KEYSIGHT TECHNOLOGIES

NATIONAL HIGH MAGNETIC FIELD LABORATORY

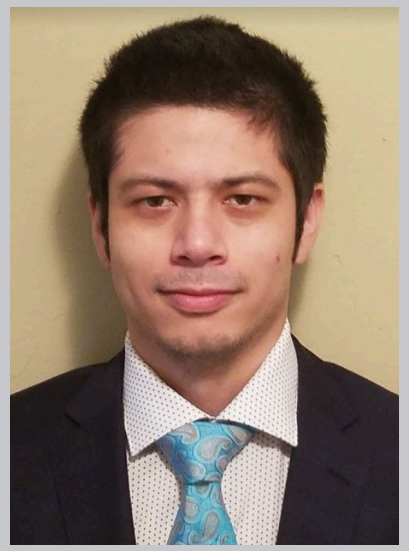
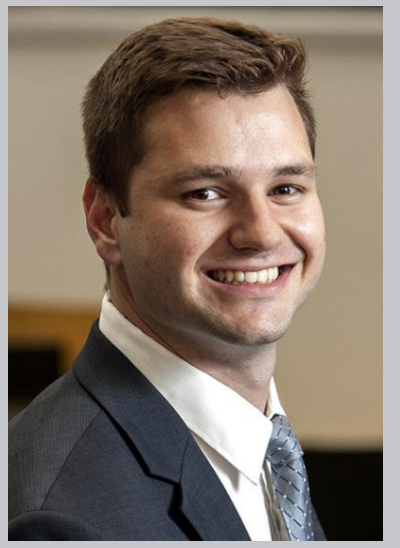
# SeniorDesignII

T307

# Team 307

## Keysight Narrow Band “Oscilloscope” for High Power Tuning of NMR Probes

# Introduction

| Jonathan Burt | Gabriel De Leon | Emil Lobachev | Asher Rich | Kyle York |
|---|---|---|---|---|
| **Programming Lead**<br>Document Lead | **Financial Advisor**<br>Web Master | **Lead ECE**<br>DGR | **Team Leader**<br>Communications Lead | **Research Lead**<br>Circuit & Hardware Assembly Lead |
|  |  |  |  |  |

# Presentation Outline

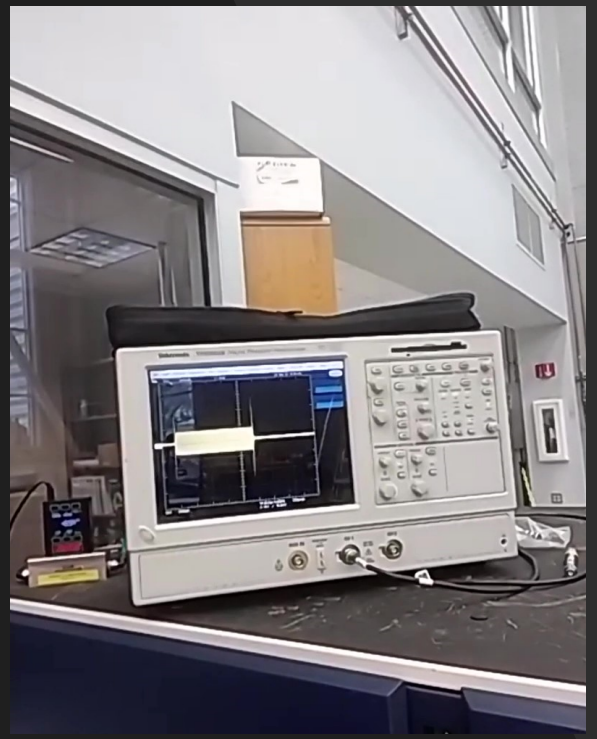
- Introduction
- Project Recap
- Previous Work
- Current Progress
- Future Work
- New Design Configurations
- Summary

