TEST REPORT

Report Number: 101773309LAX-001
Project Number: G101773309

Report Issue Date: November 25, 2014

Product Designation: Garage Door Tilt Sensor
Model: WST-400

Standards: FCC Part 15.231
Industry Canada RSS 210 Issue 8, December 2010

FCC ID: XQC-WST400
IC: 9863B-WST400

Tested by:
Intertek Testing Services NA, Inc.
25791 Commercentre Drive
Lake Forest, CA 92630 USA

Client:
Ecolink
2055 Corte Del Nogal
Carlsbad, CA 92011 USA

Report prepared by

Meak Nget
EMC Engineering Supervisor

Report reviewed by

Krishna K Vemuri
EMC Senior Staff Engineer

TABLE OF CONTENTS

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 3.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested found Compliant with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

2 Test Summary

TEST	FCC REFERENCE	IC REFERENCE	Test Date	RESULTS
Radiated Emission	15.231(b)	RSS-210 A1.1.2	08/06/2014 to 11/17/2014	Complies
Out of Band Radiated Emission	15.231(b)	RSS-210 A1.1.2	08/06/2014 to 11/17/2014	Complies
AC Conducted Emission	15.207	RSS-Gen (6.1)	Not Applicable*	Not Applicable*
20 dB / 99% Bandwidth	15.231(c)	RSS-210 A1.1.3	08/07/2014	Complies
Transmitter Deactivation Time	15.231(a)	RSS-210 A1.1.1(a)	08/07/2014	Complies
Antenna Requirement	15.203	-	08/07/2014	Complies

(*) Test not applicable due to the EUT being battery operated.

3 Client Information

This EUT was tested at the request of:

Company: Ecolink
2055 Corte Del Nogal
Carlsbad, CA 92011 USA

Contact Person: Mike Bailey
Telephone: (877) 285-5448
Email: mikeb@discoverecolink.com

3.1 Overview of the EUT:

Applicant:	Ecolink
Product Description:	Garage Door Tilt Sensor
Model Number:	WST-400
FCC Identifier:	XQC-WST400
IC Identifier:	9863B-WST400
Transmitter activation:	Manually operated. Deactivates within 5 seconds of being released.
Fundamental Frequency (MHz):	433.92 MHz
Antenna Requirement:	The EUT uses a permanently connected internal antenna.
Manufacturer name & address:	Ecolink 2055 Corte Del Nogal Carlsbad, CA 92011 USA

3.2 Environmental Conditions:

During the measurement the environmental conditions were within the listed ranges:

Temperature: 10-40 ° C

Humidity: 10-90 %

Atmospheric pressure: 86-106 kPa

3.3 Measurement Uncertainty

The measured value related to the corresponding limit will be used to decide whether the equipment meets the requirements.

The measurement uncertainty figures were calculated and correspond to a coverage factor of k = 2, providing a confidence level of respectively 95% in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian).

The expanded uncertainty (k = 2) for radiated emissions from 30 to 1000 MHz has been determined to be: ±4.2 dB at 3m

The expanded uncertainty (k = 2) for conducted emissions from 150 kHz to 30 MHz has been determined to be: ±2.6 dB

3.4 Statement of the Measurement Uncertainty

The measured result in this report is below the specification limit by a margin less than the measurement uncertainty; it is not therefore possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a higher probability that the product tested complies with the specification limit.

4 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Garage Door Tilt Sensor	Ecolink	WST-400	N/A

Received Date:	08/04/2014 and 11/12/2014
Received Condition:	Good
Type:	Production Sample

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Frequency	Number of Phases
3VDC Battery Operated	NA	NA	NA

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Normal mode of operation: ➢ Trigger switch to activate momentary operation
2	Continuous Transmit Mode

4.1 Justification:

For emission testing, the test procedures, as described in American National Standards Institute C63.4-2009 & C63.10-2009 were employed. The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it).

If the EUT attaches to peripherals, they are connected and operational (as typical as possible). The EUT is configured to transmit full power.

Each test was performed with a new battery.

4.2 Software Exercise Program:

No special software program was required to exercise the EUT.

4.3 Modifications Required for Compliance:

No modifications were made by Intertek.

4.4 Additions, Deviations and Exclusions from Standards:

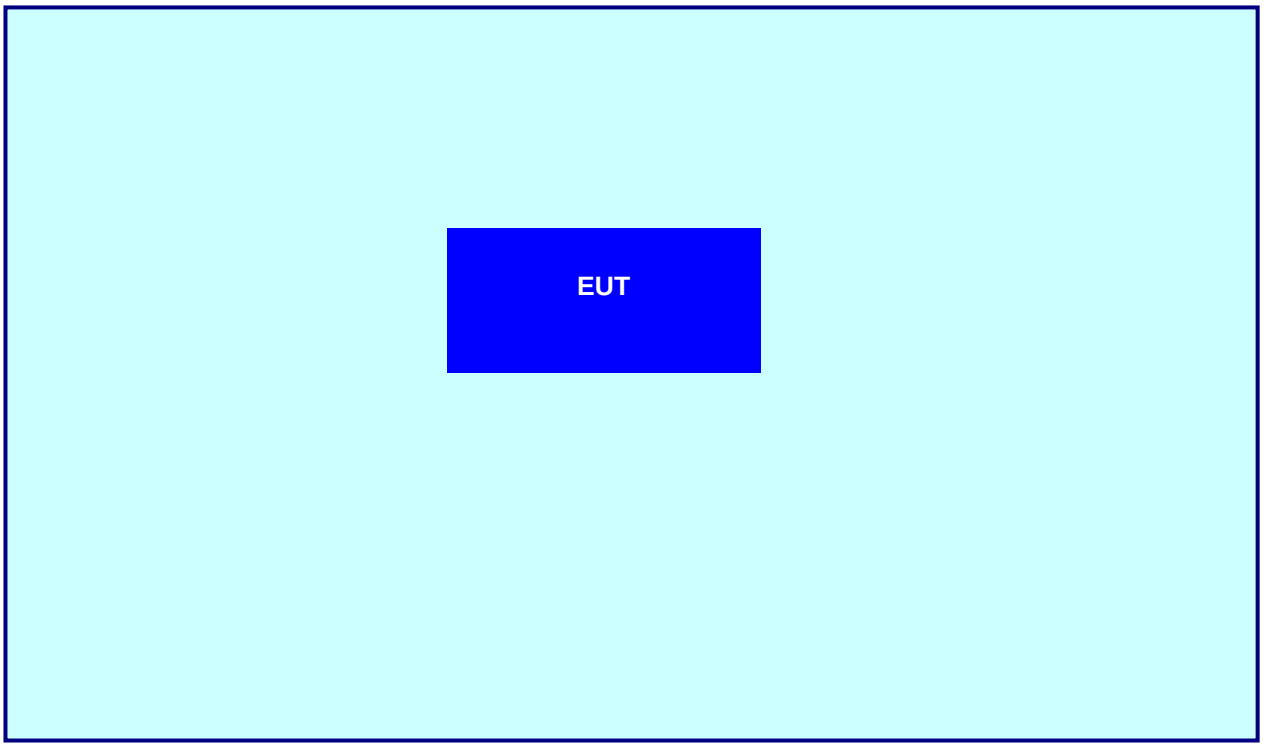
No additions, deviations or exclusions from the standard were made.

5 System setup including cable interconnection details, support equipment and simplified block diagram

5.1 Method:

Record the details of EUT cabling, document the support equipment, and show the interconnections in a block diagram.

