



Engineering Solutions & Electromagnetic Compatibility Services

FCC Part 15.231 Test Data

**EUT: Lifeshield Repeater 56-0052-02 Rev E02
(345 MHz transmitter portion)**

for

**Resolution Engineering, Inc.
1402 Heggen Street
Hudson, WI 54016
Contact: Josh Gathje
651-269-2172**

**Testing Conducted By
Rhein Tech Laboratories, Inc.
360 Herndon Parkway, Suite 1400
Herndon, VA 20170
703-689-0368**

RTL Test Engineer: Jon Wilson

RTL Project/Report Number: 2014058-1

May 23, 2014

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 ANSI-ASQ National Accreditation Board/ACLASS. Refer to certificate and scope of accreditation AT-1445.

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.

15.207

Unintentional digital emissions, mains conducted.

The Equipment Under Test (EUT) was the **Lifeshield Repeater 56-0052-02 Rev E02 (RTL Bar Code 21427)**.

15.231 Radiated Emissions Test Data – FCC Limits/ 3m Distance – Antenna 1 (Green LED)

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)	Pass/Fail
172.480	QP	V	52.4	-17.0	35.4	57.3	-21.9	Pass
258.722	QP	V	48.5	-13.0	35.5	57.3	-21.8	Pass
345.000*	Peak	H	76.9	16.3	93.2	97.3	-4.1	Pass
431.168	QP	H	50.4	-9.6	40.8	57.3	-16.5	Pass
690.0	Peak	H	83.4	-20.8	62.6	77.3	-14.7	Pass
1035.0**	Peak	V	68.0	-16.3	51.7	74.0	-22.3	Pass
1380.0	Peak	V	59.4	-13.9	45.5	74.0	-28.5	Pass
1725.0	Peak	H	58.3	-11.6	46.7	77.3	-30.6	Pass
2070.0	Peak	H	46.4	-8.7	37.7	77.3	-39.6	Pass
2415.0	Peak	V	52.4	-9.0	43.4	77.3	-33.9	Pass
2760.0	Peak	H	52.0	-9.1	42.9	74.0	-31.1	Pass
3105.0	Peak	H	58.3	-8.7	49.6	77.3	-27.7	Pass
3450.0	Peak	V	44.6	-7.1	37.5	77.3	-39.8	Pass

* Fundamental

** IC restricted band

15.231 Radiated Emissions Test Data – FCC Limits/ 3m Distance – Antenna 2 (Red LED)

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)	Pass/Fail
258.722	QP	V	54.8	-13.0	41.8	57.3	-15.5	Pass
345.000*	Peak	V	75.6	16.3	91.9	97.3	-5.4	Pass
431.168	QP	H	53.2	-9.6	43.6	57.3	-13.7	Pass
517.470	QP	H	41.0	-8.2	32.8	57.3	-24.5	Pass
690.0	Peak	V	81.0	-20.8	60.2	77.3	-17.1	Pass
1035.0**	Peak	H	68.3	-16.3	52.0	74.0	-22.0	Pass
1380.0	Peak	H	60.2	-13.9	46.3	74.0	-27.7	Pass
1725.0	Peak	V	59.2	-11.6	47.6	77.3	-29.7	Pass
2070.0	Peak	H	46.7	-8.7	38.0	77.3	-39.3	Pass
2415.0	Peak	V	51.4	-9.0	42.4	77.3	-34.9	Pass
2760.0	Peak	H	53.4	-9.1	44.3	74.0	-29.7	Pass
3105.0	Peak	H	58.3	-8.7	49.6	77.3	-27.7	Pass
3450.0	Peak	H	44.9	-7.1	37.8	77.3	-39.5	Pass

* Fundamental

** IC restricted band

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 per ANSI C63.4:2003 8.3.1.2; 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.

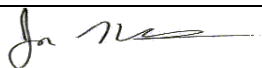
EUT Disposition

The EUT was adapted to continuously transmit for testing purposes.

