T I M C O
E N G I N E E R I N G , I n c .

FCC PART 15.231

MOMENTARILY OPERATED TRANSMITTER

TEST REPORT

Applicant	DRIVEN DESIGNS, INC.
Address	**1135 S. Bridge St.** **Belding MI 48809 USA**
Product Model Number	PA-30
Product Description	POOL ALARM TRANSMITTER
FCC ID	YHT-PPS
Date Sample Received	3/16/2017
Final Test Date	3/21/2017
Tested By	FRANKLIN ROSE
Approved By	Cory Leverett

Report Number	Version Number	Description	Issue Date
308BUT17TestReport	Rev1	Initial Issue	3/22/2017
308BUT17TestReport	Rev2	Updated FCC Rule Part on Page 6	3/22/2017

TABLE OF CONTENTS

GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

Summary

The device under test does:

☒ Fulfill the general approval requirements as identified in this test report and was selected by the customer.

☐ Not fulfill the general approval requirements as identified in this test report

Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

I attest that the necessary measurements were made at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, FL 32669

Tested by:
Name and Title: Franklin Rose, Project Manager/Testing Technician

Date: 3/21/ 2017

Reviewed and approved by:

Name and Title: Cory Leverett, Engineering Project Manager

Date:3/22/2017

GENERAL INFORMATION

EUT Description	POOL ALARM TRANSMITTER
FCC ID	YHT-PPS
Model Number	PA-30
Operating Frequency	433.92 MHz
Test Frequencies	433.92 MHz
Modulation	ON-OFF-KEYING (OOK)
EUT Power Source	☐ 110–120Vac/50– 60Hz ☐ DC Power 12V ☒ Battery Operated Exclusively
Test Item	☐ Prototype ☒ Pre-Production ☐ Production
Type of Equipment	☐ Fixed ☐ Mobile ☒ Portable
Test Conditions	Temperature: 24-26°C Relative humidity: 50-65% Barometric Pressure:
Modification to the EUT	Momentary connection added to activate transmitter.
Test Exercise	For radiated emissions testing a continuously transmitting modulated carrier was used, for verification of duty cycle and compliance with periodic operation a normally operating transmitter was used
Regulatory Standards	FCC CFR Title 47 Part 15C
Measurement Standards	ANSI C63.10: 2013 FCC CFR Title 47 Part 15.31, 15.33, 15.35

TEST RESULTS SUMMARY

Requirement	FCC Rules Part No.	RESULTS Pass/Fail/NA
Types of Momentary Signals	15.231(a)	PASS
Fundamental Output Power	15.231(b)(1)(2)(3)	PASS
Spurious Emissions and Harmonics	15.231(b)(1)(2)(3)	PASS
Occupied Bandwidth	15.231(c)	PASS

TEST SETUP

Test Exercise(e.g software description, test signal, etc.):	Connection was made to activate transmitter
Deviation from the standard(s)	No deviation from the standard(s)
Modification to the DUT:	Momentary connection added to activate transmitter.
Supporting Peripheral Equipment	NONE

PERIODIC OPERATION

FCC Rule Part No: 15.231(a)

Requirements:

The intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition

(5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (1) and (2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

Procedure: ANSI C63.10 § 7.4(e) Compliance for periodic operation

PERIODIC OPERATION

Declaration Provided by Applicant

Item	Description	Yes	No
1	Does this device transmit a signal that is only used to control another device?	X	
2	Does this device send data with this control signal?		X
3	Does this device send data? Data is, things like: temperature, wind direction, fluid amount, rate of flow, etc.		X
4	Does this device transmit continuously or automatically?	X	
5	If manually operated does this device stop transmitting within 5 seconds of releasing the button?	NA	
6	If automatically operated does it deactivate 5 seconds after activation?		X
7	Does it transmit at regular predetermined intervals?		X
8	Does it poll or send supervisory information?		X
	If yes does it do a system integrity check? How often?		X
9	Is this a fire, security or safety of life device?	X	
	If YES does the device stop transmitting after the alarm condition is satisfied?	X	
10	Duty cycle: Maximum on-time?	9.25 ms	?
	If YES, on-time in 100 ms? If Other, please specify here		X
	On time in	28 ms	?
11	Modulation technique: Please specify the modulation of the test sample, FM, or AFSK, or FSK, or on-off keying, or others?	OOK	

Meets all requirements.

