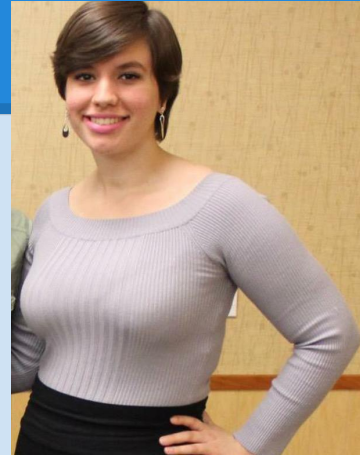
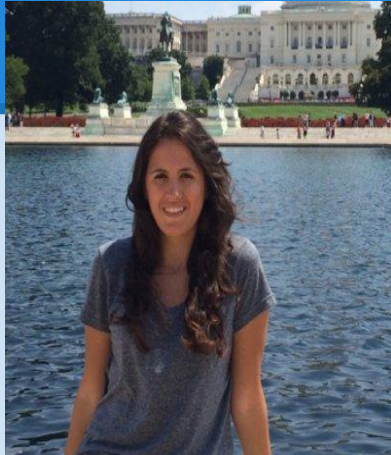


SDR - Spectrum Sensing

by Christina Baaklini, Michael Collins, and Nicole DiLeo



Overview

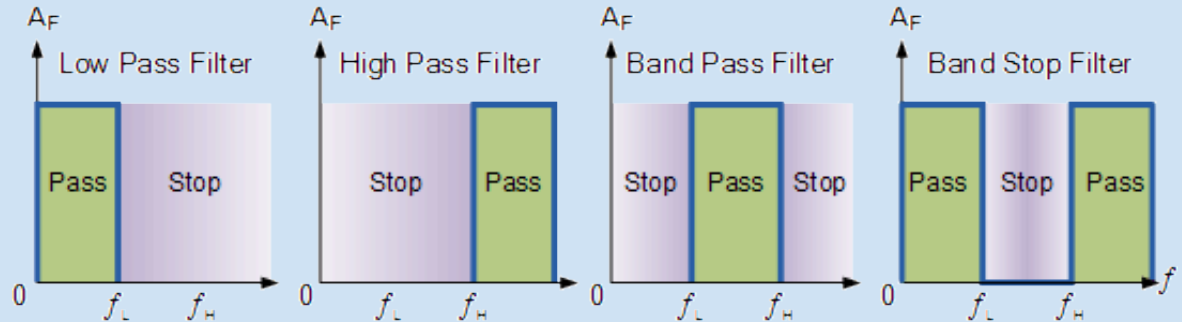
- **Filter Design**
- **Writing/Editing OMF Experiment Description Language (OEDL) Scripts**
- **Signal Visualization in MATLAB**

Filter Design

- **Ideal filters cannot always be implemented**

- **Types of Filters:**

- Low Pass Filter
- High Pass Filter
- Band Pass Filter
- Band Reject Filter



- **We plan to implement filters in MATLAB to reduce noise around desired frequency bands**

Writing/Editing OEDL Scripts

```
onEvent(:ALL_UP_AND_INSTALLED) do |event|
  wait 10
  info "Starting the Receiver"
  group("receiver").startApplications
  info "Starting the Sender"
  group("sender").startApplications
  wait 8
  property.tx_module = "waveform"
  property.rx_module = "fftmovingavgoml"
  freqs = [*796..804]
  for i in 1..9
    n = freqs.sample;
    freqs.delete(n)
    property.tx_freq = "#{n}e6"
    wait 1
  end
  property.del_rx_module = "fftmovingavgoml"
  group("sender").stopApplications
  group("receiver").stopApplications
  Experiment.done
end
```

Tutorial: Spectrum Sensing with USRP2 and Wiserd (OEDL)