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	8/20/14
Spectrum Analyzer (10 Hz-26.5 GHz)	Agilent	EXA N9010	MY51250846	901583	4/16/15
Bilog Periodic Antenna (25 MHz-2000 MHz)	ARA	LPB-2520	1037	900724	4/19/15
Amplifier (1 GHz-26.5 GHz)	Hewlett Packard	8449B OPT H02	3008A00505	900932	8/10/2014
Horn Antenna (2.0-4.0 GHz)	EMCO	3161-02	9804-1044	900772	4/20/15
Emissions Testing Software	Rhein Tech Laboratories, Inc.	Automated Emission Tester	Rev. 14.0.2	N/A	N/A

Test Personnel:

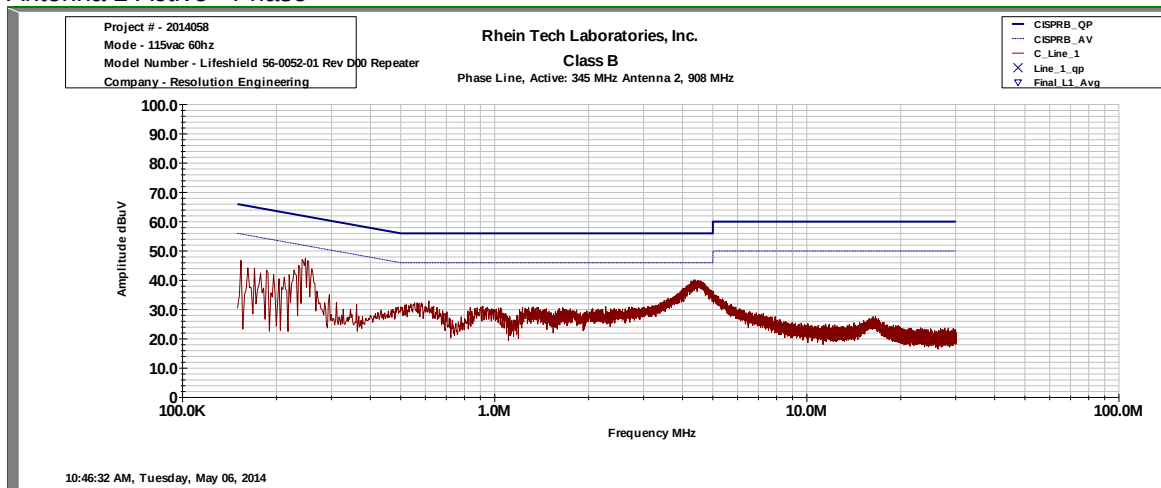
Jon Wilson		May 22, 2014
Test Engineer	Signature	Date of Test

FCC/IC Cross Reference

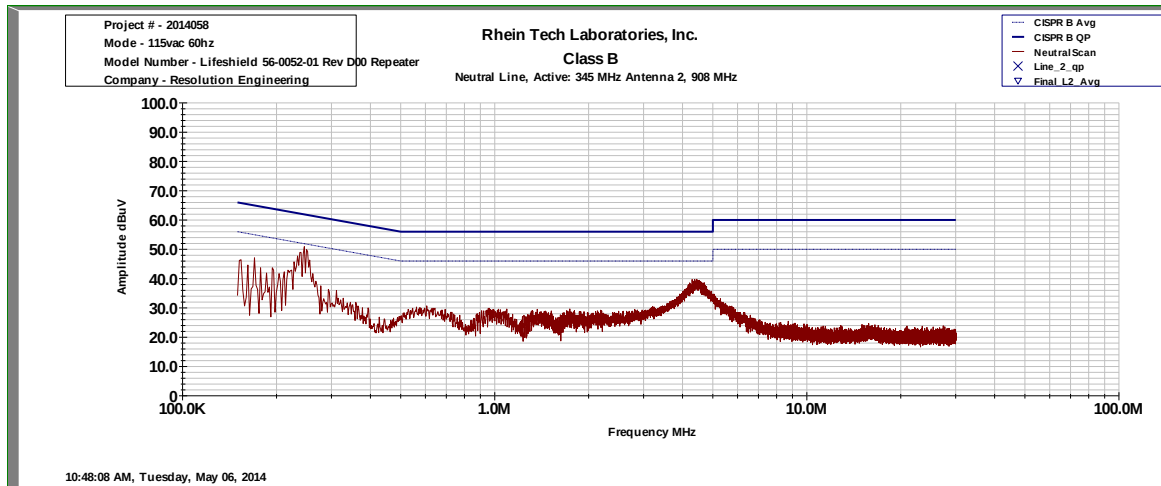
FCC 15.231(b)(2)	RSS-210 Issue 8 A1.1
FCC 15.35(b)	RSS-Gen Issue 3 7.2.3
FCC 15.205	RSS-Gen Issue 3 7.2.2
FCC 15.209	RSS-Gen Issue 3 7.2.5
FCC 15.207	RSS-Gen Issue 3 7.2.4

