Filter Frequency Response Visualizer (FFRV)

Created by Team 18 – Signal Sleuths

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Project Overview

The Filter Frequency Response Visualizer is a Bode plot visualizer utilizing analog circuit design to obtain the magnitude and phase response of a passive electrical filter. This project was designed to be used in a test environment, such as a lab, for users to become more familiar with how a filter works. Users will be able to use the computer interface designed by the team to visualize and then download the frequency response of the circuit as a comma-separated value file on their own computer. The interface will display the magnitude response in decibels and the phase response in degrees after each sweep.

Project Requirements

- Sweep through the specified frequency range of 20Hz to 30kHz
- Complete frequency sweep in seven seconds or less
- Utilize analog circuits to obtain magnitude and phase response
- Sampling must be done through firmware
- Connect with a computer interface that can visually represent the data
- Establish data transfer between Arduino and computer
- Power system that steps down and distributes power from the wall
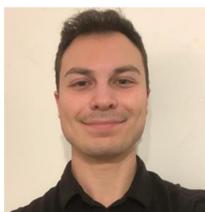
The Team

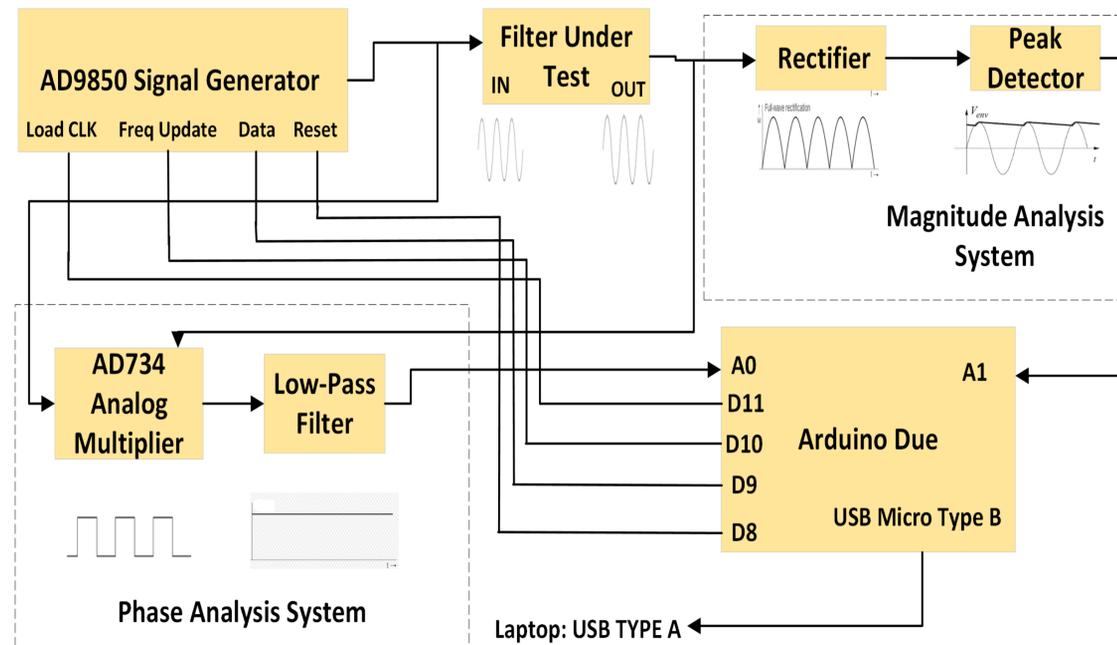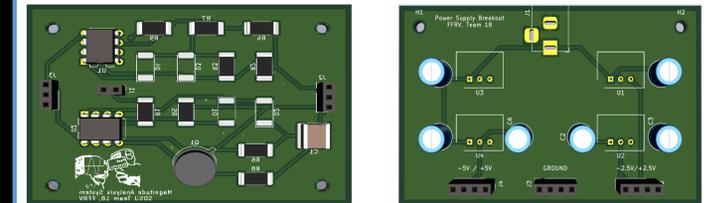Ezra Gonzalez   Trent Moca   Louise Van Aken

Jarrod Rowson   Cade Ramirez

System Level Diagram

AD9850 Signal Generator
Load CLK   Freq Update   Data   Reset

Filter Under Test
IN   OUT

Rectifier   Peak Detector

Magnitude Analysis System

AD734 Analog Multiplier   Low-Pass Filter

A0   A1
D11
D10   Arduino Due
D9
D8   USB Micro Type B

Phase Analysis System

Laptop: USB TYPE A

Firmware Flow

Data From Serial

Raw Data Conversions in GUI

Magnitude (dB):
$20 * log10(magnitude\ data)$

Phase (degrees):
$arctan(phase\ voltage\ data)$

USB Serial

Python GUI

Sweep Command From GUI

AD9850 Waveform Generator   Frequency Sweep   Filter Under Test   Output Signal   Variable Analog Sampling   ADC Support