5.2 EUT Block Diagram:



5.3 Data:

ID	Description	Length	Shielding	Ferrites
1	N/A	N/A	N/A	N/A

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
N/A	N/A	N/A	N/A

6 Radiated Emissions (FCC Part 15.231)

Date:	11/12/2014 to 11/17/2014	**Result: Complies**
Tested by:	Meak Nget	
Standard:	FCC Part 15.231(b)	
Test Point:	Anechoic Chamber 3 meters distance	
Operation mode:	See Section 4	
Note:	Battery Operated	

6.1 General:

Tests are performed in accordance with FCC Part 15.231(b).

Radiated emissions measurements were performed according to the procedures in ANSI C63.10 (2009). Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Data Sheet"** of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

6.2 Related Submittal(s) Grants:

This report is for use with an application for certification of a low power transmitter. One transmitter is included in the application: WST-400 (Garage Door Tilt Sensor).

6.3 Test Facility:

The 3 meter semi-anechoic chamber used to collect the radiated data is located in 25791 Commercentre Drive, Lake Forest, CA 92630 USA. This test facility is on file with the FCC and A2LA accredited.

6.4 Sample Calculation:

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation is as follows:
FS = RA + AF + CF - AG + DCF (Duty Cycle Factor used in Average measurements)
Where: FS = Field Strength in dB (μV/m)
RA = Receiver Amplitude (including preamplifier) in dB (μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB (1/m)
AG = Amplifier Gain in dB
DCF = Duty Cycle Factor (used in Average measurements)

6.5 Bench Top Measurement:

DCF = Duty Cycle Factor (used in Average measurements)

1) Use the marker - delta function to determine the total transmission ON time (t), and period of the transmission (T).
2) If T < 0.1 second, calculate the Duty Cycle correction factor as 20Log (t/T).
3) If T > 0.1 second, calculate the Duty Cycle correction factor as 20Log (t/0.1).

6.6 Radiated Emission:

FCC Rule 15.231(b) and RSS-210 A1.1.2

The limit specified in section 15.231(b) was used.

Procedure

For radiated emission measurements, the EUT is placed on a plastic table rotated by a turntable. The signal is maximized through rotation and placement in the three orthogonal axes.

During the test the EUT is rotated and the antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three-meter reading using inverse scaling with distance.

Radiated emission measurements were performed from 30 MHz to 5000 MHz.
Analyzer resolution is:
100 kHz or greater for frequencies below 1000 MHz,
1 MHz for frequencies above 1000 MHz.

The Peak and Average values of the Field Strength of the fundamental frequency and harmonics were measured.

A sample calculation, configuration photographs and data tables of the emissions are included.

6.7 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
1140	EMI Test Receiver	Rohde & Schwarz	ESCI7	100825	01/27/2014	01/27/2015
690	FSP Spectrum Analyzer	Rohde & Schwarz	FSP40	100027	01/21/2014	01/21/2015
1445	Preamplifier	A.H.Systems	PAM-0207	266	03/25/2014	03/25/2015
1147	Bilog Antenna	TESEQ	CBL 6112D	32852	02/01/2014	02/01/2015
692	DRG Horn Antenna	ETS Lindgren	3115	00031626	10/13/2014	10/13/2015
1014	Barometer Temp/Humidity	Omega	IBTHX-W	0480395	04/02/2014	04/02/2015

6.8 Software Utilized:

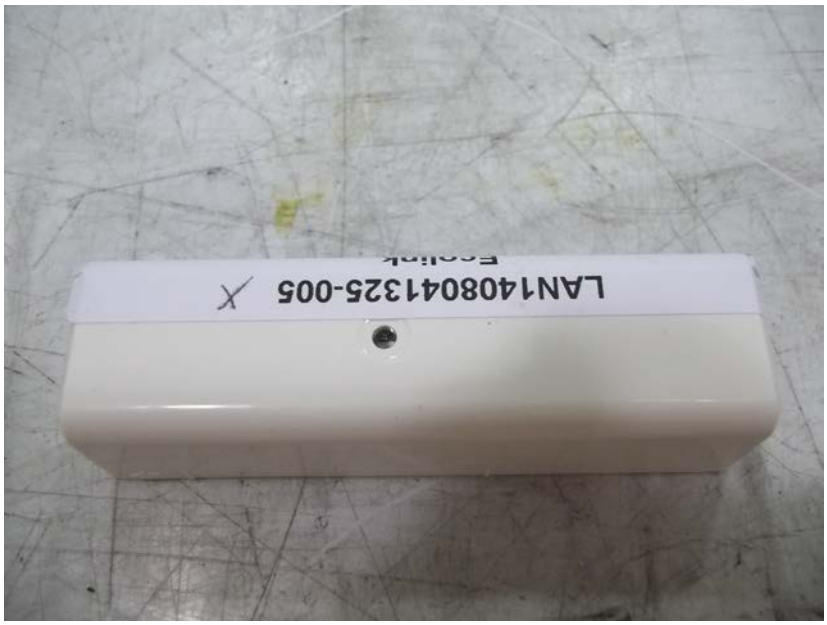
Description	Manufacturer	Version
Excel	Microsoft	Office 2010

6.9 Results:

- ❖ The sample tested was found to comply.

6.10 Test Setup Photographs:

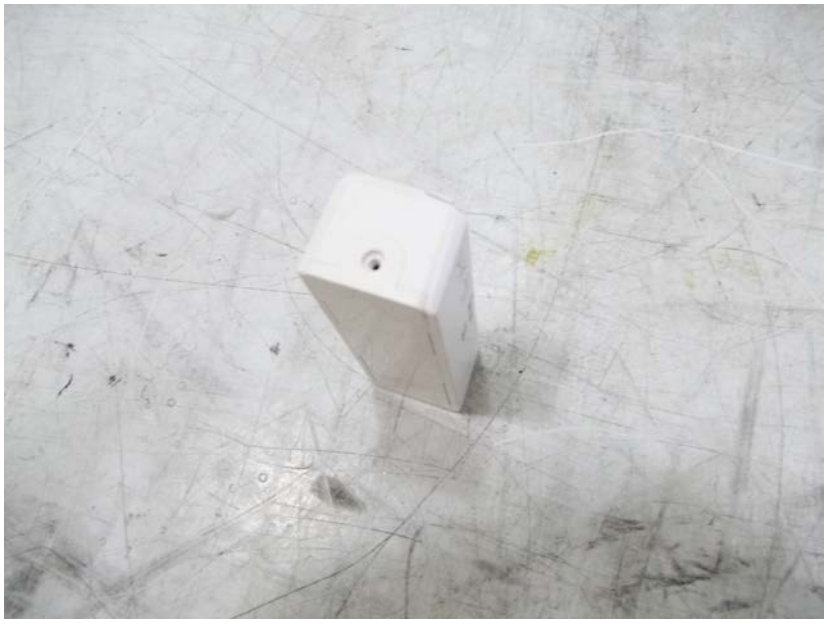
6.11 Test Setup Photographs:



Test Setup: X Orthogonal Position

6.12 Test Setup Photographs:

Test Setup: Y Orthogonal Position



Test Setup: Z Orthogonal Position

6.13 Test Data:

Test: Radiated Emissions
Frequency Range: 30 MHz to 5000 MHz
Limits: FCC Part 15.231(b)
Measurement Distance: 3 meters

Measurement Uncertainty: 4.2 dB
Power Input: Battery Operated
EUT: WST-400
Test Mode: Transmitting continuously