15.207 Conducted Line Emissions Test Data – FCC Limits

Antenna 2 Active - Phase

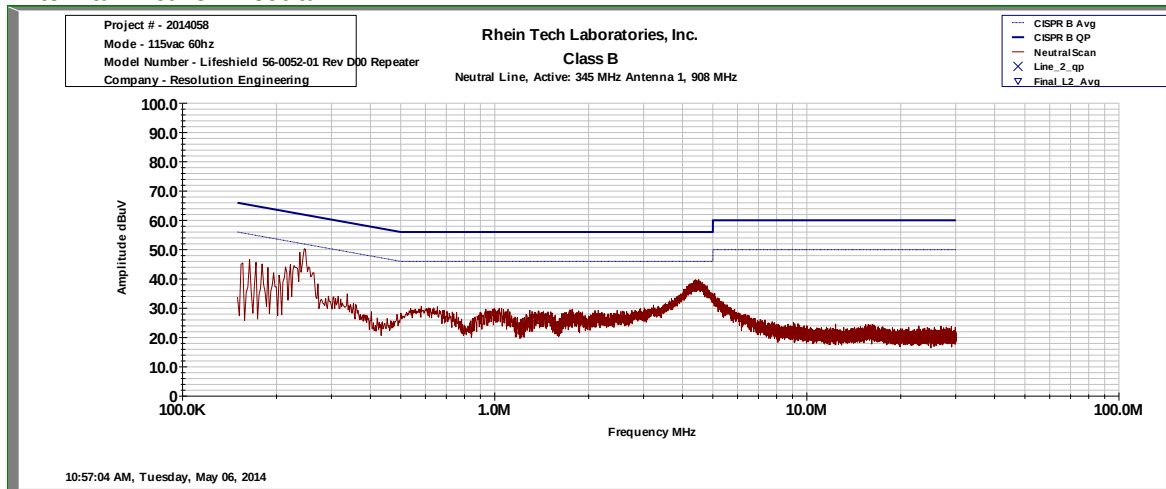


Antenna 2 Active - Neutral



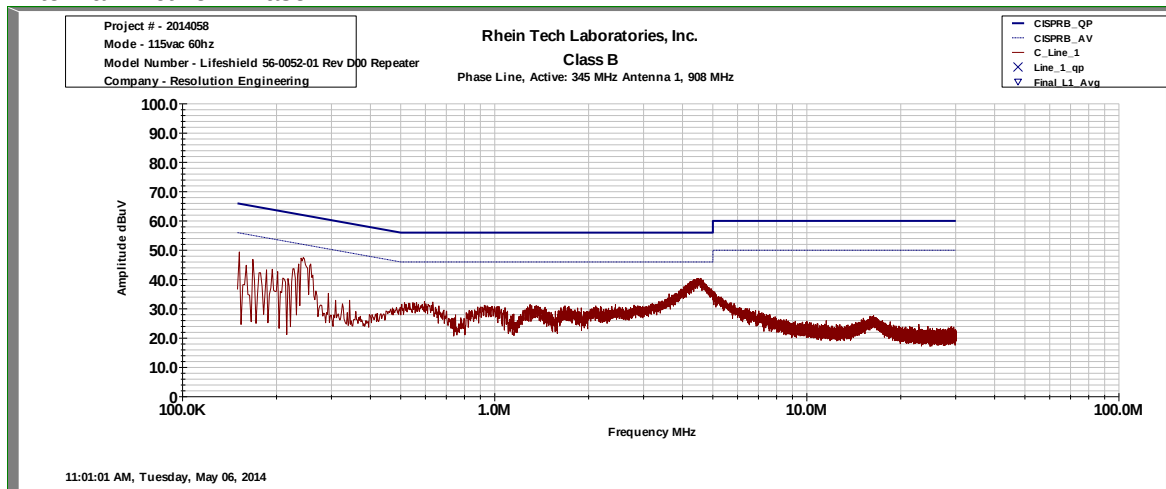
Frequency (MHz)	Detector	Level (dBμV)	Site Correction Factor (dB)	Corrected Level (dBμV)	Limit (dBμV)	Margin (dB)	Pass/Fail
0.246	QP	50.7	0.4	51.1	61.9	-10.8	Pass
0.246	Av	41.4	0.4	41.8	51.9	-10.1	Pass

