Continuously Transmitting Unmodulated (CW) at 319.5 MHz				
Deviations:	None				
Comments:	None				

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

Run #	4	**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 (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
1597.508	65.9	1.5	1.0	152.0		0.0	Vert	PK	0.0	67.4	74.0	-6.6	EUT Vert
958.512	38.3	20.4	1.1	34.0		10.0	Horz	PK	0.0	68.7	75.9	-7.2	EUT Horiz
1597.508	65.9	1.5	1.0	152.0	-21.2	0.0	Vert	AV	0.0	46.2	54.0	-7.8	EUT Vert
2875.650	57.7	8.3	1.1	176.0		0.0	Horz	PK	0.0	66.0	74.0	-8.0	EUT Horiz
958.512	38.3	20.4	1.1	34.0	-21.2	10.0	Horz	AV	0.0	47.5	55.9	-8.4	EUT Horiz
2875.475	57.1	8.3	1.3	114.0		0.0	Vert	PK	0.0	65.4	74.0	-8.6	EUT Vert
1597.525	63.6	1.5	1.1	94.0		0.0	Horz	PK	0.0	65.1	74.0	-8.9	EUT Horiz
2875.650	57.7	8.3	1.1	176.0	-21.2	0.0	Horz	AV	0.0	44.8	54.0	-9.2	EUT Horiz
1597.525	63.6	1.5	1.1	94.0	-21.2	0.0	Horz	AV	0.0	43.9	54.0	-10.1	EUT Horiz
639.002	42.0	13.2	1.7	235.0		10.0	Horz	PK	0.0	65.2	75.9	-10.7	EUT Horiz
2556.050	58.2	6.9	1.2	163.0		0.0	Vert	PK	0.0	65.1	75.9	-10.8	EUT Vert
1278.042	64.0	0.9	1.2	155.0		0.0	Vert	PK	0.0	64.9	75.9	-11.0	EUT Vert
2236.583	56.9	6.1	1.1	256.0		0.0	Horz	PK	0.0	63.0	74.0	-11.0	EUT Horiz

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
639.017	41.3	13.2	1.0	136.0		10.0	Vert	PK	0.0	64.5	75.9	-11.4	EUT on Side
639.015	41.3	13.2	1.8	15.0		10.0	Horz	PK	0.0	64.5	75.9	-11.4	EUT Vert
1278.050	63.6	0.9	1.5	348.0		0.0	Horz	PK	0.0	64.5	75.9	-11.4	EUT Horiz
1917.033	59.4	5.1	3.2	220.0		0.0	Horz	PK	0.0	64.5	75.9	-11.4	EUT Horiz
639.002	42.0	13.2	1.7	235.0	-21.2	10.0	Horz	AV	0.0	44.0	55.9	-11.9	EUT Horiz
2556.050	58.2	6.9	1.2	163.0	-21.2	0.0	Vert	AV	0.0	43.9	55.9	-12.0	EUT Vert
1278.042	64.0	0.9	1.2	155.0	-21.2	0.0	Vert	AV	0.0	43.7	55.9	-12.2	EUT Vert