# Project Recap

- Background
- Requirements

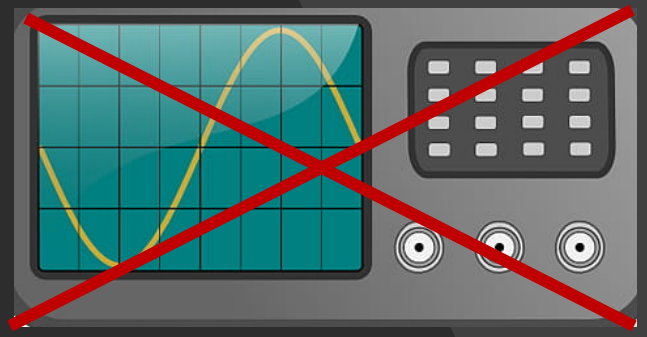
# Background

## Motivation



## Plan


## Expectations



Emil Lobachev

# Background

- Most Basic Signal Flow Chart for the Project

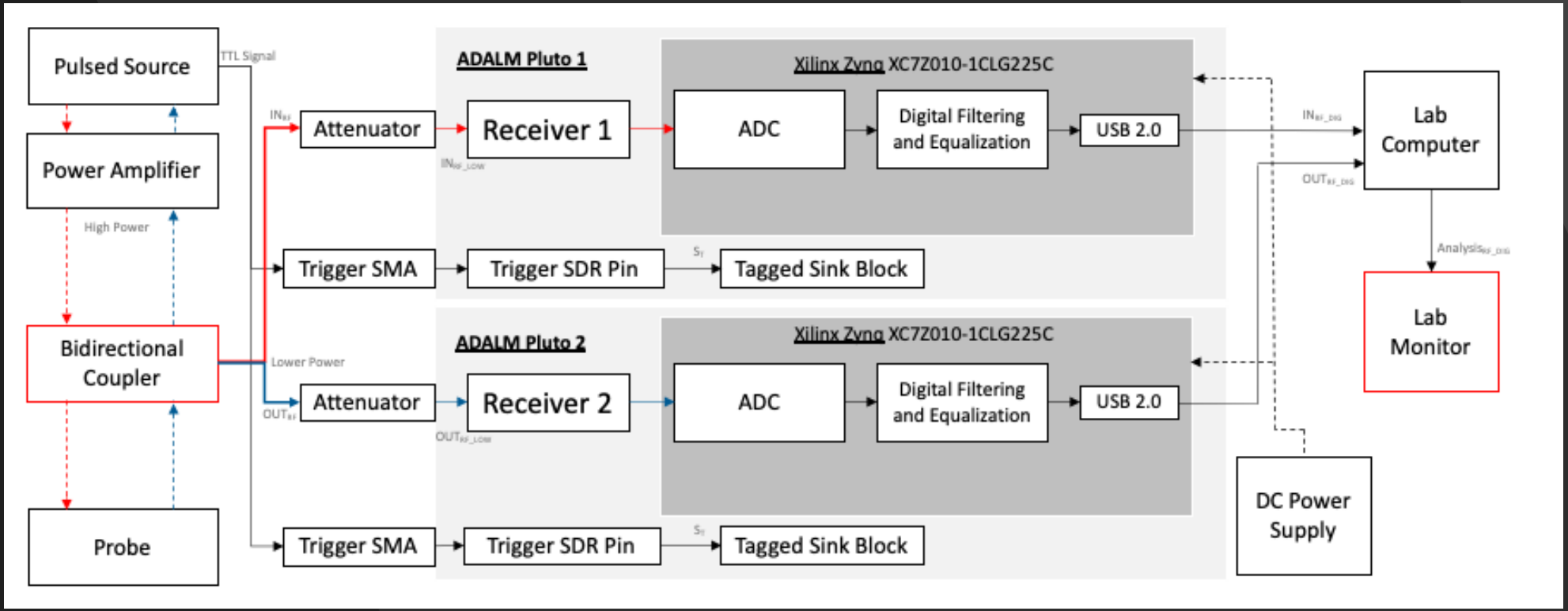

Analog

61.44 MSPS ADC

Digital

# Background

## More Complex Signal Flow Chart for the Project

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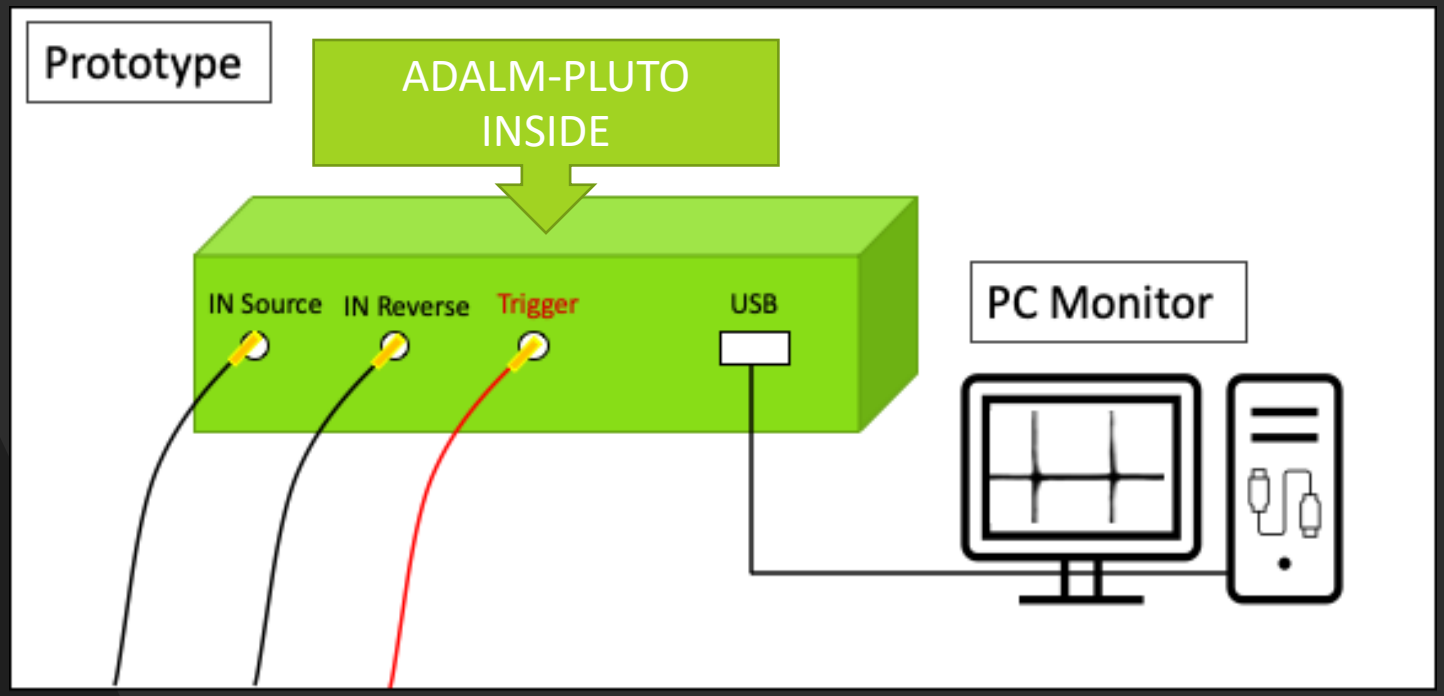
# Background