Antenna 1 Active - Neutral

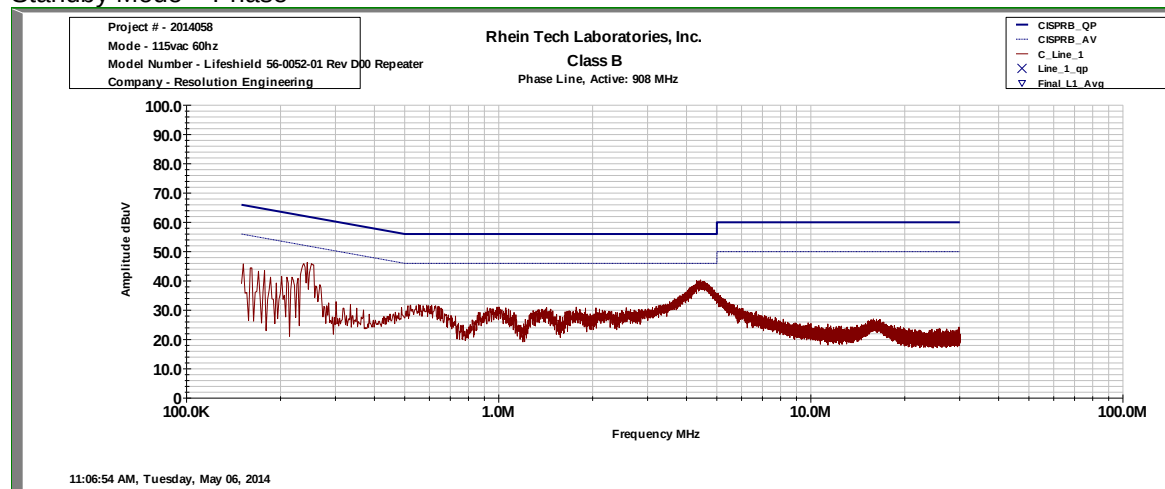


Frequency (MHz)	Detector	Level (dBμV)	Site Correction Factor (dB)	Corrected Level (dBμV)	Limit (dBμV)	Margin (dB)	Pass/Fail
0.246	QP	50.1	0.4	50.5	61.9	-11.4	Pass
0.246	Av	41.8	0.4	42.2	51.9	-9.7	Pass

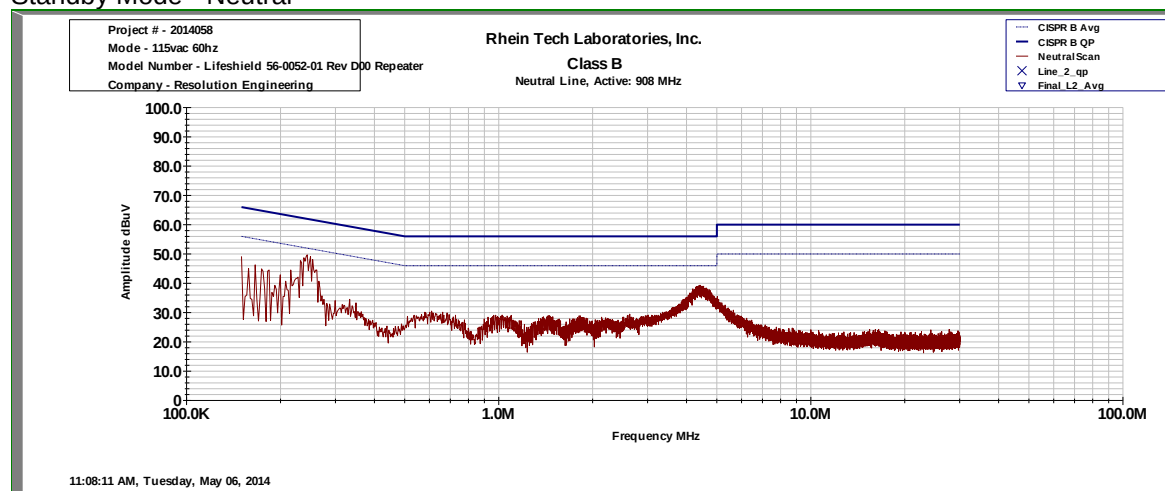
Antenna 1 Active - Phase



Standby Mode – Phase



Standby Mode - Neutral



Frequency (MHz)	Detector	Level (dBμV)	Site Correction Factor (dB)	Corrected Level (dBμV)	Limit (dBμV)	Margin (dB)	Pass/Fail
0.246	QP	50.3	0.4	50.7	61.9	-11.2	Pass
0.246	Av	41.0	0.4	41.4	51.9	-10.5	Pass

Result: Pass

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.

