NTSC Audio and Video Through Optic Fiber

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What is NTSC?

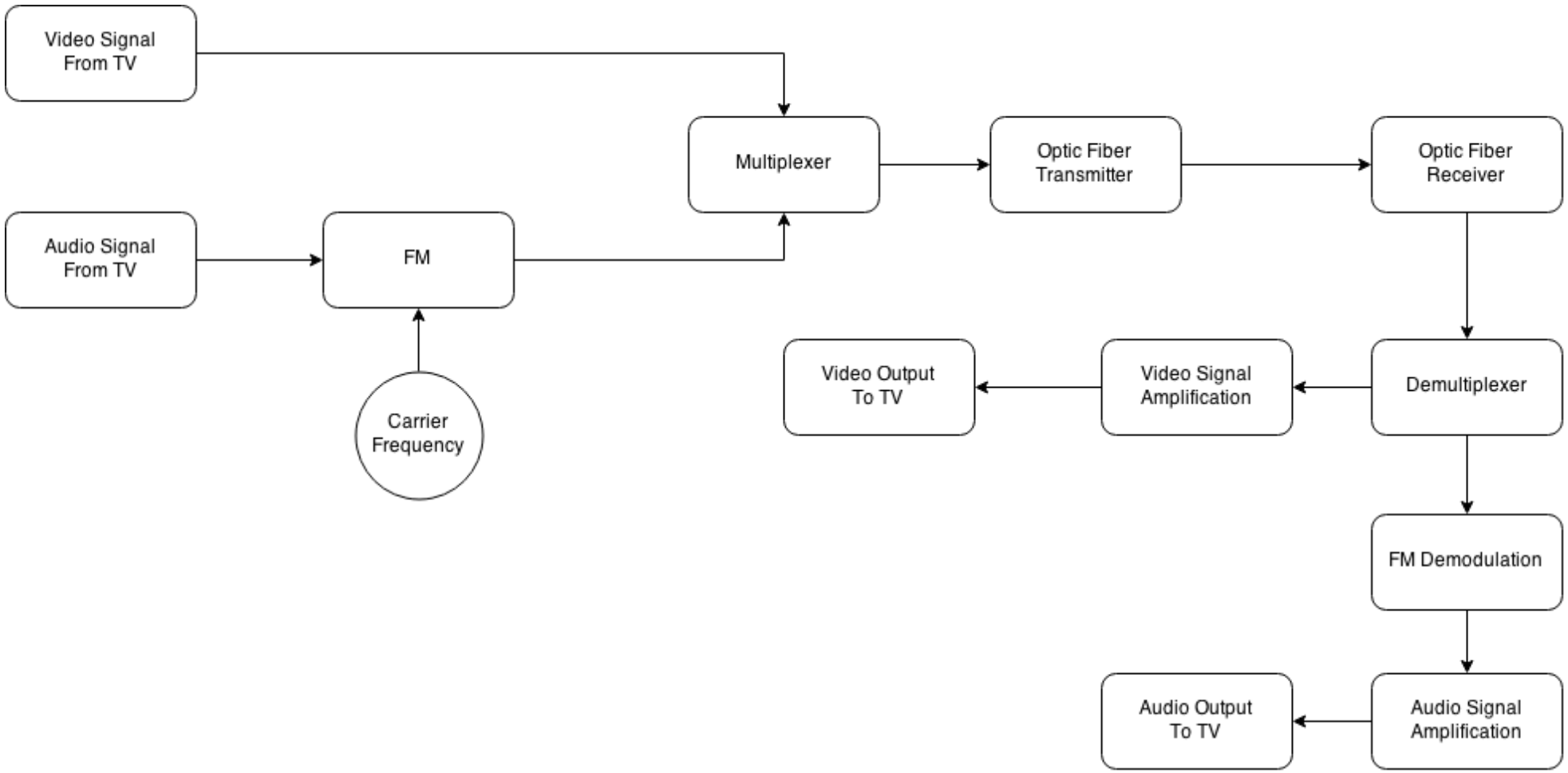
- Goal: To transmit Audio and Video Signals through a fiber optic connection
- NTSC was widely used analog audio/video format
- Developed in the 1950’s
- Has a frequency bandwidth of about 8.4MHz

