Audio Pitch Shifting and Transmission through Optical Fiber

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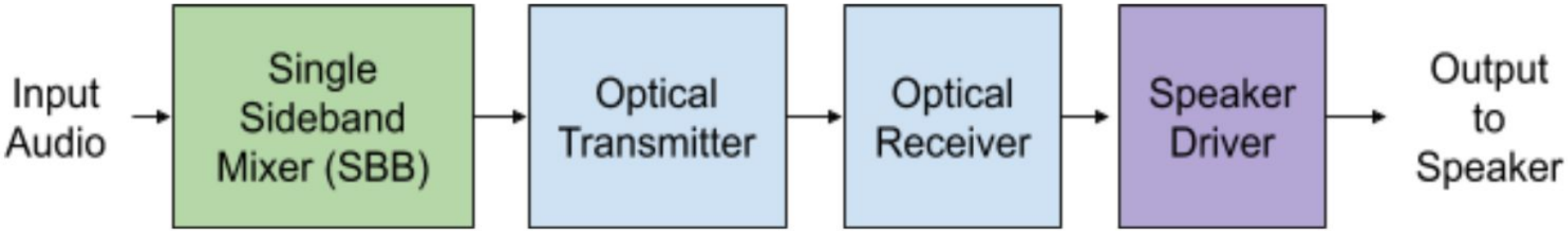
Motivation

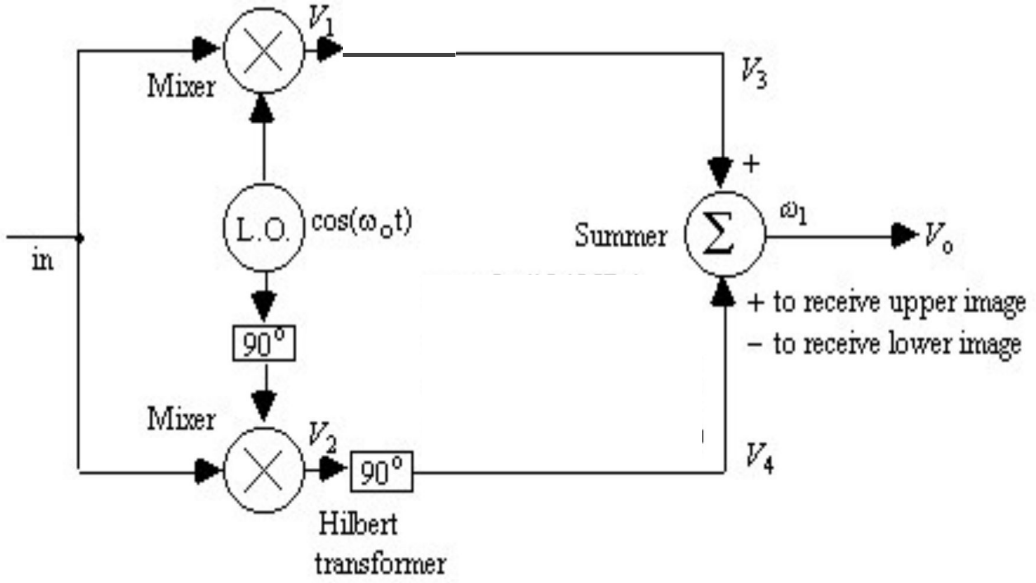
- Pitch shifting is cool
- Explore optics
- Learn to make a PCB board
  - Less wires and more reliable
  - Neater
  - Cool

