

Gain and Phase Analyzer

May 8, 2015

Team

Chris Pavlina

Electrical Engineer, Team Lead

Harrison Owens

Computer Engineer

Ken Zach

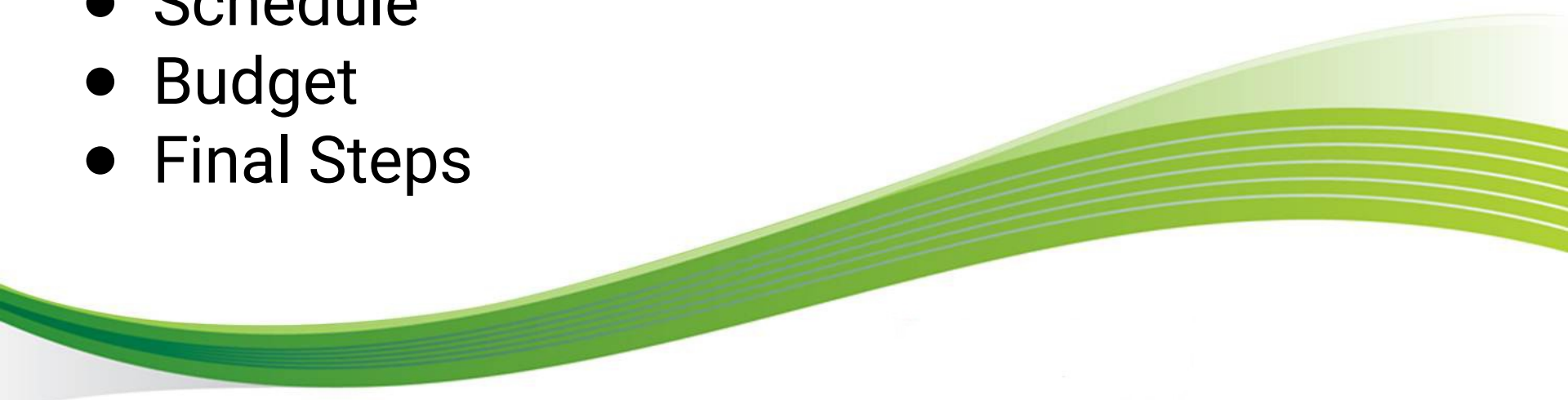
Computer Engineer

Kyle Temkin

Faculty Advisor

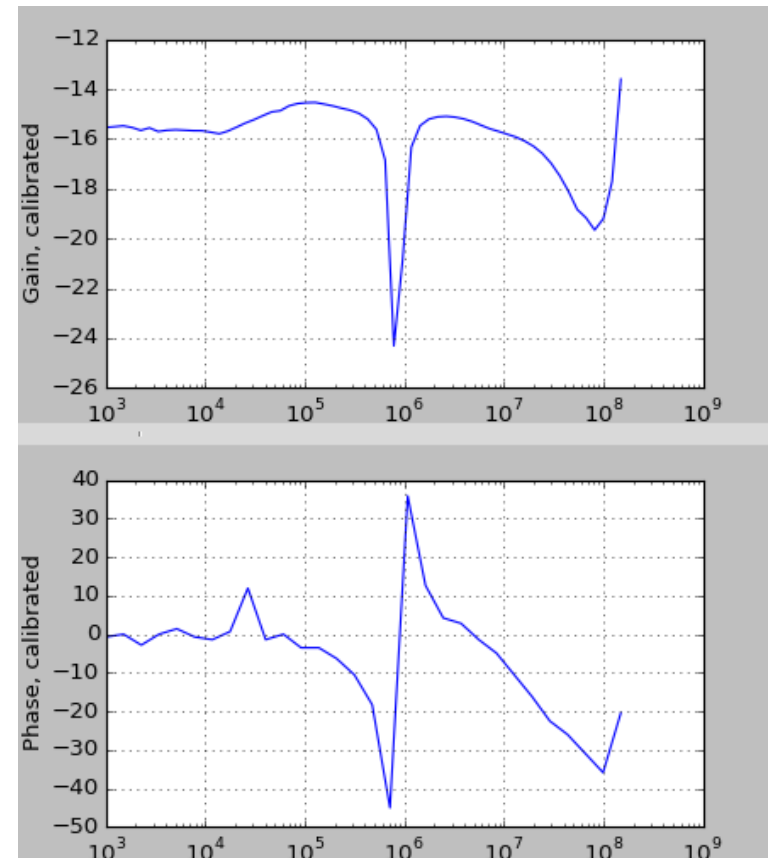


Agenda

- Purpose
 - Requirements
 - Design
 - PCB
 - GUI
 - Schedule
 - Budget
 - Final Steps
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Purpose

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



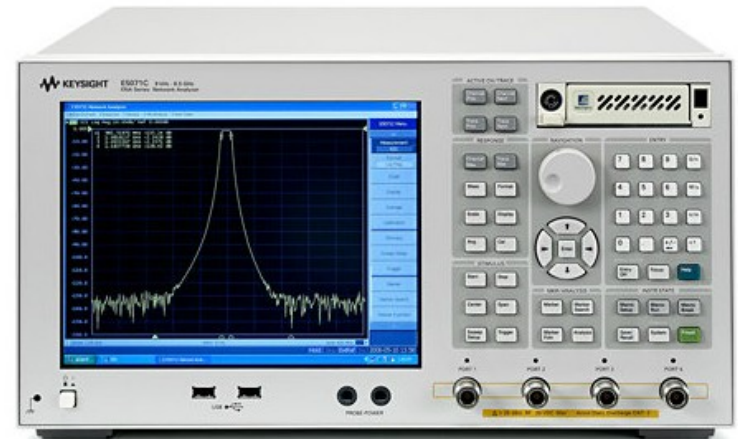
Uses

- Education
- Testing, design, characterization of:
 - Filters
 - Amplifiers
 - Control systems

