Gain and Phase Analyzer

May 8, 2015

Team

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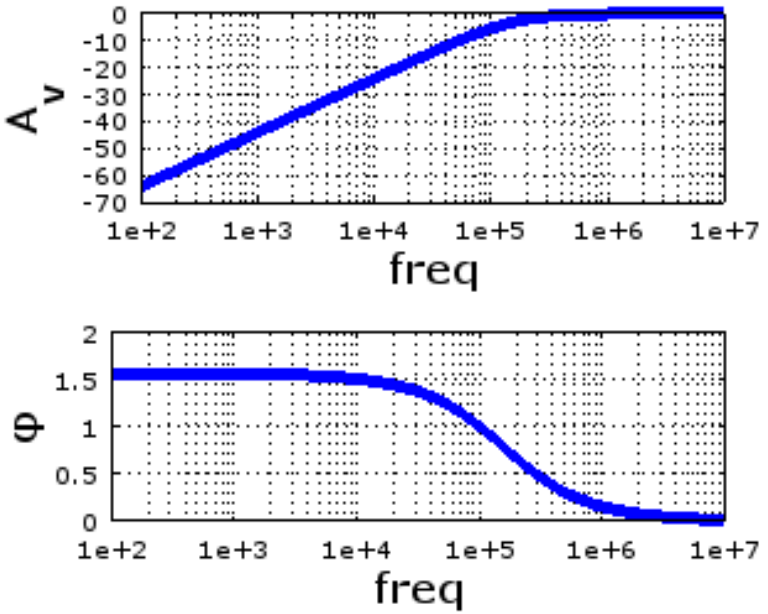
Agenda

- Purpose
- Requirements
- Design
- Schedule
- Budget
- Next Steps

Purpose

- Test the performance of filters, amplifiers
- Generate Bode plot with amplitude and phase



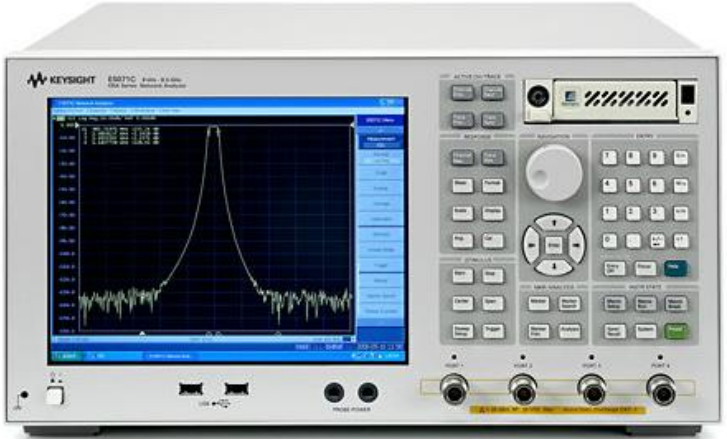
Uses

Education

Testing, design, characterization of:

- Signal filters
- Signal amplifiers
- Control systems

Why?