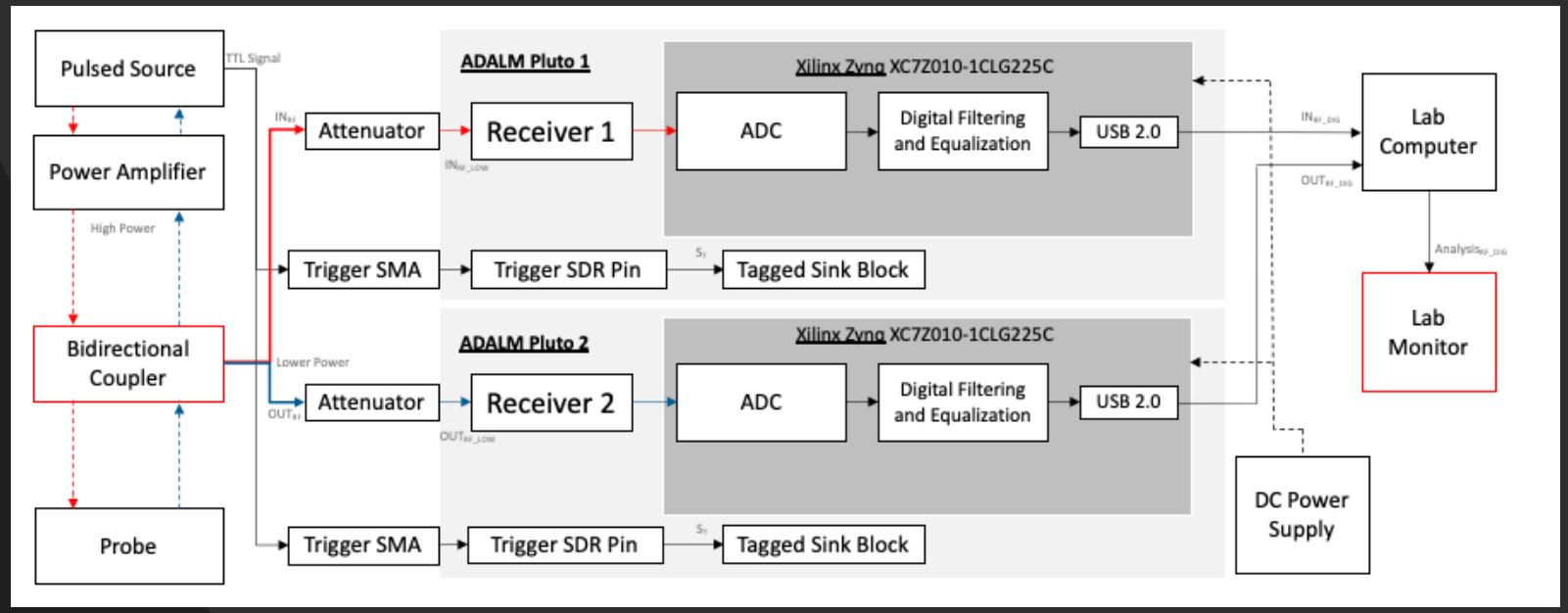
- Simplified Model




Emil Lobachev

# Requirements and Design

- NI, Envelope, Trigger, Range
- Planning ➡ Initial Design



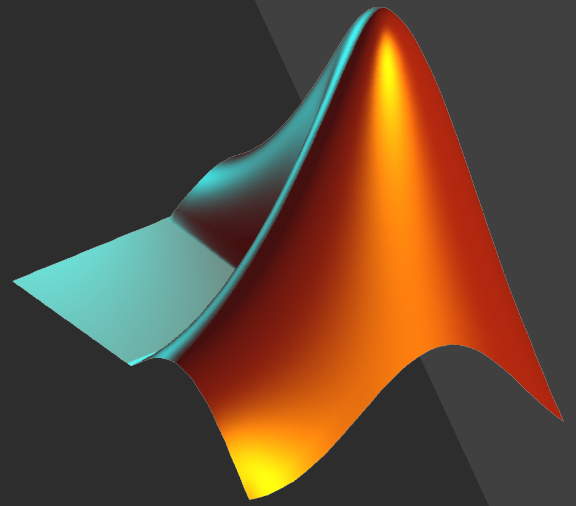

Jonathan Burt

# Previous Work

- What Worked
- What Did Not
- Advisor Notes

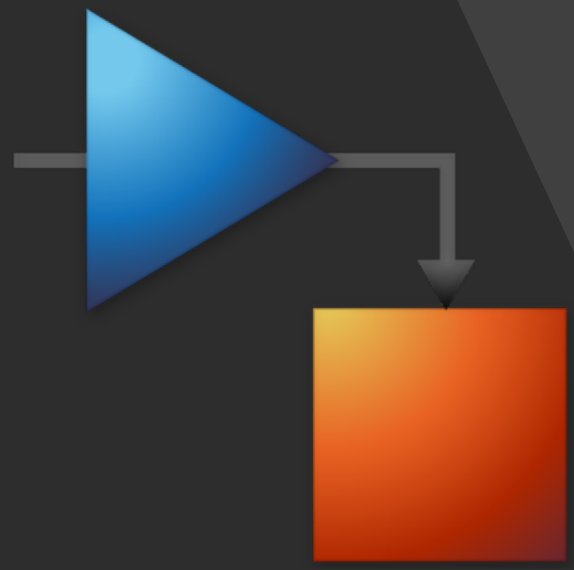
# What Worked

- MATLAB
  - Signal capture and playback
- Simulink