2236.583	56.9	6.1	1.1	256.0	-21.2	0.0	Horz	AV	0.0	41.8	54.0	-12.2	EUT Horiz
639.017	41.3	13.2	1.0	136.0	-21.2	10.0	Vert	AV	0.0	43.3	55.9	-12.6	EUT on Side
639.015	41.3	13.2	1.8	15.0	-21.2	10.0	Horz	AV	0.0	43.3	55.9	-12.6	EUT Vert
1917.033	59.4	5.1	3.2	220.0	-21.2	0.0	Horz	AV	0.0	43.3	55.9	-12.6	EUT Horiz
1278.050	63.6	0.9	1.5	348.0	-21.2	0.0	Horz	AV	0.0	43.3	55.9	-12.6	EUT Horiz
3195.025	54.5	8.8	2.2	238.0		0.0	Horz	PK	0.0	63.3	75.9	-12.6	EUT Horiz
2556.050	56.2	6.9	1.2	144.0		0.0	Horz	PK	0.0	63.1	75.9	-12.8	EUT Horiz
958.508	32.4	20.4	1.7	104.0		10.0	Vert	PK	0.0	62.8	75.9	-13.1	EUT Vert
3195.025	54.5	8.8	2.2	238.0	-21.2	0.0	Horz	AV	0.0	42.1	55.9	-13.8	EUT Horiz
2556.050	56.2	6.9	1.2	144.0	-21.2	0.0	Horz	AV	0.0	41.9	55.9	-14.0	EUT Horiz
1917.067	56.7	5.1	1.2	105.0		0.0	Vert	PK	0.0	61.8	75.9	-14.1	EUT Vert
958.508	32.4	20.4	1.7	104.0	-21.2	10.0	Vert	AV	0.0	41.6	55.9	-14.3	EUT Vert
639.012	38.4	13.2	1.2	256.0		10.0	Vert	PK	0.0	61.6	75.9	-14.3	EUT Vert
1917.067	56.7	5.1	1.2	105.0	-21.2	0.0	Vert	AV	0.0	40.6	55.9	-15.3	EUT Vert
639.012	38.4	13.2	1.2	256.0	-21.2	10.0	Vert	AV	0.0	40.4	55.9	-15.5	EUT Vert
639.024	36.2	13.2	1.6	203.0		10.0	Horz	PK	0.0	59.4	75.9	-16.5	EUT on Side
639.017	35.7	13.2	1.0	56.0		10.0	Vert	PK	0.0	58.9	75.9	-17.0	EUT Horiz
3195.017	49.7	8.8	1.2	136.0		0.0	Vert	PK	0.0	58.5	75.9	-17.4	EUT Vert
639.024	36.2	13.2	1.6	203.0	-21.2	10.0	Horz	AV	0.0	38.2	55.9	-17.7	EUT on Side
2236.550	50.2	6.1	2.0	79.0		0.0	Vert	PK	0.0	56.3	74.0	-17.7	EUT Vert
639.017	35.7	13.2	1.0	56.0	-21.2	10.0	Vert	AV	0.0	37.7	55.9	-18.2	EUT Horiz
3195.017	49.7	8.8	1.2	136.0	-21.2	0.0	Vert	AV	0.0	37.3	55.9	-18.6	EUT Vert
2236.550	50.2	6.1	2.0	79.0	-21.2	0.0	Vert	AV	0.0	35.1	54.0	-18.9	EUT Vert
2875.475	57.1	8.3	1.3	114.0	-21.2	0.0	Vert	AV	0.0	44.2	74.0	-29.8	EUT Vert

