

Resolution Products, Inc.

**Wireless Security Panel
FCC ID: U5X-RE6100**

Certification Test Report

15.231 433MHz

December 3, 2014

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1. Introduction

The RE6100 is a wireless security system. The unit is powered by a 12VDC power supply and is backed up by a rechargeable NiMH battery. The device measures 8.8 x 8.9 x 2.8”.

The device receives messages from security sensors transmitting at 433.92MHz. It also communicates with Bluetooth LE devices in the 2.4GHz band.

This report pertains to the 433.92MHz transceiver. A separate report will cover the 2.4GHz Bluetooth LE transceiver.

In addition to testing each radio independently, Co-location testing between the 433.92MHz and 2.4GHz radios was performed, and no further emissions were found.

Certification is requested under FCC Rules, Part 15, Subpart C, Paragraph 15.231.

2. Statement of Compliance

Specific sections of FCC Rules Part 2 that require information or listing are given below.

2.1. FCC Part 2 §2.907

This is an application for certification of original equipment

2.2. FCC Part 2 §2.911

- a) This application has been filed electronically using form 731.
- b) All required information has been supplied in this application and its attachments.
- c) This application has been electronically signed by an officer of Resolution Products, Inc.
- d) The technical test data has been signed by the agency performing the testing.
- e) Signature supplied in appropriate block on form 731.
- f) Processing fee has been paid.
- g) Signatures have been supplied electronically.

2.3. FCC Part 2 §2.913

- a) This application has been filed electronically.
- b) Appropriate fees have been filed electronically.
- c) Equipment samples shall be supplied as requested.

2.4. FCC Part 2 §2.915

We are requesting a grant of certification. This application shows compliance with the technical standards.

2.5. FCC Part 2 §2.925

A label shall be affixed to each piece of equipment, showing the FCC identifier. The label shall read “FCC ID: U5X-RE6100”. See Exhibit B for a photograph showing the label and location on the device.

2.6. FCC Part 2 §2.943, 2.945

Sample production equipment shall be submitted to the FCC upon request.

2.7. FCC Part 2 §2.947

- a) Measurement procedure follows ANSI C63.4: 2009.
- b) A description of utilized test equipment is contained in the report.

2.8. FCC Part 2 §2.948

Radiated measurements were taken at the following FCC-approved facility:

Rhein Tech Laboratories, Inc.
360 Herndon Parkway, Suite 1400
Herndon, VA 20170 USA
Contact: Rick McMurray
703-689-0368

Photographs of the test site are shown in Exhibit J.

2.9. FCC Part 2 §2.1033

- a) Form 731 has been filed electronically.
- b) The technical report, along with its exhibits, contains the information as follows:
 - (1) full name and mailing address of the manufacturer of the device and the applicant for certification:
Resolution Products, Inc.
1402 Heggen Street
Hudson, WI 54016
 - (2) FCC Identifier is U5X-RE6100
 - (3) Copy of the installation/user instructions is furnished as Exhibit E.
 - (4) A brief description of the device and operation is furnished in Exhibit F. Schematic is furnished in Exhibit G.
 - (5) Block diagram furnished in Exhibit H.
 - (6) This document constitutes a technical test report.
 - (7) Internal and external photographs have been furnished in Exhibits A and C.
 - (8) Not applicable. There are no peripheral or accessory devices used with this device. It is a standalone device.
 - (9) This application not pursuant to the transition rules of section 15.37
 - (10) Not applicable. This device does not include a scanning receiver.
 - (11) Not applicable.
 - (12) Not applicable.
- c) Not applicable. This device shall operate under Part 15 of the rules.
- d) Not applicable.
- e) Not applicable. This is not a composite system.