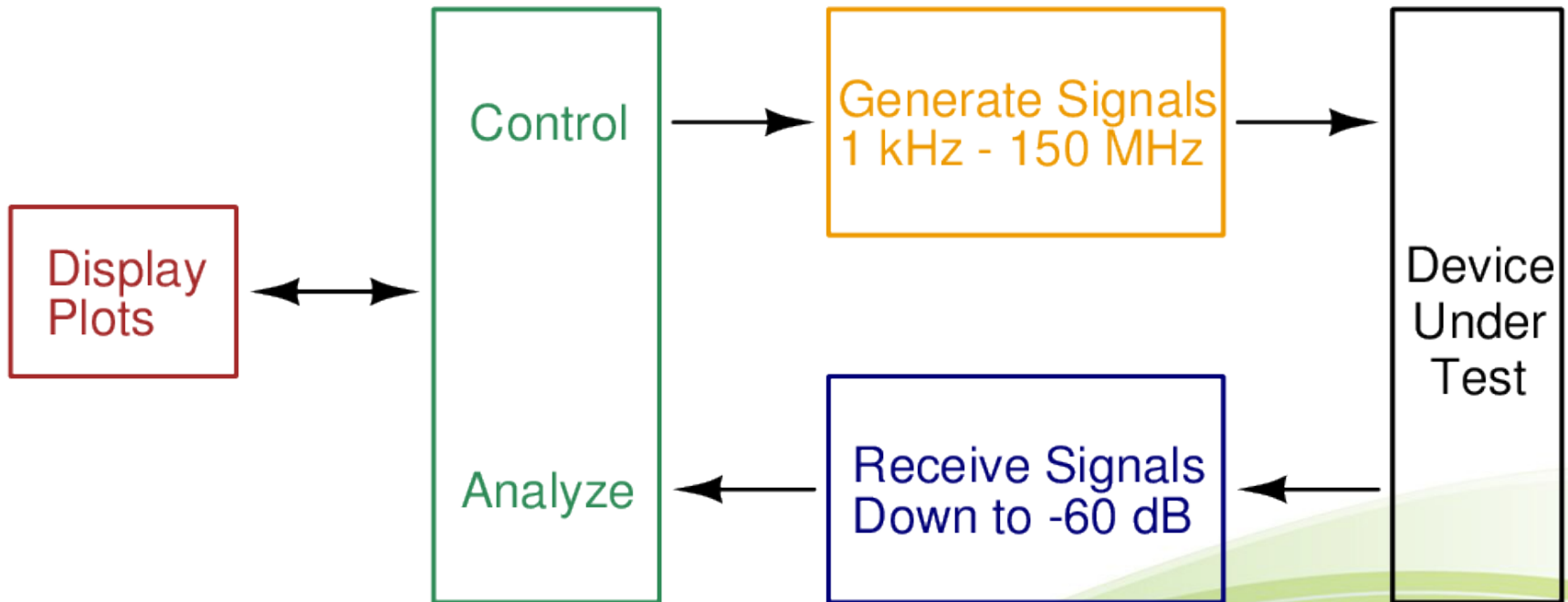


Why?

- Current state of industry
 - Large
 - Expensive! This one is \$33k:
 - Learning curve
 - Students can't see how it works!
- Our Goal
 - Portable
 - Cost around \$200
 - Easy to use for students and teachers
 - Open source

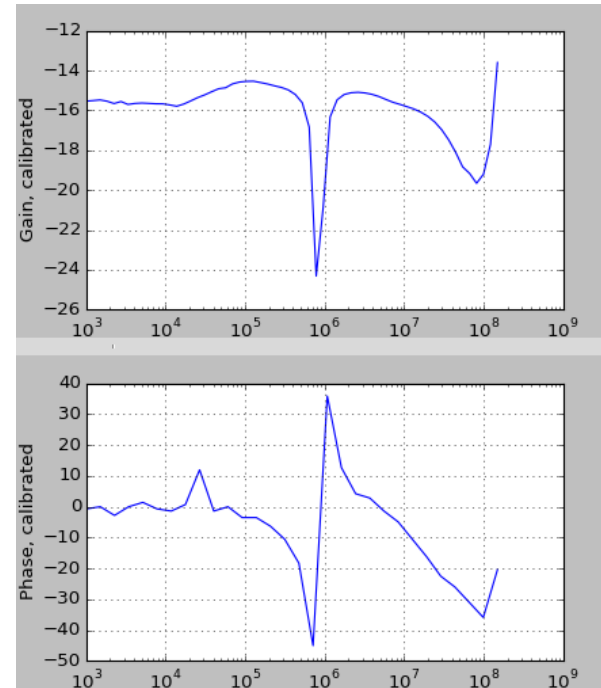
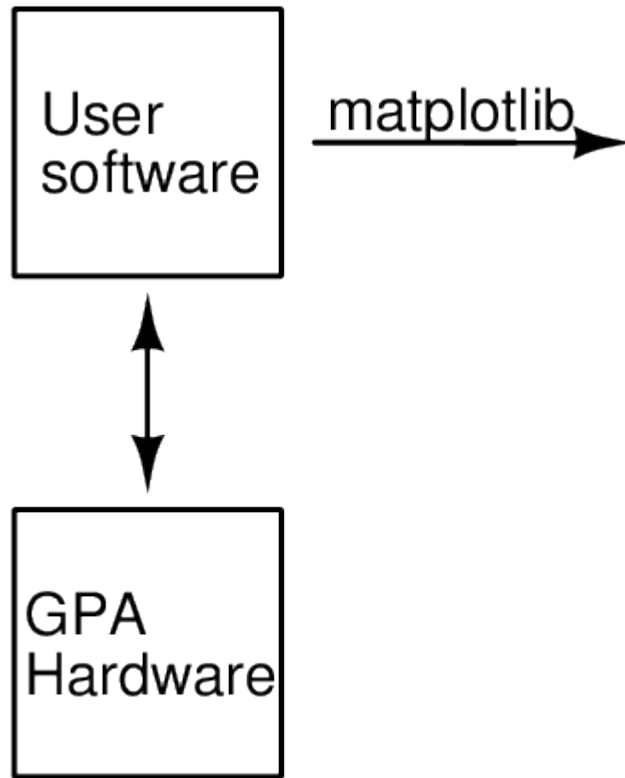