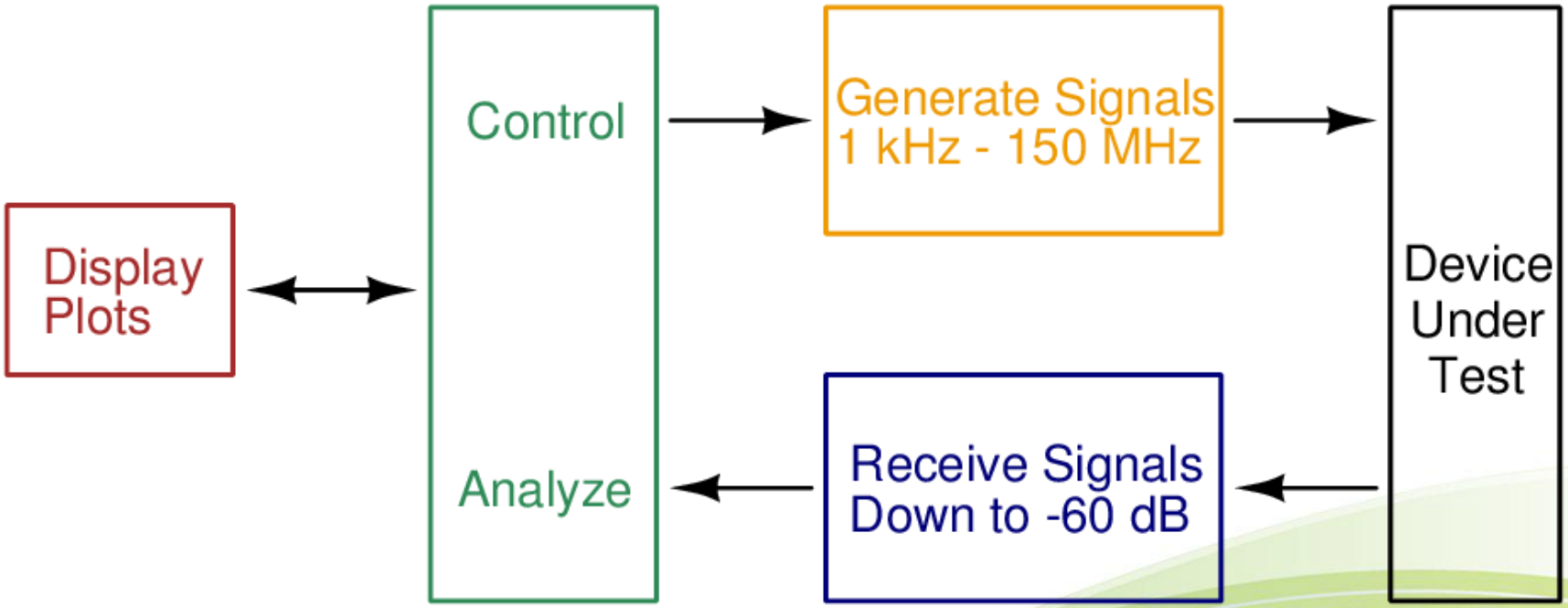


- Current state of industry
  - Large
  - Expensive
  - Learning curve
  - Students can’t see how it works!

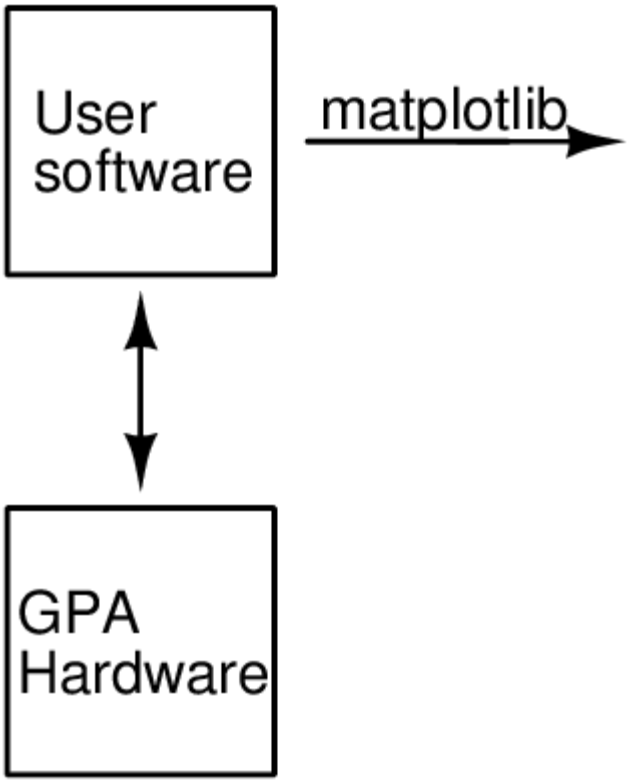
- Our Goal
  - Portable
  - Cost around $200
  - Easy to use for students and teachers
  - Open source