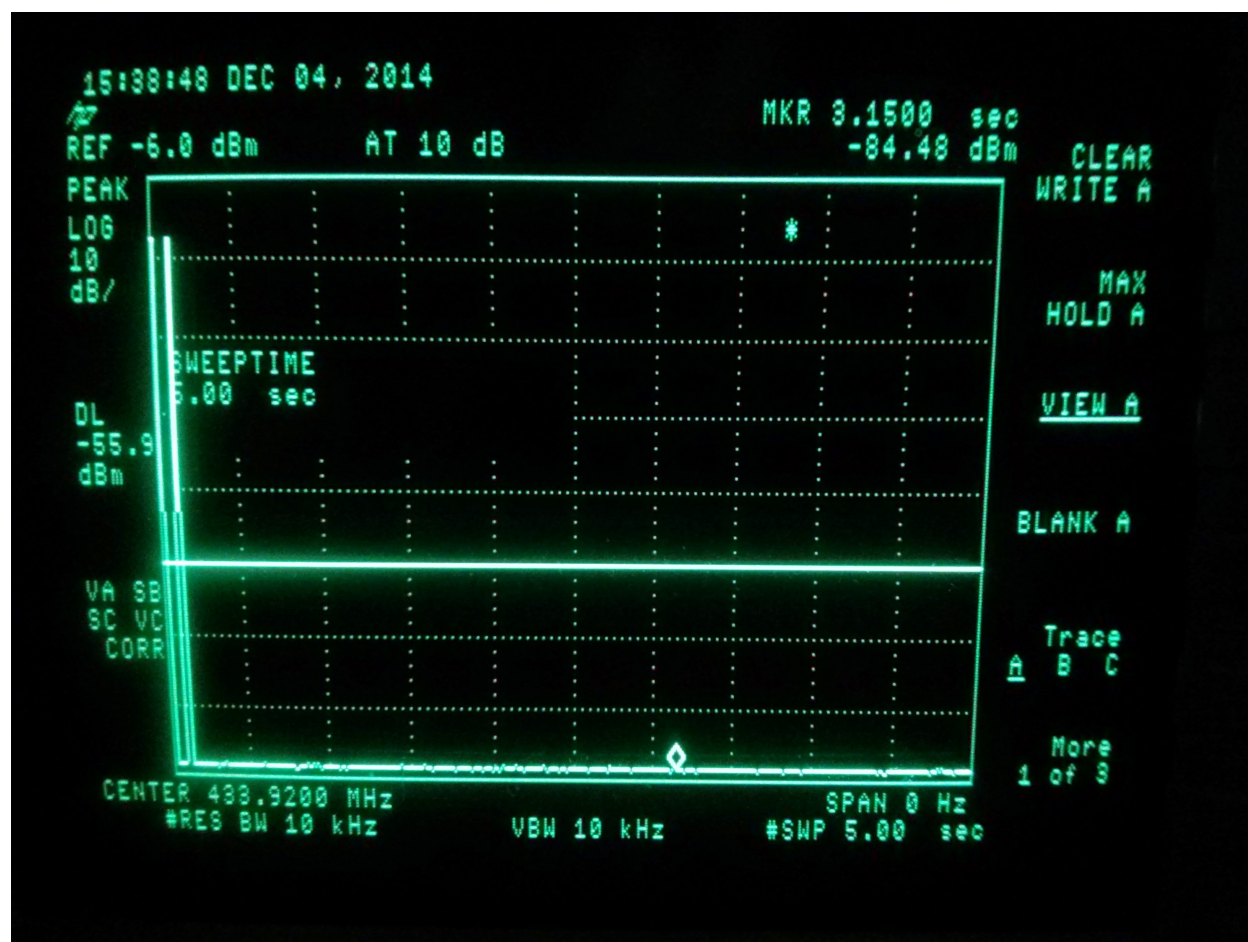
3. Discussion of Laboratory Measurements and Rules Compliance

Plots in this report were made using a HP8594E Spectrum Analyzer, ID# 021814-1, Cal: 2/26/2014, Due: 2/26/2015.