FCC Part 15.231 (X-Position-Horizontal Polarization)										
Frequency MHz	FS dB(uV/m)	Limit@3m dB(uV/m)	Margin dB	RA dB(uV)	AG dB	AF dB(1/m)	CF dB	DCF dB	Detector Pk/Av	Restricted ✓
433.92	87.37	100.8	-13.5	66.47	0	17.1	3.8	0	Pk	
433.92	67.37	80.8	-13.5	66.47	0	17.1	3.8	-20	Av	
867.84	58.03	80.8	-22.8	31.43	0	21.3	5.3	0	Pk	
867.84	38.03	60.8	-22.8	31.43	0	21.3	5.3	-20	Av	
1301.76	44.53	74.0	-29.5	59.01	45.78	25.2	6.1	0	Pk	✓
1301.76	24.53	54.0	-29.5	59.01	45.78	25.2	6.1	-20	Av	✓
1735.68	56.16	74.0	-17.8	67.74	45.52	25.84	8.1	0	Pk	
1735.68	36.16	54.0	-17.8	67.74	45.52	25.84	8.1	-20	Av	
2169.6	64.6	74.0	-9.4	72.08	45.33	27.75	10.1	0	Pk	
2169.6	44.6	54.0	-9.4	72.08	45.33	27.75	10.1	-20	Av	
2603.52	70.83	74.0	-3.1	76.7	44.83	28.76	10.2	0	Pk	
2603.52	50.83	54.0	-3.1	76.7	44.83	28.76	10.2	-20	Av	
3037.44	67.82	74.0	-6.2	70.42	44.36	29.96	11.8	0	Pk	
3037.44	47.82	54.0	-6.2	70.42	44.36	29.96	11.8	-20	Av	
3471.36	67.67	74.0	-6.3	69.03	44.3	31.14	11.8	0	Pk	
3471.36	47.67	54.0	-6.3	69.03	44.3	31.14	11.8	-20	Av	
3905.28	45.83	74.0	-28.2	45.43	43.84	32.44	11.8	0	Pk	✓
3905.28	25.83	54.0	-28.2	45.43	43.84	32.44	11.8	-20	Av	✓
*4339.2	70.99	74.0	-3.0	68.65	43.5	32.14	13.7	0	Pk	✓
*4339.2	50.99	54.0	-3.0	68.65	43.5	32.14	13.7	-20	Av	✓
Detectors/Bandwidths (Det/RBW/VBW)= (120kHz/300kHz) (1 MHz/3MHz)										

Quasi FS – (Final) Quasi Peak Field Strength
RA – Receiver (quasi peak) Amplitude
AG – Preamp Gain
AF – Antenna Factor
CF – Cable Factor
DCF- Duty Cycle Factor
Calculation: FS=RA+AF+CF-AG+DCF

Test Result: (*)The EUT PASSED Radiated Emission test with 3.0 dB Av margin at 4339.2 MHz. The measured result in this report is below the specification limit by a margin less than the measurement uncertainty; it is not therefore possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a higher probability that the product tested complies with the specification limit.

Deviations, Additions, or Exclusions: NONE

6.14 Test Data:

Test: Radiated Emissions
Frequency Range: 30 MHz to 5000 MHz
Limits: FCC Part 15.231(b)
Measurement Distance: 3 meters

Measurement Uncertainty: 4.2 dB
Power Input: Battery Operated
EUT: WST-400
Test Mode: Transmitting continuously

FCC Part 15.231 (X-Position-Vertical Polarization)										
Frequency MHz	FS dB(uV/m)	Limit@3m dB(uV/m)	Margin dB	RA dB(uV)	AG dB	AF dB(1/m)	CF dB	DCF dB	Detector Pk/Av	Restricted ✓
433.92	81.29	100.8	-19.5	60.39	0	17.1	3.8	0	Pk	
433.92	61.29	80.8	-19.5	60.39	0	17.1	3.8	-20	Av	
867.84	51.49	80.8	-29.3	24.89	0	21.3	5.3	0	Pk	
867.84	31.49	60.8	-29.3	24.89	0	21.3	5.3	-20	Av	
1301.76	42.42	74.0	-31.6	56.9	45.78	25.2	6.1	0	Pk	✓
1301.76	22.42	54.0	-31.6	56.9	45.78	25.2	6.1	-20	Av	✓
1735.68	53.81	74.0	-20.2	65.39	45.52	25.84	8.1	0	Pk	
1735.68	33.81	54.0	-20.2	65.39	45.52	25.84	8.1	-20	Av	
2169.6	60.57	74.0	-13.4	68.05	45.33	27.75	10.1	0	Pk	
2169.6	40.57	54.0	-13.4	68.05	45.33	27.75	10.1	-20	Av	
2603.52	63.33	74.0	-10.7	69.2	44.83	28.76	10.2	0	Pk	
2603.52	43.33	54.0	-10.7	69.2	44.83	28.76	10.2	-20	Av	
3037.44	64.91	74.0	-9.1	67.51	44.36	29.96	11.8	0	Pk	
3037.44	44.91	54.0	-9.1	67.51	44.36	29.96	11.8	-20	Av	
3471.36	67.67	74.0	-6.3	69.03	44.3	31.14	11.8	0	Pk	
3471.36	47.67	54.0	-6.3	69.03	44.3	31.14	11.8	-20	Av	
3905.28	72.29	74.0	-1.7	71.89	43.84	32.44	11.8	0	Pk	✓
3905.28	52.29	54.0	-1.7	71.89	43.84	32.44	11.8	-20	Av	✓
4339.2	67.81	74.0	-6.2	65.47	43.5	32.14	13.7	0	Pk	✓
4339.2	47.81	54.0	-6.2	65.47	43.5	32.14	13.7	-20	Av	✓
Detectors/Bandwidths (Det/RBW/VBW)= (120kHz/300kHz) (1 MHz/3MHz)										

Quasi FS – (Final) Quasi Peak Field Strength
RA – Receiver (quasi peak) Amplitude
AG – Preamp Gain
AF – Antenna Factor
CF – Cable Factor
DCF- Duty Cycle Factor
Calculation: FS=RA+AF+CF-AG+DCF

Test Result:	(*)The EUT PASSED Radiated Emission test with 1.7 dB Av margin at 3905.28 MHz. The measured result in this report is below the specification limit by a margin less than the measurement uncertainty; it is not therefore possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a higher probability that the product tested complies with the specification limit.

Deviations, Additions, or Exclusions: NONE

6.15 Test Data:

Test: Radiated Emissions
Frequency Range: 30 MHz to 5000 MHz
Limits: FCC Part 15.231(b)
Measurement Distance: 3 meters

Measurement Uncertainty: 4.2 dB
Power Input: Battery Operated
EUT: WST-400
Test Mode: Transmitting continuously