Measured NTSC Signal

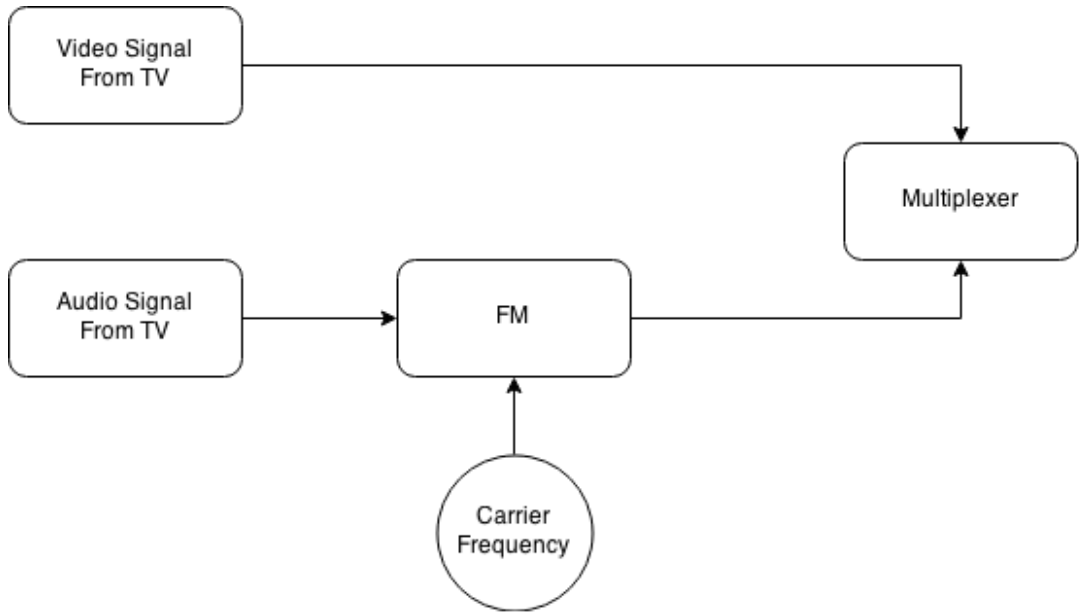
Project Motivation

- An old standard in a new medium
- Gather insight on optic fiber
- Learn about implementing Modulation/Demodulation

