

# Fast, Compact, High Strength Magnetic Pulse Generator

EE 492 Weekly Report

May 15-30

Week 14

Advisors: Mani Mina, John Pritchard, Robert Bouda  
Client: High Speed Systems Engineering Lab  
Members: Team Leader – Adam Kaas  
Team Webmaster – Gregory Fontana, Meiyong Himmtann  
Team Communication Leader – Brittany Duffy  
Team Key Concept Holder – Megan Sharp, Brandon Dixon  
Team Commissioner – Alain Ndoutoume  
Website: <http://may1530.ece.iastate.edu>

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## Weekly Summary

This week, our team spent a lot of time formatting and getting our poster to completion for the IRP panel. With our new overvoltage protection plan, meetings were held to better understand this plan. In addition, we discovered a way to “prove” we hit 500 G with a 1 microsecond pulse. Overall, this was a very successful week for our team.

## Meeting Notes

### 4/15 Poster Meeting

**Duration:** 1 hour      **Members Present:** Brittany, Adam, Meiyong

**Purpose and Goals:** Update each other on poster changes. Continue formatting.

**Achievements:** All purposes and goals were met with the deadline in mind to have the poster completed by Sunday night.

### 4/15 Overvoltage Protection Meeting

**Duration:** 1 hour      **Members Present:** Brandon

**Purpose and Goals:** Better understand our overvoltage protection plan, and discuss questions the panel may ask us.

**Achievements:** Learned there may be a flaw with the LED branches of the overvoltage protection, discussed the ramifications and whether it's necessary to fix.

### 4/16 Group meeting with Core Members

**Duration:** 1 hour      **Members Present:** All

**Purpose and Goals:** Give update to poster design. Know where we're at with testing.

**Achievements:** Let everyone know we will be testing the circuits.

### 4/17 Proving we hit 500 G

**Duration:** 1.5 hours      **Members Present:** Adam, Greg, Brittany, Megan

**Purpose and Goals:** Perform testing on the circuit using the FLM material to show our theoretical calculations are accurate with our actual measurements. Use this data to affirm we can achieve 500 G.

