



Engineering Solutions & Electromagnetic Compatibility Services

FCC Part 15.231 and 15.207 Test Data

**319.5, 345, 433.92 MHz Wireless to Wireless Translator
Part # 56-0076-00 RevB02**

for

**Resolution Engineering, Inc.
1402 Heggen Street
Hudson, WI 54016
Contact: Josh Gathje**

**Testing Conducted By
Rhein Tech Laboratories, Inc.
360 Herndon Parkway, Suite 1400
Herndon, VA 20170
RTL Test Engineer: Jon Wilson**

RTL Project/Report Number: 2016013

February 12, 2016

This report may not be reproduced, except in full, without the full written approval of Rhein Tech Laboratories, Inc. and Resolution Engineering. 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.

The Equipment Under Test (EUT) was the **319.5, 345, 433.92 MHz Wireless to Wireless Translator, Part # 56-0076-00 RevB02**. RTL barcodes: 21929, 21930

Testing Represented in Report

15.231

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 Resolution Engineering. No average data is presented in this report. Data is also presented for spurious, non-harmonic radiated emissions per 15.209.

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 100 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.

15.207

AC Power Line Conducted Emissions

Test Procedure

The power line conducted emission measurements were performed in a Series 81 type shielded enclosure manufactured by Rayproof. The EUT was placed on a wooden table. Power was fed to the EUT through a 50-ohm/50 microhenry LISN. The 50-ohm output of the EUT LISN was connected to the spectrum analyzer input through a Solar 100 kHz high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 100 kHz. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The analyzer's 6 dB resolution bandwidth was set to 9 kHz. The video bandwidth was set to a value at least three times greater than the resolution bandwidth. Average measurements are performed in linear mode using a 9 kHz resolution bandwidth and a 1 Hz video bandwidth. The frequency spectrum was scanned from 150 kHz to 30 MHz.

EUT Disposition

The EUT was adapted to continuously transmit for testing purposes.

15.231 Radiated Emissions Test Data – FCC Limits - 3m Distance

Top Antenna

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
319.523	Peak	79.3	14.4	93.7	95.9	-2.2	Pass
639.046	Peak	59.7	-4.3	55.4	75.9	-20.5	Pass
958.569	Peak	53.9	-1.8	52.1	75.9	-23.8	Pass
1278.092	Peak	47.9	3.6	51.5	74.0	-22.5	Pass
1597.615	Peak	53.7	5.4	59.1	74.0	-14.9	Pass
1917.138	Peak	53.1	7.3	60.4	75.9	-15.5	Pass
2236.661	Peak	52.8	-15.1	37.7	74.0	-36.3	Pass
2556.184	Peak	49.1	-14.7	34.4	75.9	-41.5	Pass
2875.707	Peak	50.2	-14.5	35.7	74.0	-38.3	Pass
3195.230	Peak	55.9	-13.7	42.2	75.9	-33.7	Pass

Side Antenna

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
319.523	Peak	80.9	14.4	95.3	95.9	-0.6	Pass
639.046	Peak	61.0	-4.3	56.7	75.9	-19.2	Pass
958.569	Peak	49.2	-1.8	47.4	75.9	-28.5	Pass
1278.092	Peak	48.4	3.6	52.0	74.0	-22.0	Pass
1597.615	Peak	53.6	5.4	59.0	74.0	-15.0	Pass
1917.138	Peak	53.1	7.3	60.4	75.9	-15.5	Pass
2236.661	Peak	51.7	-15.1	36.6	74.0	-37.4	Pass
2556.184	Peak	49.3	-14.7	34.6	75.9	-41.3	Pass
2875.707	Peak	50.1	-14.5	35.6	74.0	-38.4	Pass
3195.230	Peak	54.6	-13.7	40.9	75.9	-35.0	Pass

Top Antenna

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
345.000	Peak	80.2	15.3	95.5	97.3	-1.8	Pass
690.000	Peak	58.6	-4.0	54.6	77.3	-22.7	Pass
1,035.000	Peak	53.0	0.0	53.0	74.0	-21.0	Pass
1,380.000	Peak	50.0	4.1	54.1	74.0	-19.9	Pass
1,725.000	Peak	53.8	7.4	61.2	77.3	-16.1	Pass
2,070.000	Peak	55.2	-15.8	39.4	77.3	-37.9	Pass
2,415.000	Peak	54.3	-15.2	39.1	77.3	-38.2	Pass
2,760.000	Peak	50.2	-14.7	35.5	74.0	-38.5	Pass
3,105.000	Peak	53.6	-14.0	39.6	77.3	-37.7	Pass
3,450.000	Peak	59.0	-13.4	45.6	77.3	-31.7	Pass