System Design

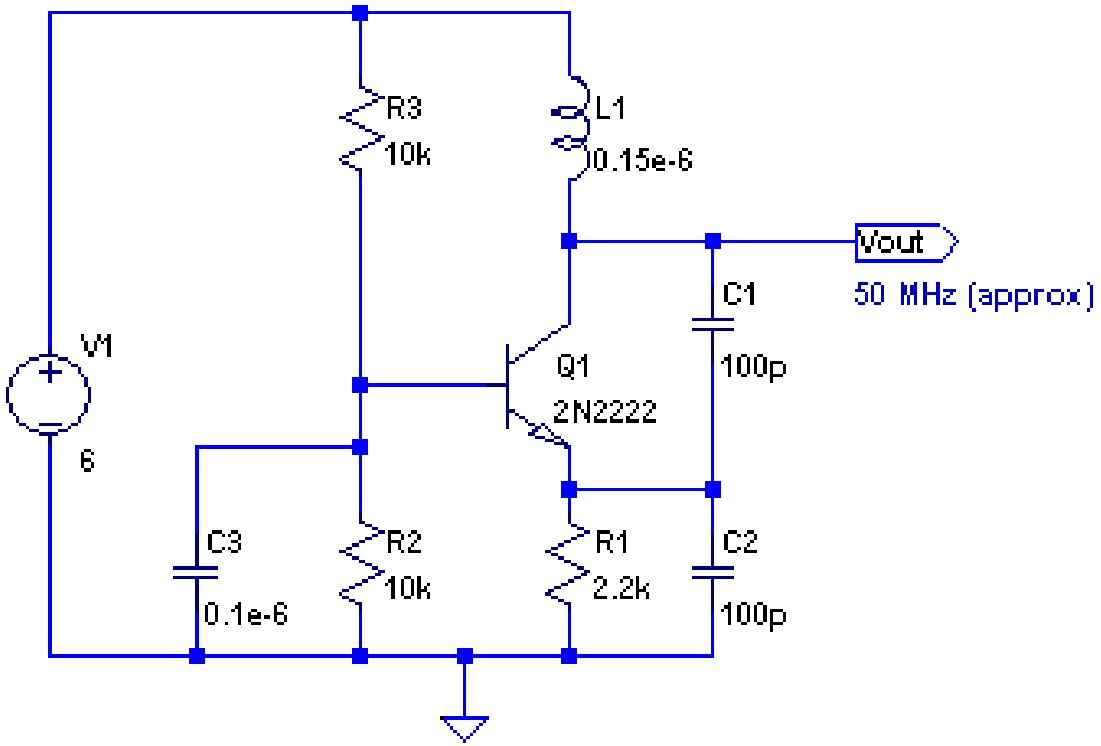


First Stage: Modulation and Multiplexing



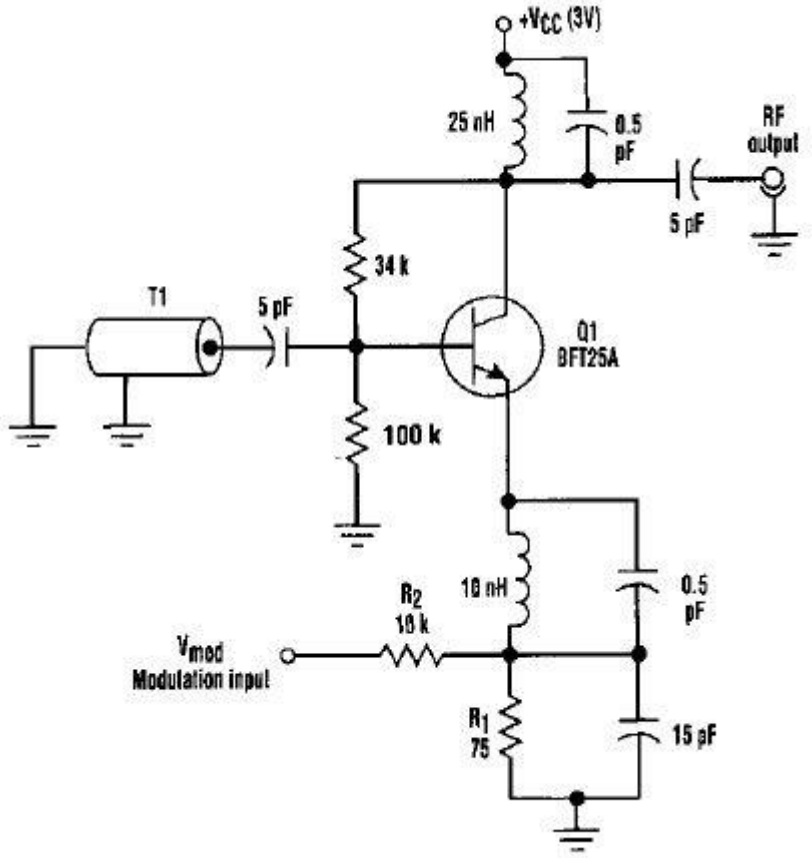
- Goal: Convert signals from TV other device into a format for transmission