Conducted Line Emissions Test Equipment

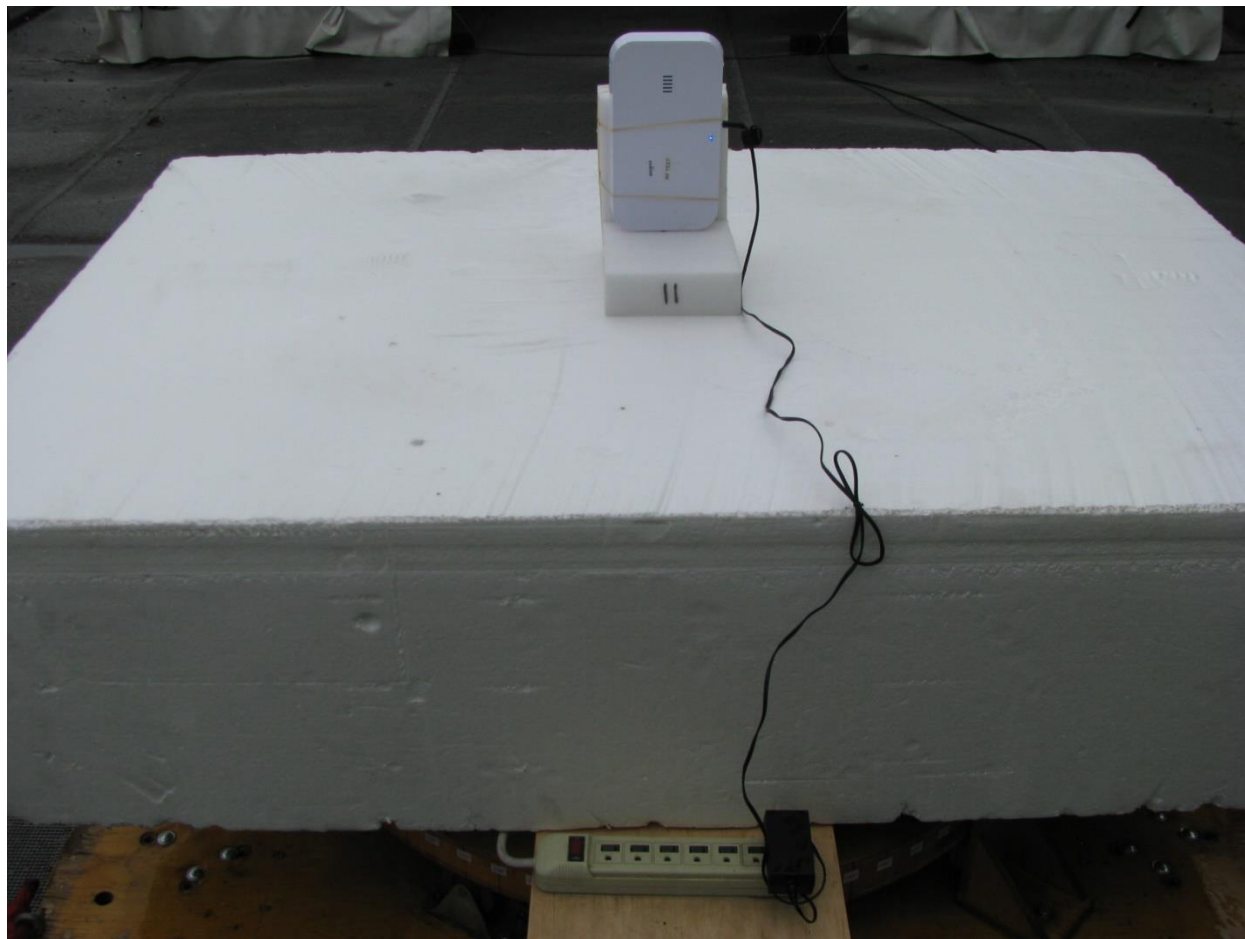
Part Type	Manufacturer	Model	Serial Number	Barcode	Cal Due Date
Conducted Emissions					
Spectrum Analyzer (100 Hz – 22 GHz)	Hewlett Packard	8566B	3138A07771	900930	4/21/2016
Spectrum Analyzer Display Section	Hewlett Packard	85662A	3144A20839	900931	4/21/2016
Quasi-Peak Adapter	Hewlett Packard	85650A	2412A00414	900969	4/21/2016
Filter	Solar	8130	947306	900729	3/26/2015
16A LISN	AFJ International	LS16/110VAC	16010020080	901083	8/27/2014
Test software	Quantum Change	Tile!	4.0.A.8	N/A	N/A

Test Personnel:

Jon Wilson		May 6, 2014
Test Engineer	Signature	Date Of Test

Test Configuration Photograph

Radiated Emissions



Conducted Emissions



EUT Photographs

