



Engineering Solutions & Electromagnetic Compatibility Services

FCC Part 15.231 Test Data

433.92 MHz Sensor

Model: RE307

for

**Alula
1402 Heggen Street
Hudson, WI 54016
Contact: Chris Weltzien**

Testing Conducted By:

**Rhein Tech Laboratories, Inc.
360 Herndon Parkway, Suite 1400
Herndon, VA 20170**

RTL Test Engineer: Jon Wilson

RTL Project/Report Number: 2018159

December 26, 2018

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from, the applicable parts of FCC Part 2, FCC Part 15, and ANSI C63.10.

Signature: 

Date: December 26, 2018

Typed/Printed Name: Desmond A. Fraser

Position: President

This report may not be reproduced, except in full, without the full written approval of Rhein Tech Laboratories, Inc. and Alula. Test results relate only to the item tested.

These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANAB. Refer to certificate and scope of accreditation AT-1445. ISED test site number: 2956A-1

Radiated Spurious Harmonics Emissions

The data and limits presented in this report are for radiated emissions per 15.231(b)(2) which references 15.35(b), and peak limiting for restricted bands per 15.209(e), which again references 15.35(b)(2), as procured by Alula. No average data is presented in this report. Data (if applicable) is also presented for spurious, non-harmonic radiated emissions per 15.209. The Equipment Under Test (EUT) was the **433.92 MHz RE307 (RTL Bar Code 22997)** and **RE607 (RTL Bar Code 22998)**.

Test Procedure

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; that is, the measurement antenna height was varied between 1 and 4 m, and the EUT was rotated through 360° on a rotating turntable until the maximum emissions were found. Both horizontal and vertical measurement antenna polarizations were used. A resolution bandwidth of 120 kHz was used for frequencies less than 1000 MHz, and a resolution bandwidth of 1 MHz was used for frequencies greater than or equal to 1000 MHz. The video bandwidth was set to a value at least three times greater than the resolution bandwidth.

EUT Disposition

The EUT was adapted to continuously transmit for testing purposes.

15.231 Radiated Spurious Harmonics Emissions Test Data – Peak: RE307

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
433.900	Peak	V	75.0	18.2	93.2	100.8	-7.6
867.800	Peak	V	51.6	-2.3	49.3	80.8	-31.5
1301.800	Peak	V	47.3	3.2	50.5	74.0	-23.5
1735.700	Peak	V	43.0	7.4	50.4	80.8	-30.4
2169.600	Peak	V	41.3	-11.2	30.1	80.8	-50.7
2603.500	Peak	V	47.6	-10.5	37.1	80.8	-43.7
3037.400	Peak	V	59.5	-10.3	49.2	80.8	-31.6
3471.400	Peak	H	60.8	-8.7	52.1	80.8	-28.7
3905.300	Peak	H	55.1	-7.1	48.0	74.0	-26.0
4339.200	Peak	H	35.5	-1.6	33.9	74.0	-40.1

All spurious emissions in the applicable frequency range were investigated; only harmonic emissions were present as noted above.

Measurement uncertainty: Measurement uncertainties shown for these tests are expanded uncertainties expressed at 95% confidence level using a coverage factor $k = 2$. ± 4.6 dB

Radiated Emissions Test Equipment

Part	Manufacturer	Model	Serial Number	RTL Bar Code	Calibration Due Date
Amplifier (20 MHz - 2 GHz)	Rhein Tech Laboratories, Inc.	PR-1040	900905	900905	8/18/18
Amplifier (1-26.5 GHz)	Hewlett Packard	8449B OPT H02	3008A00505	900932	8/18/18
Antenna (30 MHz – 2 GHz)	Chase	CBL6112	2099	900791	10/4/20
Horn Antenna 2 - 4 GHz	EMCO	3161-02	9804-1044	900772	5/17/21
Horn Antenna 4.0-8.2 GHz	EMCO	3161-03	9508-1020	900321	5/17/21
Quasi-Peak Adapter	Hewlett Packard	85650A	2521A00743	900339	4/26/19
Spectrum Analyzer Display	Hewlett Packard	85662A	3144A20839	900930	4/16/19
Spectrum Analyzer (100 Hz – 22 GHz)	Hewlett Packard	8566B	3138A07771	900931	4/26/19
UHF Notch Filter	Par Electronics	400-512 (25W)	N/A	901135	8/21/18