Carrier Frequency Generation



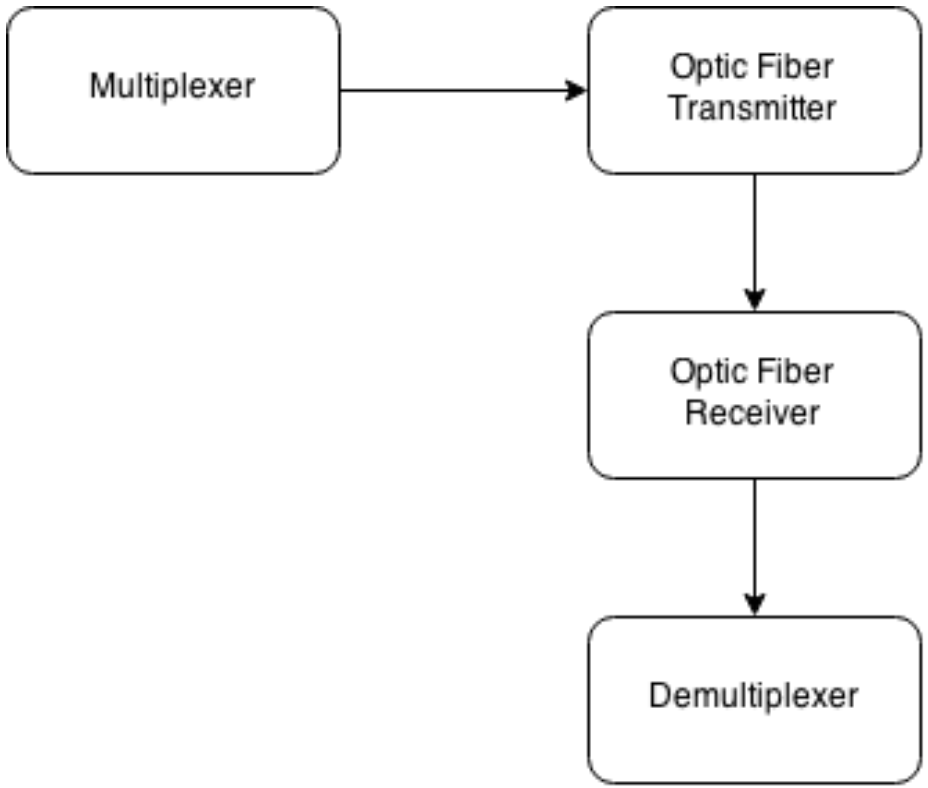
- Colpitts Oscillator
- Provides stable sine wave output even at higher frequencies
- Tank LC circuit with active component

Frequency Modulation



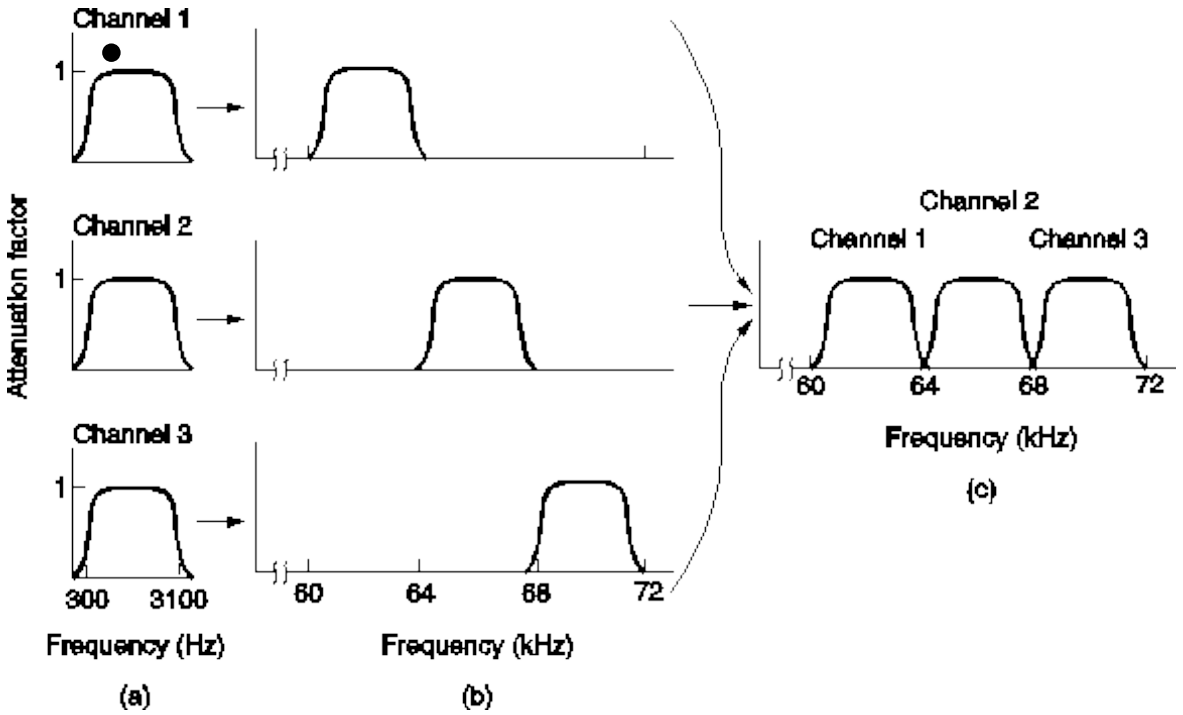
- Used on the Audio signal
- Higher resistance to noise than AM
- Less Harmonic Distortion from Transmitter/Receiver