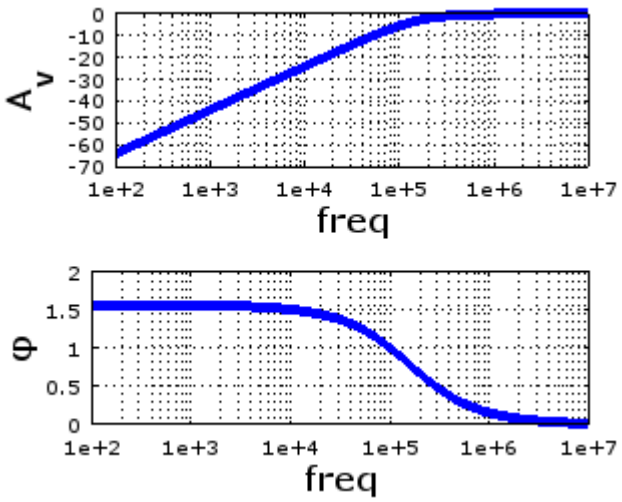
Image: Keysight Technologies, “E5071C ENA Series Network Analyzer”

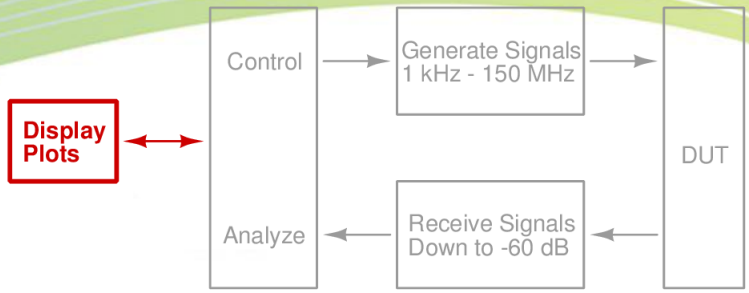
Requirements



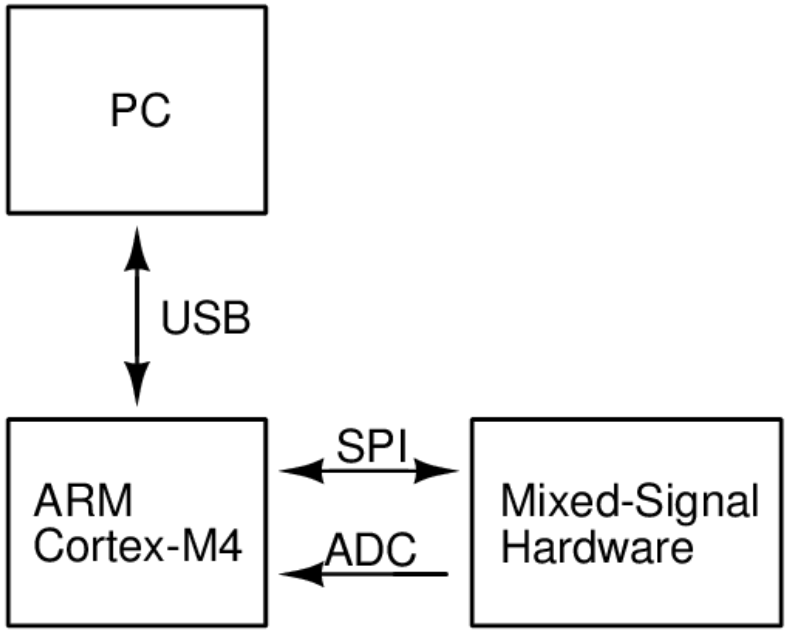
Design — Software

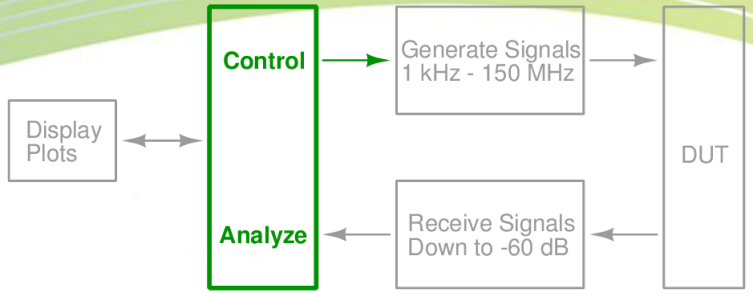




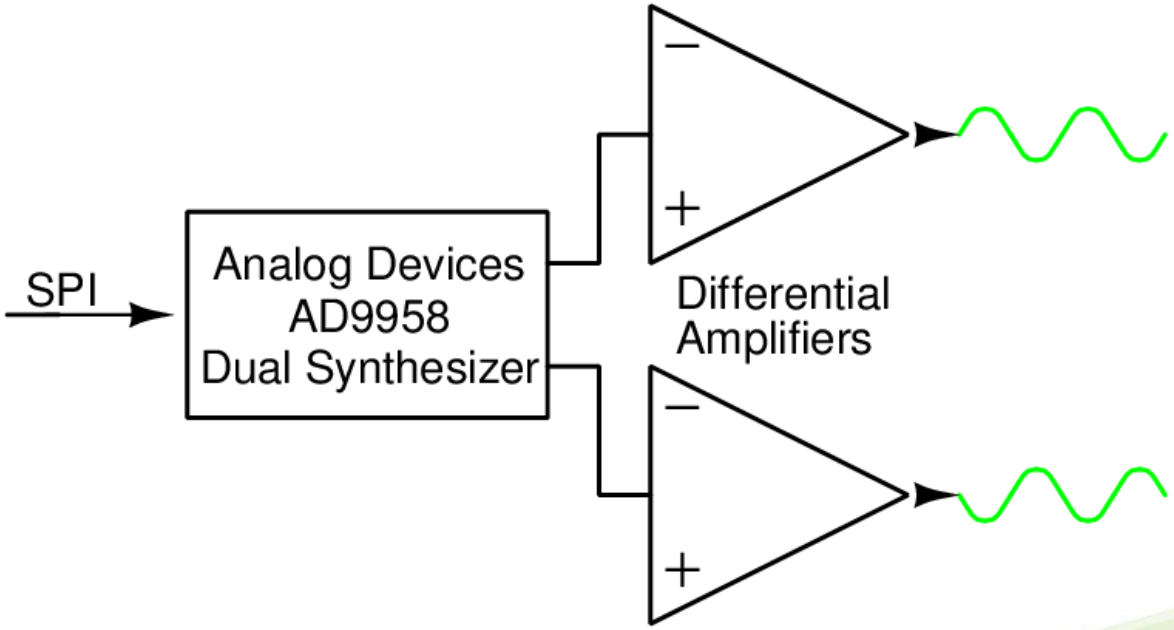


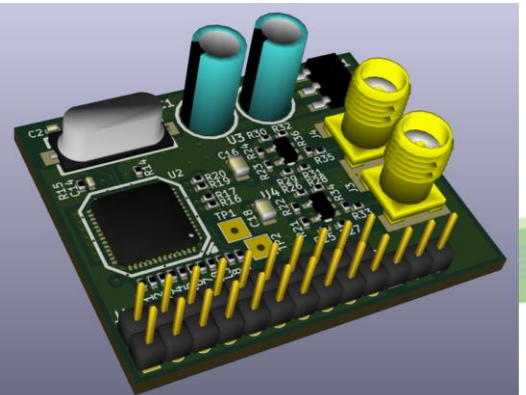