3.1. FCC Part 15 §15.231(a)(1)

A transmission of 2 packets is sent by the device upon an alarm or arming condition. These packets are 20ms in length and are sent with a spacing of 100ms.

A plot of the transmissions is shown below. This plot shows the transmissions occurring in a 5 second window as a result of one activation. The packets are shown to conclude within the 5-second window.



3.2. FCC Part 15 §15.231(a)(3)

This device does not send supervision packets.

3.3. FCC Part 15 §15.231(a)(4)

Device does not continue transmitting beyond the packets resulting from each activation.

3.4. FCC Part 15 §15.231(a)(5)

There is no setup information transmitted with this device.

3.5. FCC Part 15 §15.231(b)

3.5.1. Raw Field Strength Limits

Interpolation performed on the data in the §15.231(b) table yields raw field strength limits as follows:

Fundamental: 80.825dBuV/m

Spurious: 60.825dBuV/m

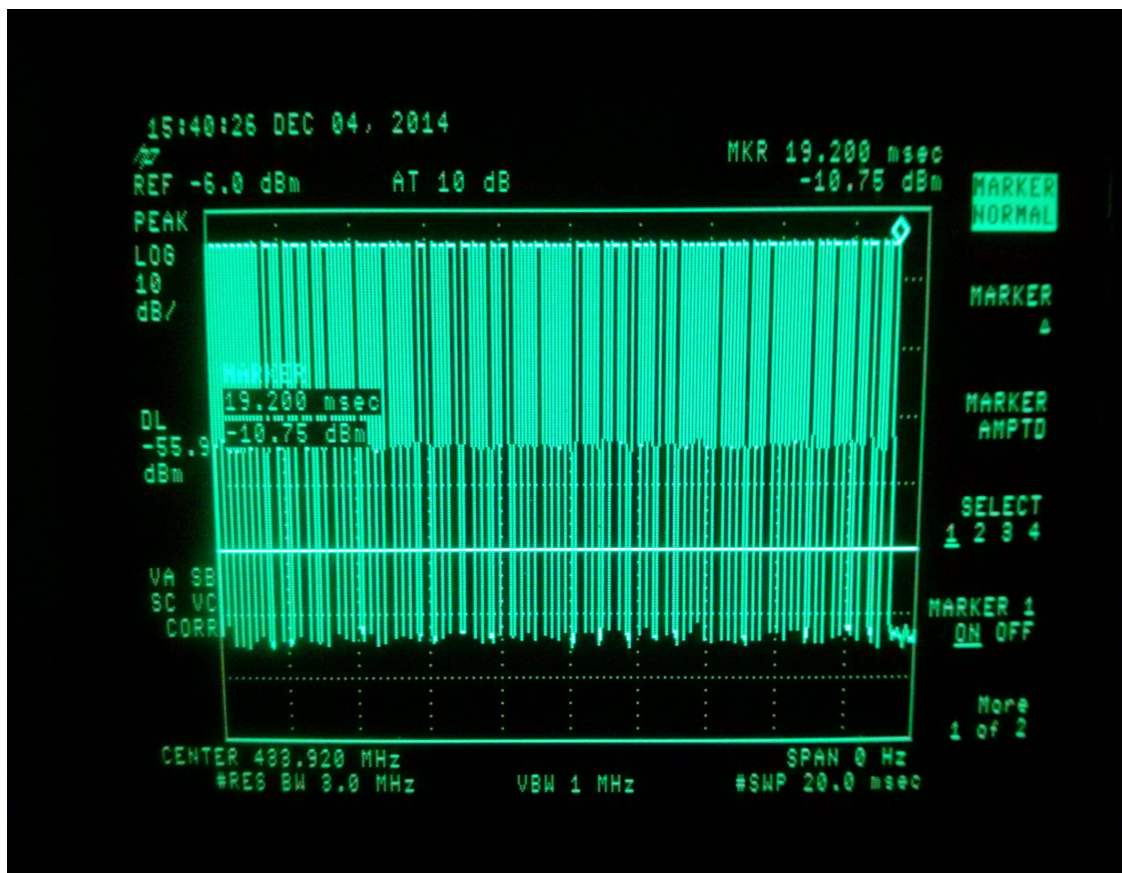
Certain harmonics of the transmitted signal fall in the restricted bands of §15.205. These harmonics are all above 960MHz and have the following limit as given in §15.209:

Restricted band limit = 500uV/m = 54dBuV/m.