Stage 2: Optic Fiber Transmission



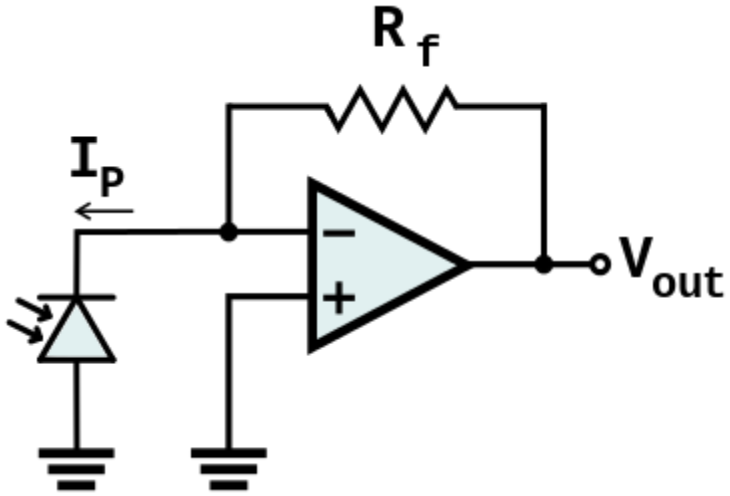
- Goal: transmit combined signals successfully
- Combining Audio & Video signals through FDM
- Transmitter is modeled as LED
- Receiver modeled as photodiode

Frequency-Division Multiplexing



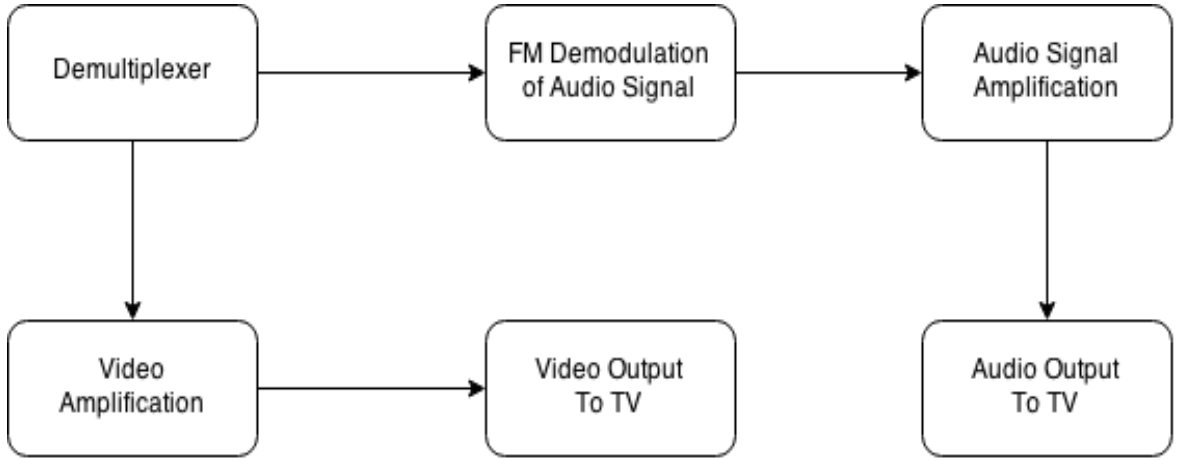
- Audio & Video signals in their own frequency bands
- Multiplexing is as simple as adding the signals together
- Demultiplexing: filter out one of the signals