Side Antenna

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
345.000	Peak	81.6	15.3	96.9	97.3	-0.4	Pass
690.000	Peak	60.7	-4.0	56.7	77.3	-20.6	Pass
1,035.000	Peak	49.5	0.0	49.5	74.0	-24.5	Pass
1,380.000	Peak	49.2	4.1	53.3	74.0	-20.7	Pass
1,725.000	Peak	52.3	7.4	59.7	77.3	-17.6	Pass
2,070.000	Peak	53.6	-15.8	37.8	77.3	-39.5	Pass
2,415.000	Peak	57.1	-15.2	41.9	77.3	-35.4	Pass
2,760.000	Peak	49.7	-14.7	35.0	74.0	-39.0	Pass
3,105.000	Peak	51.0	-14.0	37.0	77.3	-40.3	Pass
3,450.000	Peak	58.0	-13.4	44.6	77.3	-32.7	Pass

Top Antenna

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
433.920	Peak	79.1	17.6	96.7	100.8	-4.1	Pass
867.840	Peak	60.8	-2.7	58.1	80.8	-22.7	Pass
1301.763	Peak	61.0	2.4	63.4	74.0	-10.6	Pass
1735.688	Peak	52.9	7.0	59.9	80.8	-20.9	Pass
2169.590	Peak	50.4	-15.3	35.1	80.8	-45.7	Pass
2603.510	Peak	52.0	-14.5	37.5	80.8	-43.3	Pass
3037.430	Peak	57.1	-14.0	43.1	80.8	-37.7	Pass
3471.350	Peak	58.4	-13.5	44.9	80.8	-35.9	Pass
3905.270	Peak	49.3	-12.7	36.7	74.0	-37.4	Pass
4339.190	Peak	52.1	-7.2	44.9	74.0	-29.1	Pass

Side Antenna

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
433.920	Peak	82.1	17.6	99.7	100.8	-1.1	Pass
867.840	Peak	60.9	-2.7	58.2	80.8	-22.6	Pass
1301.763	Peak	57.8	2.4	60.2	74.0	-13.8	Pass
1735.688	Peak	50.5	7.0	57.5	80.8	-23.3	Pass
2169.590	Peak	50.7	-15.3	35.4	80.8	-45.4	Pass
2603.510	Peak	52.2	-14.5	37.7	80.8	-43.1	Pass
3037.430	Peak	56.4	-14.0	42.4	80.8	-38.4	Pass
3471.350	Peak	54.9	-13.5	41.4	80.8	-39.4	Pass
3905.270	Peak	48.5	-12.7	35.9	74.0	-38.2	Pass
4339.190	Peak	50.8	-7.2	43.6	74.0	-30.4	Pass

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

Radiated Emissions Test Equipment

RTL Bar Code	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901583	Agilent Technologies	EXA N9010A	Spectrum Analyzer (10 Hz – 26.5 GHz)	ATO-7568 SER MY51250846	4/21/17
900772	EMCO	3161-02	Horn Antenna (2 – 4 GHz)	9804-1044	4/9/18
900321	EMCO	3161-03	Horn Antenna (4 – 8 GHz)	9508-1020	4/9/18
901683	Com-Power Corp.	PAM-118A	Preamplifier (500 Mhz – 18 GHz)	551076	8/18/16
900905	Rhein Tech Laboratories	PR-1040	Amplifier (30 - 2000 MHz)	N/A	9/11/16
900791	Chase	CBL6112	Antenna (30 MHz – 2 GHz)	2099	6/11/17

Test Personnel:

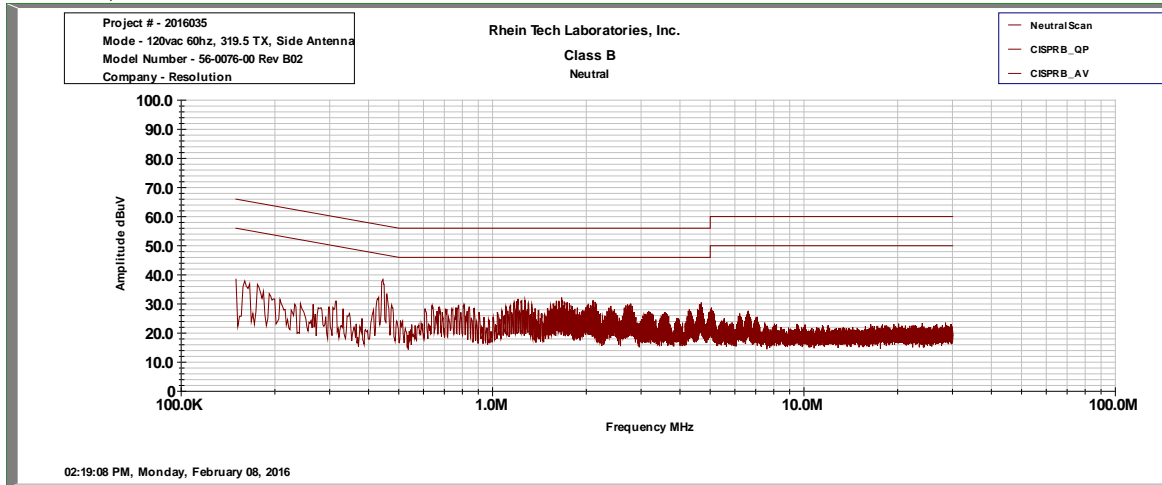
Jon Wilson		February 8-11, 2016
Test Engineer	Signature	Date of Test

FCC/IC Cross Reference

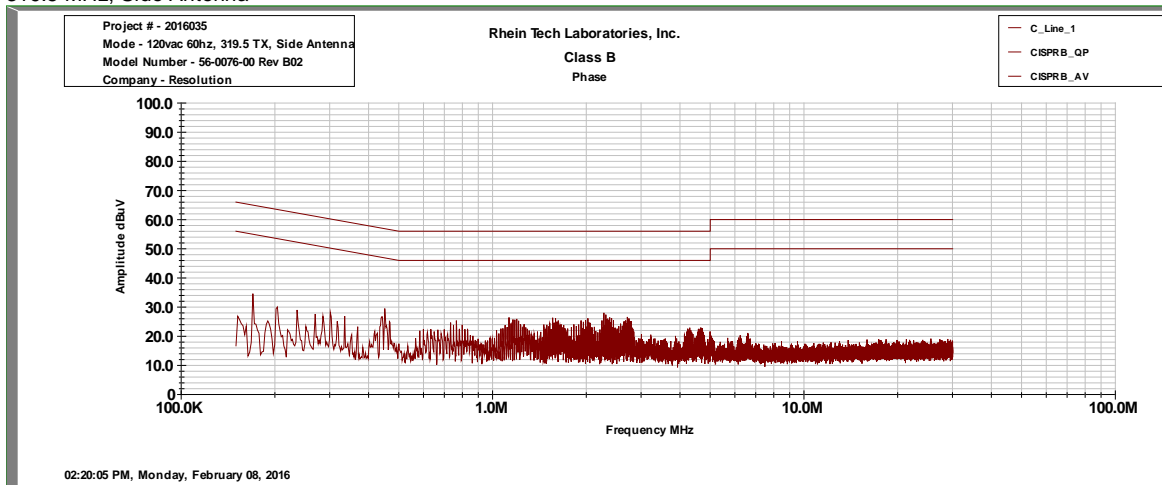
FCC 15.231(b)(2)	RSS-210 Issue 8 A1.1
FCC 15.35(b)	RSS-Gen Issue 4 8.1
FCC 15.205	RSS-Gen Issue 4 8.10
FCC 15.207	RSS-Gen Issue 4 8.8
FCC 15.209	RSS-Gen Issue 4 8.9