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
Probe - Near Field Set	Com-Power	PS-400	IPF	NCR	NCR
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	21-Nov-17	21-Nov-18

TEST DESCRIPTION

A near-field probe was placed near the transmitter. A low-loss coaxial cable was used to connect the near-field probe to the spectrum analyzer. 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 2017.12.13

EUT:	Shatter Pro Glassbreak			Work Order:	UTCF0090
Serial Number:	09E4794			Date:	29-Mar-18
Customer:	UTC Fire and Security			Temperature:	22 °C
Attendees:	None			Humidity:	44.2% RH
Project:	None			Barometric Pres.:	1020 mbar
Tested by:	Johnny Candelas	Power:	Battery	Job Site:	OC10

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

COMMENTS

Limit based on center frequency: 319.5 MHz * 0.25% = 0.79875 MHz.

DEVIATIONS FROM TEST STANDARD

None

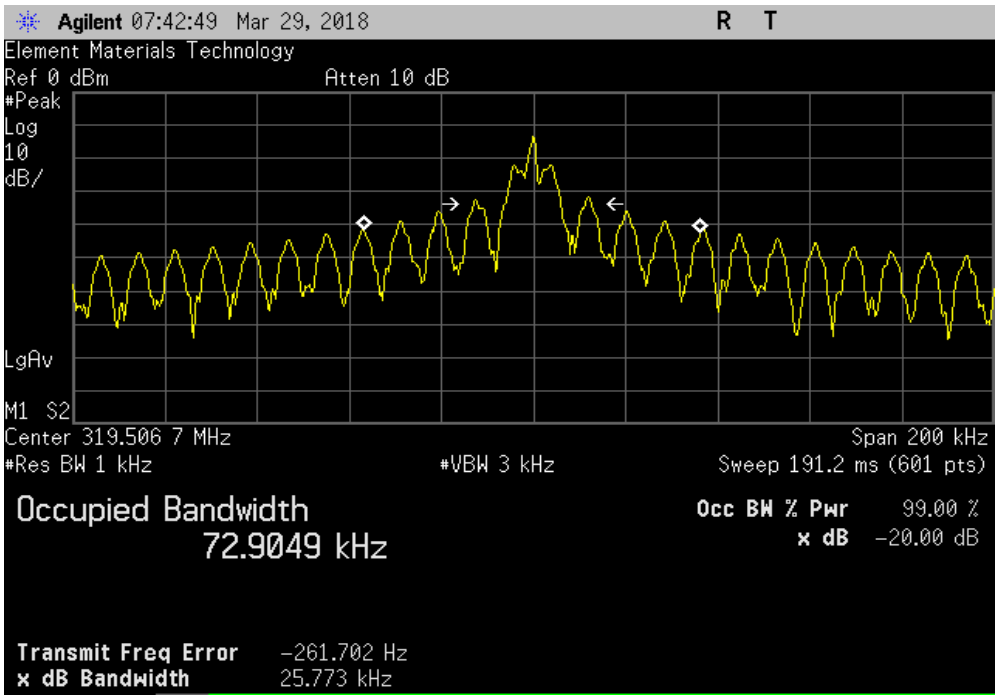
Configuration #	1	Signature

	Value	Limit	Result
319.5 MHz	25.773 kHz	798.75 kHz	Pass

OCCUPIED BANDWIDTH

XMit 2017.12.13

319.5 MHz						
				Value	Limit	Result
				25.773 kHz	798.75 kHz	Pass



DUTY CYCLE

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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
Probe - Near Field Set	Com-Power	PS-400	IPF	NCR	NCR
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	21-Nov-17	21-Nov-18

TEST DESCRIPTION

A near-field probe was placed near the transmitter. A low-loss coaxial cable was used to connect the near-field probe to the spectrum analyzer. The EUT was transmitting at its maximum data rate.
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 = 0.9794 mSec
Pulsewidth of Type 2 Pulse = 0.1251 mSec
Pulsewidth of Type 3 Pulse = 0.4907 mSec
Number of Type 1 Pulses = 1
Number of Type 2 Pulses = 58
Number of Type 3 Pulses = 1

Duty Cycle = 20 log [((1)(0.9794) + (58)(0.1251) + (1)(0.4907))/100] = -21.18 dB

The duty cycle correction factor of –21.18 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 2017.12.13

EUT:	Shatter Pro Glassbreak			**Work Order:**	UTCF0090
Serial Number:	09E4794			**Date:**	29-Mar-18
Customer:	UTC Fire and Security			**Temperature:**	22 °C
Attendees:	None			**Humidity:**	44.2% RH
Project:	None			**Barometric Pres.:**	1020 mbar
Tested by:	Johnny Candelas	**Power:**	Battery	**Job Site:**	OC10

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

COMMENTS

Period between bursts is greater than 100 mS. Initial amplitude increase on the 30 mS screen capture is due to the system becoming active and is below the spurious limits, so this was excluded from the "on time" of the duty cycle calculation.