DUTY CYCLE

Requirements: There are no requirements for the duty cycle; it is measured to determine compliance with the periodic operation average emission limits and the automatic transmission on time requirement.

Procedure: ANSI C63.10 § 7.5 Average value of pulsed emissions

Formula: $\delta \text{ (dB)} = 20 \log [\Sigma(n_1 t_1 + n_2 t_2 + n_3 t_3) / T]$

Where:

δ is the duty cycle correction factor (dB)
T is the period that the pulses are averaged over
t_1 is the pulse width of subpulse 1
t_2 is the pulse width of subpulse 2
t_3 is the pulse width of subpulse 3
n_1 is the number of t_1 pulses
n_2 is the number of t_2 pulses
n_3 is the number of t_3 pulses

Test Data: Calculation of Duty Cycle

Sub Pulse	Duration (ms)	Number	On Time (ms)
1	0.190	26	4.95
2	0.391	11	4.30
		Total On Time (ms)	9.25
		Period (ms)	28.00
		Duty Cycle (%)	33%
		Cor Factor (dB)	-9.62

See the following plots.

Applicant: DRIVEN DESIGNS, INC.   Table of Contents
FCC ID: YHT-PPS
Report: 308BUT17TestReport_Rev1   Page 8 of 19

DUTY CYCLE

Test Data: Pulse Train Period Plot

Rep Rate = 28.00 ms

DUTY CYCLE

Test Data: **Number of Pulses Plot**
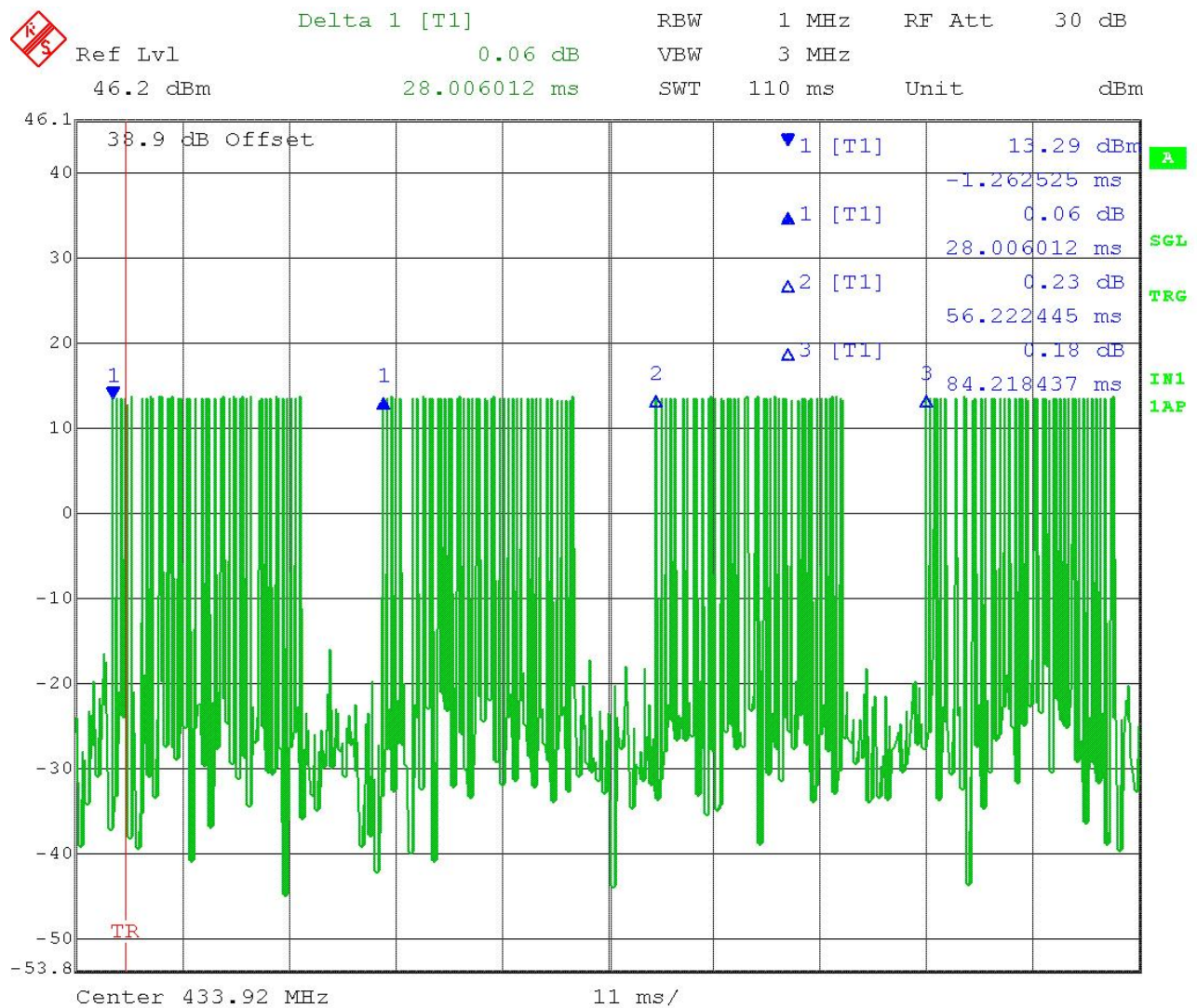
Subpulse 1 = 26 / Subpulse 2 = 11