15.207 Conducted Line Emissions Test Data – FCC Limits

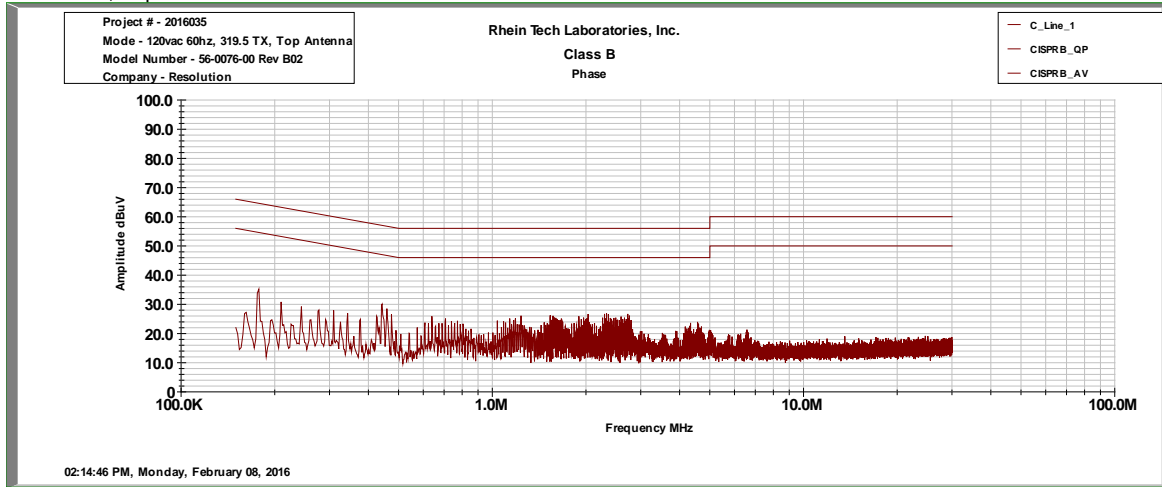
319.5 MHz, Side Antenna



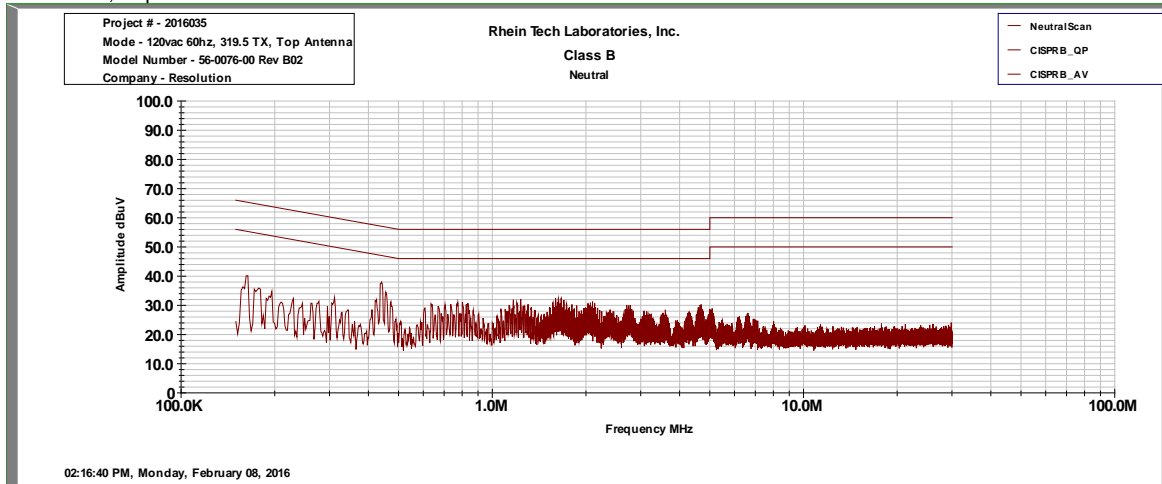
319.5 MHz, Side Antenna



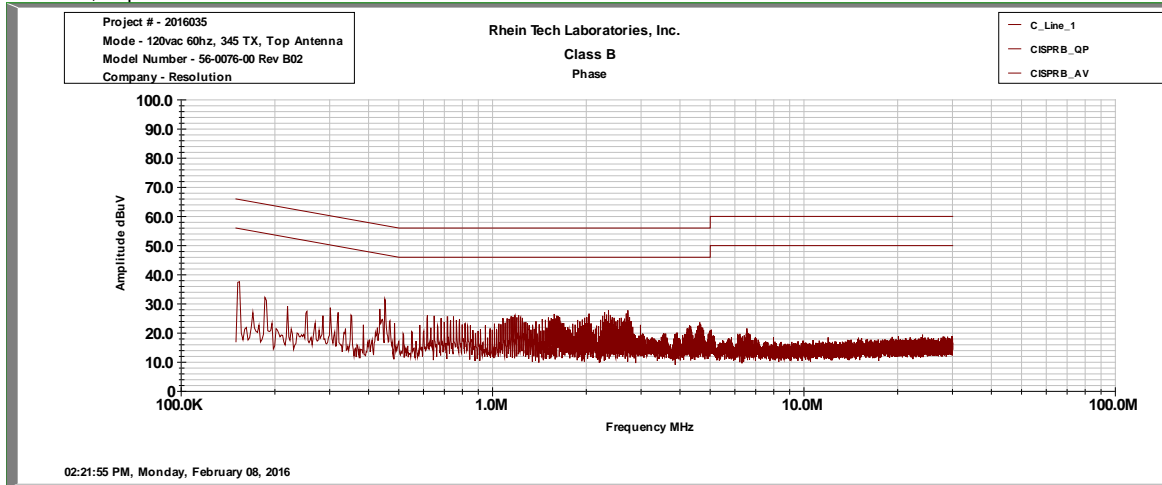
319.5 MHz, Top Antenna



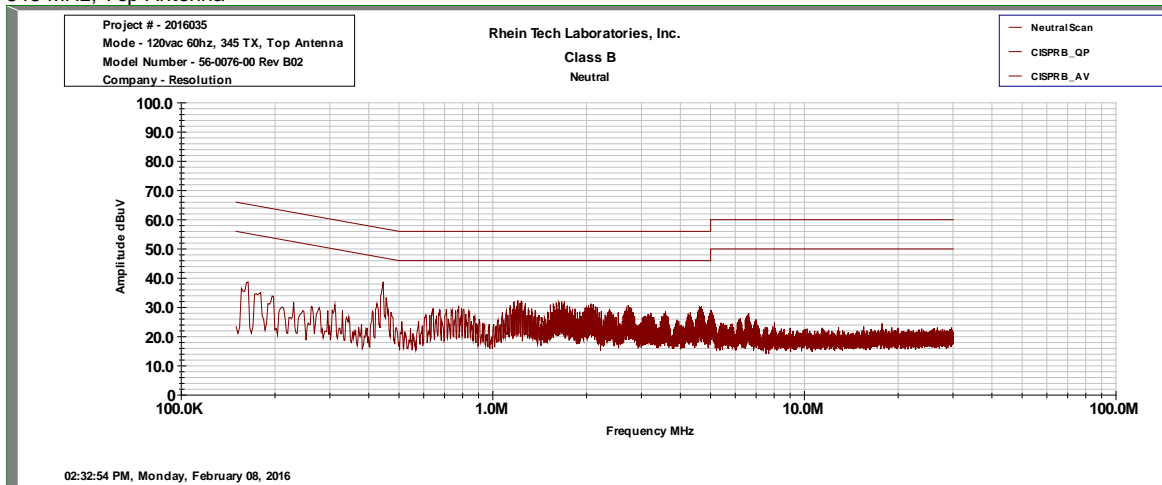