Test Personnel:

Jon Wilson		July 20, 2018
EMC Test Engineer	Signature	Date of Test

FCC/IC Cross Reference

5 second timing	FCC 15.231(a)	RSS-210 Issue 9 A1.1
Field Strength	FCC 15.231(b)(2)	RSS-210 Issue 9 A1.2
Restricted Band	FCC 15.205	RSS-Gen Issue 5 8.10
General Field Strength	FCC 15.209	RSS-Gen Issue 5 8.9
Bandwidth	FCC 15.231(c)	RSS-210 Issue 9 A1.3

Occupied Bandwidth

15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz

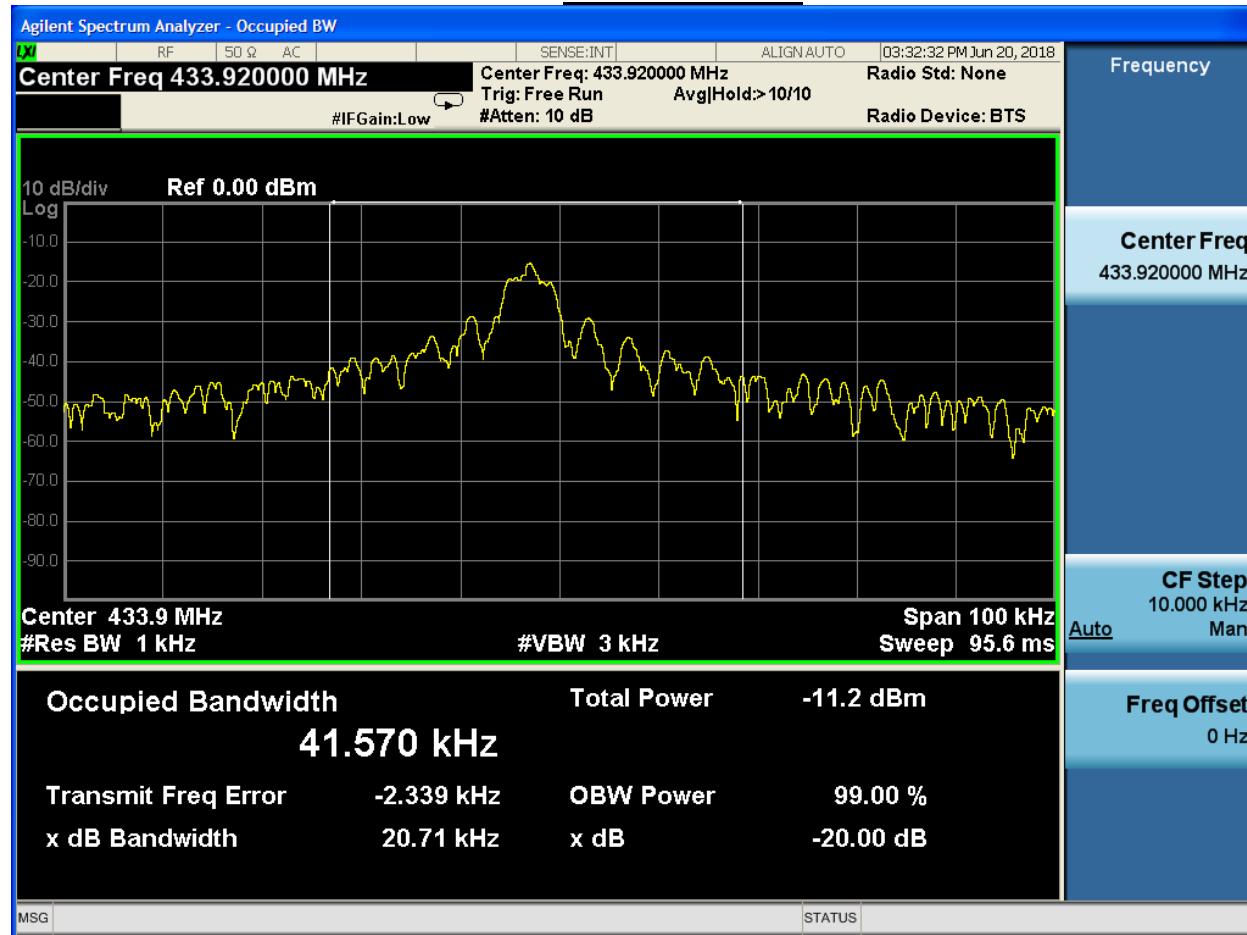