Requirements

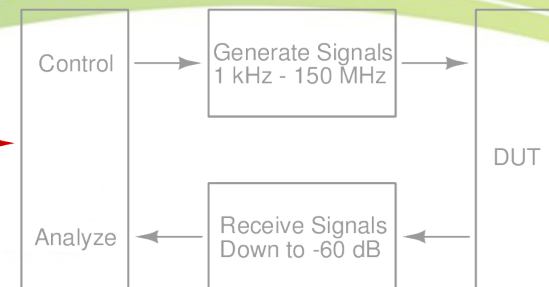


Design

Software

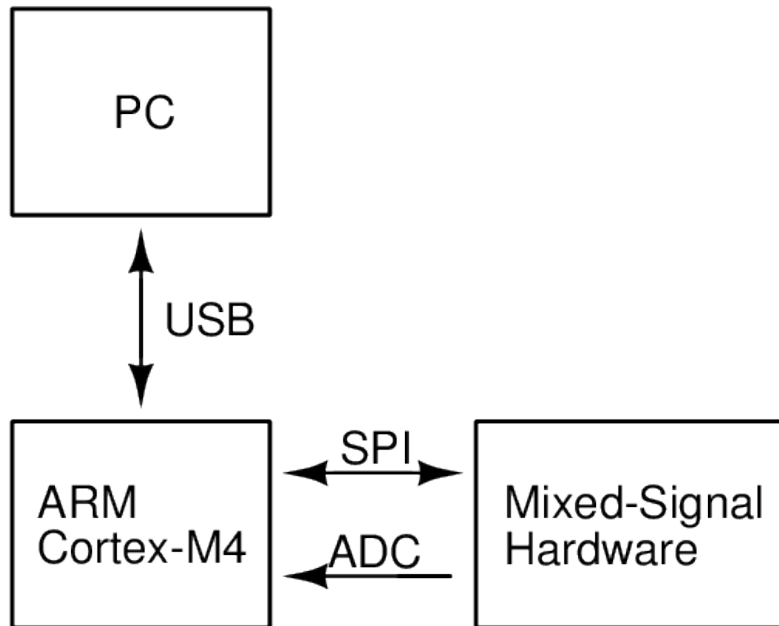


Display
Plots

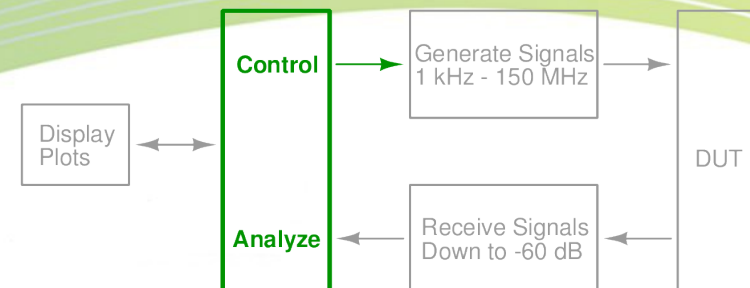


Design

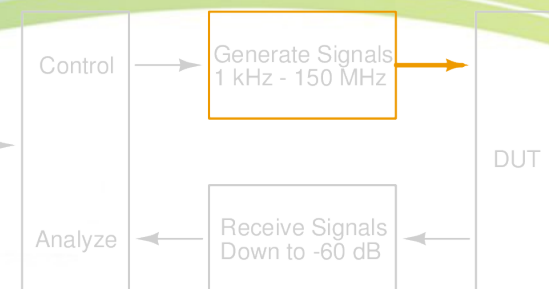
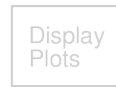
Microcontroller



SAM4S Development Board

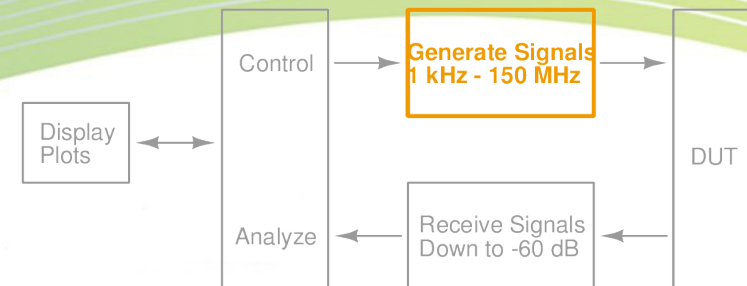
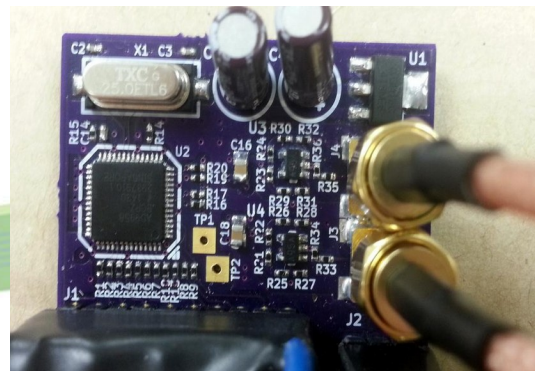
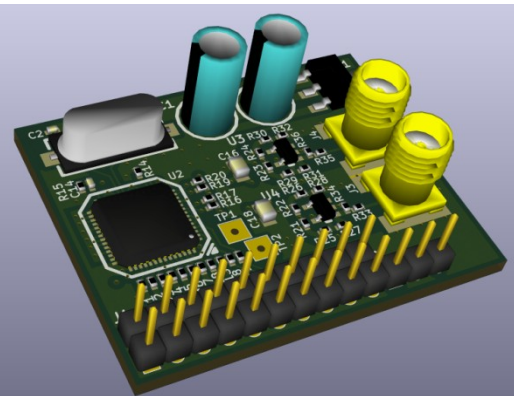
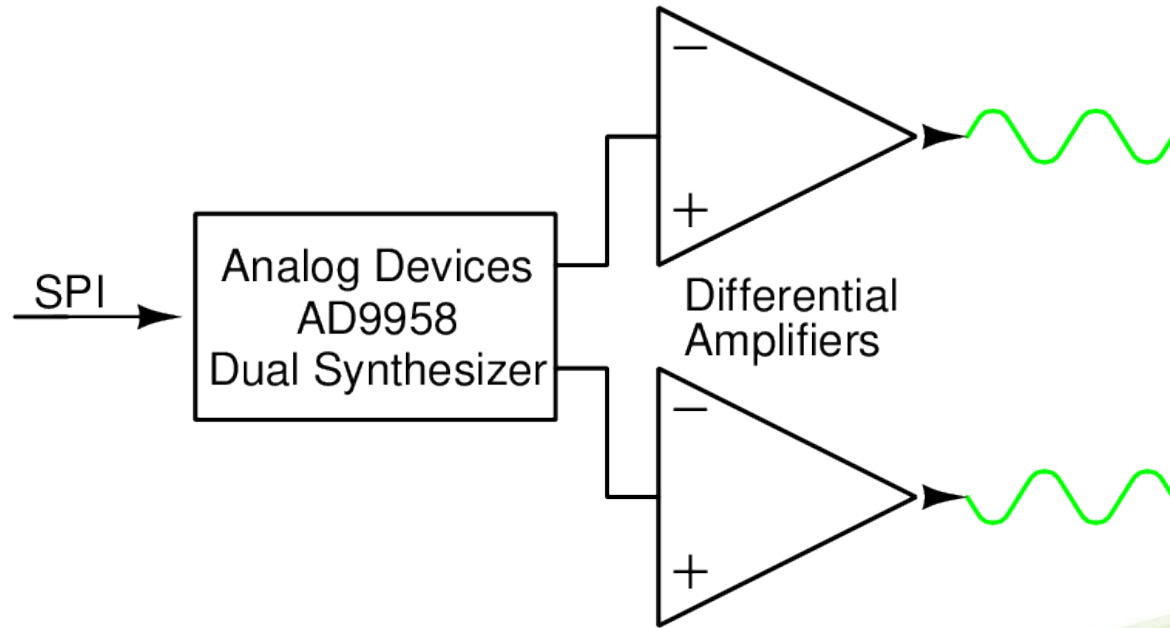