**Achievements:** Performed tests using Coil C.

Coil C

200 G achieved with these parameters:

# of Turns 5

Length 6.30428 mm

Radius 7.62 mm

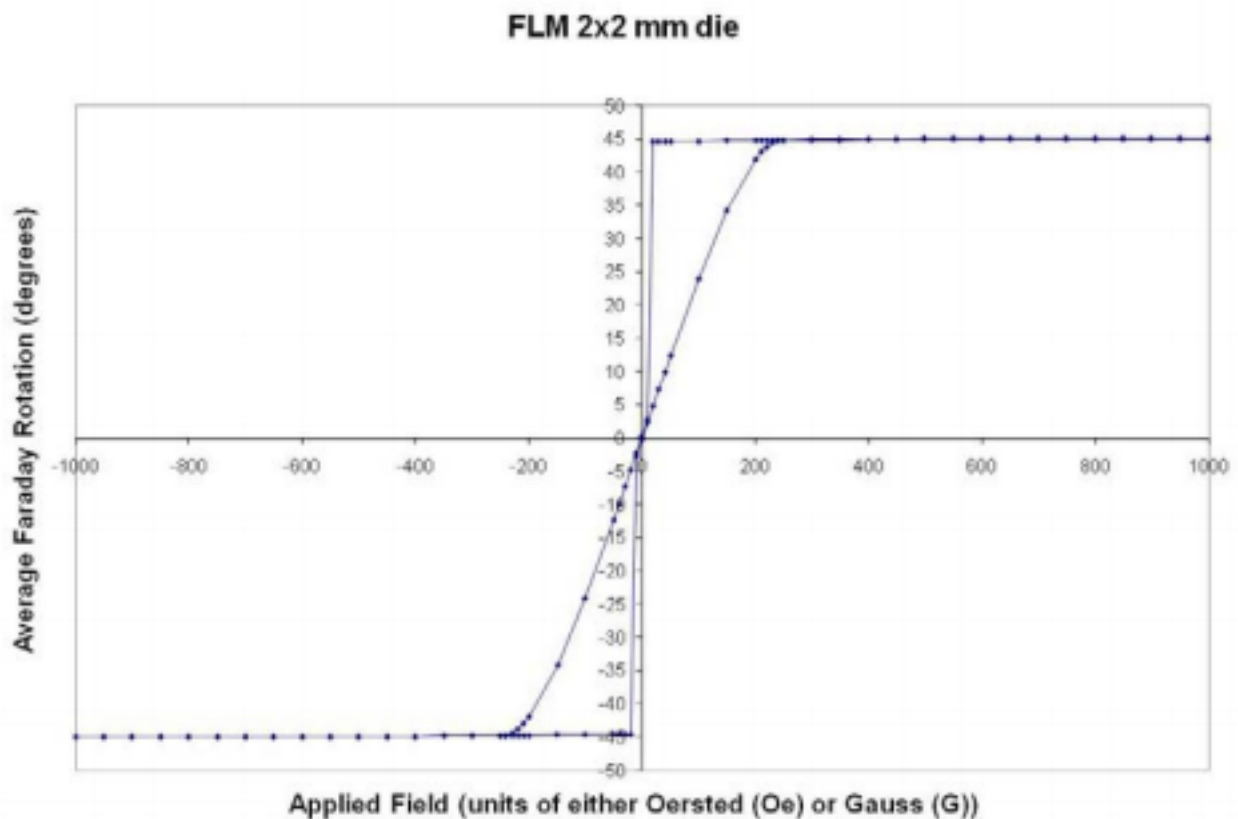
Wire 0.89154 mm

Fin Radius 6.72846 mm

Amps 47.3022

Data uploaded to Senior Design II > Testing > 4-17 Testing in Google Drive.

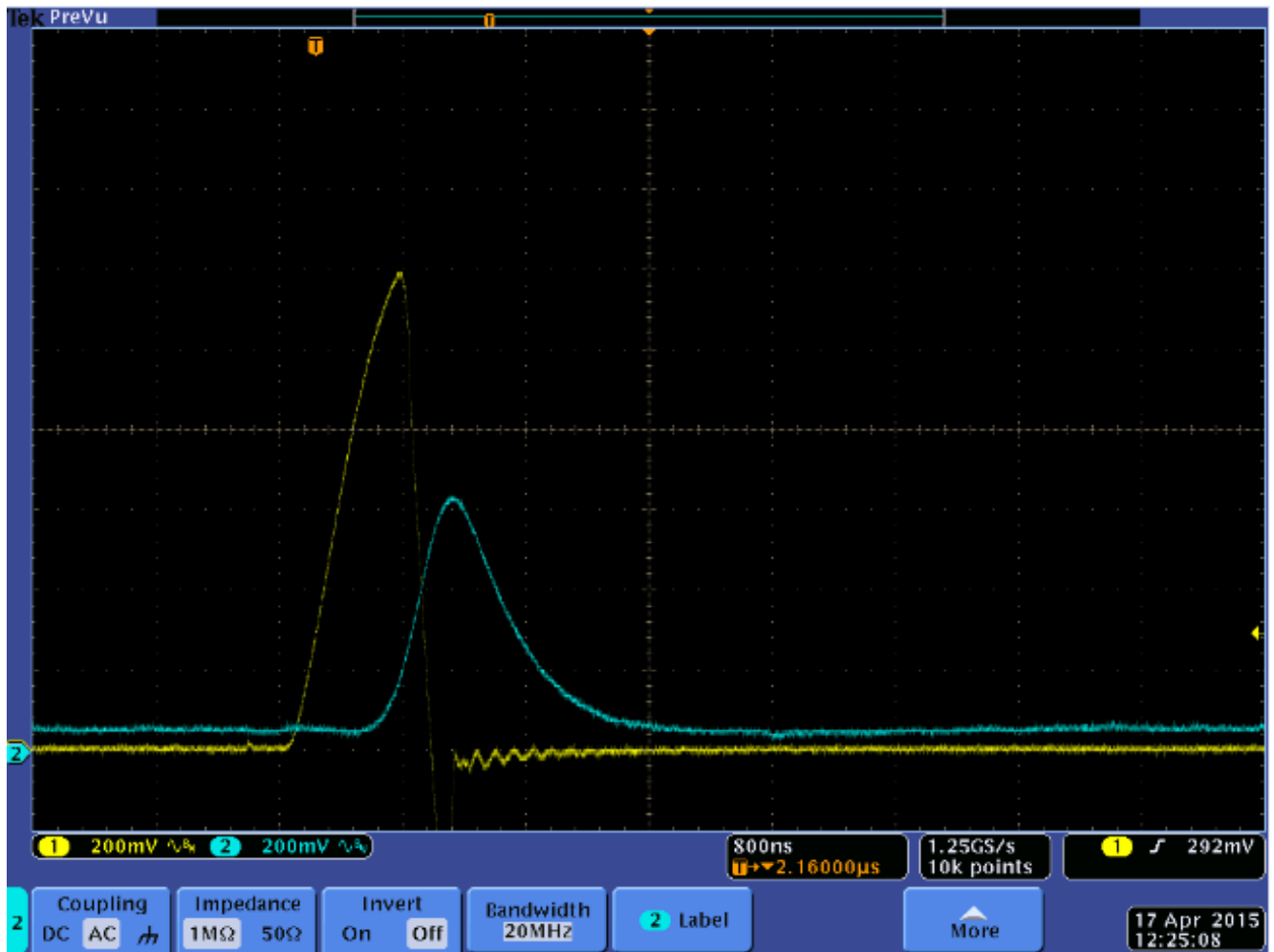
To perform the test, we wanted to see when the FLM material (Saturation point of 225 G) would reach saturation. We began by setting the pulse voltage to 2 V and increased the voltage by 0.1 V until the optical material became unstable by reaching saturation.



