TEST REPORT

Report Number: HK12031519-1

Application
for
Original Grant
of 47 CFR Part 15 Certification

433MHz Transmitter (Water Sensor)

FCC ID: U9K-WT1000

Prepared and Checked by:

Signed on File
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June 05, 2012

GENERAL INFORMATION

Applicant Name:	SimpliSafe, Inc.
Applicant Address:	1035 Cambridge Street, Suite 18A, Cambridge, Massachusetts 02141, USA
FCC Specification Standard:	FCC Part 15, October 1, 2010 Edition
FCC ID:	U9K-WT1000
FCC Model(s):	WT1000
Type of EUT:	Security/Remote Control Transmitter
Description of EUT:	433MHz Transmitter (Water Sensor)
Serial Number:	N/A
Sample Receipt Date:	March 27, 2012
Date of Test:	May 18 - 30, 2012
Report Date:	June 05, 2012
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

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EXHIBIT 1
TEST RESULTS SUMMARY & STATEMENT OF COMPLIANCE

1.0 Test Results Summary & Statement of Compliance

1.1 Summary of Test Results

Test Items	FCC Part 15 Section	Results	Details see section
Antenna Requirement	15.203	Pass	2.1
Radiated Emission 5-Second Transmission Requirement Bandwidth	15.231(b) 15.231(a2) 15.231(c)	Pass Pass Pass	4.2 4.3.2 4.3.1
Radiated Emission in Restricted Bands	15.205	Pass	4.2
AC Power Line Conducted Emission	15.207	N/A	N/A

Note: Pursuant to FCC Part 15 Section 15.215(c), the 20dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over expected variations in temperature and supply voltage were considered.

1.2 Statement of Compliance

The equipment under test is found to be complying with the following standard:

FCC Part 15, October 1, 2010 Edition

EXHIBIT 2
GENERAL DESCRIPTION

2.0 **General Description**

2.1 Product Description

The WT1000 is a 433MHz Transmitter (Water Sensor). It operates at 433.92MHz. The Water Sensor is powered by a 3VDC CR2450 battery cell.

The antenna used in water sensor is integral, and the test sample is a prototype.

The circuit description is saved with filename: descri.pdf.

2.2 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.4 (2009). Preliminary radiated scans and all radiated measurements were performed in Open Area Test Sites. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

2.3 Test Facility

The open area test site facility used to collect the radiated data is at Roof Top of Intertek Testing Services Hong Kong Ltd., which is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong. This test facility and site measurement data have been fully placed on file with the FCC.

EXHIBIT 3
SYSTEM TEST CONFIGURATION

3.0 **System Test Configuration**

3.1 Justification

For radiated emissions testing, the equipment under test (EUT) was setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables (if any) were manipulated to produce worst case emissions.

The EUT was powered by a new battery cell.

For the measurements, the EUT was attached to a plastic stand if necessary and placed on the wooden turntable. If the EUT attached to peripherals, they were connected and operational to simulate typical use.

The signal was maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization were varied during the search for maximum signal level. The antenna height was varied from 1 to 4 meters. Radiated emissions were taken at three meters unless the signal level was too low for measurement at that distance. If necessary, a pre-amplifier was used and/or the test was conducted at a closer distance.

For transmitter radiated measurement, the spectrum analyzer resolution bandwidth was 100 kHz for frequencies below 1000 MHz. The resolution bandwidth was 1 MHz for frequencies above 1000 MHz.

Radiated emission measurement for transmitter was performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

3.1 Justification - Cont'd

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in section 4.2.3.

Determination of pulse desensitization was made according to *Hewlett Packard Application Note 150-2, Spectrum Analysis... Pulsed RF.* The effective period (Teff) was referred to Exhibit 4.2.3. With the resolution bandwidth 100kHz and spectrum analyzer IF bandwidth 3dB, the pulse desensitization factor was 0dB.

3.2 EUT Exercising Software

There was no special software to exercise the device. Once the button was depressed, the unit transmitted the typical signal. For simplicity of testing, the unit was wired to transmit continuously.

3.3 Details of EUT and Description of Accessories

Details of EUT:

A battery (provided with the unit) was used to power the device. Its description is listed below.

(1) Battery: 3VDC CR2450 Battery Cell (Supplied by Client)

Description of Peripherals:

There are no special accessories necessary for compliance of this product.

3.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

EXHIBIT 4
TEST RESULTS

4.0 **Test Results**

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

4.1 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD + AV

where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
PD = Pulse Desensitization in dB
AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflects the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD +AV

Example
Assume a receiver reading of 62.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 62.0 dBμV
AF = 7.4 dB
CF = 1.6 dB
AG = 29 dB
PD = 0 dB
AV = -10 dB
FS = 62 + 7.4 +1.6 -29 +0 + (-10) = 32 dBμV/m

Level in μV/m = Common Antilogarithm [(32 dBμV/m)/20] = 39.8 μV/m

4.2 Radiated Emissions

4.2.1 Radiated Emission Configuration Photograph

Worst Case Radiated Emission
at

433.920 MHz

The worst case radiated emission configuration photographs are attached in the Appendix and saved with filename: config photos.pdf

4.2.2 Radiated Emission Data

The data in tables 1-2 list the significant emission frequencies, the limit and the margin of compliance.