Signal Output



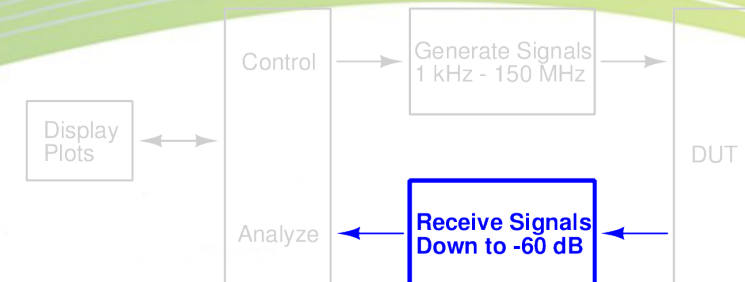
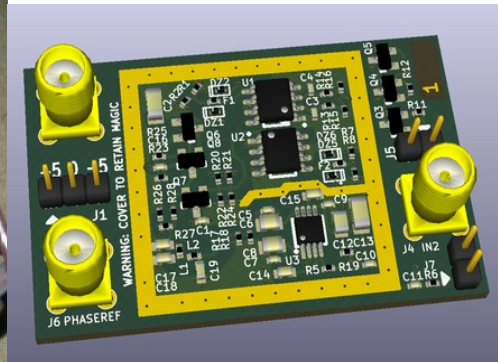
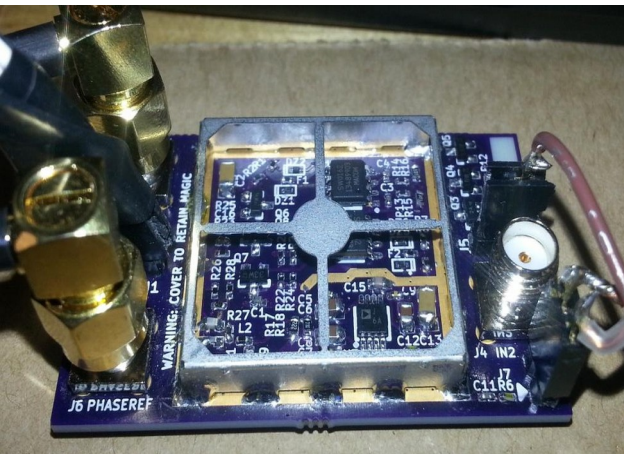
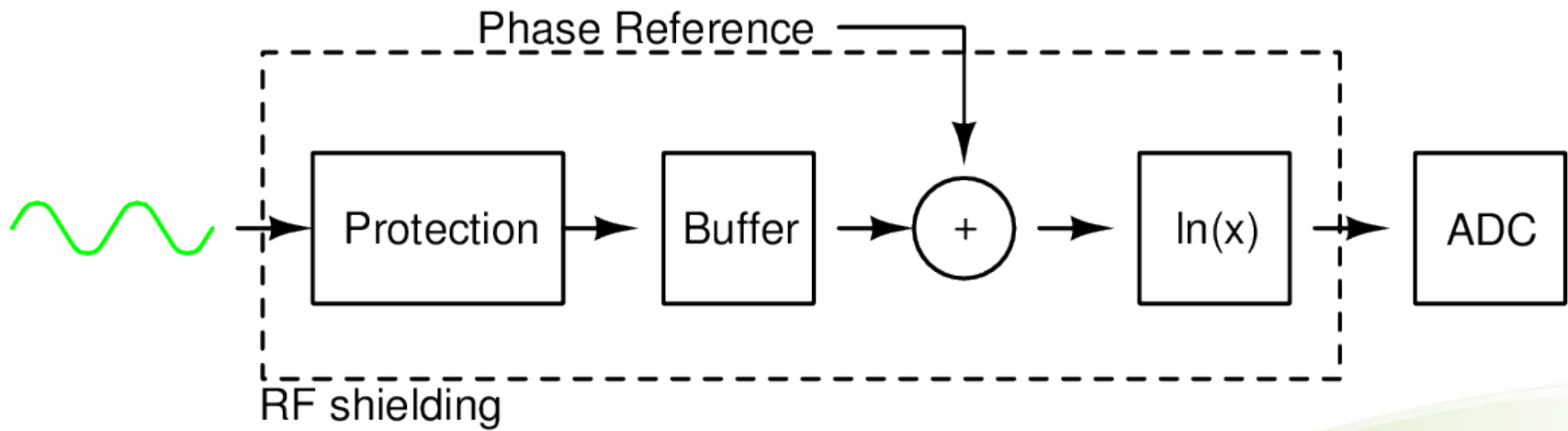
Design