  - Display signal



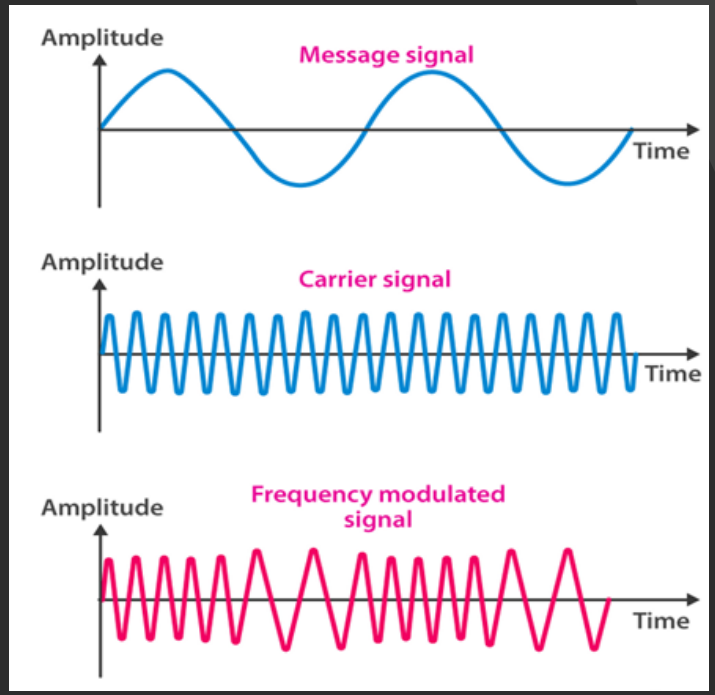
# What Did Not

- MATLAB
  - Crashes
- Simulink
  - Wrong domain



# Advisor Notes

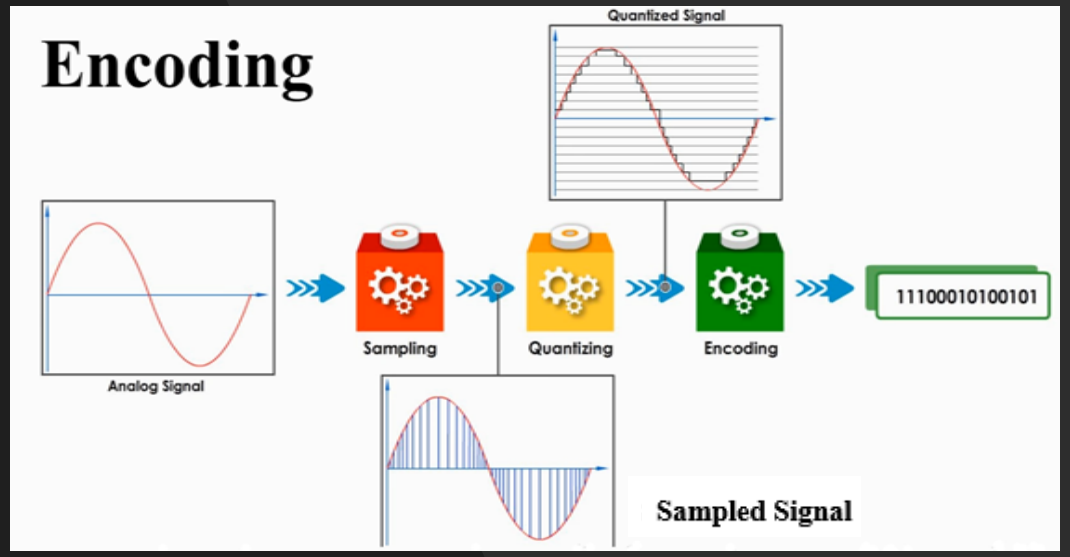
- Message Signal
- Modulation

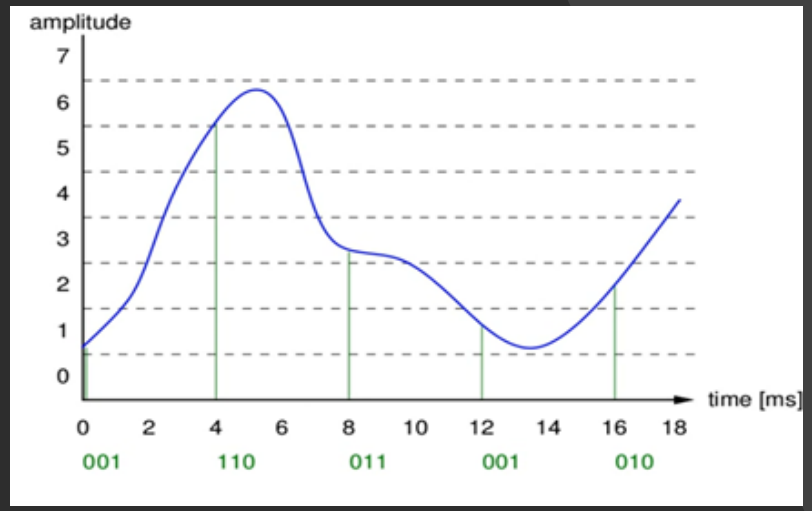



Gabriel De Leon

# Advisor Notes

- Pulse Code Modulation
- Encoding Process



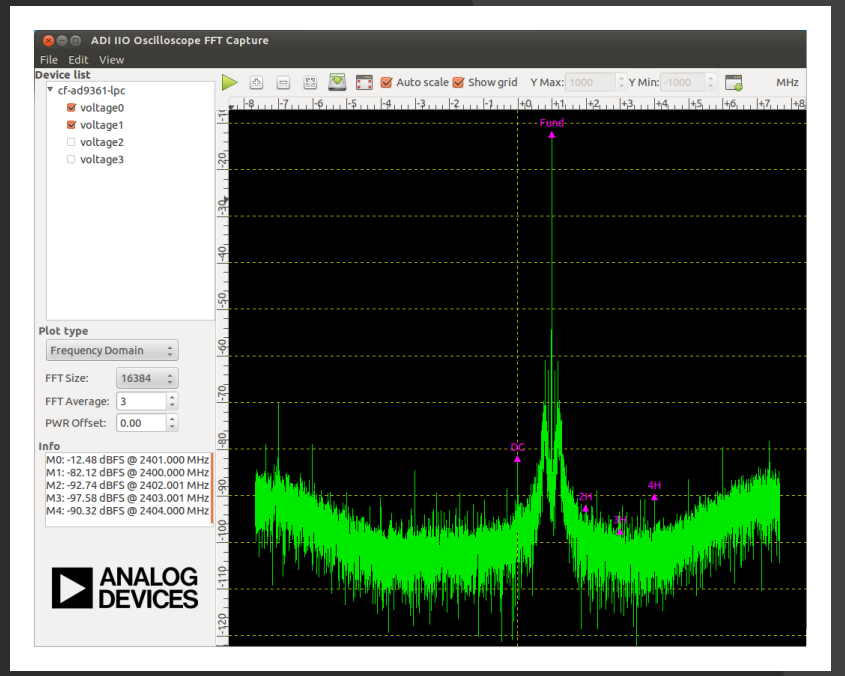

Gabriel De Leon