3 Major Components

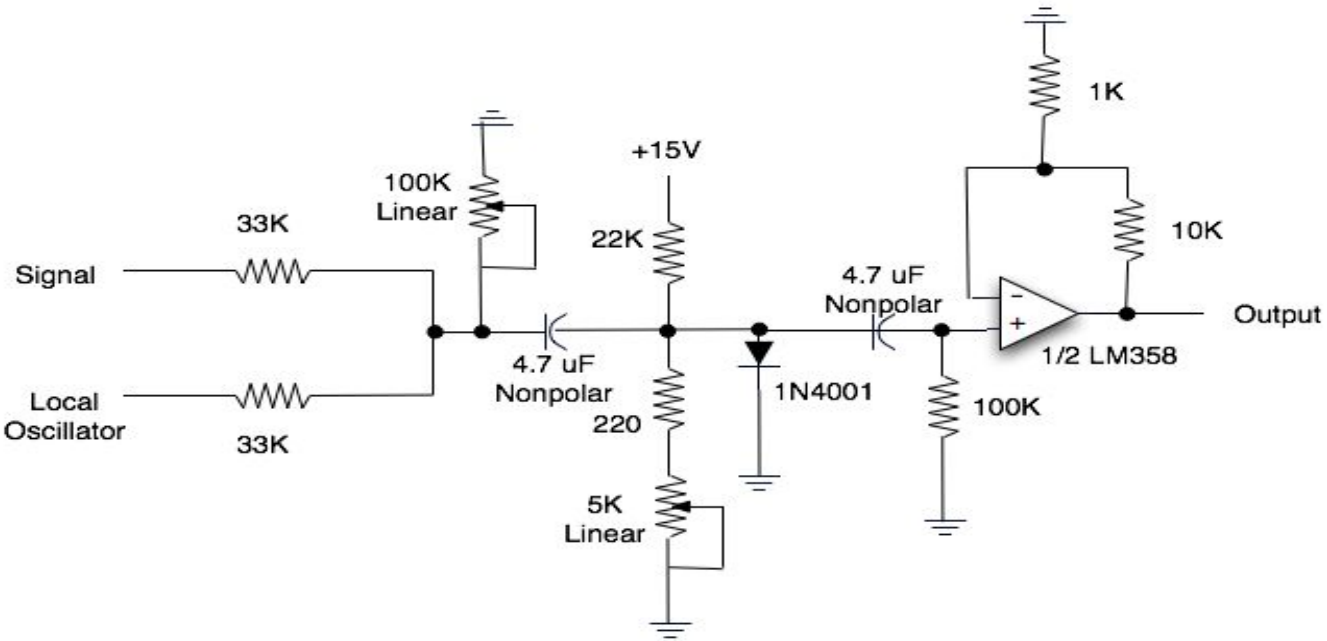


Single Sideband Mixer (SSB)

- Normal Mixer output sum and differences of input frequencies
- SSB will be used to select output without using filters

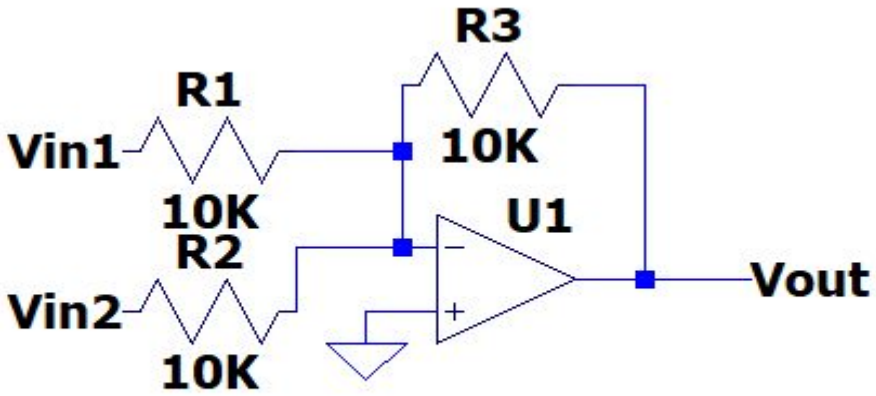


SSB: mixer


1K
+15V
100K
Linear
33K
10K
22K
Signal
4.7 uF
Nonpolar
Output
1/2 LM358
4.7 uF
Nonpolar
1N4001
Local
Oscillator
220
100K
33K
5K
Linear