RE307

433.92 MHz * 0.25% = 1085 kHz = Limit

99% Bandwidth is 41.570 kHz

20 dB Bandwidth is 20.71 kHz

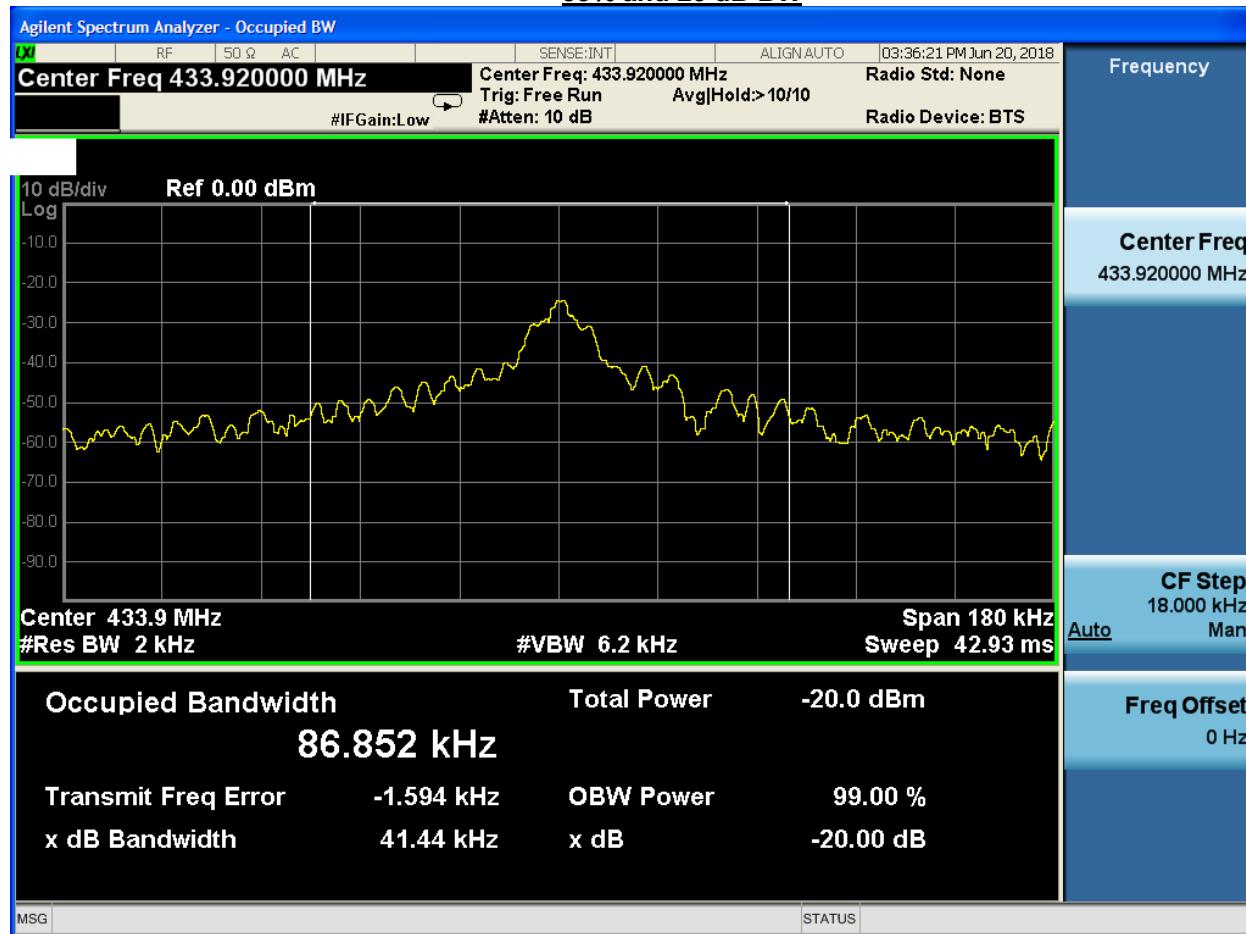
99% and 20 dB BW



RE607:

433.92 MHz * 0.25% = 1085 kHz = Limit
99% Bandwidth is 86.852 kHz
20 dB Bandwidth is 41.44 kHz

99% and 20 dB BW



Measurement uncertainty: $\pm 1 \times 10^{-6}$ Hz. This measurement uncertainty is an expanded uncertainty for 95% confidence level received with a coverage factor k=2.