# Current Progress

- Updates
- Obstacles
- Future Work

# Updates

- Returning to IIO Oscilloscope
- Able to display signal in time domain



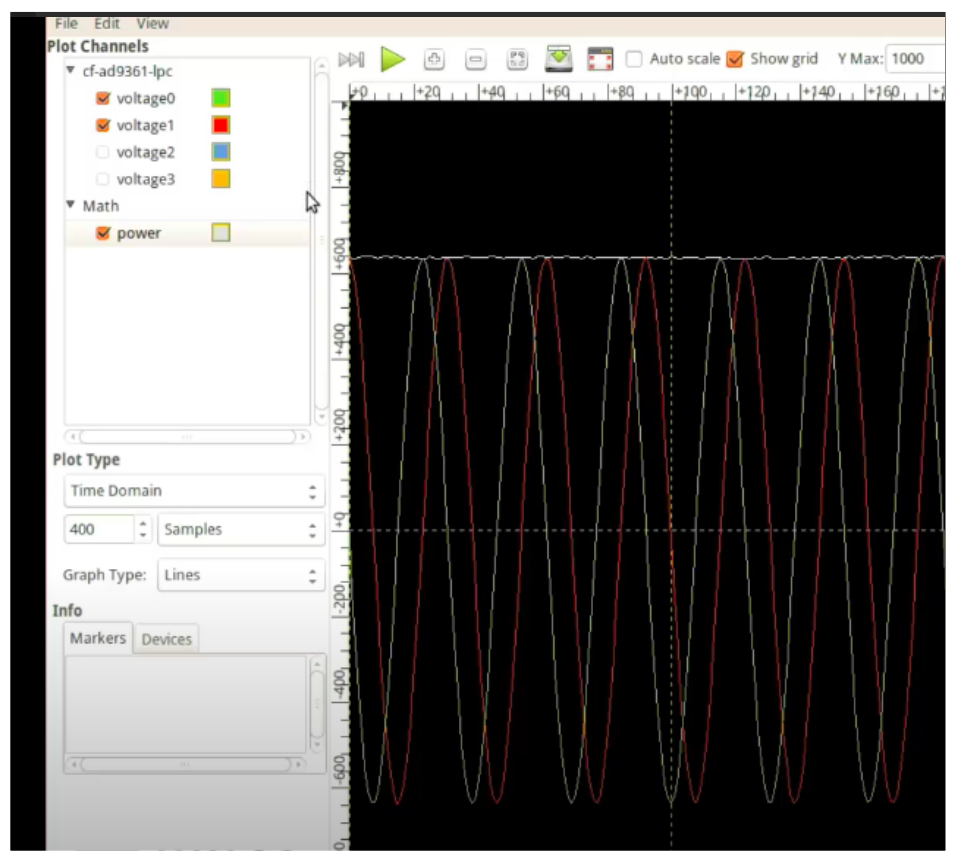

Emil Lobachev

# Obstacles

- Display 2 signals using 2 separate ADALM-PLUTO SDRs in the same window
- Math functions
- Test with real 900MHz signal
- Test with provided Trigger vs Implemented in IIO Oscilloscope Trigger function