DEVIATIONS FROM TEST STANDARD

None

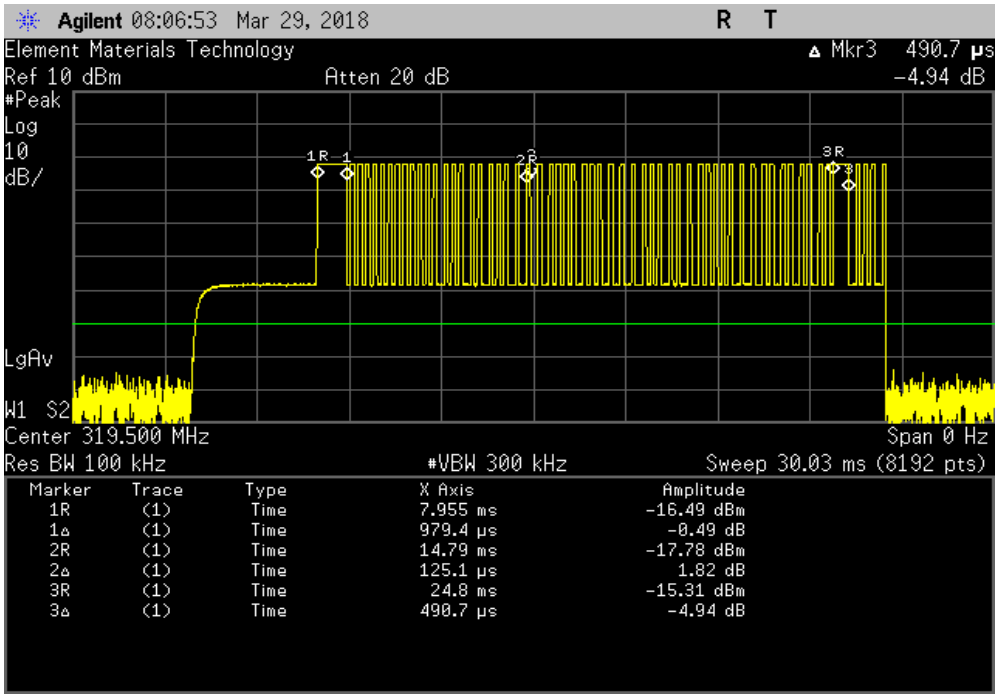
Configuration #	1	Signature

	Pulse Width Type 1 (ms)	Pulse Width Type 2 (ms)	Pulse Width Type 3 (ms)	Limit	Result
30ms Interval	0.9794	0.1251	0.4907	N/A	N/A
100ms Interval	N/A	N/A	N/A	N/A	N/A
1s Interval	N/A	N/A	N/A	N/A	N/A
5s Interval	N/A	N/A	N/A	N/A	N/A
10s Interval	N/A	N/A	N/A	N/A	N/A

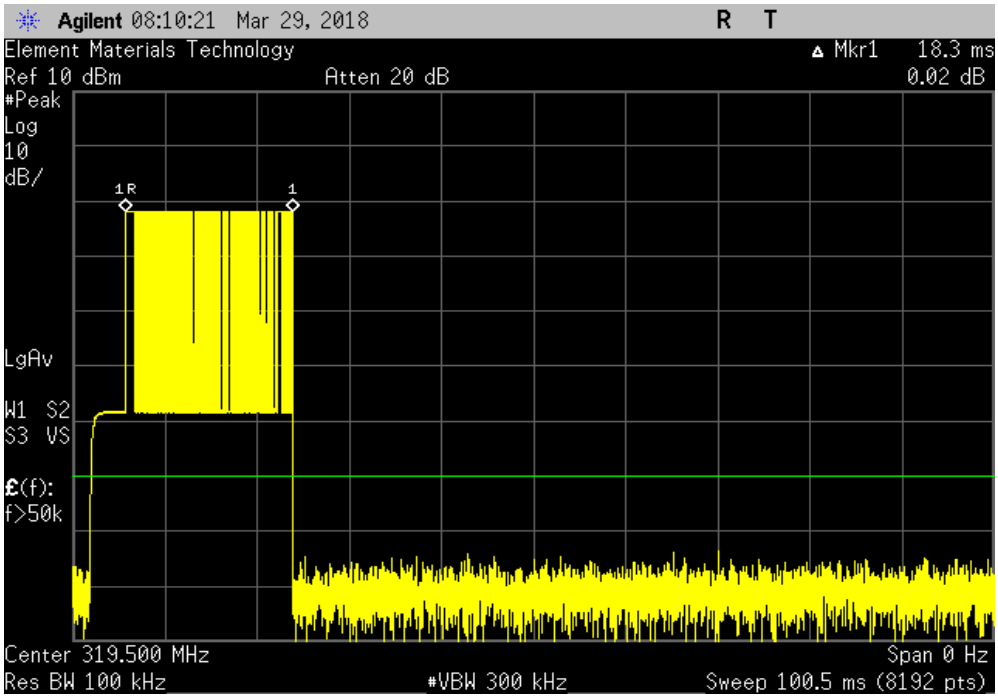
DUTY CYCLE

XMit 2017.12.13

30ms Interval						
		Pulse Width Type 1 (ms)	Pulse Width Type 2 (ms)	Pulse Width Type 3 (ms)	Limit	Result
		0.9794	0.1251	0.4907	N/A	N/A



100ms Interval						
		Pulse Width Type 1 (ms)	Pulse Width Type 2 (ms)	Pulse Width Type 3 (ms)	Limit	Result
		N/A	N/A	N/A	N/A	N/A