Design — Microcontroller

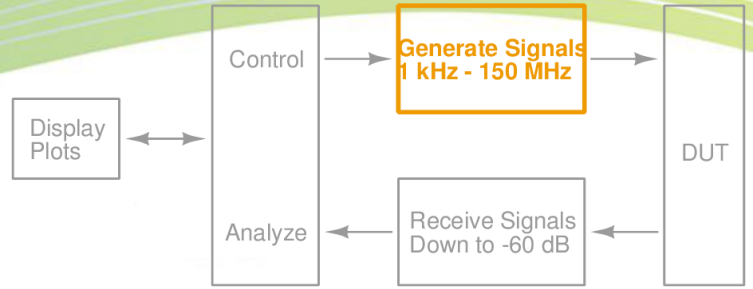




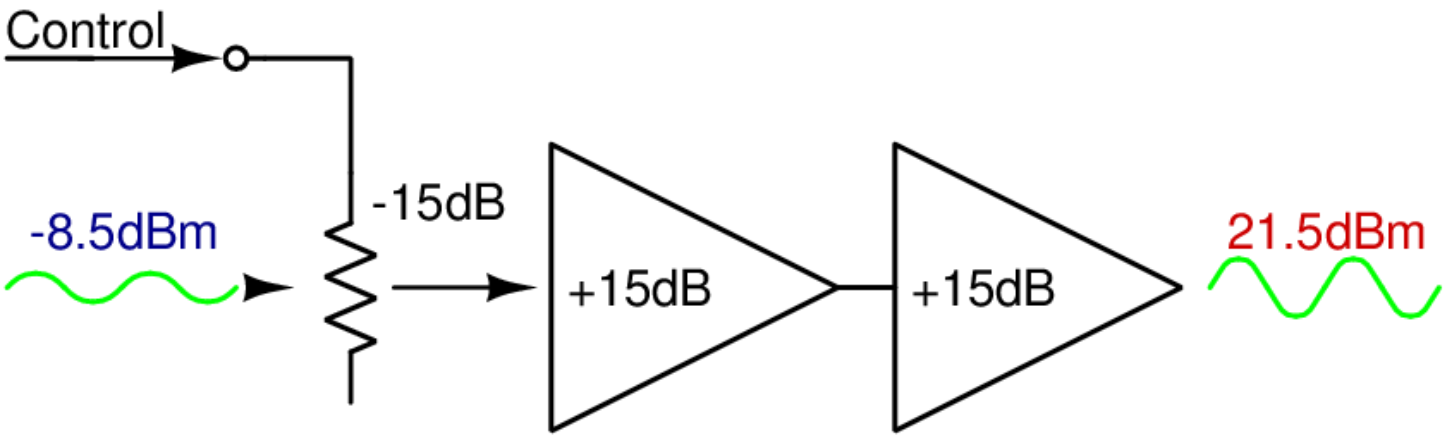
Design — Signal Generation

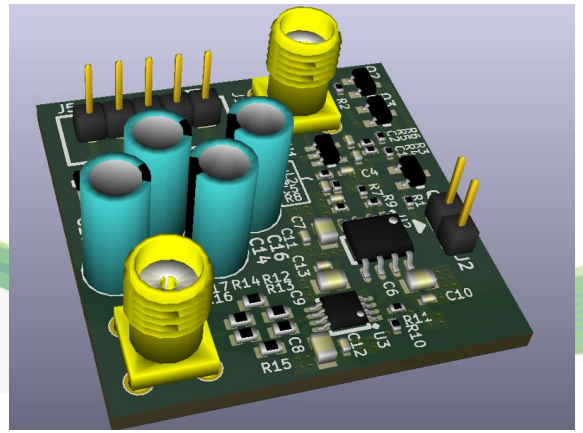


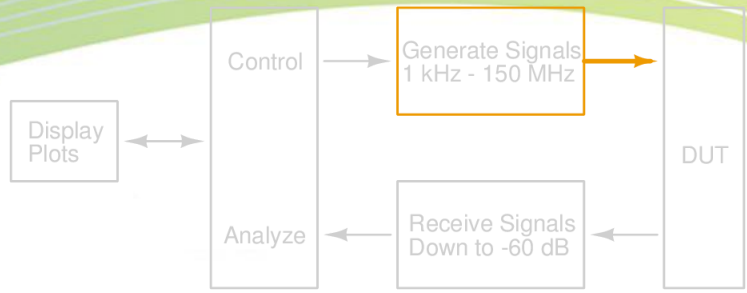




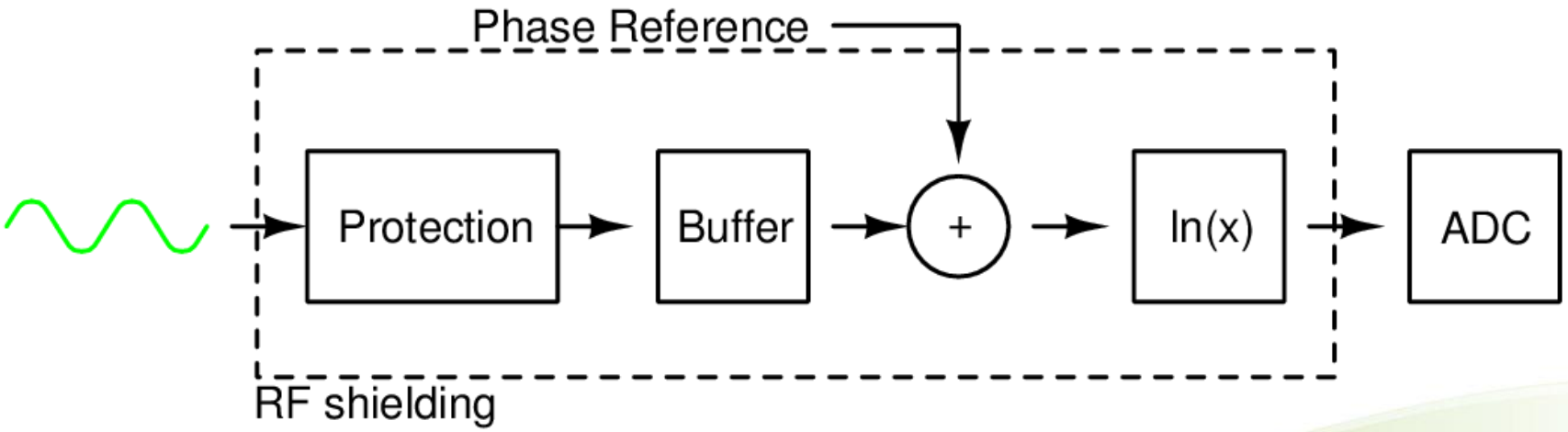
Design — Signal Output

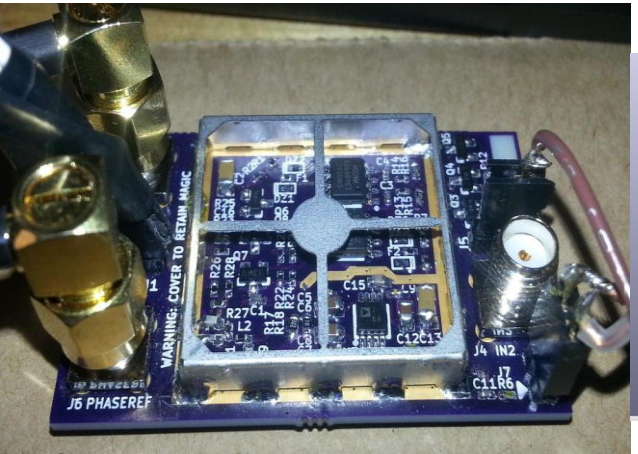


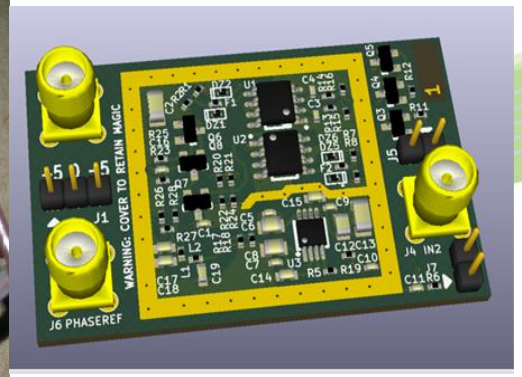