Transmission



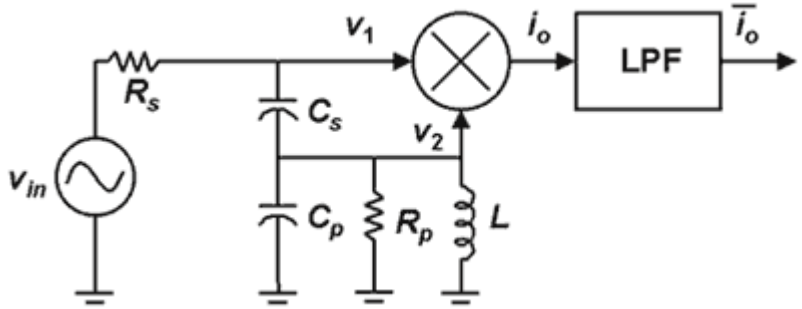
- Done through optic fiber
- Transmitter modeled as LED
- Receiver modeled as photodiode

Stage 3: Demodulation and Output

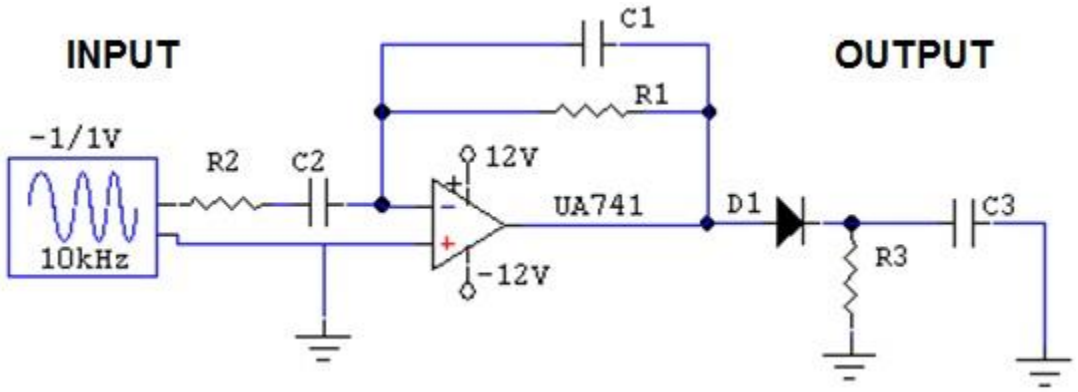


- Goal: Convert received signal to proper output formats
- Video Signal doesn’t need to be demodulated
- Audio Signal requires FM demodulation scheme

Frequency Demodulation



- Quadrature Demodulation
- Slope Detection



Challenges

- Implementing the FM Schemes (varactor vs non-varactor)
- Dealing with the transmitter / receiver
- Demultiplexers are low-pass/band-pass filters

Proposed Enhancements

- Support for two audio channels
- Tunable Frequency Modulation for each audio channel
- IF(Intermediate Frequency) reception
- Frequency Modulate video signal

Project Timeline

	Week of April 13	Week of April 20	Week of April 27	Week of May 4
Design Individual Blocks				
Build Individual Blocks				
Integrating Blocks				
Debugging and Fine-Tuning				
Demonstration of Completed Project				