DUTY CYCLE

Test Data: **SubPulse 1 Duration Plot**

Subpulse 1 Duration = 190.38 µS
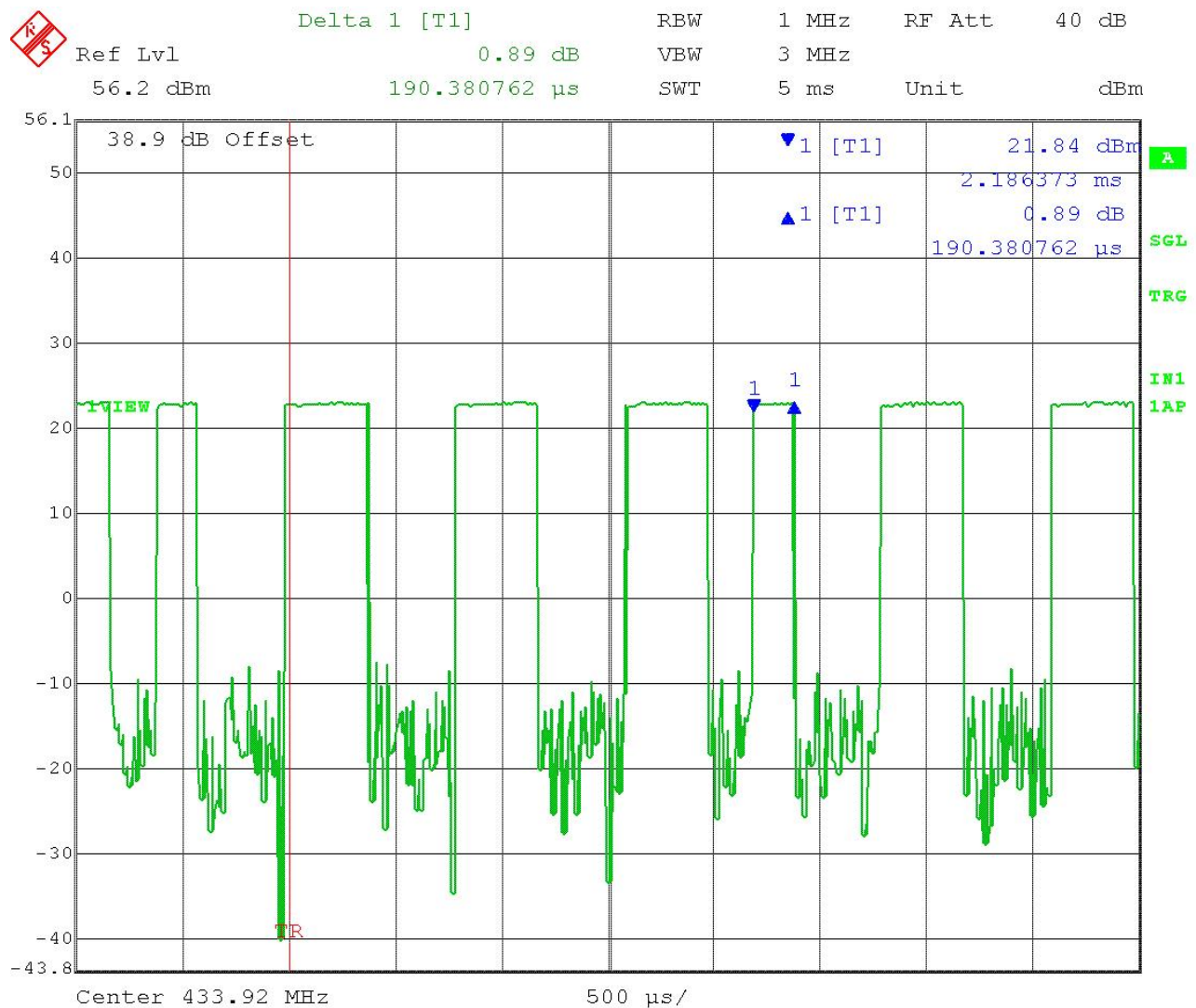
DUTY CYCLE