Judgement -

Passed by 0.2 dB margin compare with average limit

4.2.3 Transmitter Duty Cycle Calculation

Duty Cycle (DC)
= Maximum On time in 100ms [Last 100ms of Data Packet] / 100ms
= 52ms / 100ms

Average Factor (AF) = 20 log(DC)
= 20* log (0.52)
= -5.6dB

The sample plot shows the bit timing is saved with filename: timing.pdf

Mode: TX

Table 1

Radiated Emission Data

Polarization	Frequency (MHz)	Reading (dBuV)	Pre-Amp (dB)	Antenna factor (dB)	Average Factor (dB)	Net at 3m (dBuV/m)	Average Limit at 3m (dBuV/m)	Margin (dB)
H	433.920	77.2	16	25.0	5.6	80.6	80.8	-0.2
V	867.840	35.4	16	31.0	5.6	44.8	60.8	-16.0
V	***1301.760***	***61.3***	***33***	***26.1***	***5.6***	***48.8***	***54.0***	***-5.2***
V	1735.680	59.2	33	27.2	5.6	47.8	60.8	-13.0
V	2169.600	54.6	33	29.4	5.6	45.4	60.8	-15.4
V	2603.520	52.5	33	30.4	5.6	44.3	60.8	-16.5
H	3037.440	55.6	33	31.9	5.6	48.9	60.8	-11.9
H	3471.360	54.7	33	31.9	5.6	48.0	60.8	-12.8
H	***3905.280***	***50.7***	***33***	***33.3***	***5.6***	***45.4***	***54.0***	***-8.6***
H	***4339.200***	***49.0***	***33***	***34.8***	***5.6***	***45.2***	***54.0***	***-8.8***

NOTES:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

Mode: TX

Table 2

Radiated Emission Data

Polarization	Frequency (MHz)	Reading (dBuV)	Pre-Amp (dB)	Antenna factor (dB)	Net at 3m (dBuV/m)	Peak Limit at 3m (dBuV/m)	Margin (dB)
H	433.920	77.2	16	25.0	86.2	100.8	-14.6
V	867.840	35.4	16	31.0	50.4	80.8	-30.4
V	***1301.760***	***61.3***	***33***	***26.1***	***54.4***	***74.0***	***-19.6***
V	1735.680	59.2	33	27.2	53.4	80.8	-27.4
V	2169.600	54.6	33	29.4	51.0	80.8	-29.8
V	2603.520	52.5	33	30.4	49.9	80.8	-30.9
H	3037.440	55.6	33	31.9	54.5	80.8	-26.3
H	3471.360	54.7	33	31.9	53.6	80.8	-27.2
H	***3905.280***	***50.7***	***33***	***33.3***	***51.0***	***74.0***	***-23.0***
H	***4339.200***	***49.0***	***33***	***34.8***	***50.8***	***74.0***	***-23.2***

NOTES:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

4.3 Transmitter Bandwidth and 5-Second Transmission

4.3.1 Measured Bandwidth

The plot shows the fundamental emission when modulated is saved with filename: bw.pdf. From the plot, the bandwidth is observed to be 152kHz, at 20dBc where the bandwidth limit is 1084kHz.

Therefore, the EUT meets the requirement of FCC Part 15 Section 15.231(c).

4.3.2 5-Second Transmission Requirement

[ ] Pursuant to FCC Part 15 Section 15.231(a)(1), a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released. The EUT meets the requirement. A preliminary copy of the 5-second transmission requirement is saved with filename: 5s.pdf.

[×] Pursuant to FCC Part 15 Section 15.231(a)(2), a transmitter activated automatically shall cease transmitter within 5 seconds after activation. The EUT meets the requirement. A preliminary copy of the 5-seconds transmission requirement is saved with filename: 5s.pdf.

4.4 AC Power Line Conducted Emission

[×] Not applicable – EUT is only powered by a battery for operation.

[ ] EUT connects to AC power line. Emission Data is listed in following pages.

[ ] Base Unit connects to AC power line and has transmission. Handset connects to AC power line but has no transmission. Emission Data of Base Unit is listed in following pages.

EXHIBIT 5
EQUIPMENT LIST

5.0 **Equipment List**

1) Radiated Emissions Test

Equipment	Log Periodic Antenna	Double Ridged Guide Antenna (1GHz -18GHz)	Spectrum Analyzer (9kHz to 26.5GHz)
Registration No.	EW-0446	EW-1133	EW-2188
Manufacturer	EMCO	EMCO	AGILENTTECH
Model No.	3146	3115	E4407B
Calibration Date	Oct. 31, 2011	Mar. 02, 2011	Sep. 26, 2011
Calibration Due Date	Apr. 30, 2013	Sep. 02, 2012	Sep. 26, 2012

Equipment	EMI Test Receiver	Biconical Antenna 20MHz to 200MHz	Spectrum Analyzer
Registration No.	EW-2500	EW-2512	EW-2466
Manufacturer	R&S	EMCO	ROHDESCHWARZ
Model No.	ESCI	3104C	FSP30
Calibration Date	Feb. 24, 2012	Nov. 15, 2011	Apr. 11, 2011
Calibration Due Date	Feb. 24, 2013	May. 15, 2013	Jul. 11, 2012

END OF TEST REPORT