Hysteresis Curve of FLM material.

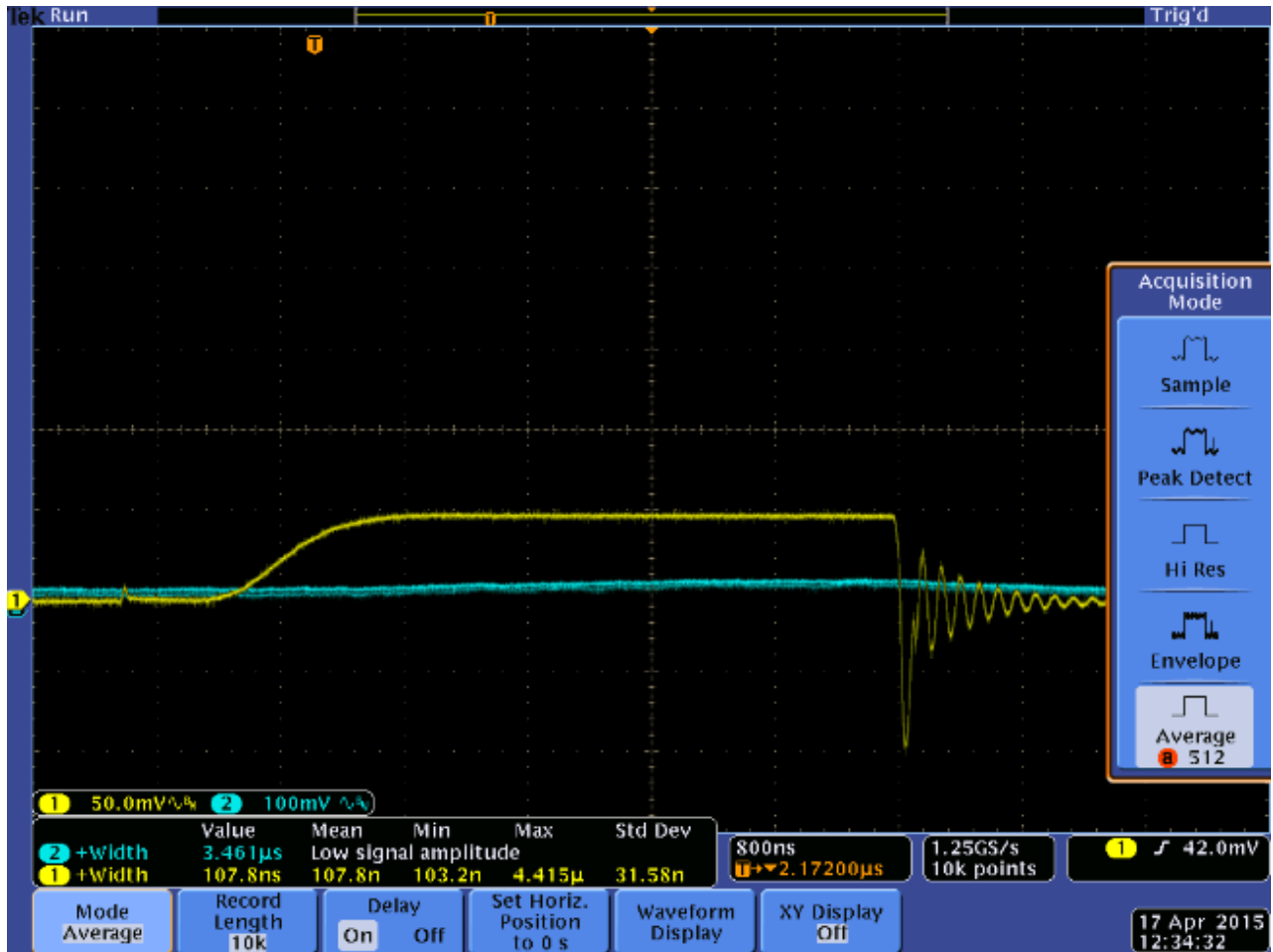
As shown in the Hysteresis Curve above, the increase in Average Faraday Rotation is quite linear to the increase in the applied magnetic field up to approximately 200 G before it reaches saturation at 225 G per the datasheet provided by Integrated Photonics.