DUTY CYCLE

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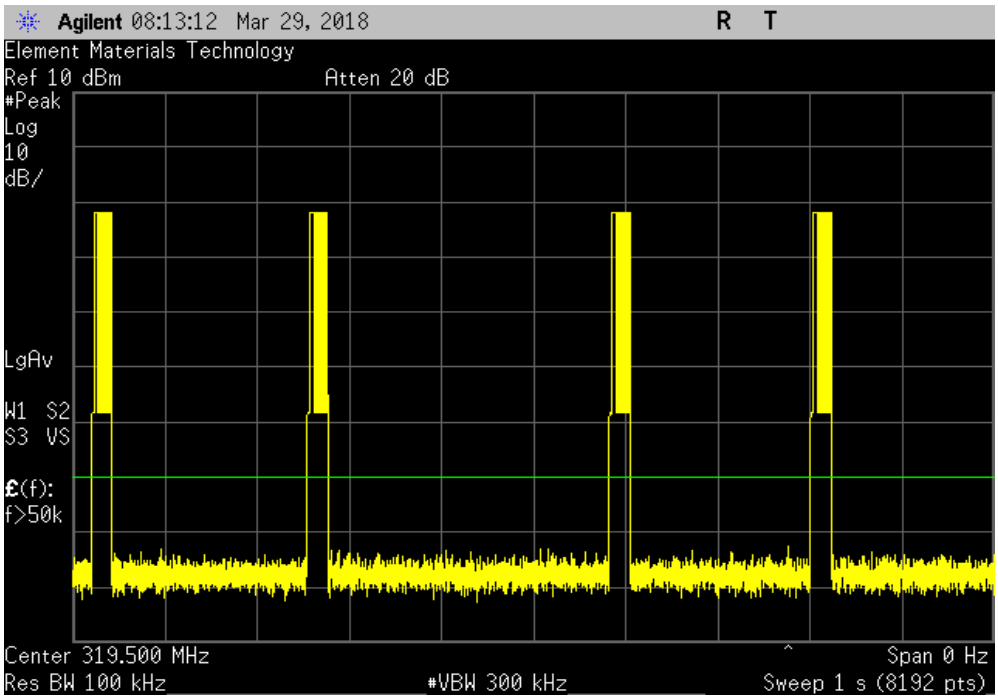
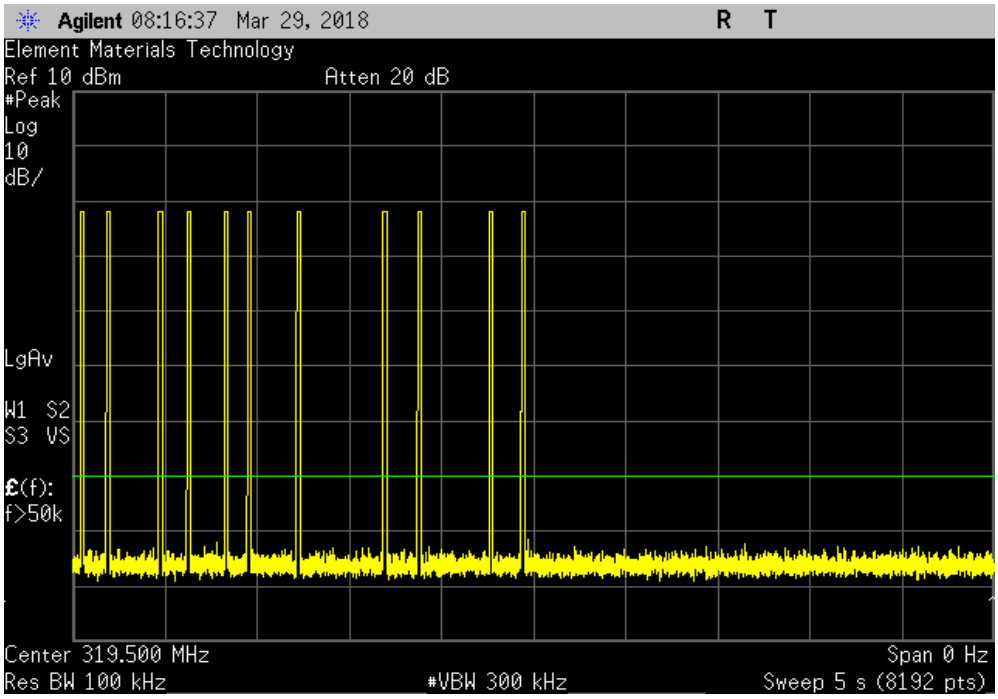
1s Interval						
		Pulse Width Type 1 (ms)	Pulse Width Type 2 (ms)	Pulse Width Type 3 (ms)	Limit	Result
		N/A	N/A	N/A	N/A	N/A



5s Interval						
		Pulse Width Type 1 (ms)	Pulse Width Type 2 (ms)	Pulse Width Type 3 (ms)	Limit	Result
		N/A	N/A	N/A	N/A	N/A



DUTY CYCLE

XMit 2017.12.13

10s Interval						
		Pulse Width Type 1 (ms)	Pulse Width Type 2 (ms)	Pulse Width Type 3 (ms)	Limit	Result
		N/A	N/A	N/A	N/A	N/A