319.5 MHz, Top Antenna



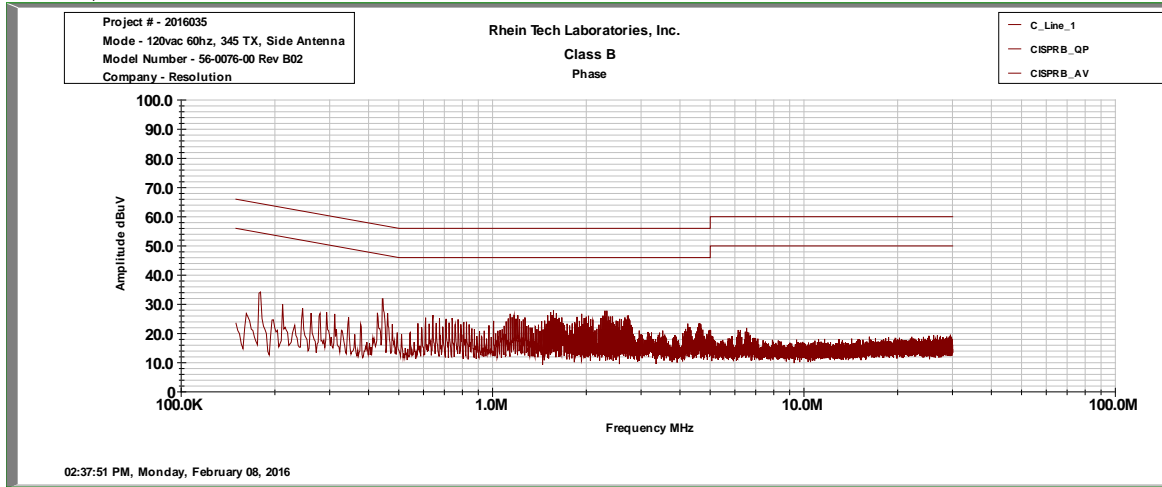
345 MHz, Top Antenna



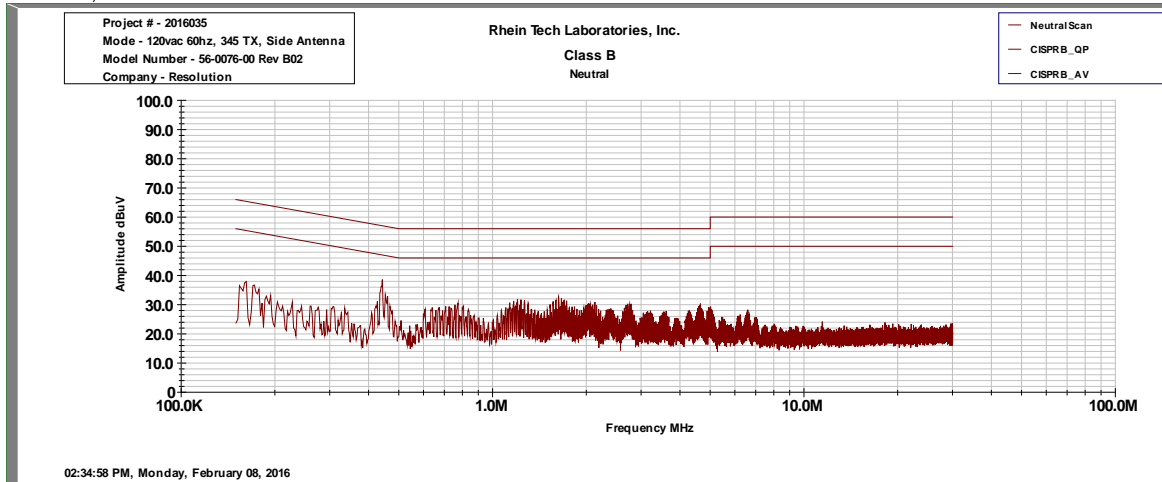
345 MHz, Top Antenna



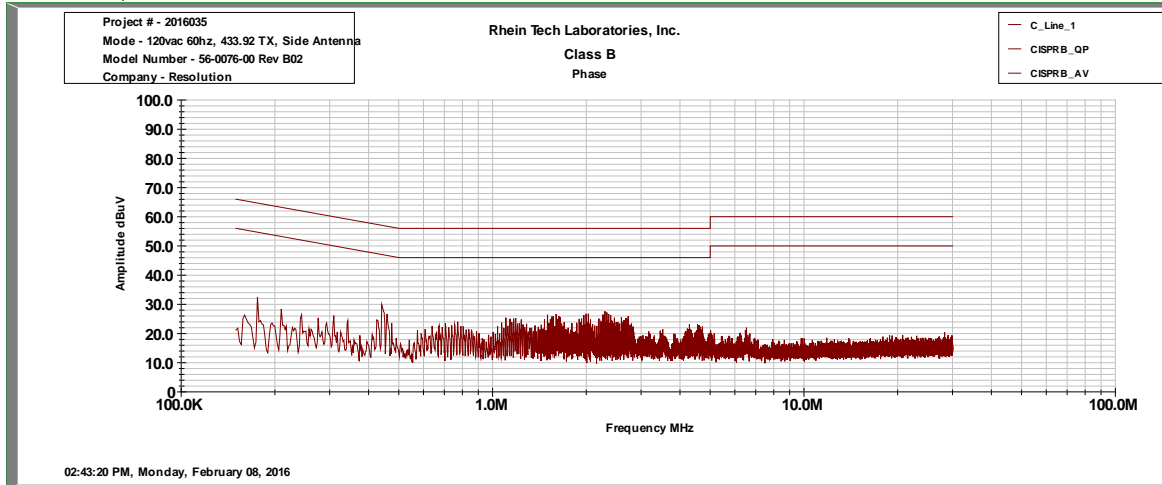
345 MHz, Side Antenna



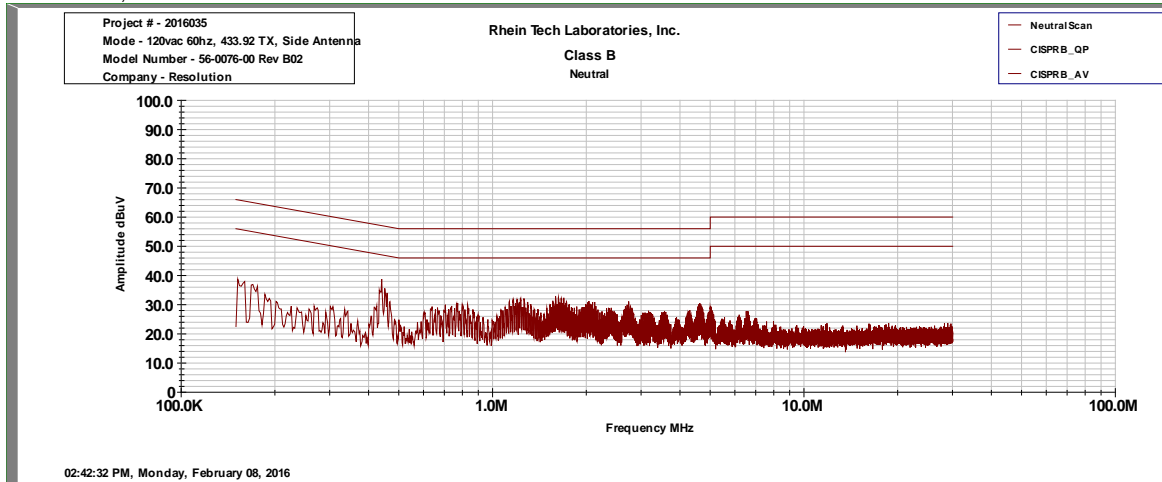
345 MHz, Side Antenna