Our O-Scope was measuring the voltage signal measured on the current sense resistor at Port 1 and measuring the optical signal voltage at Port 2. (Get figure from John for new setup with amplifier)



TEK0000 (Demonstrates less than 1us pulse)

In the photo tek0006, we changed the scale on the electric pulse. In the photo tek00008 we changed the scale on the optical signal. In the photo tek0011 we observed that the MO material became unstable.



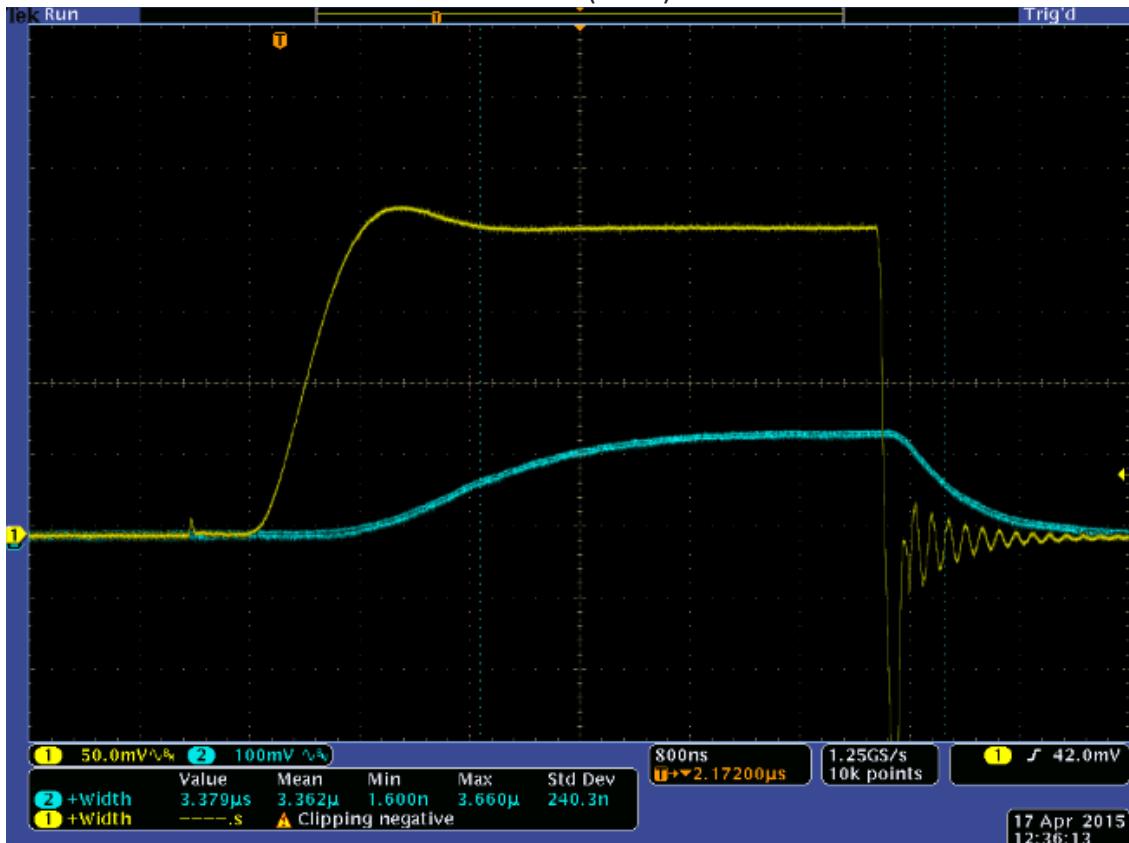
TEK0001 (2.0 V)