Phase and Magnitude Values   Output Comma Delimited Data

Arduino Firmware

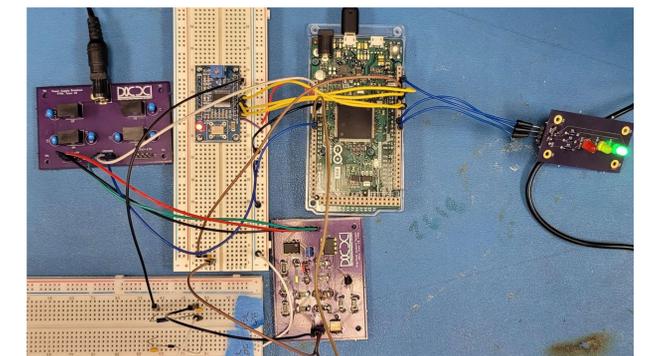## PCB Design And Enclosure

Magnitude Analysis System   Power Distribution System

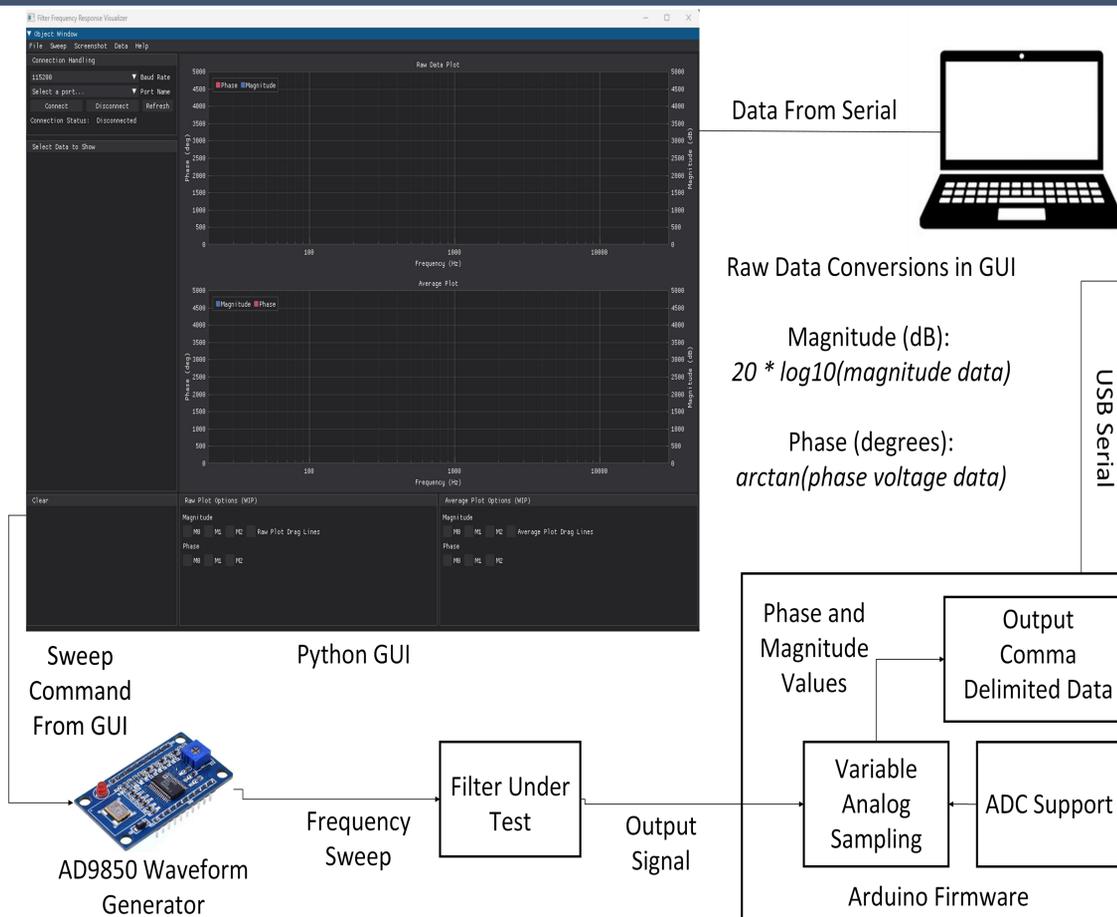
Enclosure 3D Render
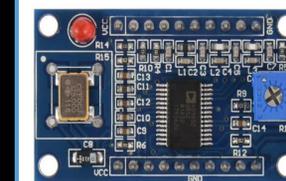

Test setup of FFRV

Procured Components

AD9850 DDS Signal Generator
Also referred to as the WOS, this module is used to generate the frequency sweep that goes through the filter under test

Arduino Due
This microcontroller drives and powers the AD9850, samples the filter response to the frequency sweep, and transmits the response data to the GUI.

AD734 Analog Multiplier
This integrated circuit is responsible for multiplying the AD9850 output with the response from the filter under test to detect the phase response.

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