Signal Generation



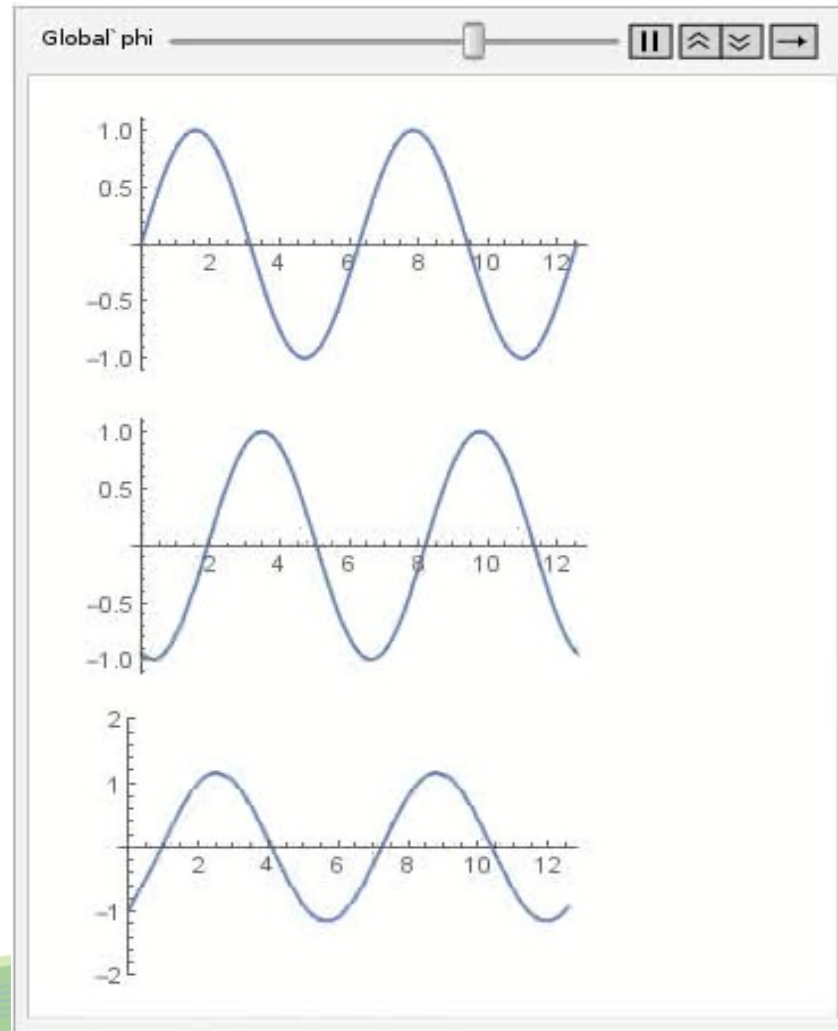
Design

Detection

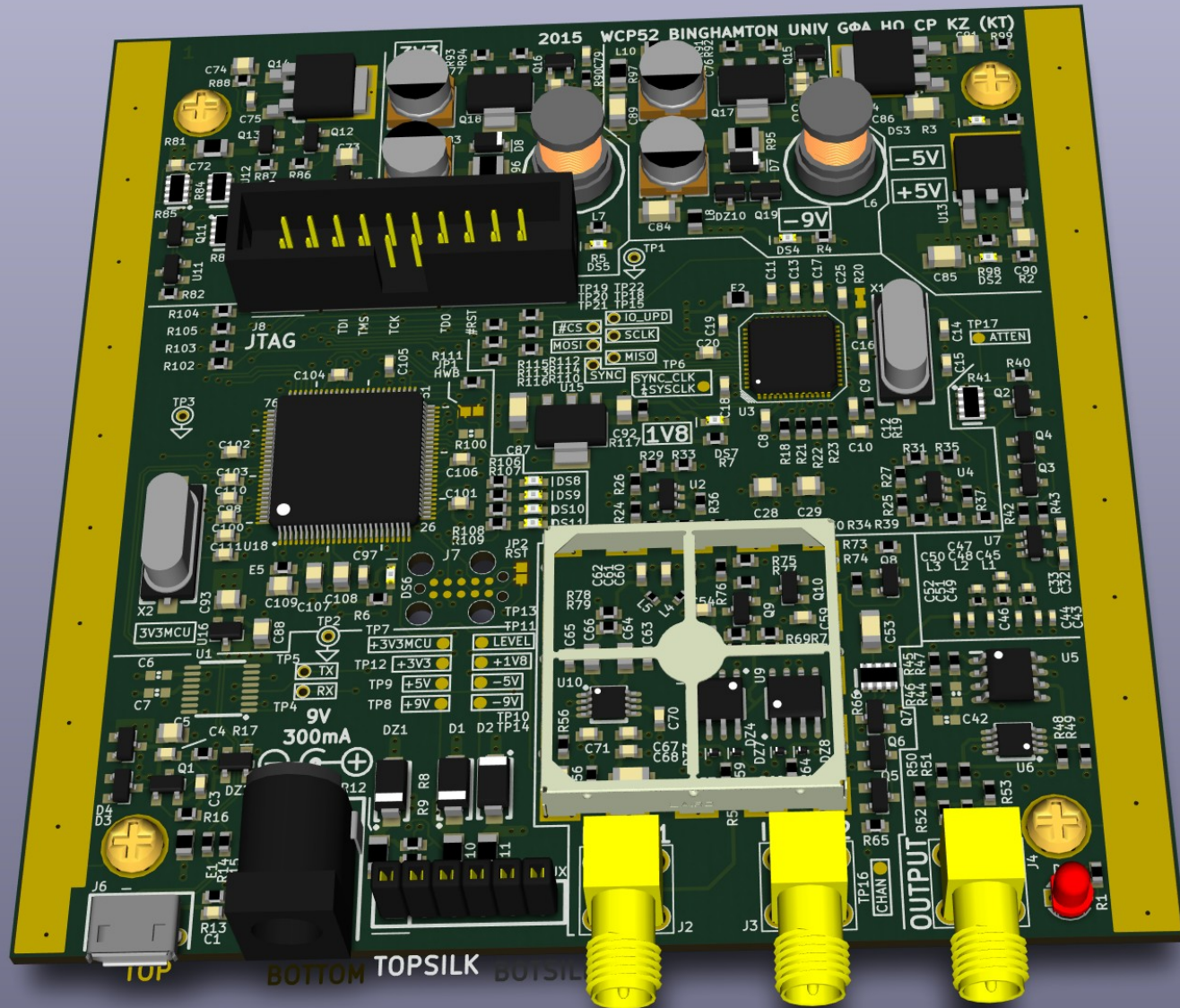


Design

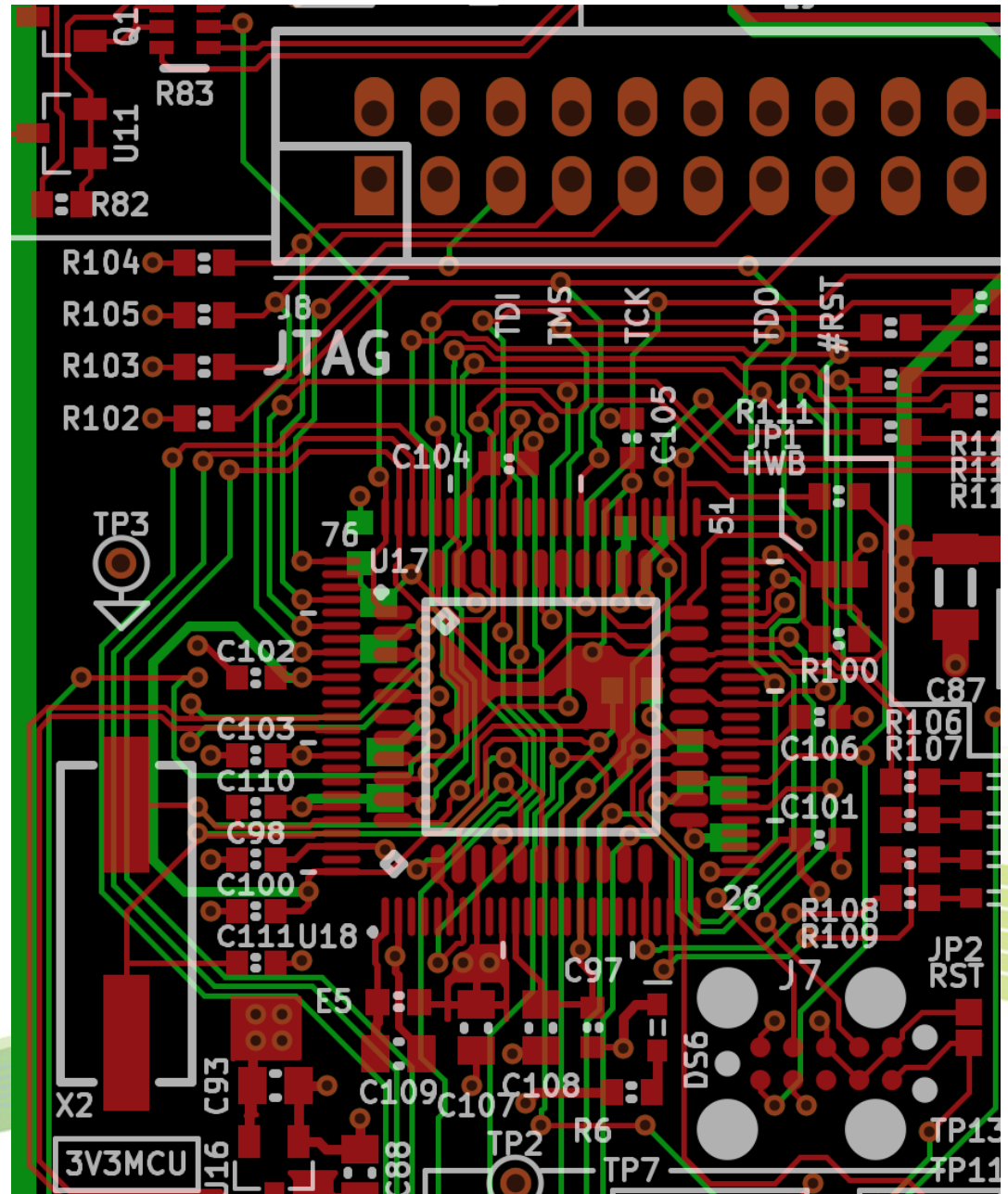
Phase Detection



Design — PCB

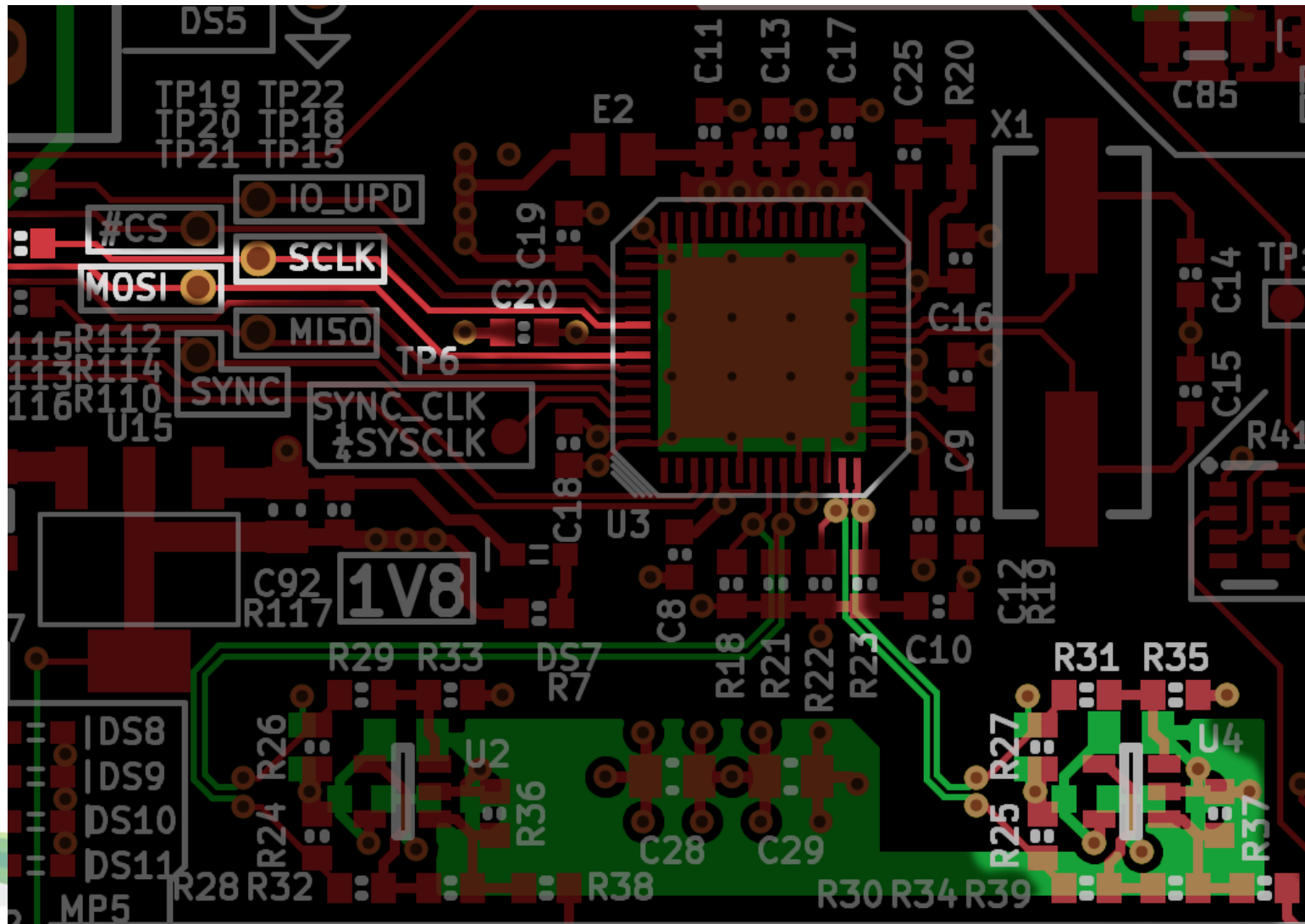


Microcontroller



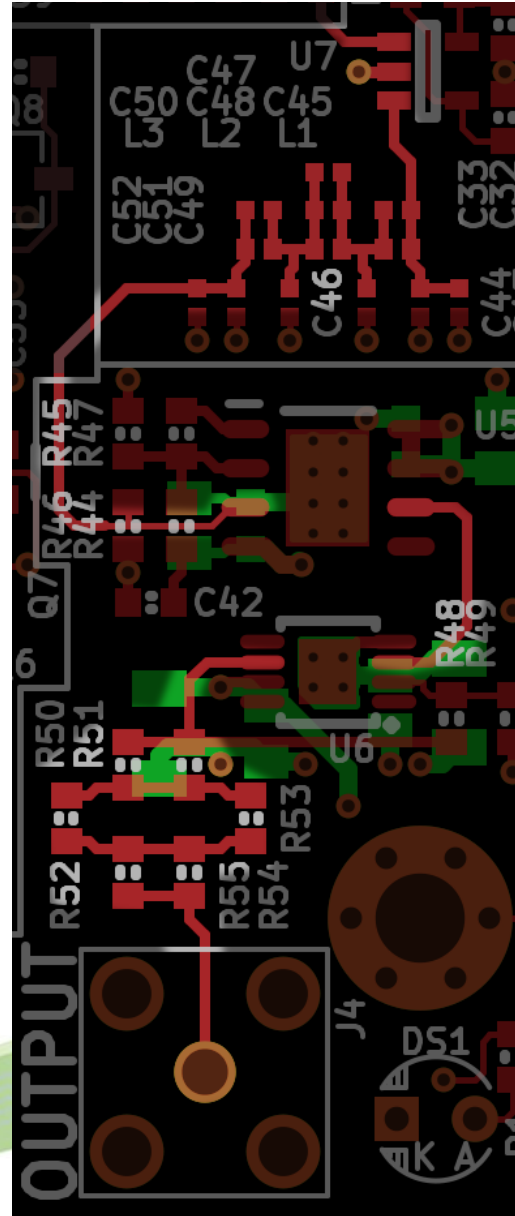
Design – PCB

Synthesizer



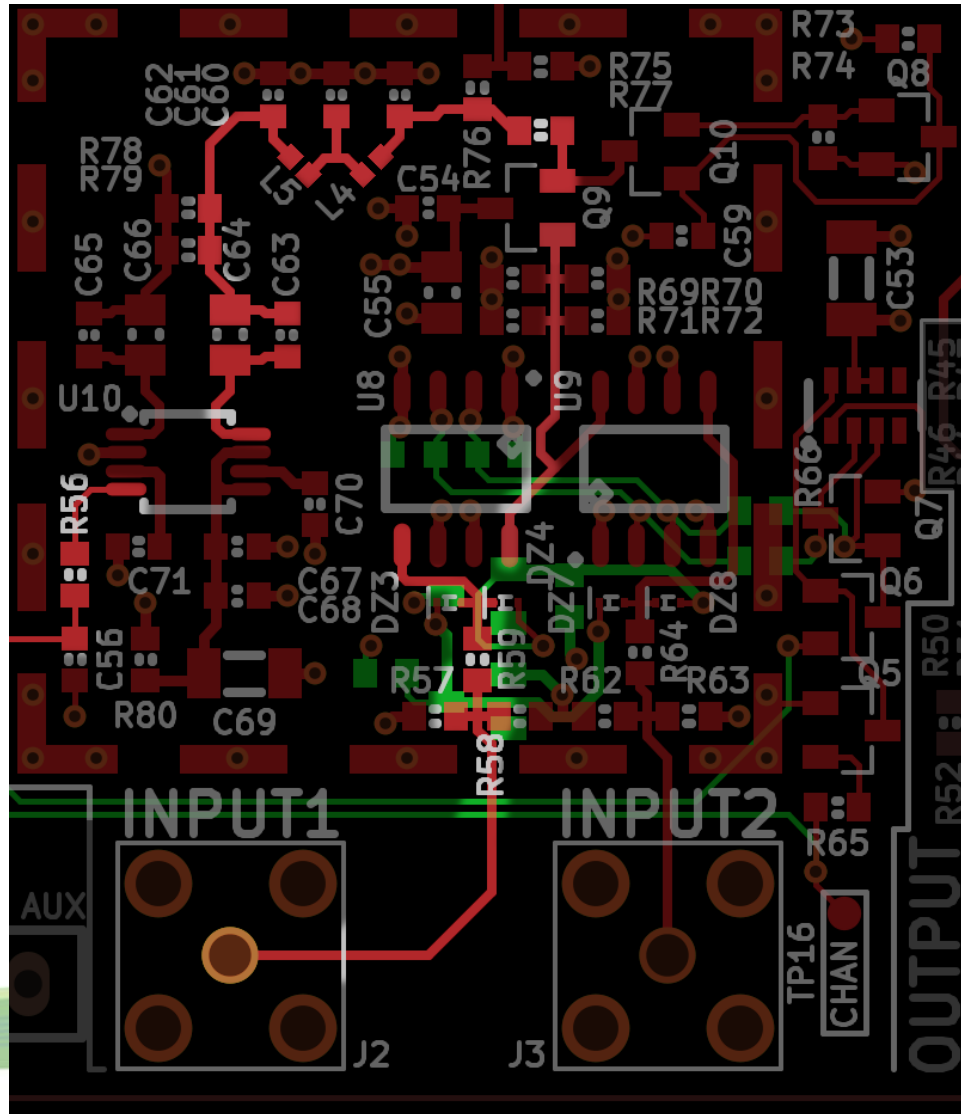