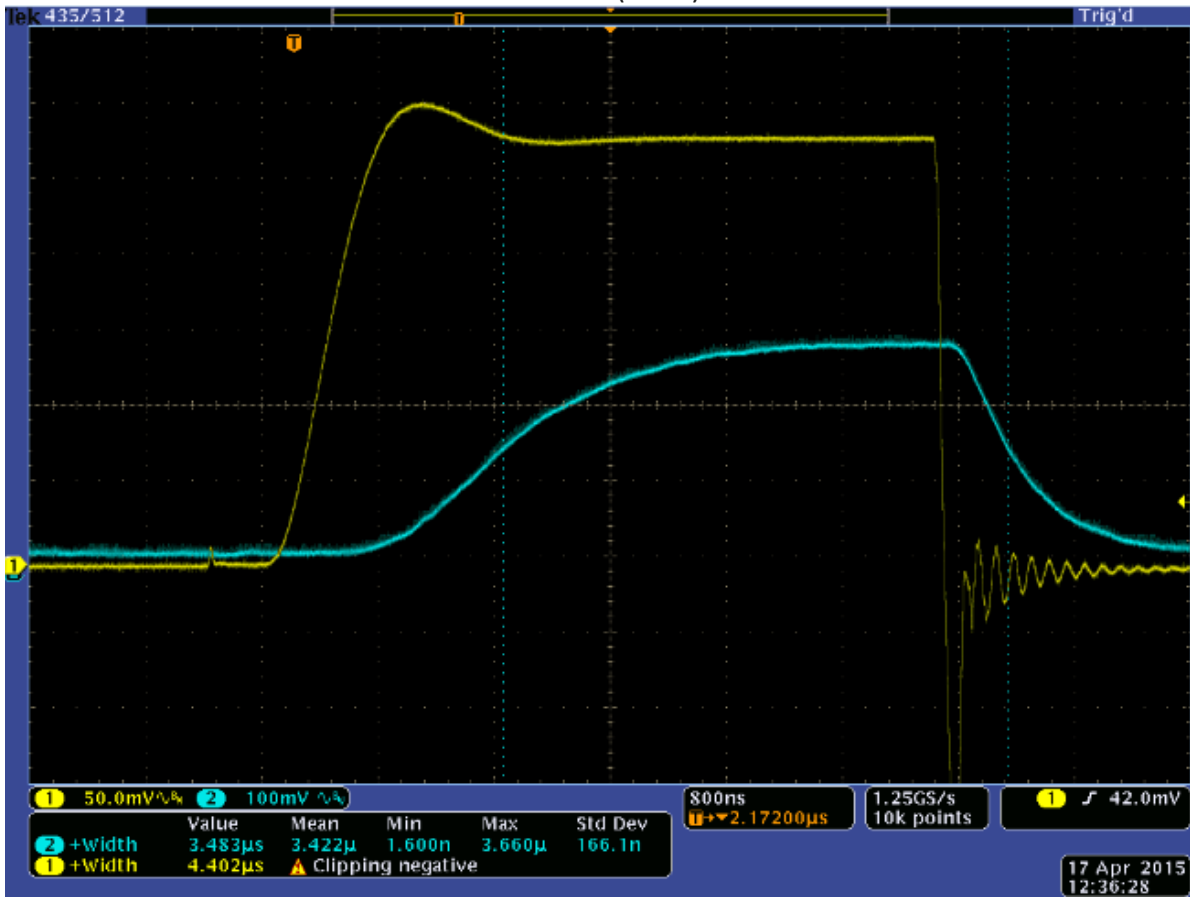
TEK0002 (2.1 V)



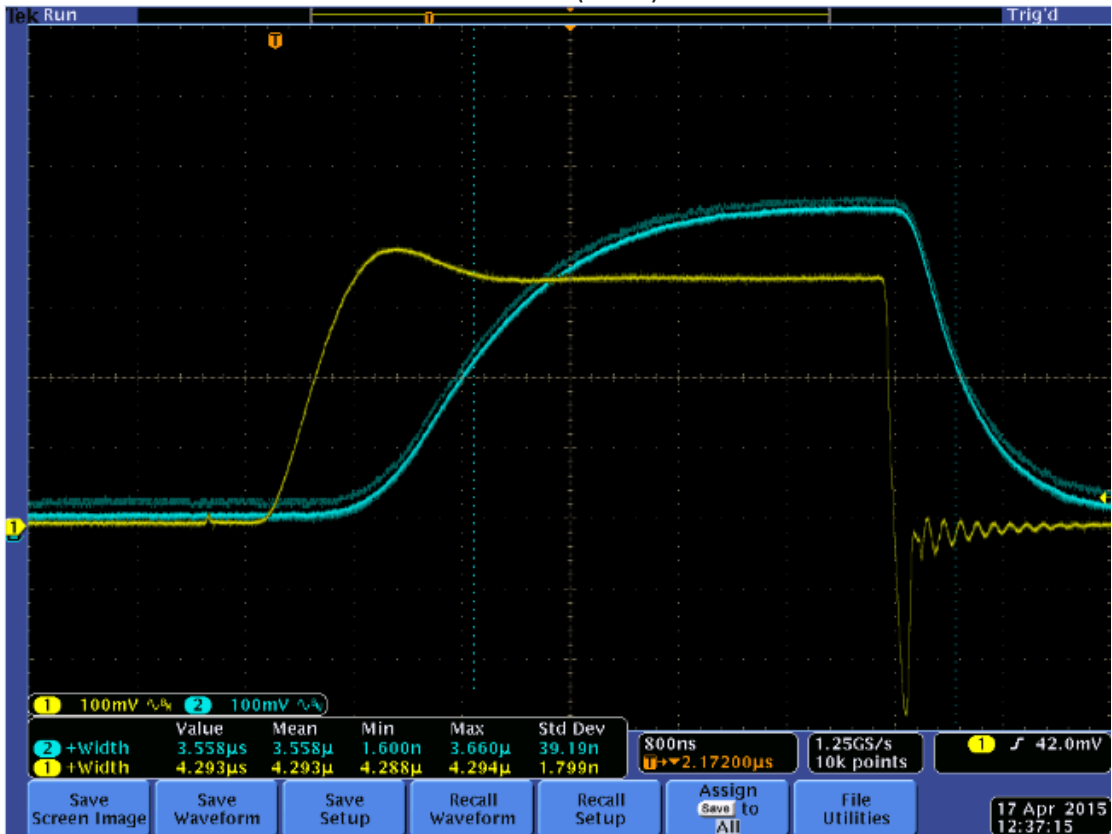
TEK0003 (2.2 V)