FCC Part 15.231 (Y-Position-Horizontal Polarization)										
Frequency MHz	FS dB(uV/m)	Limit@3m dB(uV/m)	Margin dB	RA dB(uV)	AG dB	AF dB(1/m)	CF dB	DCF dB	Detector Pk/Av	Restricted ✓
433.92	87.16	100.8	-13.7	66.26	0	17.1	3.8	0	Pk	
433.92	67.16	80.8	-13.7	66.26	0	17.1	3.8	-20	Av	
867.84	59.33	80.8	-21.5	32.73	0	21.3	5.3	0	Pk	
867.84	39.33	60.8	-21.5	32.73	0	21.3	5.3	-20	Av	
1301.76	46.33	74.0	-27.7	60.81	45.78	25.2	6.1	0	Pk	✓
1301.76	26.33	54.0	-27.7	60.81	45.78	25.2	6.1	-20	Av	✓
1735.68	55.9	74.0	-18.1	67.48	45.52	25.84	8.1	0	Pk	
1735.68	35.9	54.0	-18.1	67.48	45.52	25.84	8.1	-20	Av	
2169.6	66.51	74.0	-7.5	73.99	45.33	27.75	10.1	0	Pk	
2169.6	46.51	54.0	-7.5	73.99	45.33	27.75	10.1	-20	Av	
2603.52	69.68	74.0	-4.3	75.55	44.83	28.76	10.2	0	Pk	
2603.52	49.68	54.0	-4.3	75.55	44.83	28.76	10.2	-20	Av	
3037.44	64.42	74.0	-9.6	67.02	44.36	29.96	11.8	0	Pk	
3037.44	44.42	54.0	-9.6	67.02	44.36	29.96	11.8	-20	Av	
3471.36	68.15	74.0	-5.8	69.51	44.3	31.14	11.8	0	Pk	
3471.36	48.15	54.0	-5.8	69.51	44.3	31.14	11.8	-20	Av	
3905.28	73.37	74.0	-0.6	72.97	43.84	32.44	11.8	0	Pk	✓
3905.28	53.37	54.0	-0.6	72.97	43.84	32.44	11.8	-20	Av	✓
4339.2	68.77	74.0	-5.2	66.43	43.5	32.14	13.7	0	Pk	✓
4339.2	48.77	54.0	-5.2	66.43	43.5	32.14	13.7	-20	Av	✓
Detectors/Bandwidths (Det/RBW/VBW)= (120kHz/300kHz) (1 MHz/3MHz)										

Quasi FS – (Final) Quasi Peak Field Strength
RA – Receiver (quasi peak) Amplitude
AG – Preamp Gain
AF – Antenna Factor
CF – Cable Factor
DCF- Duty Cycle Factor
Calculation: FS=RA+AF+CF-AG+DCF

Test Result:	(*)The EUT PASSED Radiated Emission test with 0.6 dB Av margin at 3905.28 MHz. The measured result in this report is below the specification limit by a margin less than the measurement uncertainty; it is not therefore possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a higher probability that the product tested complies with the specification limit.

Deviations, Additions, or Exclusions: NONE

6.16 Test Data:

Test: Radiated Emissions
Frequency Range: 30 MHz to 5000 MHz
Limits: FCC Part 15.231(b)
Measurement Distance: 3 meters

Measurement Uncertainty: 4.2 dB
Power Input: Battery Operated
EUT: WST-400
Test Mode: Transmitting continuously

FCC Part 15.231 (Y-Position-Vertical Polarization)										
Frequency MHz	FS dB(uV/m)	Limit@3m dB(uV/m)	Margin dB	RA dB(uV)	AG dB	AF dB(1/m)	CF dB	DCF dB	Detector Pk/Av	Restricted ✓
433.92	82.11	100.8	-18.7	61.21	0	17.1	3.8	0	Pk	
433.92	62.11	80.8	-18.7	61.21	0	17.1	3.8	-20	Av	
867.84	56.35	80.8	-24.5	29.75	0	21.3	5.3	0	Pk	
867.84	36.35	60.8	-24.5	29.75	0	21.3	5.3	-20	Av	
1301.76	41.87	74.0	-32.1	56.35	45.78	25.2	6.1	0	Pk	✓
1301.76	21.87	54.0	-32.1	56.35	45.78	25.2	6.1	-20	Av	✓
1735.68	53.04	74.0	-20.9	64.62	45.52	25.84	8.1	0	Pk	
1735.68	33.04	54.0	-20.9	64.62	45.52	25.84	8.1	-20	Av	
2169.6	62.93	74.0	-11.1	70.41	45.33	27.75	10.1	0	Pk	
2169.6	42.93	54.0	-11.1	70.41	45.33	27.75	10.1	-20	Av	
2603.52	62.53	74.0	-11.5	68.4	44.83	28.76	10.2	0	Pk	
2603.52	42.53	54.0	-11.5	68.4	44.83	28.76	10.2	-20	Av	
3037.44	63.49	74.0	-10.5	66.09	44.36	29.96	11.8	0	Pk	
3037.44	43.49	54.0	-10.5	66.09	44.36	29.96	11.8	-20	Av	
3471.36	68.28	74.0	-5.7	69.64	44.3	31.14	11.8	0	Pk	
3471.36	48.28	54.0	-5.7	69.64	44.3	31.14	11.8	-20	Av	
3905.28	73.01	74.0	-1.0	72.61	43.84	32.44	11.8	0	Pk	✓
3905.28	53.01	54.0	-1.0	72.61	43.84	32.44	11.8	-20	Av	✓
4339.2	72.62	74.0	-1.4	70.28	43.5	32.14	13.7	0	Pk	✓
4339.2	52.62	54.0	-1.4	70.28	43.5	32.14	13.7	-20	Av	✓
Detectors/Bandwidths (Det/RBW/VBW)= (120kHz/300kHz) (1 MHz/3MHz)										

Quasi FS – (Final) Quasi Peak Field Strength
RA – Receiver (quasi peak) Amplitude
AG – Preamp Gain
AF – Antenna Factor
CF – Cable Factor
DCF- Duty Cycle Factor
Calculation: FS=RA+AF+CF0-AG+DCF

Test Result:	(*)The EUT PASSED Radiated Emission test with 1.0 dB Av margin at 3905.28 MHz. The measured result in this report is below the specification limit by a margin less than the measurement uncertainty; it is not therefore possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a higher probability that the product tested complies with the specification limit.

Deviations, Additions, or Exclusions: NONE

6.17 Test Data:

Test: Radiated Emissions
Frequency Range: 30 MHz to 5000 MHz
Limits: FCC Part 15.231(b)
Measurement Distance: 3 meters

Measurement Uncertainty: 4.2 dB
Power Input: Battery Operated
EUT: WST-400
Test Mode: Transmitting continuously

FCC Part 15.231 (Z-Position-Horizontal Polarization)										
Frequency MHz	FS dB(uV/m)	Limit@3m dB(uV/m)	Margin dB	RA dB(uV)	AG dB	AF dB(1/m)	CF dB	DCF dB	Detector Pk/Av	Restricted ✓
433.92	80.94	100.8	-19.9	60.04	0	17.1	3.8	0	Pk	
433.92	60.94	80.8	-19.9	60.04	0	17.1	3.8	-20	Av	
867.84	52.5	80.8	-28.3	25.9	0	21.3	5.3	0	Pk	
867.84	32.5	60.8	-28.3	25.9	0	21.3	5.3	-20	Av	
1301.76	40.25	74.0	-33.7	54.73	45.78	25.2	6.1	0	Pk	✓
1301.76	20.25	54.0	-33.7	54.73	45.78	25.2	6.1	-20	Av	✓
1735.68	47.42	74.0	-26.6	59	45.52	25.84	8.1	0	Pk	
1735.68	27.42	54.0	-26.6	59	45.52	25.84	8.1	-20	Av	
2169.6	54.99	74.0	-19.0	62.47	45.33	27.75	10.1	0	Pk	
2169.6	34.99	54.0	-19.0	62.47	45.33	27.75	10.1	-20	Av	
2603.52	57.86	74.0	-16.1	63.73	44.83	28.76	10.2	0	Pk	
2603.52	37.86	54.0	-16.1	63.73	44.83	28.76	10.2	-20	Av	
3037.44	64.79	74.0	-9.2	67.39	44.36	29.96	11.8	0	Pk	
3037.44	44.79	54.0	-9.2	67.39	44.36	29.96	11.8	-20	Av	
*3471.36	70.22	74.0	-3.8	71.58	44.3	31.14	11.8	0	Pk	
*3471.36	50.22	54.0	-3.8	71.58	44.3	31.14	11.8	-20	Av	
3905.28	61.91	74.0	-12.1	61.51	43.84	32.44	11.8	0	Pk	✓
3905.28	41.91	54.0	-12.1	61.51	43.84	32.44	11.8	-20	Av	✓
4339.2	69.95	74.0	-4.0	67.61	43.5	32.14	13.7	0	Pk	✓
4339.2	49.95	54.0	-4.0	67.61	43.5	32.14	13.7	-20	Av	✓
Detectors/Bandwidths (Det/RBW/VBW)= (120kHz/300kHz) (1 MHz/3MHz)										

