

# **FM Station RF Proof Report**

Station: KZVV Fairbanks, AK

FIN# 176152

Frequency: 88.3 MHz

August 28, 2013

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## Introduction

To accomodate KRFF Fairbanks, AK (FIN 173890) sharing the ERI SHPX-6AC-HW antenna with KZVV Fairbanks, AK (FIN 176152) a combiner has been installed. This document provides evidence that KZVV and KRFF are in compliance with FCC Part 73.317. Steve Wilde is a Broadcast Engineer employed by Education Media Foundation. Steve Wilde completed the KZVV emissions proof on August 14, 2013.

## Test Equipment

- Agilent N9912A 2-Port Network Analyzer
- Agilent N9912A Spectrum Analyzer
- ERI 2-Port CD230-2 Directional Coupler
- Shively 2914-3 Bandpass filter
- Mini Circuits High Pass filters

## Station Equipment

- Crown 2KW FM Transmitter
- ERI 955 CIC-003 Two Station Branch Combiner
- ERI SHPX-6AC-HW FM Antenna
- RFS 1-5/8" Air Coaxial line

## Summary

Harmonics, Intermodulation, Spurious, and Occupied Bandwidth Emissions measurements were made for KRFF and KZVV at the output of the ERI 955 CIC-003 Branch Combiner filter with KRFF and KZVV operating at 100% power. These measurements provide proof that KRFF and KZVV are in compliance with the requirements of FCC Part 73.317.

AFFIDAVIT

STATE OF CALIFORNIA  
Sacramento County

I, Steve Wilde, do affirm that:

1. I have been engaged in the RF engineering and installation of broadcast facilities since 2005.
2. That I have been a Broadcast Engineer involved in RF Engineering since 2005.
3. I further declare, under penalty of perjury, that the statements contained herein are true and correct to the best of my knowledge.