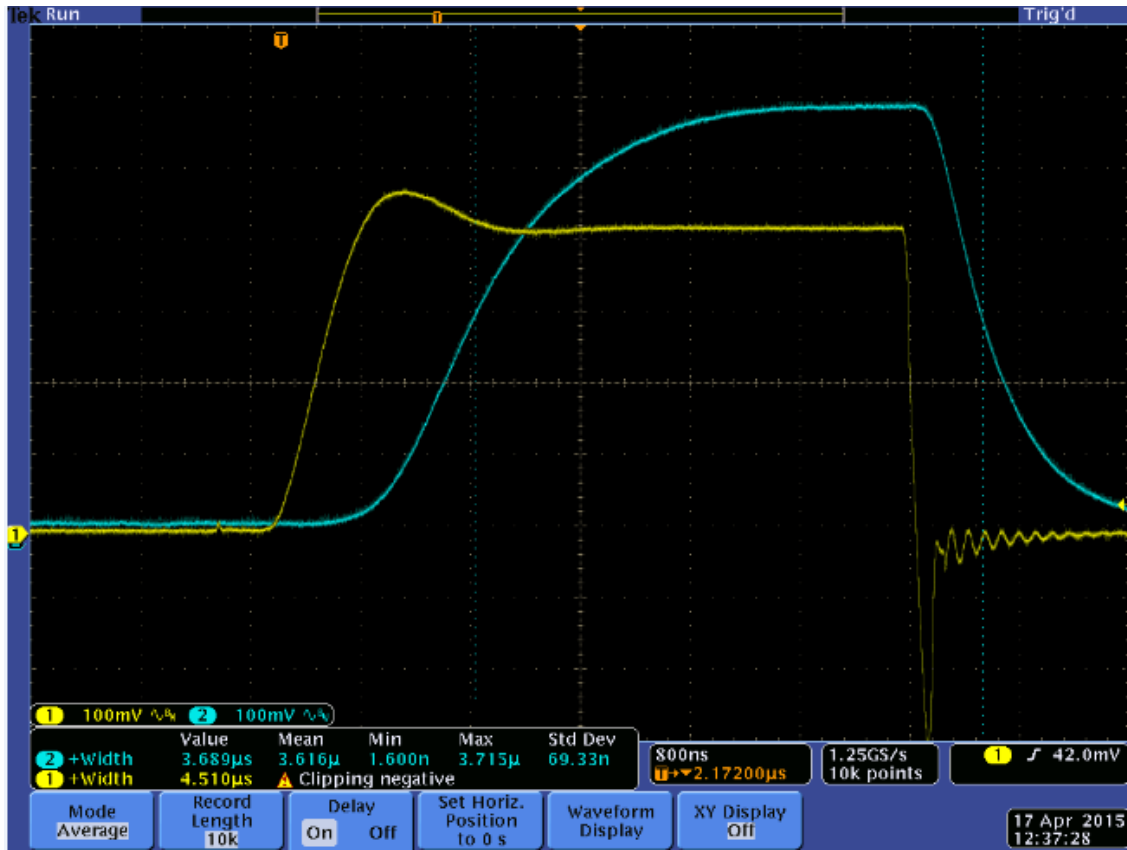
TEK0004 (2.3 V)