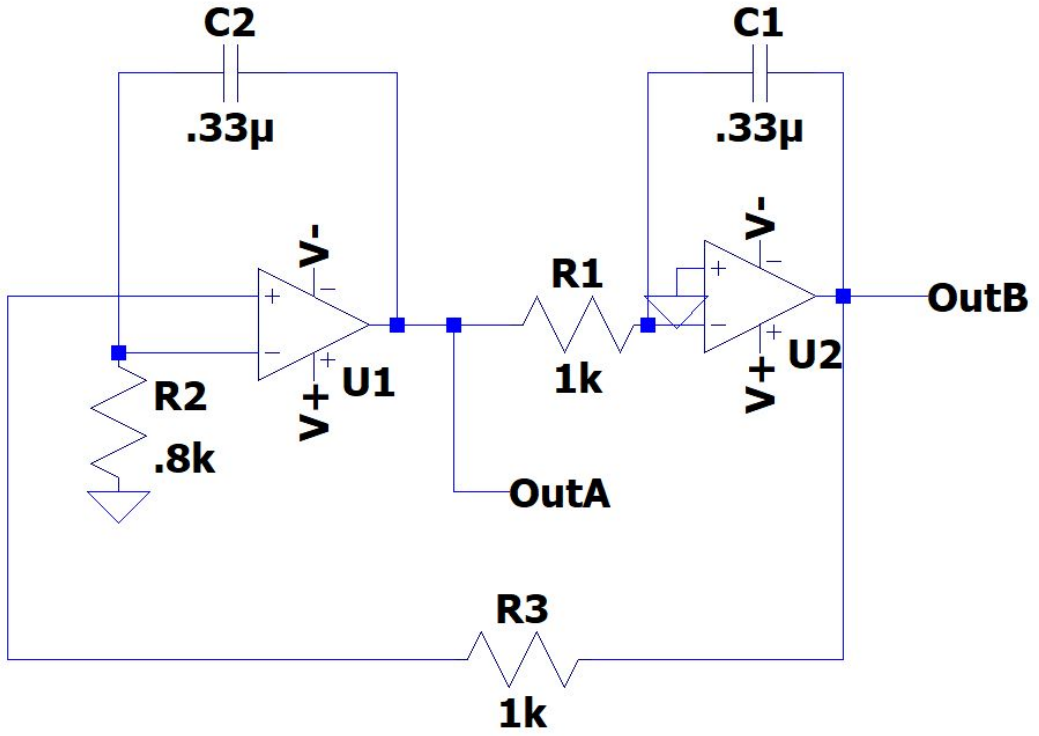
SSB: Summer

$$Vout = -\frac{R3}{R1}Vin1 - \frac{R3}{R2}Vin2$$



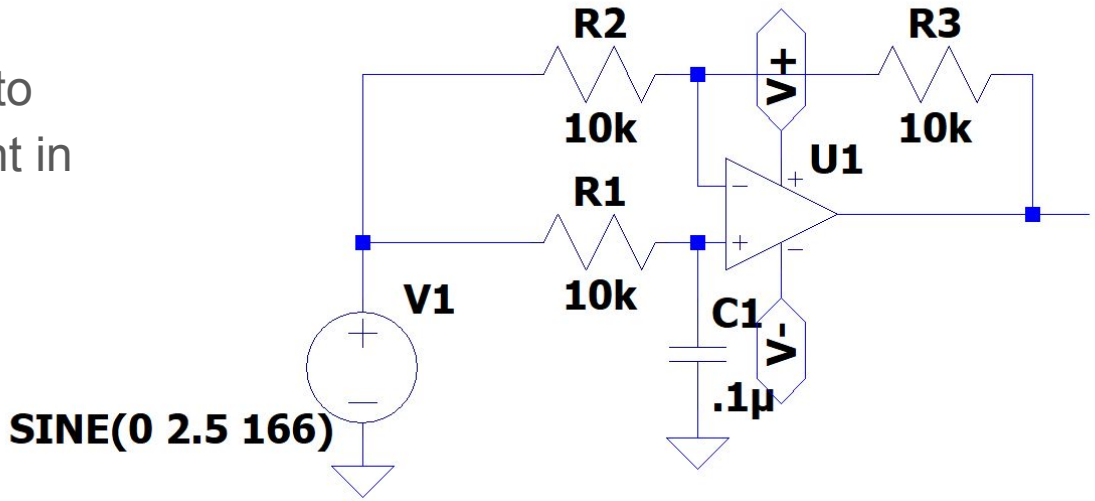
SSB: Wein Bridge Oscillator

- Outputs both the cosine an the sine waveform
- Vary frequency by changing R1 and R3