Occupied Bandwidth Test Equipment

RTL Bar Code	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	2/06/20

Test Personnel:

Khue Do		June 20, 2018
Test Engineer	Signature	Date of Test

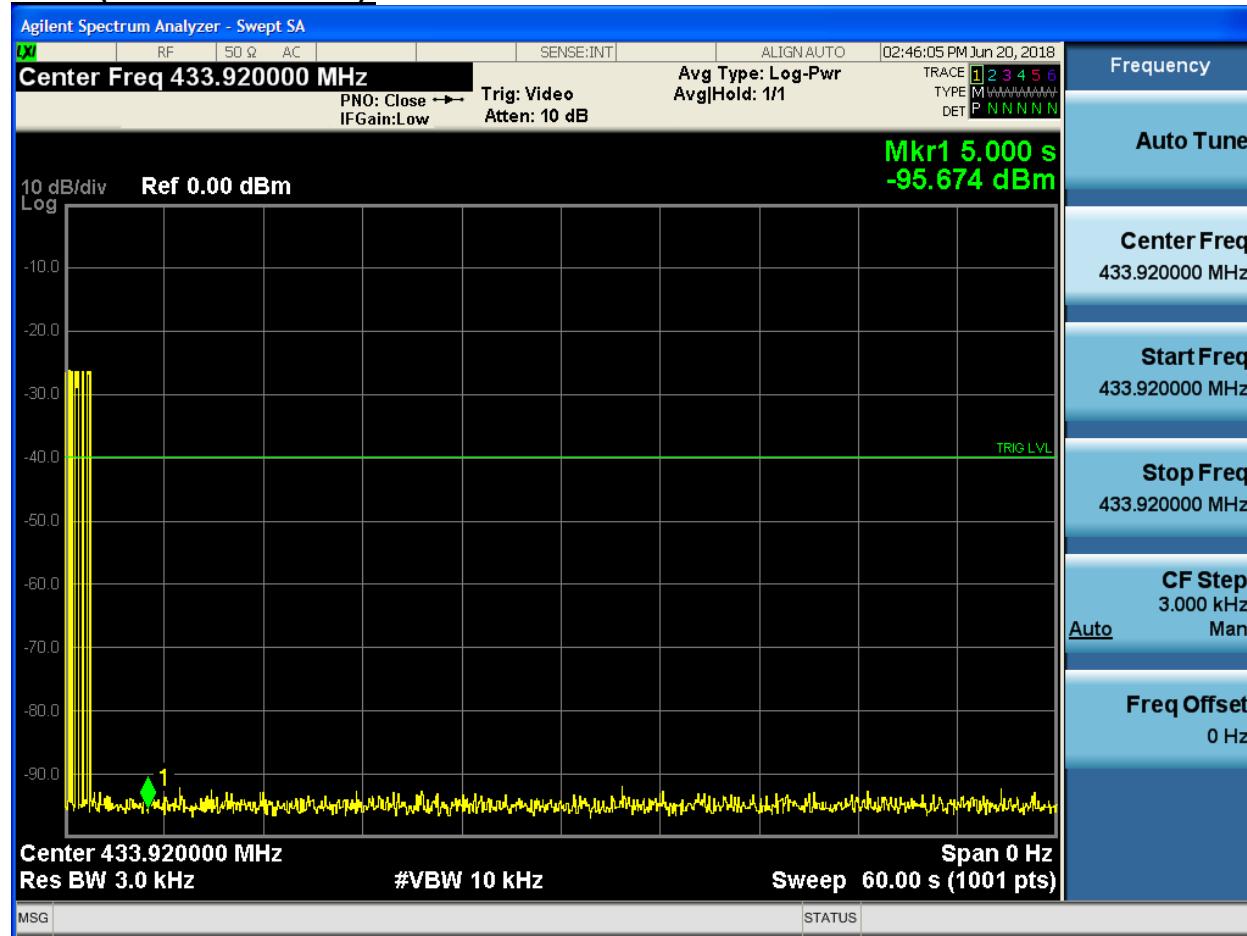
Transmitter Deactivation

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.