3.5.2. Duty Cycle Correction Factor and Resulting Limits

This transmitter uses ASK modulation. Each transmitted packet has a length of 20mS with a minimum of 100ms gap between each packet.

Each transmitted packet contains 100 bits, each 200us long. The bits use Manchester encoding, so every 200us bit has an on time of 100us. Total packet on time is then 10ms. The maximum transmitter duty cycle in a 100ms period thus is $10/100 = 10\%$.



Calculating the allowed duty cycle correction factor as given in §15.35(c):

$$20\log(10/100) = -20\text{dB}$$

Resulting radiated field strength limits are as follows:

Fundamental:	100.825dBuV/m
Spurious:	80.825dBuV/m
Restricted Band:	74dBuV/m

3.5.3. Measured Radiated Field Strength Data

Radiated fundamental and spurious emissions were tested at three meters. The EUT was tested in the three orthogonal planes with the receive antenna in both polarities. The emissions were maximized per ANSI C63.4:2003 8.3.1.2; that is, the measurement antenna height was varied between 1 and 4m, and the EUT was rotated through 360 degrees on a rotating turntable until the maximum emissions were found. Both horizontal and vertical measurement antenna polarizations were used. A resolution bandwidth of 100kHz was used for frequencies less than 1000MHz, and a resolution bandwidth of 1MHz was used for frequencies greater than or equal to 1000MHz. The video bandwidth was set to a value at least three times greater than the resolution bandwidth.

All spurious emissions in the applicable frequency range were investigated, only harmonic emissions were present as noted in the test report. The EUT was adapted to continuously transmit for testing purposes.

The transceiver continuously switches between two antennas to radiate and receive the 433MHz signal.

The top antenna had the following test results:

The fundamental signal, at 97.3dBuV/m, passed by 3.5dB.

The highest spurious signal was the 2nd harmonic, which passed by 28.7dB.

The side antenna had the following test results:

The fundamental signal, at 98.2dBuV/m, passed by 2.6dB.

The highest spurious signal was the 6th harmonic, which passed by 29.4dB.

All non-harmonic spurious emissions in the applicable frequency range were investigated.

The highest spurious emission is at 216.97MHz, at 41.9dBuV/m, passed by 18.9dB.

Next highest spurious emission is at 325.44MHz, at 35.1dBuV/m, passed by 10.9dB.

Closest spurious emission to the limit is at 78.55MHz, 34.6dBuV/m, passed by 5.4dB.

Measured radiated field strength data is shown in Exhibit K.

3.6. FCC Part 15 §15.231(c)

Allowed 20dB bandwidth of the transmitted signal is 0.25% of the carrier frequency.

BW Limit = 0.0025*433.92MHz

BW Limit = 1.0848MHz

The plot below shows the modulated signal. Bandwidth of the modulated signal is 33.5kHz or 0.0335MHz. These measurements show compliance with the bandwidth requirements.

15:55:22 DEC 04, 2014

REF -6.0 dBm AT 10 dB

MKR Δ 33.5 kHz
.10 dB

PEAK
LOG
10
dB/

MARKER
NORMAL

MARKER
Δ

MARKER
AMPTD

SELECT
1 2 3 4

MARKER 1
ON OFF

More
1 of 2

MA SB
SC FC
CORR

CENTER 433.9200 MHz
#RES BW 3.0 kHz

#VBW 10 kHz

SPAN 100.0 kHz
SWP 100 msec