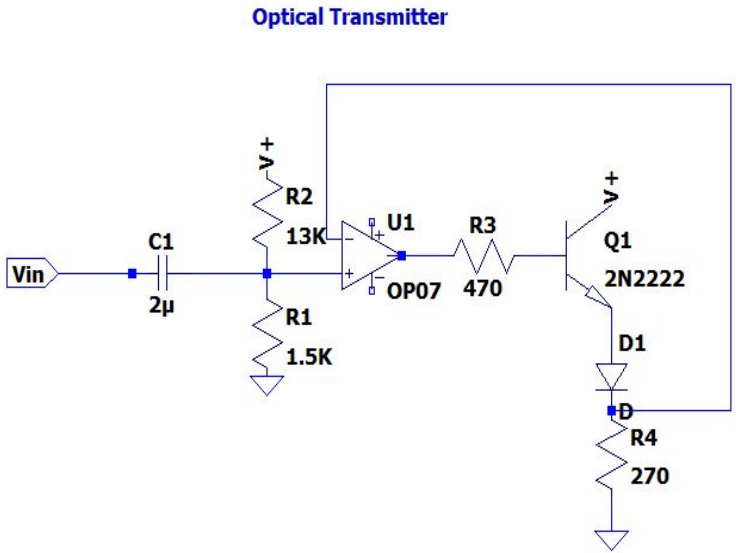


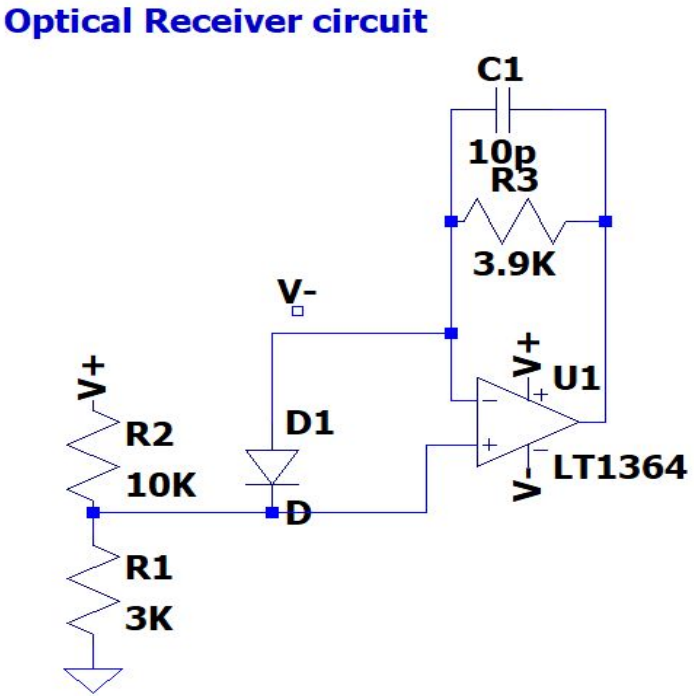
SSB: 90º Phase Shifter using an All Pass Filter

- Issue: Only works for one specific frequency, therefore, for different frequencies, we need to tune the R1 component in the all-pass filter