Steve Wilde  
Educational Media Foundation  
August 28, 2013

8/28/2013

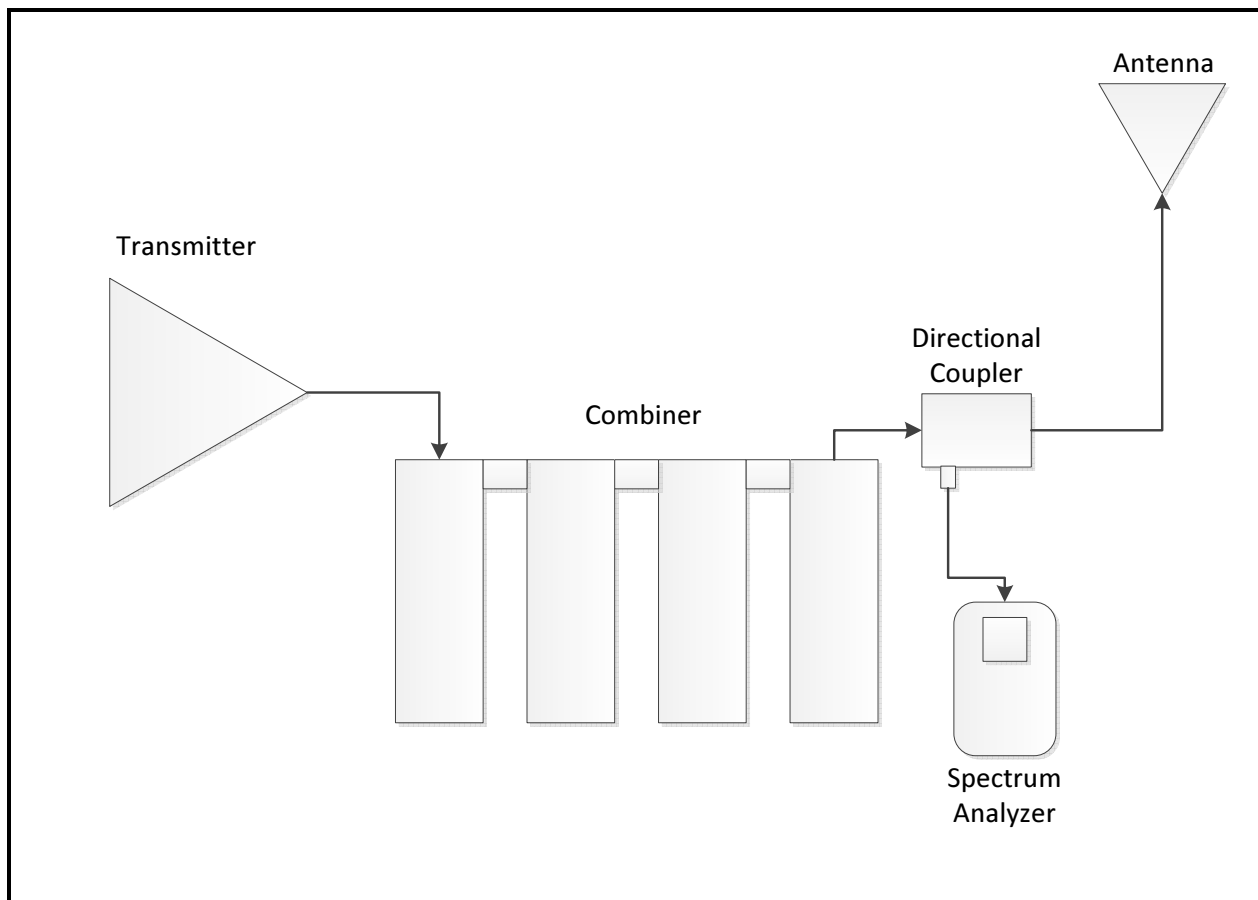
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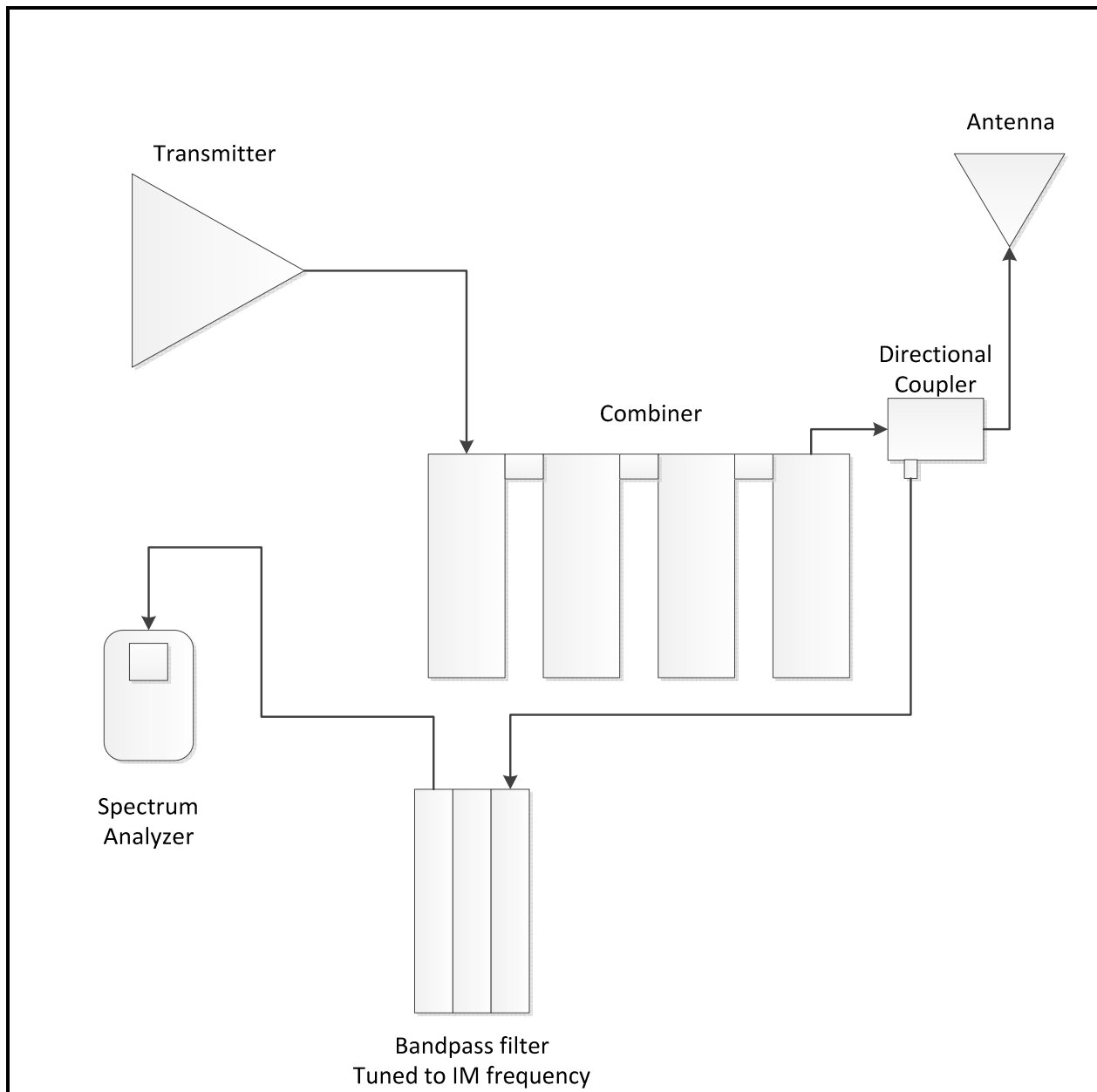
Steve Wilde  
Broadcast Engineer  
Signed by: Steve Wilde