Test Data: **SubPulse 2 Duration Plot**

Subpulse 2 Duration = 390.78 μS
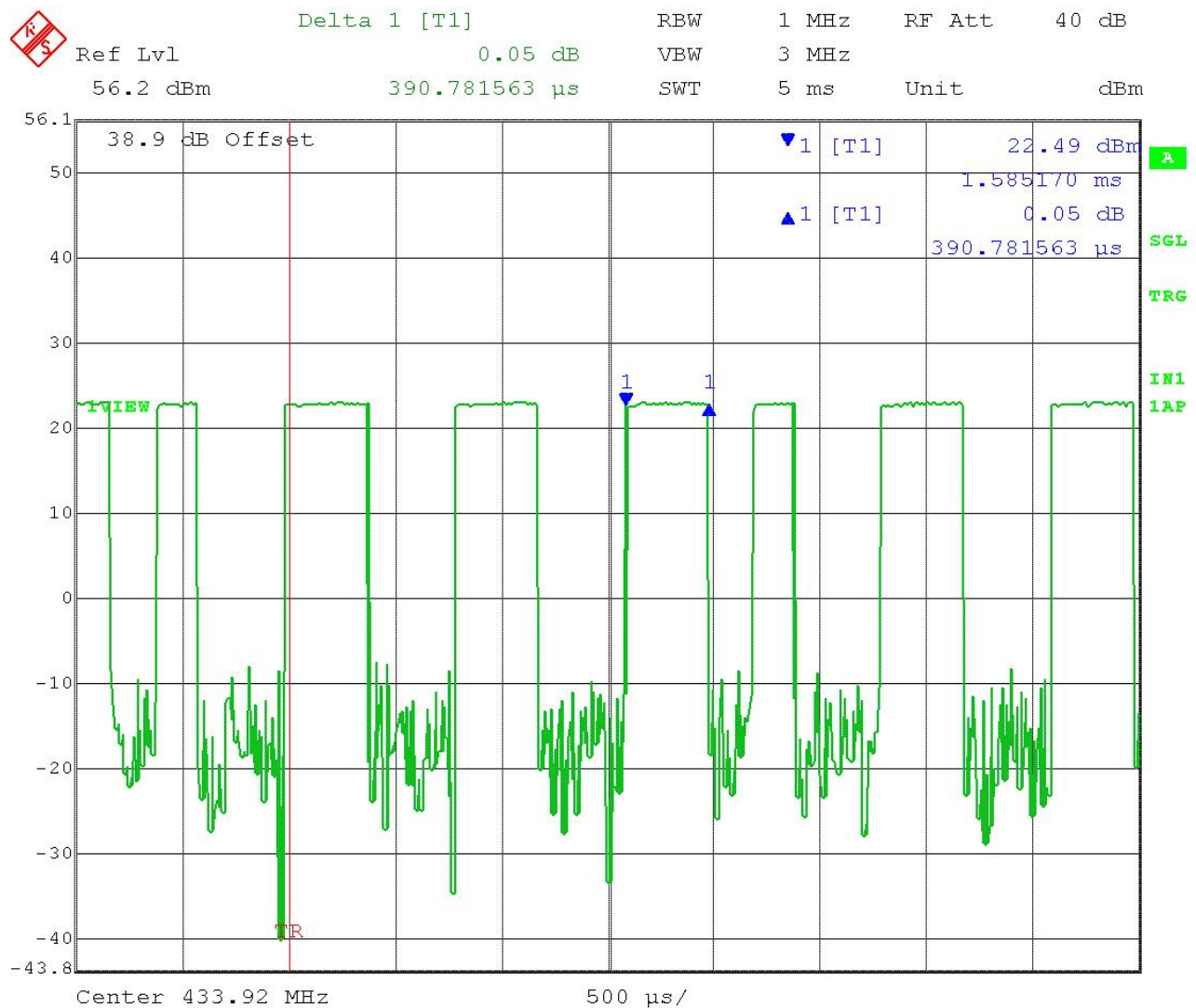
RADIATION EMISSIONS:

FCC Rules Part No.: 15.231(b)(1)(2)(3), 15.209 (a), 15.205(a)(b)

Requirements: In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

[1]Linear interpolations.

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

RADIATION EMISSIONS:

Calculation of the effective limit: ANSI C63.10 section 7.6.2

The effective limit at the frequency of interest is found by linearly interpolating using the familiar slope-intercept formula, y = mx + b, rewritten as in Equation (12):

The effective limit at the frequency of interest is found by linearly interpolating using the familiar slope-intercept formula, $y = mx + b$, rewritten as in Equation (12):

$$\text{Limit}\left[\mu V/m\right] = \text{Lim}_{\text{lower}} + \Delta F\left[\left(\text{Lim}_{\text{upper}} - \text{Lim}_{\text{lower}}\right)/\left(f_{\text{upper}} - f_{\text{lower}}\right)\right] \qquad (12)$$

where

$\text{Lim}_{\text{lower}}$	is the limit at the lower frequency of the intended band of operation
$\text{Lim}_{\text{upper}}$	is the limit at the upper frequency of the intended band of operation
f_{lower}	is the lower frequency of the intended band of operation
f_{upper}	is the upper frequency of the intended band of operation
ΔF	equals $f_{\text{c}} - f_{\text{lower}}$
f_{c}	is the center frequency of the emission signal

The effective limit in dBµV/m is found using [20 log (Limit [µV/m])].

15.231 Limits for Fundamental and Spurious outside of restricted bands

Limit Type	f_c (MHz)	Limit (dBuV/m)	Limit (uV/m)	Lim lower (uV/m)	lim upper (uV/m)	f lower (MHz)	f upper (MHz)	Δ F (MHz)
Fund	433.92	80.83	10996.67	3750.00	12500.00	260.00	470.00	173.92
Spurs	433.92	60.83	1099.67	375.00	1250.00	260.00	470.00	173.92

15.209 limits for Restricted Band Emissions	
Frequency (MHz)	Limits
9 – 490 kHz	2400/F (kHz) µV/m @ 300 meters
490 – 1705 kHz	24000/F (kHz) µV/m @ 30 meters
1705 – 30 MHz	29.54 dBµV/m measured @ 30 meters
30 – 88	40.0 dBµV/m measured @ 3 meters
88 – 216	43.5 dBµV/m measured @ 3 meters
216 – 960	46.0 dBµV/m measured @ 3 meters
Above 960	54.0 dBµV/m measured @ 3 meters

RADIATION EMISSIONS:

Test Method: ANSI C63.10 § 6.3 – 6.6 Radiated Emissions Unlicensed Devices

The EUT was placed on a table with dimensions of 1m by 1.5m, 80 cm high below 1 GHz and 150 cm high above 1 GHz. The EUT was placed in the center of the table. The table used for radiated measurements is capable of continuous rotation. The spectrum was scanned from 9 KHz or the lowest frequency generated to the 10th harmonic of the fundamental.