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

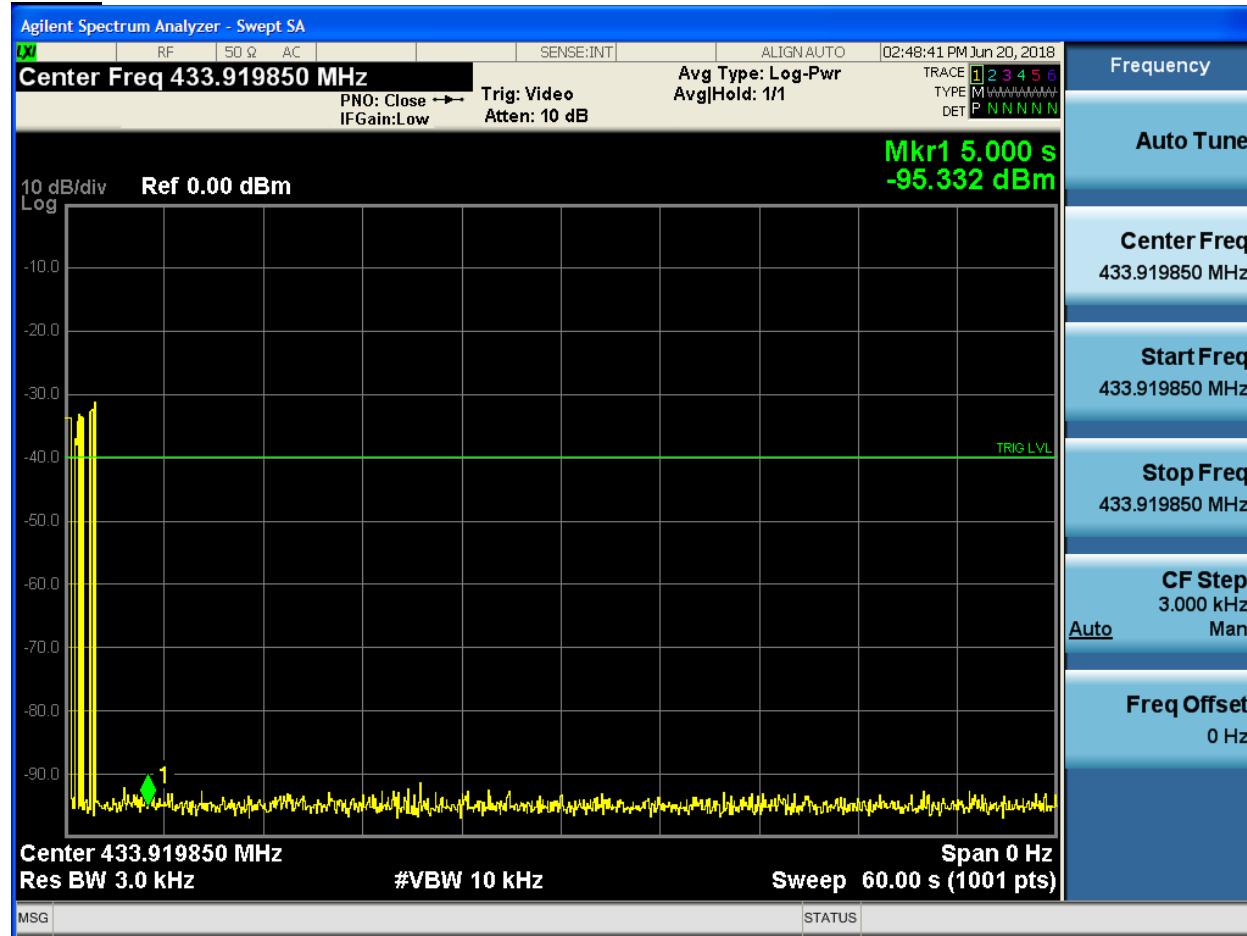
RE307 (56-0099-03 Rev A00):



15.231(a)

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RE307:



Test Equipment

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Test Personnel:

Khue Do		June 20, 2018
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Appendix A: Test Configuration Photographs