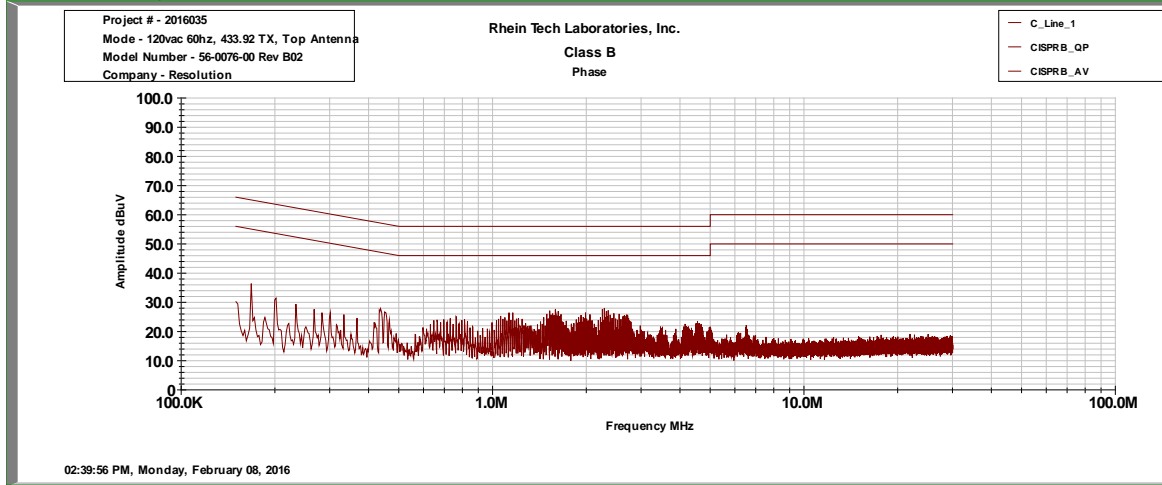
433.92 MHz, Side Antenna



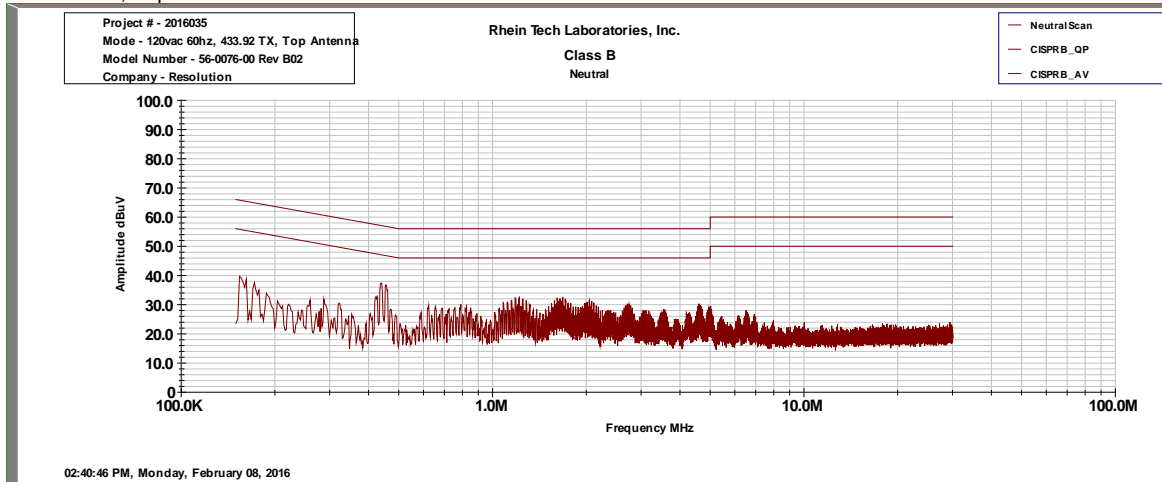
433.92 MHz, Side Antenna



433.92 MHz, Top Antenna



433.92 MHz, Top Antenna



Result: Pass

Conducted Line Emissions Test Equipment

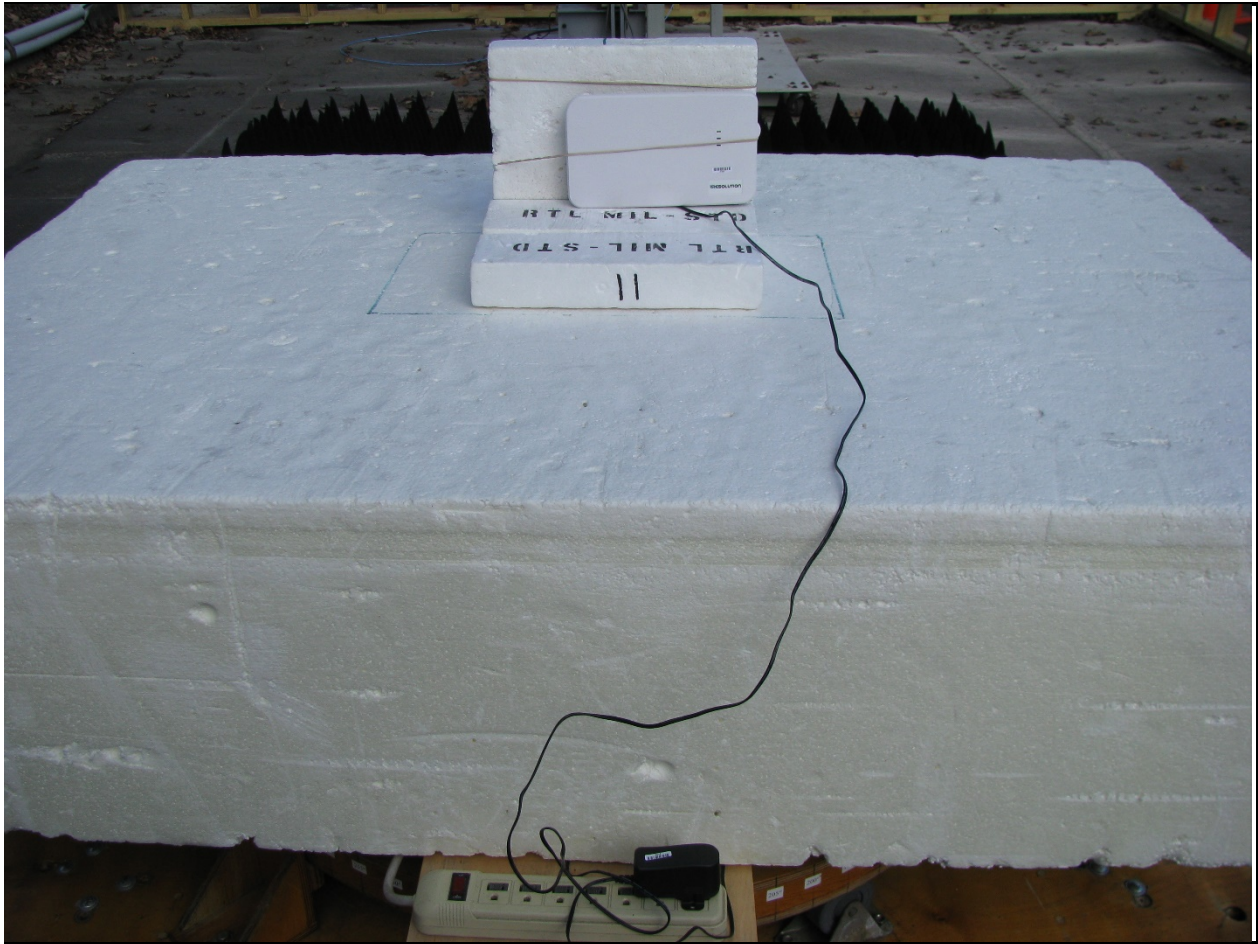
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900339	Hewlett Packard	85650A	Quasi-Peak Adapter	2521A00743	2/17/2016
900930	Hewlett Packard	85662A	Spectrum Analyzer Display	3144A20839	4/21/2016
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz – 22 GHz)	3138A07771	4/21/2016
901084	AFJ International	LS16	16A LISN	16010020082	4/1/16
900728	Solar	Type 8130-7.0	Filter	N/A	4/9/17

Test Personnel:

Jon Wilson		February 8, 2016
Test Engineer	Signature	Date of Test

Appendix A: Test Configuration Photographs

Radiated Emissions





Conducted Emissions



Appendix B: EUT Photograph