Design — PCB

Output Power Amplifier



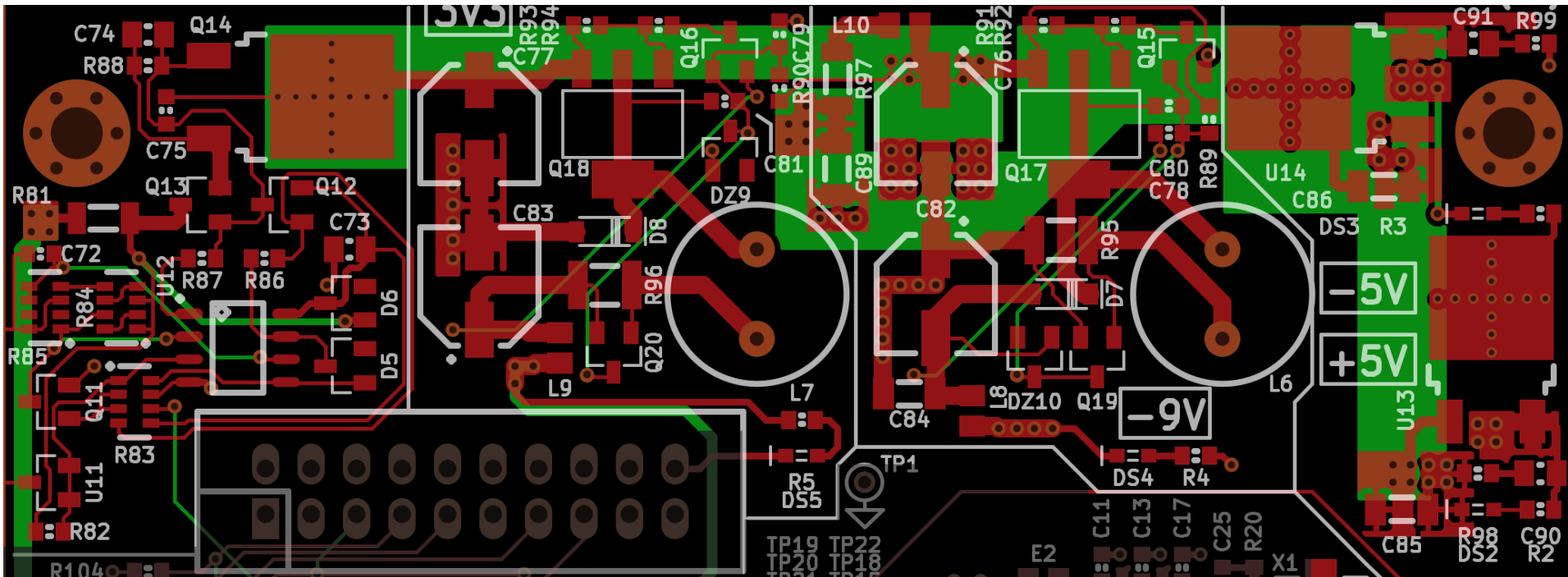
Design – PCB

Input Frontend and Detection



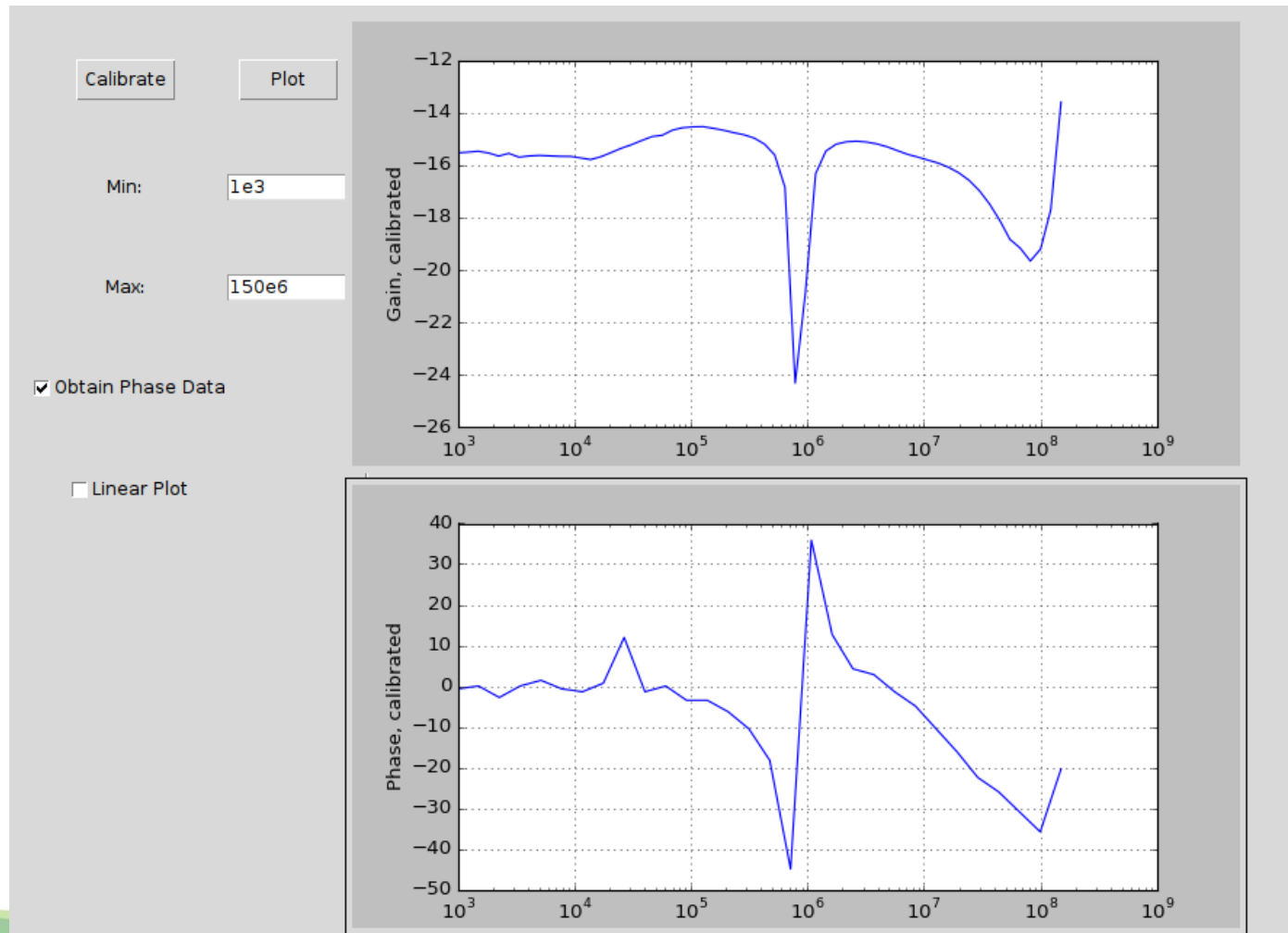
Design — PCB

Power Supply



Design

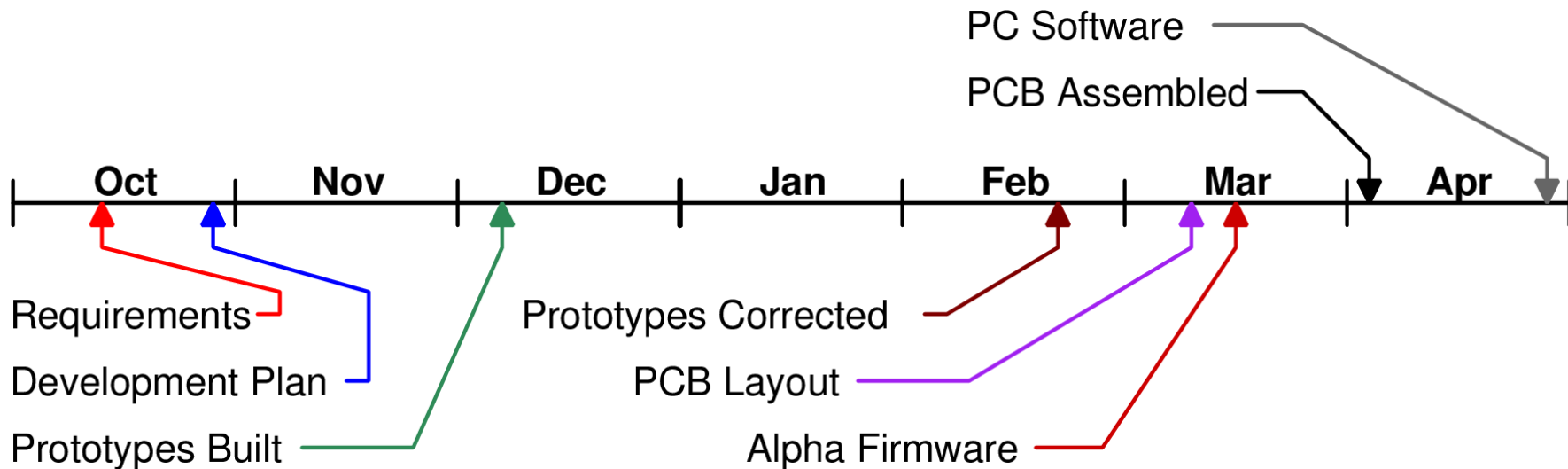
GUI



Schedule

Item	Completed
Specification	October 17, 2014
Development plan	October 31, 2014
Prototypes built	December 5, 2014