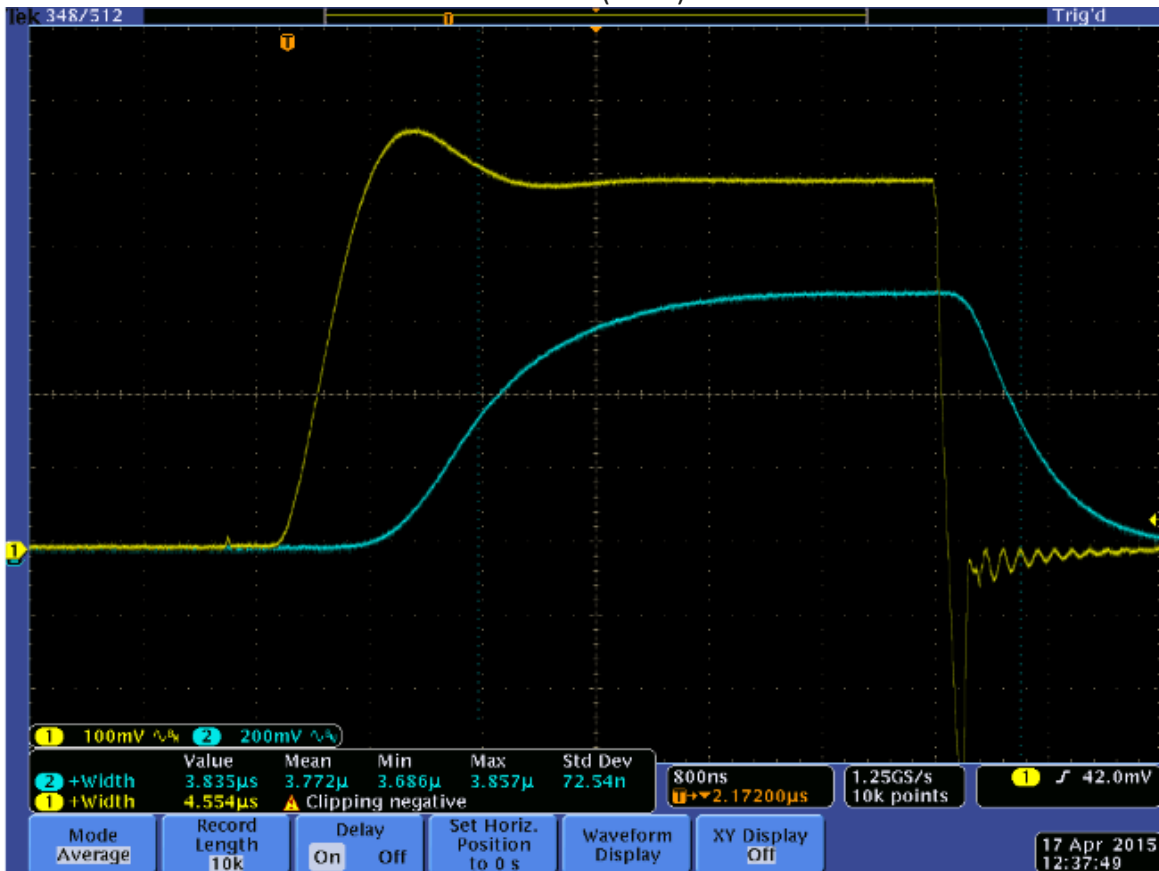
TEK0005 (2.4 V)



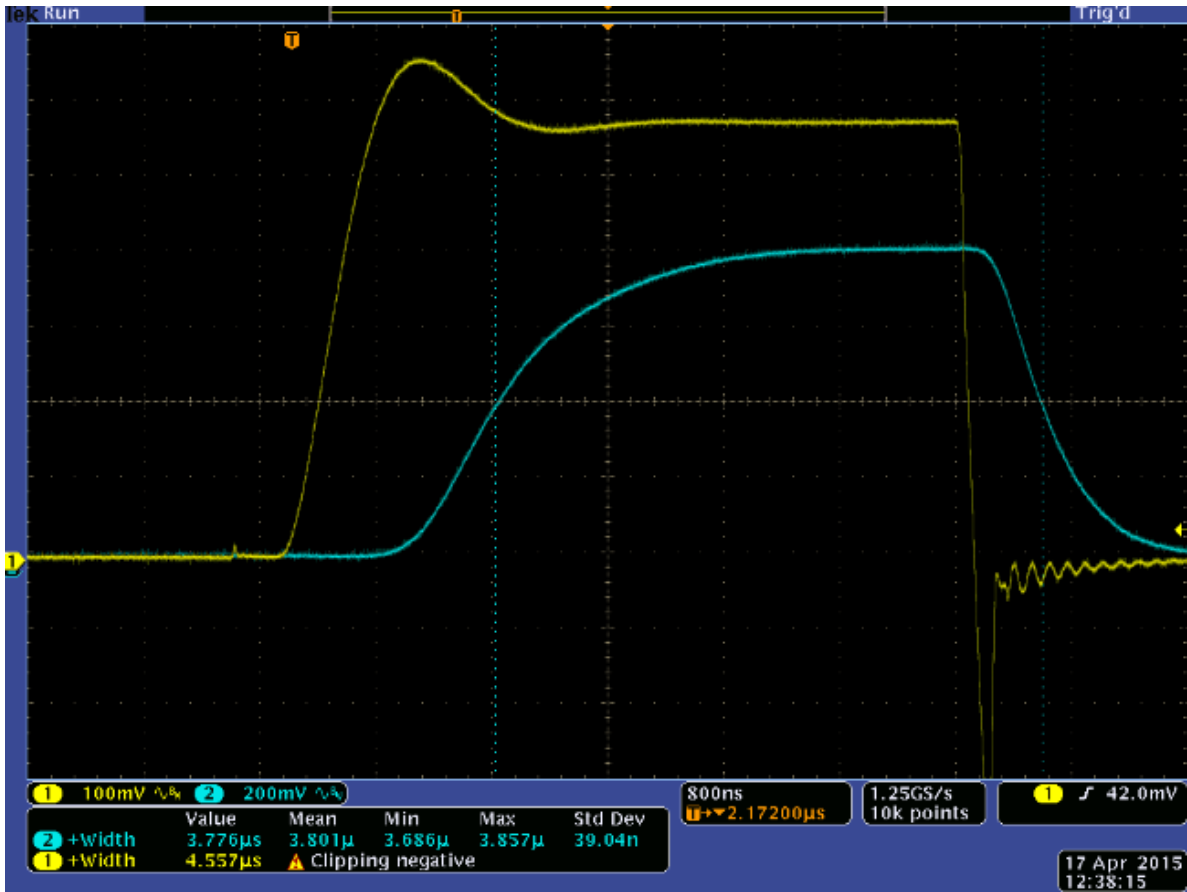
TEK0006 (2.5 V)