Peak readings were taken in three (3) orthogonal planes when necessary and the highest readings were converted to average readings based on the duty cycle.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

Formula of Conversion Factors:

The field strength at 3m was established by adding the meter reading of the spectrum analyzer to the antenna correction factor supplied by the antenna manufacturer plus the coax loss. The antenna correction factors are stated in terms of dB/m. The gain of the preselector was accounted for in the spectrum analyzer reading.

   Example:

Freq. MHz	Meter Reading dBμV	ACF dB/m	Cable Loss dB	Field Strength dBμV/m @ 3 m
33	20	+10.36	+1.2	= 31.56

RADIATION EMISSIONS:

Test Data: Measurement Table

Tuned Freq MHz	Emission Frequency MHz		Meter Reading dBu V	Duty Cycle (dB)	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Limit (dBuV/m)	Margin dB
433.92	433.92		66.00	9.62	H	2.39	17.40	76.17	80.83	4.66
433.92	867.84		35.36	9.62	H	3.38	22.32	51.44	60.83	9.39
433.92	1301.76	*	23.61	9.62	H	4.14	29.51	47.64	54.00	6.36
433.92	1301.76	*	23.61	0.00	H	4.14	29.51	57.26	74.00	16.74
433.92	1735.68		28.02	9.62	H	4.75	29.67	52.82	60.83	8.01
433.92	2169.60		25.02	9.62	H	5.42	30.91	51.73	60.83	9.10
433.92	2603.52		21.49	9.62	H	5.91	32.60	50.38	60.83	10.45
433.92	3037.44		23.87	9.62	H	6.37	33.26	53.88	60.83	6.95
433.92	3471.36		27.96	9.62	H	6.82	33.11	58.27	60.83	2.56
433.92	3905.28	*	18.04	9.62	V	7.26	33.47	49.15	54.00	4.85
433.92	3905.28	*	18.04	0.00	V	7.26	33.47	58.77	74.00	15.23
433.92	4339.20	*	16.92	9.62	H	7.66	33.63	48.59	54.00	5.41
433.92	4339.20	*	16.92	0.00	H	7.66	33.63	58.21	74.00	15.79

* -Denotes restricted bands which must comply with limits 15.209

Notes:

The spectrum was measured from 9 KHz to the tenth harmonic of the fundamental frequency

Emissions that are 20 dB below the limit are not required to be reported.

OCCUPIED BANDWIDTH

FCC Rules Part No.:   15.231(C), & 15.215(c)

Requirements:

The 20 dB bandwidth of the emission shall fall completely inside the band of operation, and be no wider than .25% of the center frequency for devices operating between 70 and 900 MHz.