Quasi FS – (Final) Quasi Peak Field Strength
RA – Receiver (quasi peak) Amplitude
AG – Preamp Gain
AF – Antenna Factor
CF – Cable Factor
DCF- Duty Cycle Factor
Calculation: FS=RA+AF+CF-AG+DCF

Test Result:	(*)The EUT PASSED Radiated Emission test with 3.8 dB Av margin at 3471.36 MHz. The measured result in this report is below the specification limit by a margin less than the measurement uncertainty; it is not therefore possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a higher probability that the product tested complies with the specification limit.

Deviations, Additions, or Exclusions: NONE

6.18 Test Data:

Test: Radiated Emissions
Frequency Range: 30 MHz to 5000 MHz
Limits: FCC Part 15.231(b)
Measurement Distance: 3 meters

Measurement Uncertainty: 4.2 dB
Power Input: Battery Operated
EUT: WST-400
Test Mode: Transmitting continuously

FCC Part 15.231 (Z-Position-Vertical Polarization)										
Frequency MHz	FS dB(uV/m)	Limit@3m dB(uV/m)	Margin dB	RA dB(uV)	AG dB	AF dB(1/m)	CF dB	DCF dB	Detector Pk/Av	Restricted ✓
433.92	89.78	100.8	-11.0	68.88	0	17.1	3.8	0	Pk	
433.92	69.78	80.8	-11.0	68.88	0	17.1	3.8	-20	Av	
867.84	56.56	80.8	-24.3	29.96	0	21.3	5.3	0	Pk	
867.84	36.56	60.8	-24.3	29.96	0	21.3	5.3	-20	Av	
1301.76	48.23	74.0	-25.8	62.71	45.78	25.2	6.1	0	Pk	✓
1301.76	28.23	54.0	-25.8	62.71	45.78	25.2	6.1	-20	Av	✓
1735.68	53.09	74.0	-20.9	64.67	45.52	25.84	8.1	0	Pk	
1735.68	33.09	54.0	-20.9	64.67	45.52	25.84	8.1	-20	Av	
2169.6	62.07	74.0	-11.9	69.55	45.33	27.75	10.1	0	Pk	
2169.6	42.07	54.0	-11.9	69.55	45.33	27.75	10.1	-20	Av	
2603.52	66.81	74.0	-7.2	72.68	44.83	28.76	10.2	0	Pk	
2603.52	46.81	54.0	-7.2	72.68	44.83	28.76	10.2	-20	Av	
3037.44	60.34	74.0	-13.6	62.94	44.36	29.96	11.8	0	Pk	
3037.44	40.34	54.0	-13.6	62.94	44.36	29.96	11.8	-20	Av	
3471.36	65.45	74.0	-8.5	66.81	44.3	31.14	11.8	0	Pk	
3471.36	45.45	54.0	-8.5	66.81	44.3	31.14	11.8	-20	Av	
3905.28	60.71	74.0	-13.3	60.31	43.84	32.44	11.8	0	Pk	✓
3905.28	40.71	54.0	-13.3	60.31	43.84	32.44	11.8	-20	Av	✓
*4339.2	68.34	74.0	-5.6	66	43.5	32.14	13.7	0	Pk	✓
*4339.2	48.34	54.0	-5.6	66	43.5	32.14	13.7	-20	Av	✓
Detectors/Bandwidths (Det/RBW/VBW)= (120kHz/300kHz) (1 MHz/3MHz)										

Quasi FS – (Final) Quasi Peak Field Strength
RA – Receiver (quasi peak) Amplitude
AG – Preamp Gain
AF – Antenna Factor
CF – Cable Factor
DCF- Duty Cycle Factor
Calculation: FS=RA+AF+CF-AG+DCF

Deviations, Additions, or Exclusions: NONE

Test Result: (*)The EUT PASSED Radiated Emission test with 5.6 dB Av margin at 4339.2 MHz.

Deviations, Additions, or Exclusions: NONE

6.19 Occupied Bandwidth:

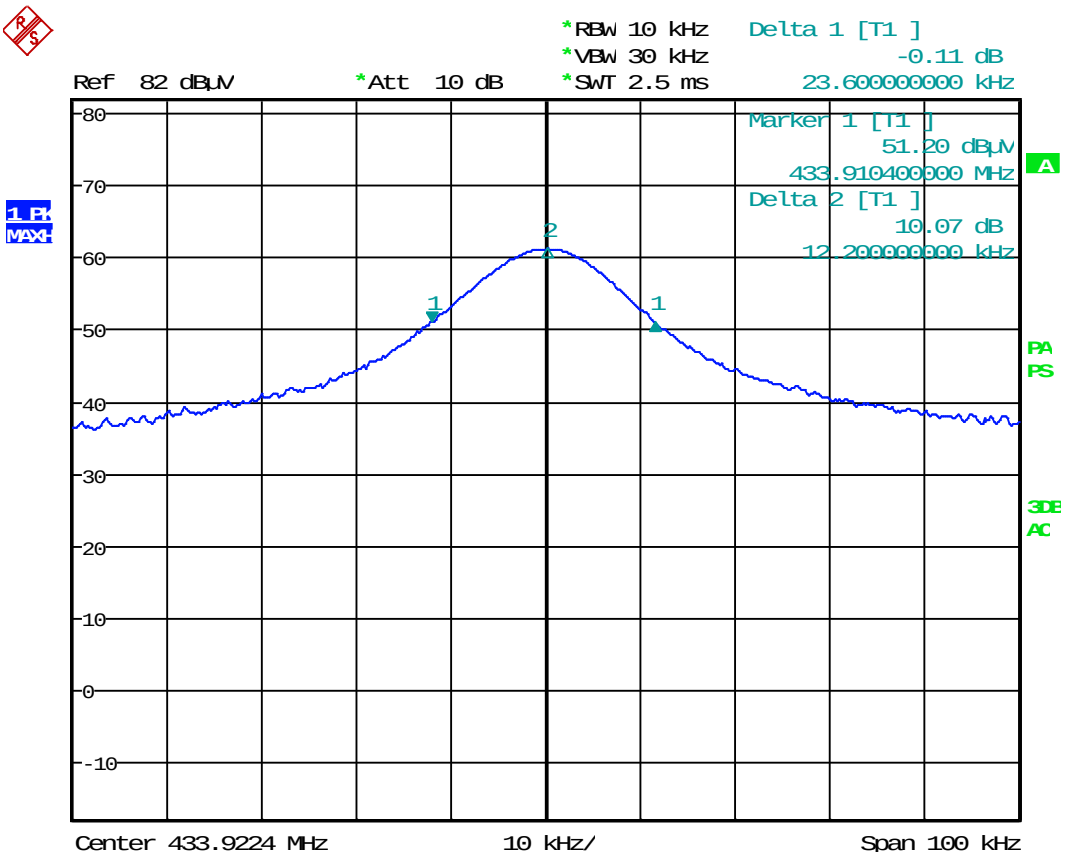
The 15.231(c) emission bandwidth requirement: No wider than 0.25% of the fundamental frequency of 433.92MHz. Limit is 1.084 MHz.