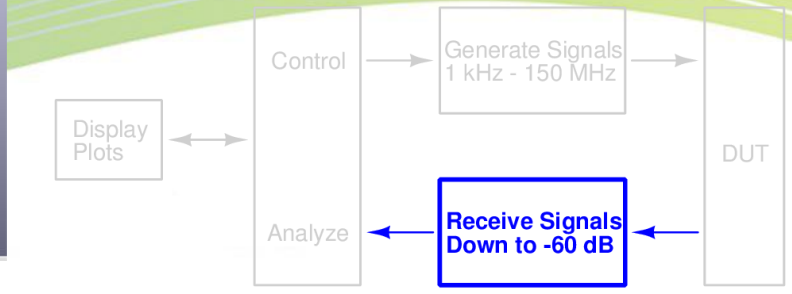


Design — Detection

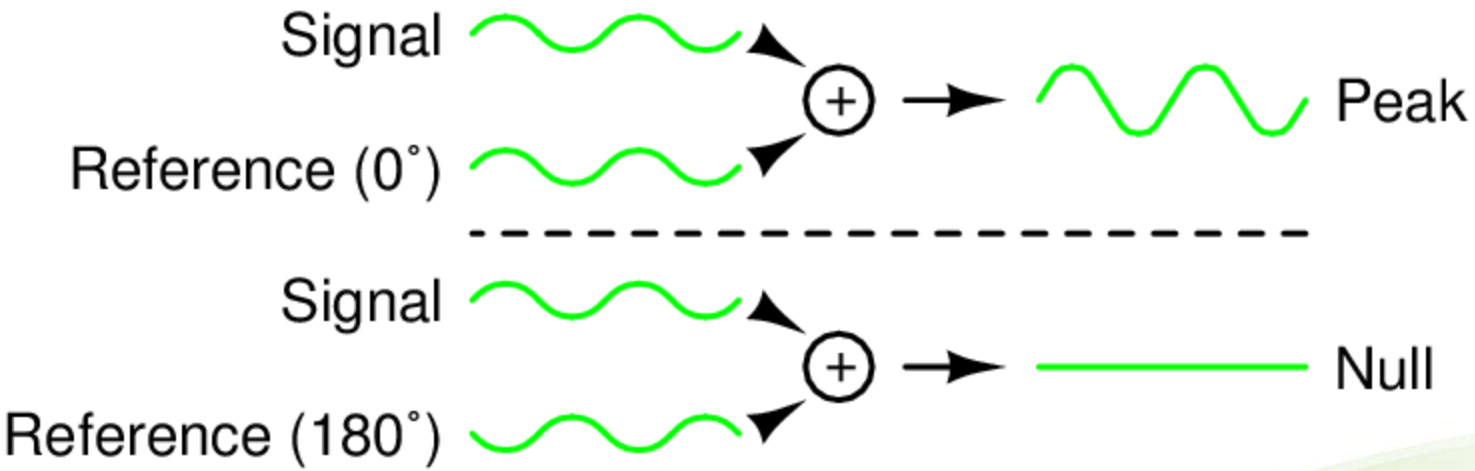




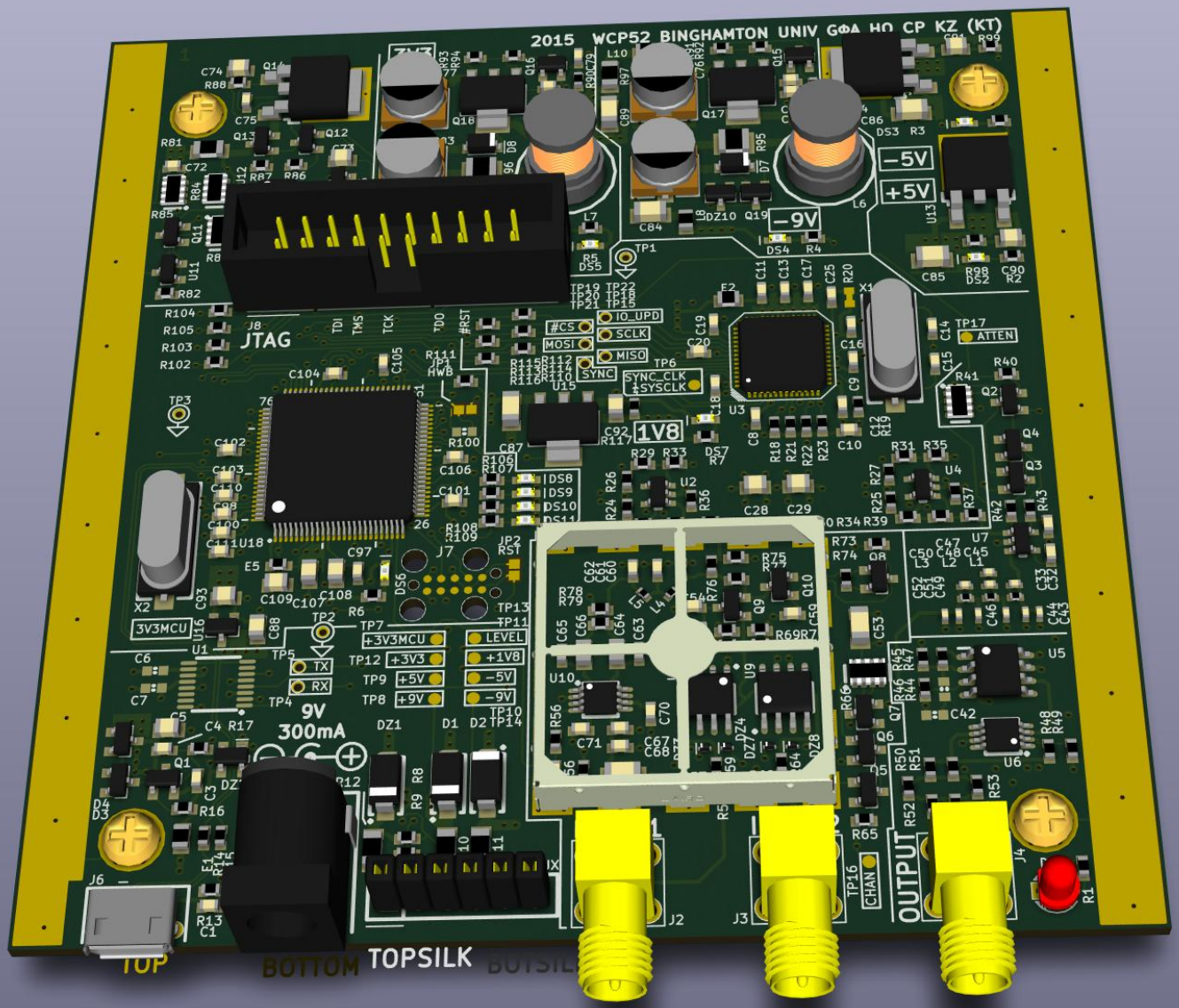




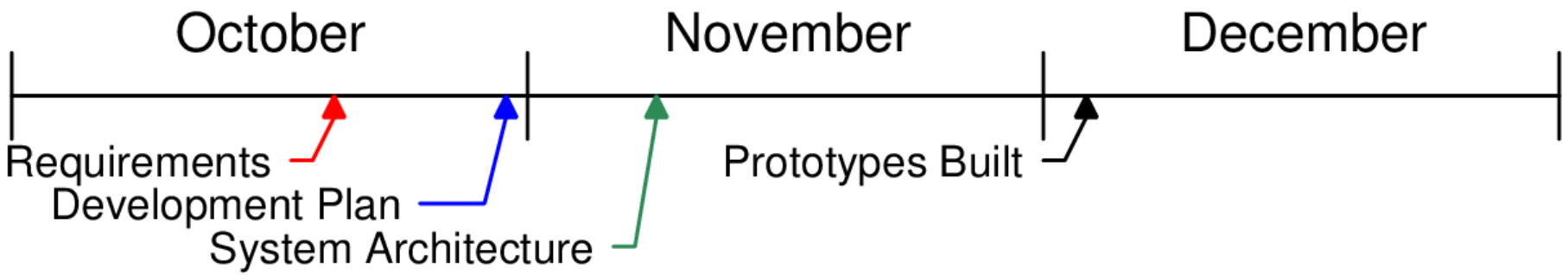
Design — Phase Detection



Design — PCB


2015 WCP52 BINGHAMTON UNIV GΦA HO CP KZ (KT)
JTAG
−5V
+5V
−9V
1V8
ATTEN
OUTPUT
9V
300mA
TOP
BOTTOM
TOPSILK

Timeline


October
November
December
Requirements
Development Plan
System Architecture
Prototypes Built

Schedule

Item	Completed
Specification	October 17, 2014
Development plan	October 31, 2014
Prototypes built	December 5, 2014
Interim	December 5, 2014
Prototypes corrected	February 26, 2015
Final PCB layout	March 14, 2015
Alpha firmware completed	March 19, 2015
PCB assembled	April 8, 2015
PC software completed	April 30, 2015

Budget

Item	Expended	Actual	Estimated to Completion	Estimated at Completion
Synth. proto.	$60	$60	$0	$60
Input proto.	$70	$70	$0	$70
Amp proto.	$91	$91	$0	$91
Final build	$210	$210	$0	$210
Enclosure	$21	$21	$0	$21
Total	$452	$452	$0	$452

Next Steps

Hardware

- Combine prototypes into a final product

Software

- Finish firmware with full analysis capability
- Write PC software that receives and plots data
- Calibration

Finalization

- Operating manual
- Software packaging and installation

Conclusion

- Product can capture Bode plots
- Uses signal synthesizer, output amplifier, input frontend, ADC, and microcontroller
- These have been prototyped and tested

Demo