Test Method: ANSI C63.10 § 6.9.2 Occupied bandwidth Relative procedure
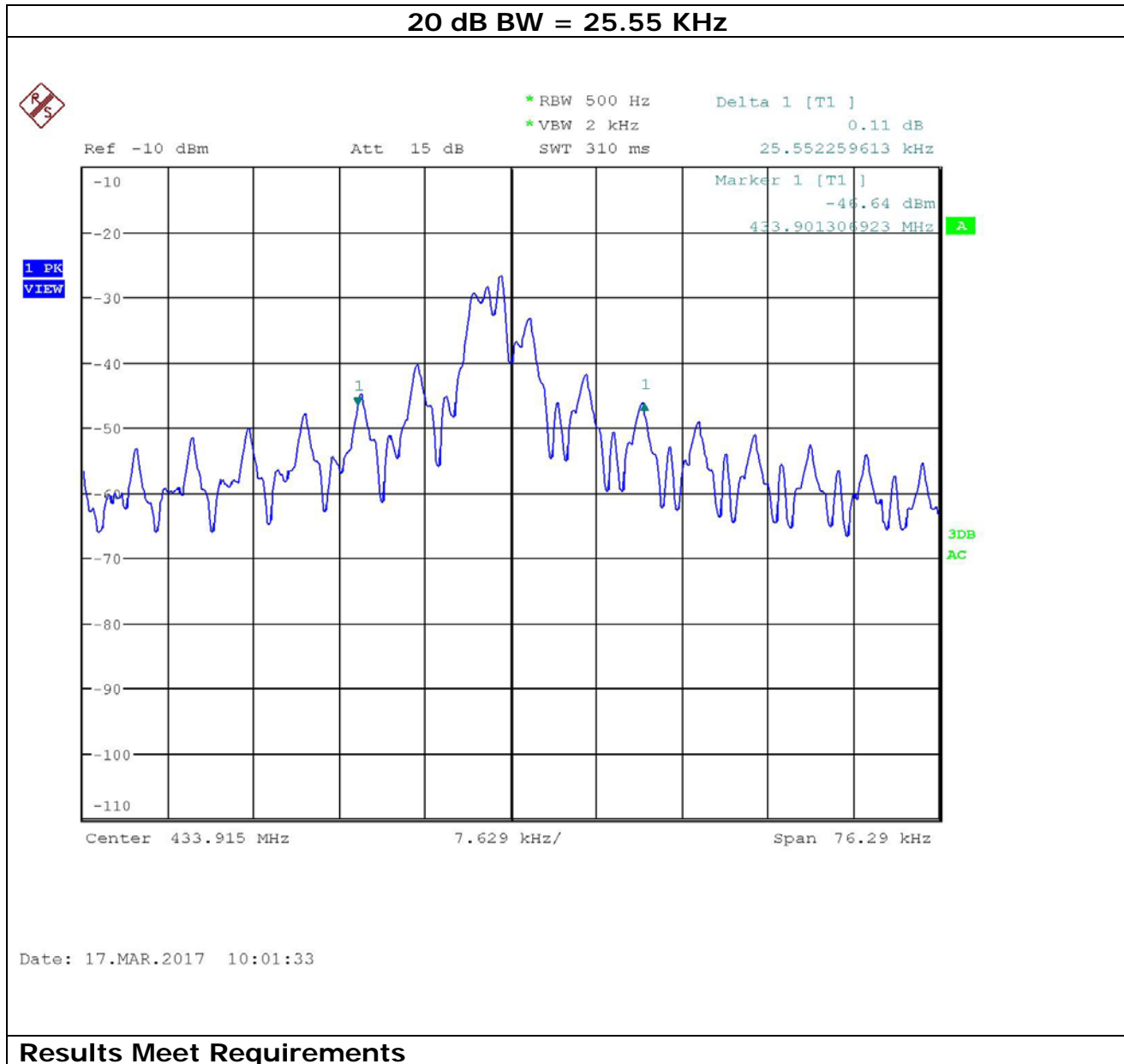

Test Data: **Measurement Table**

Tuned Frequency (MHz)	Limit (KHz)	Measured 20 dB BW (KHz)
433.92	1084.8	25.55
Margin (KHz)		1059.25

Results Meet Requirements

OCCUPIED BANDWIDTH

Test Data: 20 dB OBW Plot

---

20 dB BW = 25.55 KHz

Date: 17.MAR.2017 10:01:33

Results Meet Requirements

TEST EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Antenna: Biconical 1057	Eaton	94455-1	1057	11/18/15	11/18/17
Antenna: Log-Periodic 1122	Electro-Metrics	LPA-25	1122	07/14/15	07/14/17
Antenna: Passive Loop	EMC Test Systems	EMCO 6512	9706-1211	07/09/15	07/09/17
CHAMBER	Panashield	3M	N/A	04/25/16	12/31/17
Antenna: Double-Ridged Horn/ETS Horn 2	ETS-Lindgren Chamber	3117	00041534	03/01/17	03/01/19
EMI Test Receiver R & S ESIB 40 Screen Room	Rohde & Schwarz	ESIB 40	100274	08/16/16	08/16/18
Software: Field Strength Program	Timco	N/A	Version 4.0	NA	NA
Antenna: Active Loop	ETS-Lindgren	6502	00062529	11/18/15	11/18/17
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	04/01/16	04/01/18
Coaxial Cable - Chamber 3 cable set (Primary)	Micro-Coax	Chamber 3 cable set (Primary)	KMKM-0244-01; KMKM-0670-00; KFKF-0198-01	08/09/16	08/09/18
Bore-sight Antenna Positioning Tower	Sunol Sciences	TLT2	N/A	NA	NA

*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3

Applicant: DRIVEN DESIGNS, INC.
FCC ID: YHT-PPS
Report: 308BUT17TestReport_Rev1