<i>Interim</i>	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

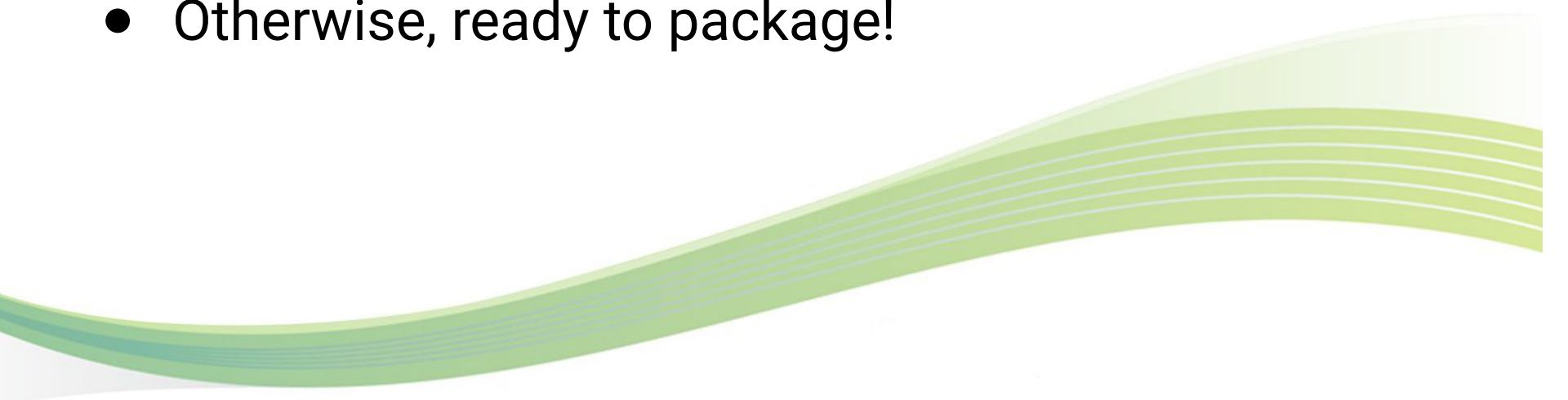
Timeline




Budget

Item	Expended	Actual	Est'd to Completion	Est'd 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

Future Plans

- Hardware revision 2?
 - Remove parts to make board smaller
 - Less expensive power amplifier
 - Further software development
 - Integration with math packages
 - More robust algorithms
 - Otherwise, ready to package!
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Conclusion

- Product can capture Bode plots
 - Uses signal synthesizer, output amplifier, input front end, ADC, and microcontroller
 - Cross-platform, open-source PC software
 - All requirements met
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Demo