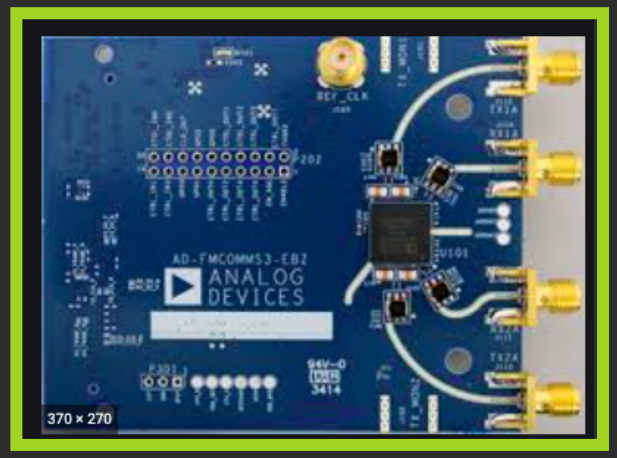
Emil Lobachev

# Obstacles




Solution 1: Fix Software

Solution 2: Purchase another SDR




… $1275 > $1000

Display 2 signals using 2 separate ADALM-PLUTO SDRs in the same window

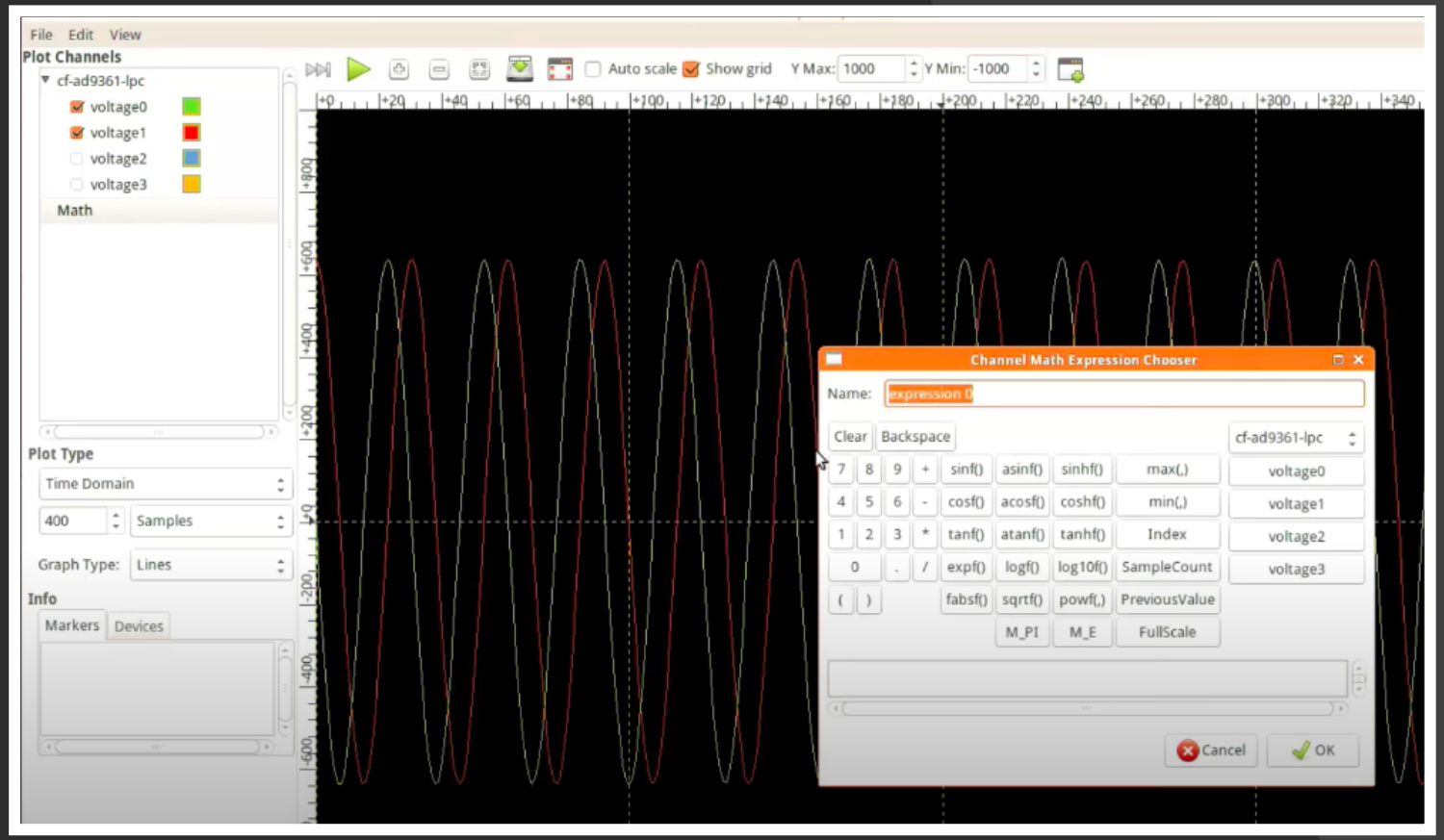
Emil Lobachev

# Obstacles

- Math functions

Power = Sqrt (I^2 + Q^2)