● Original

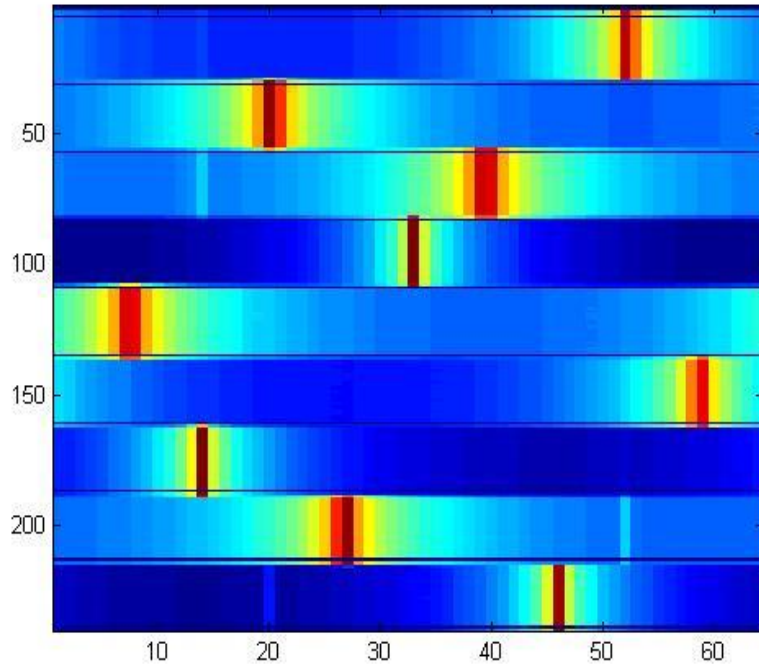
- Transmit a 798 MHz signal from one USRP to another receiving at carrier frequency of 800 MHz
- Increase the transmitter frequency from 798 to 802 MHz over a span of 5 seconds
- Write receiver readings to a file for processing in MATLAB/Octave

● Modified

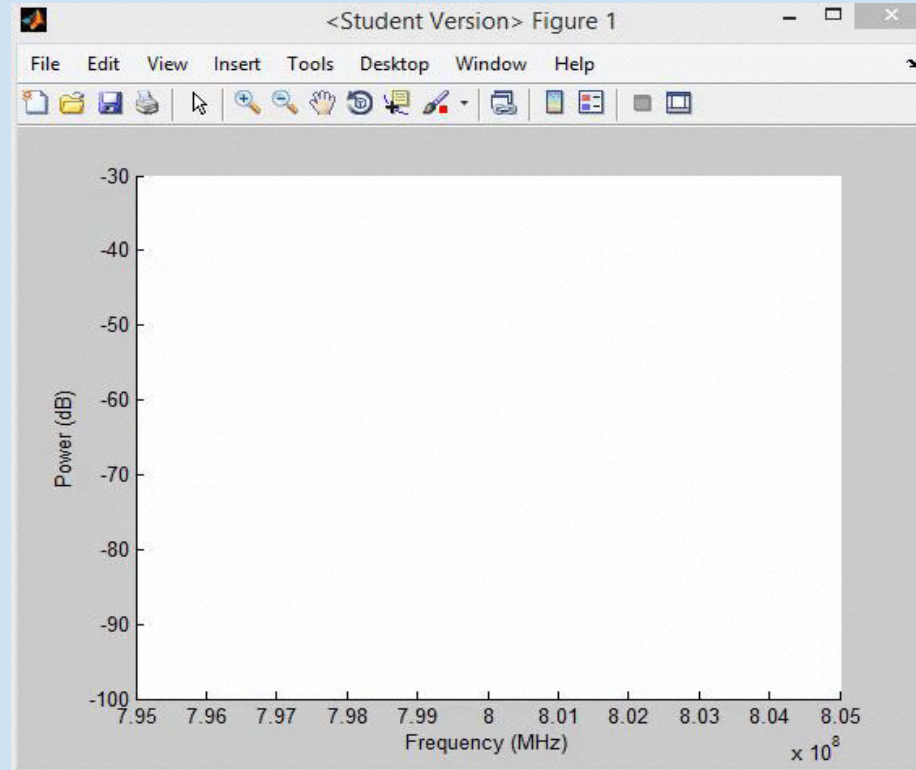
- Increased sampling rate from 5 to 10 MHz
- Randomly select transmitter frequencies from 796 to 800 MHz

Signal Visualization in MATLAB

Waterfall Plot



Animated Power vs Frequency



Next Week

- **Run tests on grid (multiple transmitters)**
- **Continue writing OEDL scripts for new experiments**
- **Implement scanning receiver instead of fixed carrier frequency**
- **Use Inverse Fast Fourier Transform (ifft in MATLAB) to generate waveforms from frequency domain readings**