The worst-case (widest) emission bandwidth at -20 dB from the reference level is 23.6 kHz.

Test Results: Pass

The following plot shows the emission bandwidth of the transmitter:

FCC 20dB BW



20dB OBW, WST-400

Date: 7.AUG.2014 10:23:45

6.20 99% Occupied Bandwidth per RSS-210 A1.1.3:

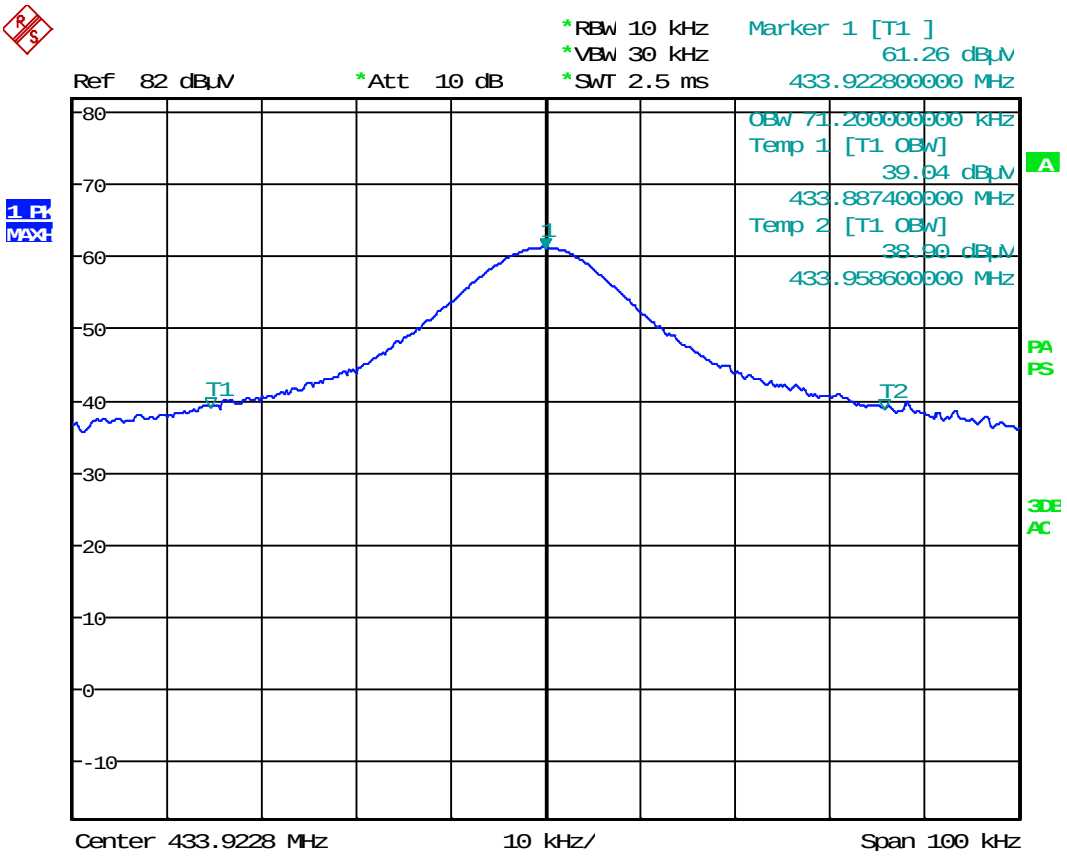
Industry Canada Occupied Bandwidth measured at 99% must be no wider than 0.25% of the fundamental frequency of 433.92MHz. Limit is 1.084 MHz.

The worst-case (widest) emission 99% occupied bandwidth is 71.2 kHz.

Test Result: Pass

The following plot shows the emission bandwidth of the transmitter:

IC 99% OBW



99% OBW, WST-400

Date: 7.AUG.2014 10:20:51

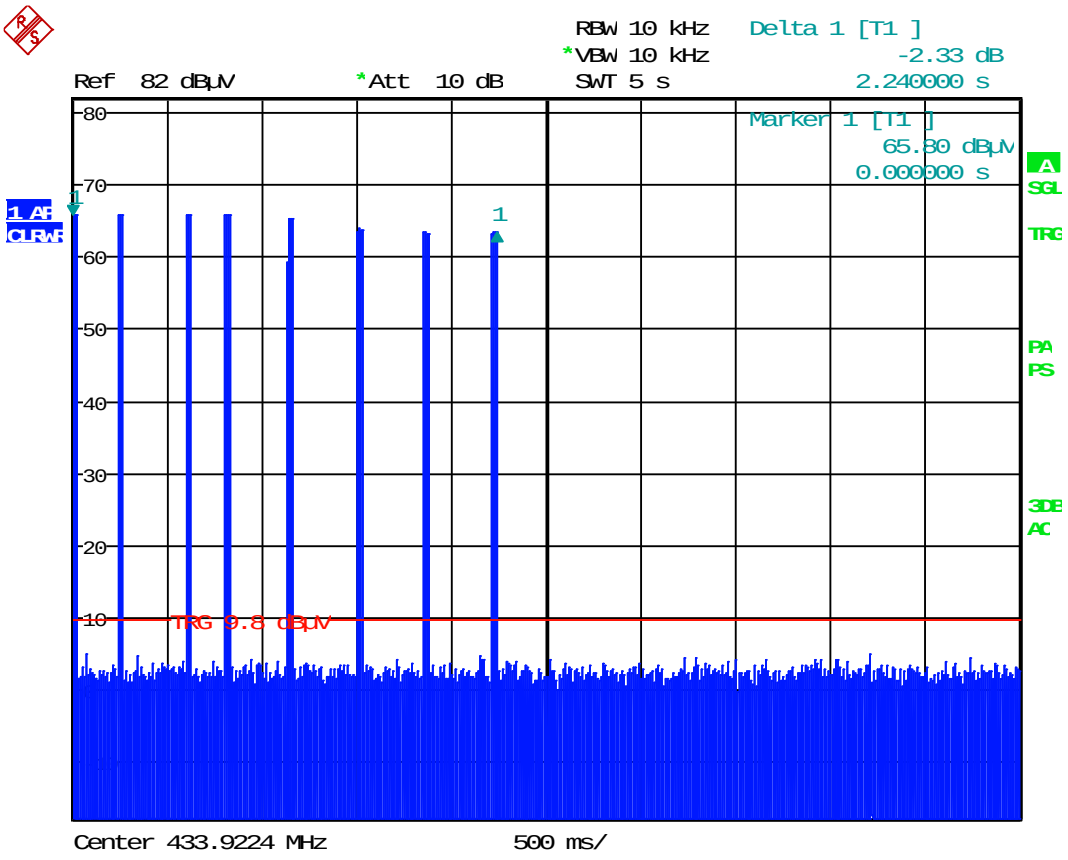
6.21 Transmitter Deactivation Time:

FCC Rule 15.231(a) and RSS-210 A1.1.1
Maximum allowed deactivation time: 5 Seconds

Manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Test Results: Pass

Garage Door Tilt Sensor stopped transmitting within not more than 5 seconds of being released. Actual time = 2.24 seconds.