To check if our signals are orthogonal



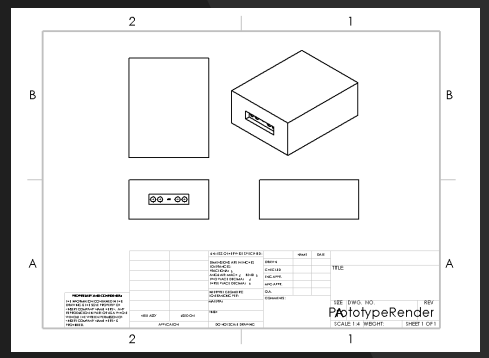

Emil Lobachev

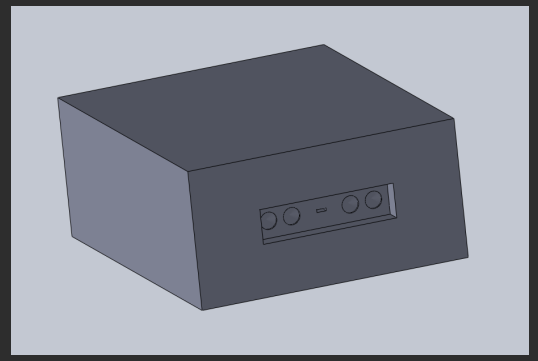
# Obstacles

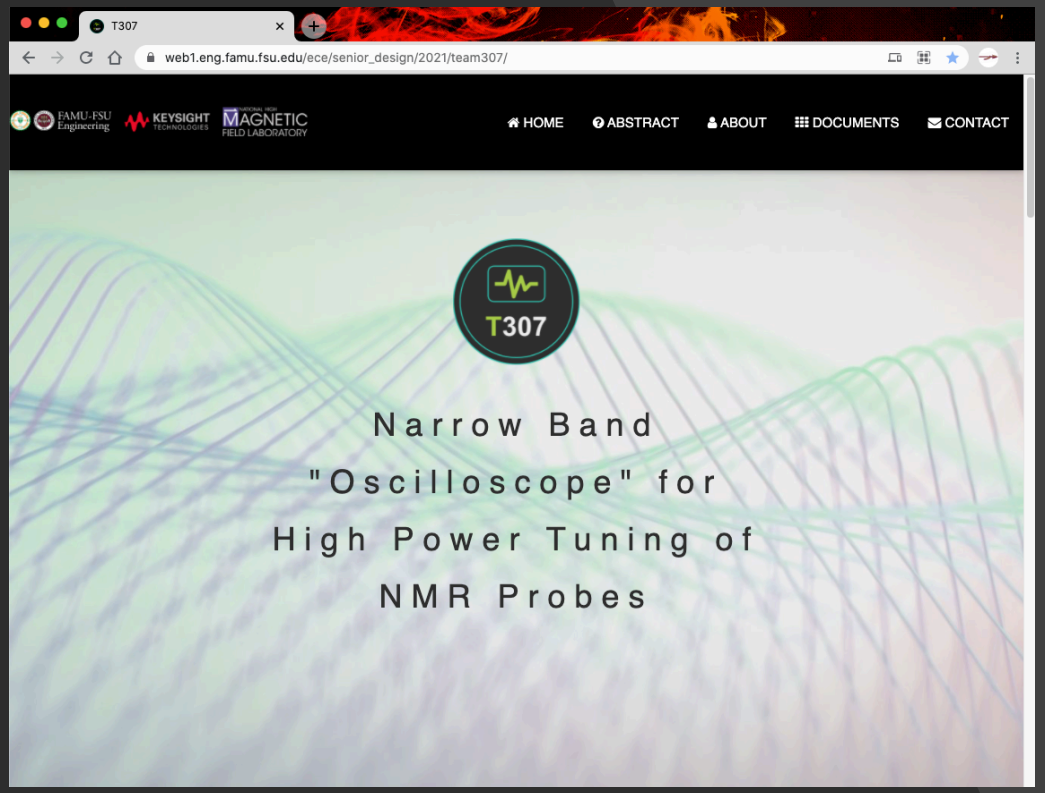
- Test with real 900MHz signal
- Test with provided Trigger vs Implemented in IIO Oscilloscope Trigger function

# Future Work

- Operating Manual
- Prototype Design
- Team Website






Asher Rich

# New Design Configurations

- Software
  - IIO Oscilloscope
- Hardware
  - Arduino Trigger Configurations

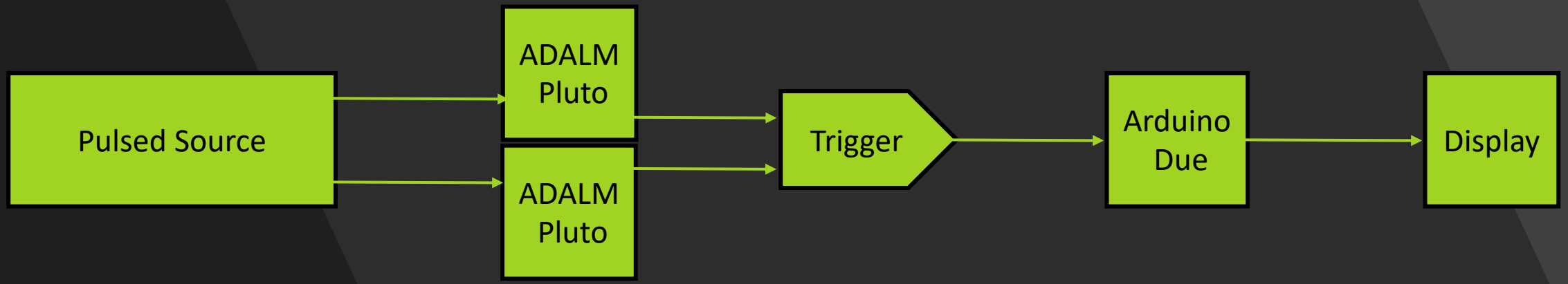
# Software Update

- MATLAB/Simulink seems slow
- IIO Oscilloscope
  - Takes in signal from SDR and immediately displays without lag

# Hardware Update

- ADALM Pluto
- Arduino Due
  - Sync and Trigger functions






Kyle York

# Summary

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# References


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Jonathan Burt

# Questions