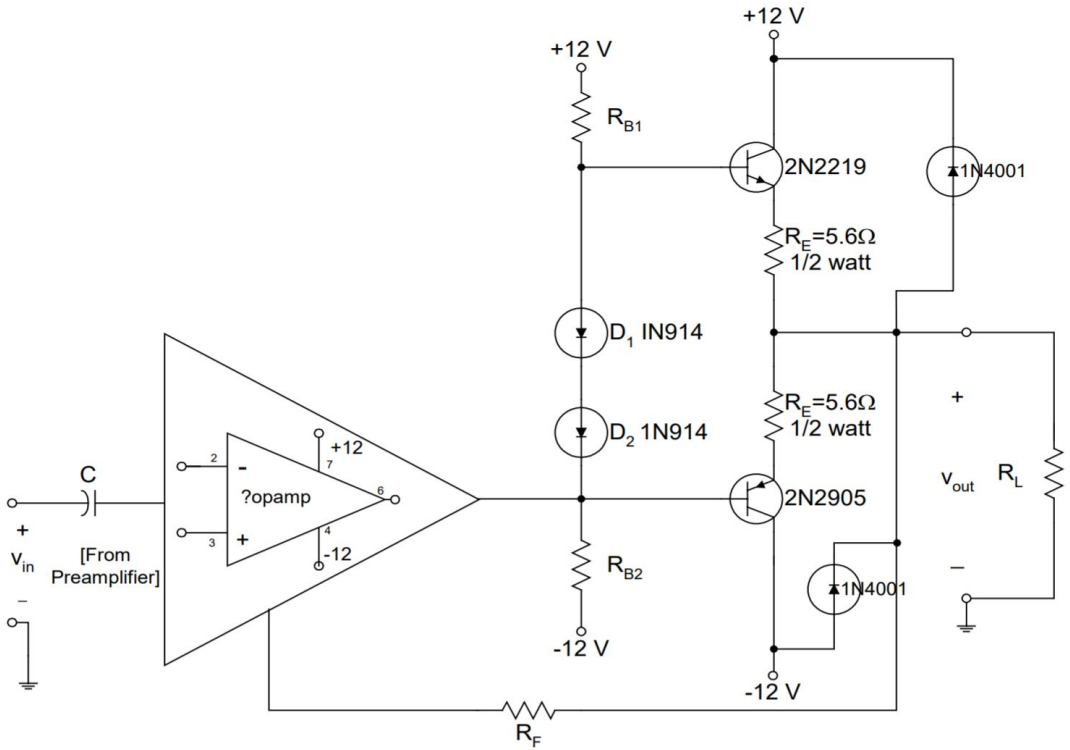


Audio is transmitted and received optically

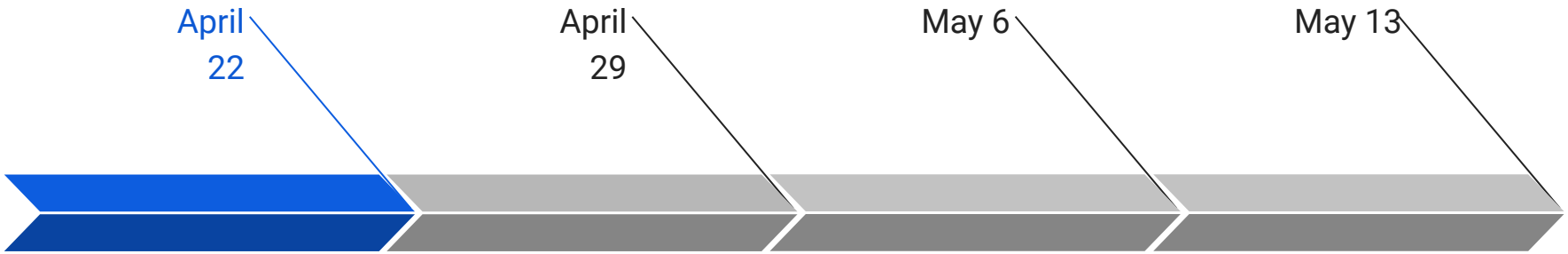




Speaker Driver from Lab 5



Timeline



Optics and Sub-Components

- Test and build optical component
- Build SBB sub components

SBB and PCB Design

- Put SBB together
- Start PCB design

Speaker Driver Module

- Finish PCB design and send it in
- Build and test speaker driver

Finishing Up

- Project Demo
- Write final report

Summary and Challenges

Finished

- Sub-components of the SBB filter
- Tested optical fibers

To Do

- Create speaker driver module
- Put the SBB filter together and test it
- Build PCB board

Challenges

- Expanding our SBB filter functionality
  - 90 degrees phase shifter that works for a wide bad of frequency
  - Putting it all together
- Time constraint due to PCB board