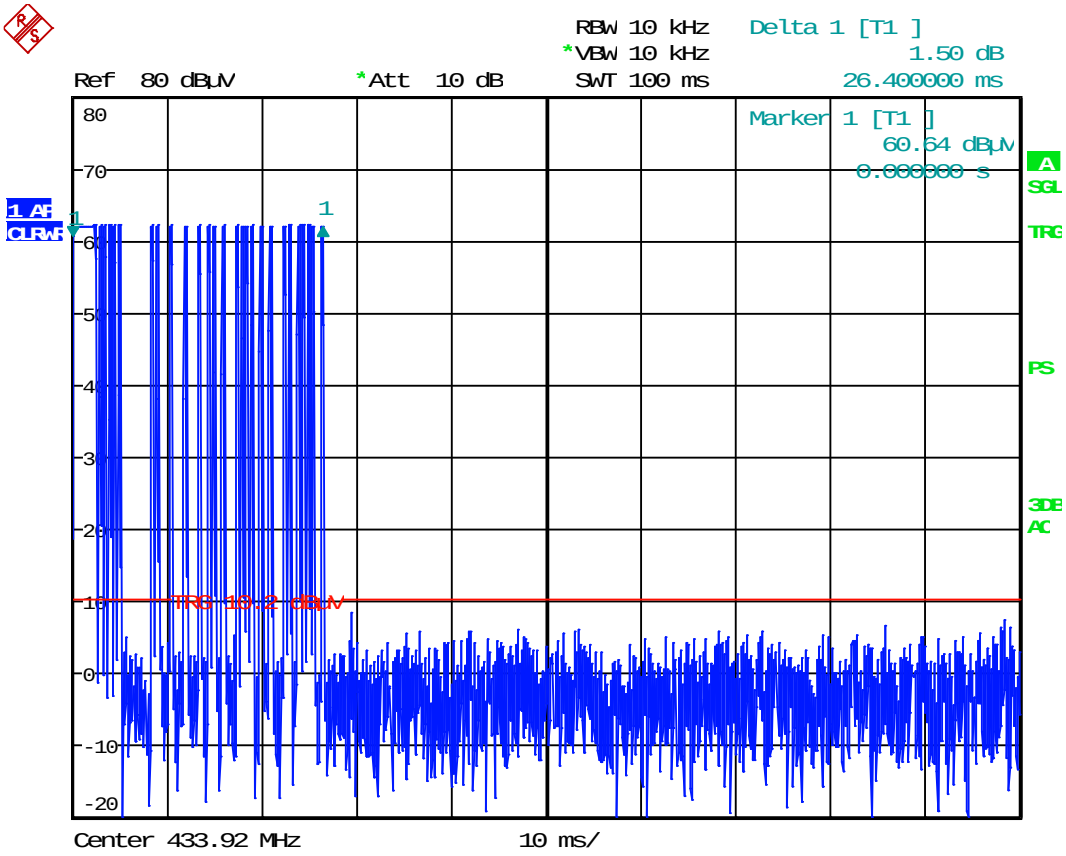
Tx Deactivation, WST-400

Date: 7.AUG.2014 10:33:37

6.22 Duty Cycle Time Graphs:

Duty Cycle Measurement over a 100 ms period, with measurements taken at each individual unique pulse occurred throughout the pulse train.

Entire Pulse Train:

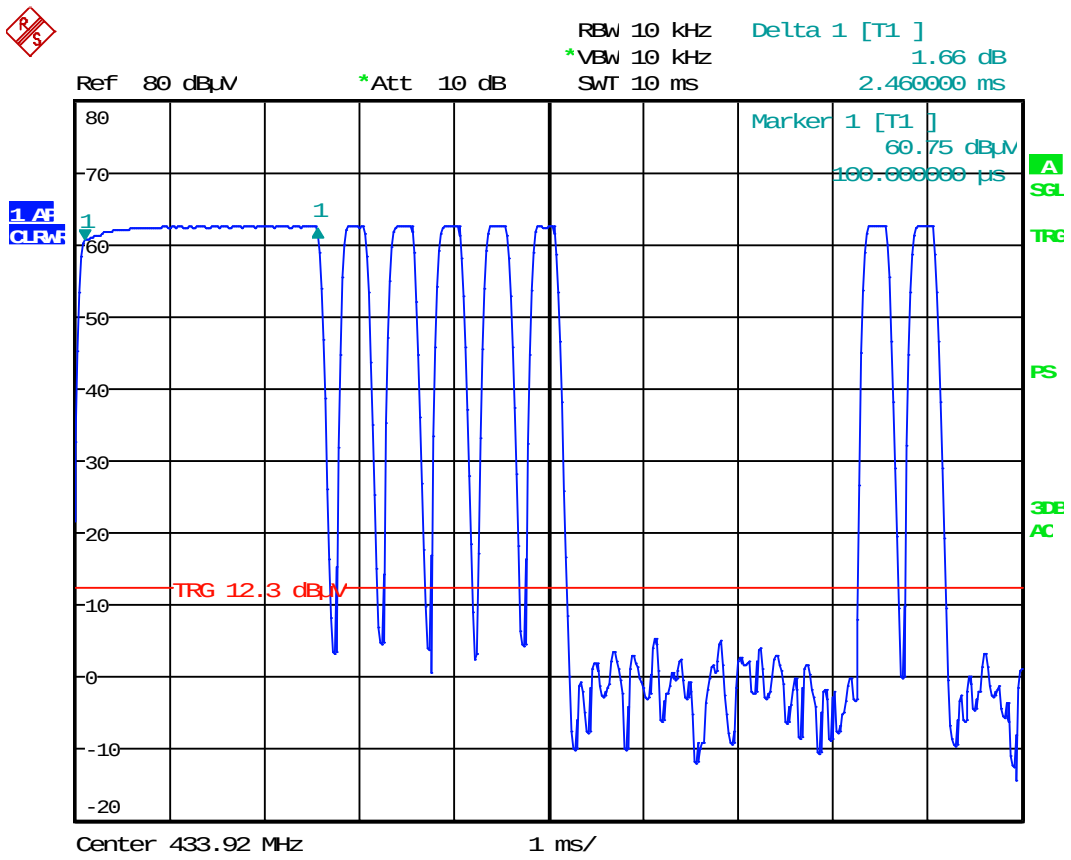


Duty Cycle, WST-400

Date: 7.AUG.2014 12:01:26

6.23 Duty Cycle Time Graphs:

Sub Pulse 1:

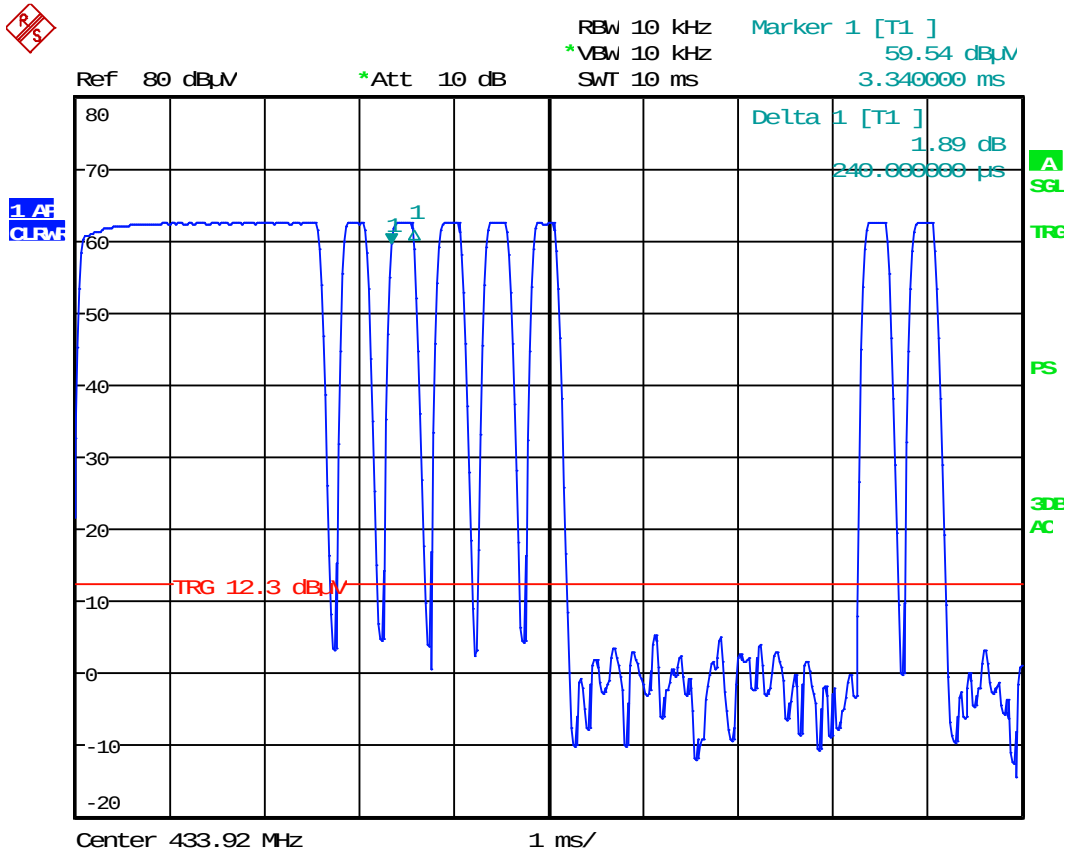


Duty Cycle, WST-400

Date: 7.AUG.2014 12:28:51

6.24 Duty Cycle Time Graphs:

Sub Pulse 2:

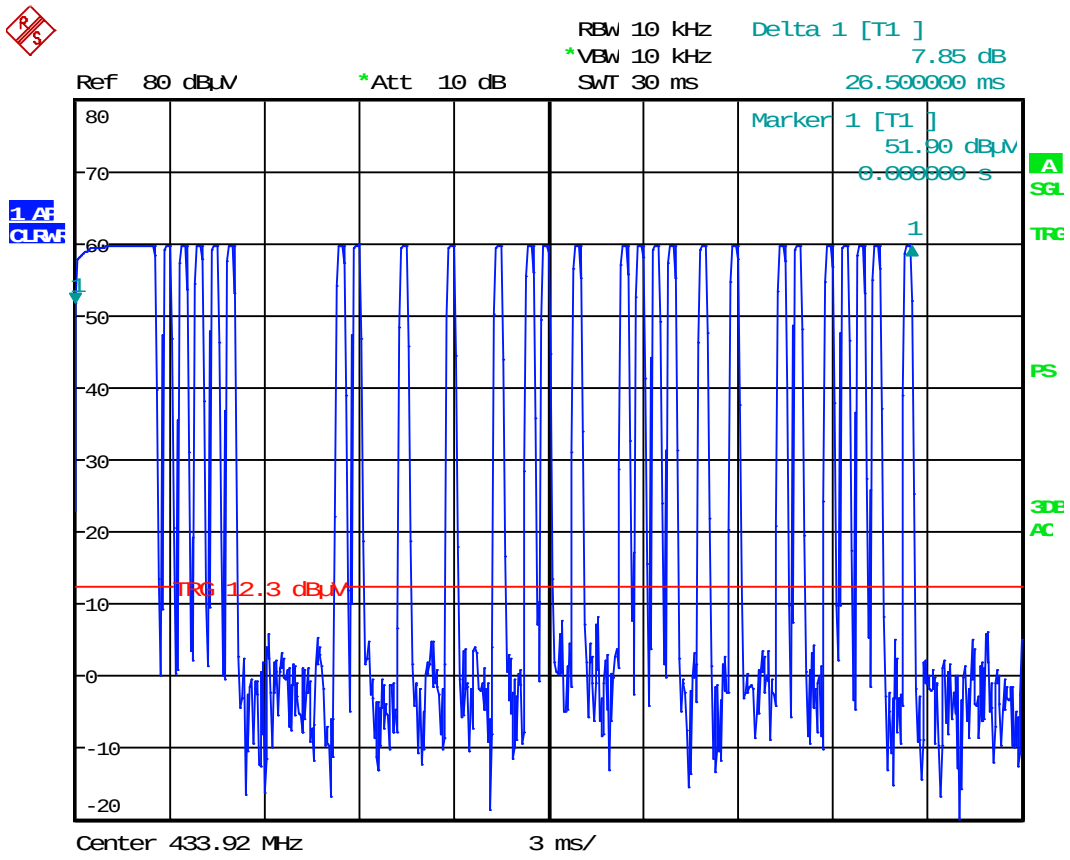


Duty Cycle, WST-400

Date: 7.AUG.2014 12:30:32

6.25 Duty Cycle Time Graphs:

Zoom Pulse Train:



Duty Cycle, WST-400

Date: 7.AUG.2014 12:33:30

6.26 Duty Cycle Time Graphs:

Duty Cycle Calculation

Sample Calculation:

If $T \leq 0.1$ second, calculate the Duty Cycle correction factor as 20Log(t/T).
If $T > 0.1$ second, calculate the Duty Cycle correction factor as 20Log(t/0.1)

Result:

The duty cycle was calculated by measuring one pulse train in a 100 ms period.

Sub-Pulse	Duration (ms)	Number of pulses	Sub-Pulse "On Time" (ms)
1	0.24	26	6.24
2	2.46	1	2.46

Total On Time = t = 8.7 ms
Total Period Time = T = 100 ms

Duty Cycle Factor = DCF = 20log(t/T) = 20log (8.7 ms/100 ms) = -21.2 dB.
Maximum applied DCF to radiated emissions data = -20 dB

7 AC Mains Conducted Emissions (FCC Part 15.207)

Date:	N/A	**Result: N/A**
Tested by:	N/A	
Standard:	FCC Part 15.207	
Test Point:	Line 1 and Line 2	
Operation mode:	See Section 4.1	
Note:	Not Applicable. EUT is battery operated	

7.1 Results:

- Not Applicable. The EUT is battery Operated.

8 Revision History

Revision Number	Revision Contents	Date	Prepared By	Reviewed By
None				

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Test Verification of Conformity

On the basis of the tests undertaken, the sample(s) of the below product have been found to comply with the requirements of the referenced specifications at the time the tests were carried out.

Applicant Name & Address	:	Ecolink 2055 Corte Del Nogal Carlsbad, CA 92011 USA
Product(s) Tested	:	Garage Door Tilt Sensor
Ratings and principal characteristics	:	Battery Operated
Model(s)	:	WST-400
Relevant Standard(s)/Specification(s)	:	FCC Part 15.231, Subpart C Industry Canada RSS 210 Issue 8, December 2010
FCC ID **IC ID**	: :	XQC-WST400 9863B-WST400
Verification Issuing Office Name & Address	:	Intertek Testing Services NA, Inc. 25800 Commercentre Drive Lake Forest, CA 92630 USA
Date of Test(s)	:	08/06/2014 to 11/17/2014
Verification/Report Number(s)	:	101773309LAX-001

NOTE: This verification is part of the full test report(s) and should be read in conjunction with it.

Name:	**Meak Nget**
Signature	
Position:	**EMC Engineering Supervisor**
Date:	**November 25, 2014**