## Measurement Diagrams

Harmonic Emissions, Spurious Emissions, and Occupied Bandwidth measurement configuration



Intermodulation frequency measurement configuration



## Measurement Results

### Frequency Measurement

Assigned Frequency	88.300000	MHz	Variance in Hz
Measured Frequency	88.299681	MHz	319

### TPO Calculation

Transmitter output KW	Combiner Power Efficiency	1-5/8" Coax Power Efficiency	Antenna Power Efficiency	ERP KW
1.88	0.92257	0.960	1.913	3.2

### Measurement Methodology

To ensure accurate measurements, the frequency response of all couplers, RF filters, and sample ports were determined prior to taking any measurements. The resulting dB reductions at each frequency were then added to the recorded measurements to ensure accurate calculations.

The spectrum analyzer reference point of the fundamental frequency is -0.3 dBm. The directional coupler has less reduction at the harmonic frequencies and thus appears as a gain in reference to the fundamental frequency. The high pass filters have more reduction at all harmonic frequencies and thus is a loss in reference to the fundamental frequency. The losses and gains are a dB reference relative to the fundamental frequency, therefore the directional coupler gain, high pass filter loss, and reference point are then added to the measurement to provide the resulting dBc calculation.

### Harmonic Emissions Measurement

Harmonic	Frequency (MHz)	Directional Coupler (dB)	High Pass Filter (dB)	89.1 MHz Reference Level (dB)	Instrument Reading (dB)	Corrected Measurement (dBc)	FCC Limit (dBc)	Clearance (dB)
X2	176.6	-5.8	0.5	0.3	-123.1	<b>-128.1</b>	-78.05	50.1
X3	264.9	-9.3	0.4	0.3	-102.3	<b>-110.9</b>	-78.05	32.8
X4	353.2	-11.7	0.3	0.3	-122.5	<b>-133.6</b>	-78.05	55.5
X5	441.5	-13.5	0.1	0.3	-121.9	<b>-135.0</b>	-78.05	56.9
X6	529.8	-14.9	0.1	0.3	-122.3	<b>-136.8</b>	-78.05	58.8
X7	618.1	-16.1	0.1	0.3	-122.0	<b>-137.7</b>	-78.05	59.7
X8	706.4	-17.1	0.1	0.3	-118.4	<b>-135.1</b>	-78.05	57.0
X9	794.7	-17.9	0.2	0.3	-120.1	<b>-137.5</b>	-78.05	59.4

### Intermodulation Emissions Measurement

Due to the relationship between the fundamental frequencies, intermodulation products were evaluated 800 KHz above and below each fundamental frequency.

IM Product Frequency (MHz)	Band Pass filter (dB)	89.1 MHz reference Level (dB)	Directional Coupler (dB)	Instrument Reading (dB)	Corrected Measurement (dBc)	FCC Limit (dBc)	Clearance (dB)
89.9	1.4	0.3	0.5	-89.49	-87.29	-80	8.19
87.5	3.1	0.3	0.3	-98.44	-94.74	-80	15.64

### Spurious Emissions Measurement

The KZVV transmitter emissions were thoroughly analyzed using an Agilent N9912A spectrum analyzer. The KZVV transmitter and RF circuit are free of spurious emissions.

### Occupied Bandwidth Measurement

The occupied bandwidth was measured with an Agilent N9912A spectrum analyzer utilizing fourteen mask segments to determine the occupied bandwidth. Measurements were made over twenty minutes using a max-hold spectrum sweep, and demonstrate that KZVV is operating within the permissible bandwidth. Note that in this spectrum analyzer plot, the noise floor exceeds -80 dBc. This is due to the dynamic range of the spectrum analyzer. Also seen in the plots are the KUAC 89.9 MHz analog and IBOC emissions.