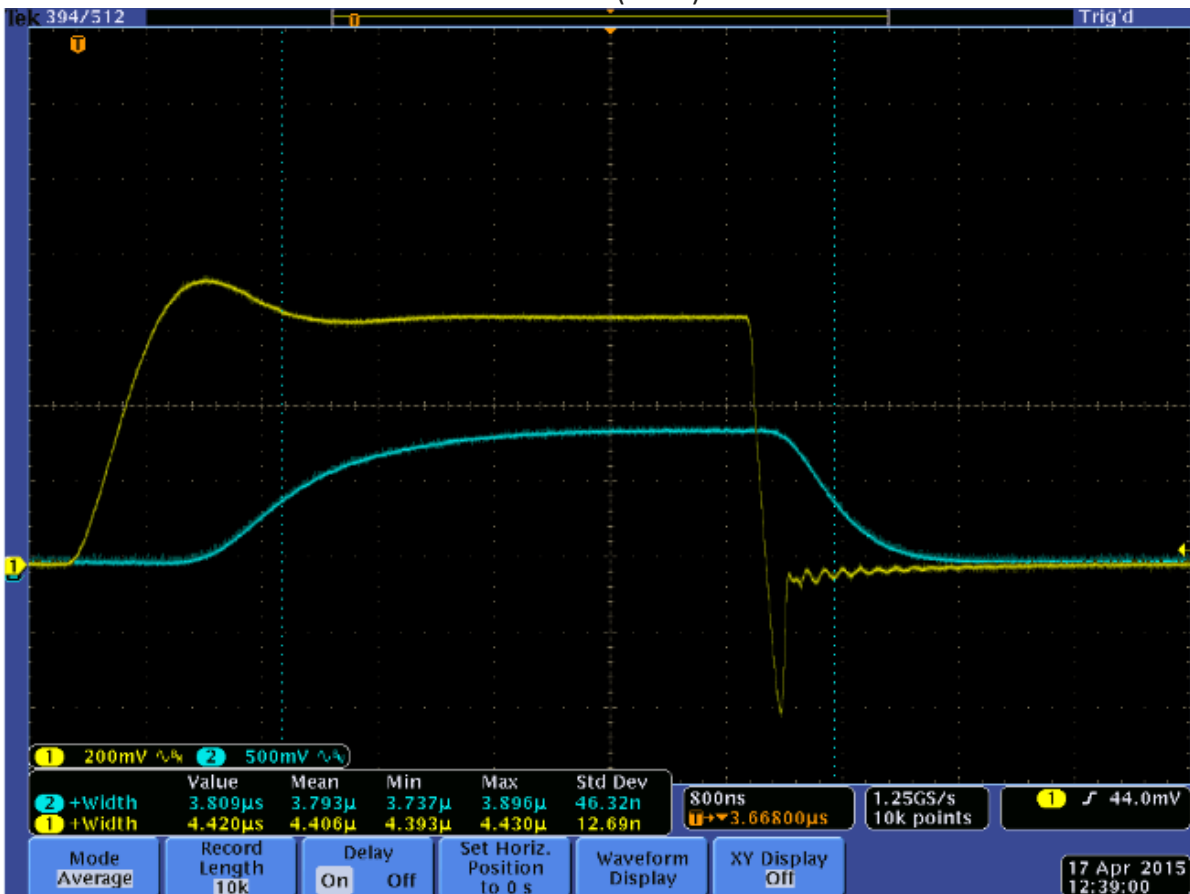
TEK0007 (2.6 V)



TEK0008 (2.7 V)

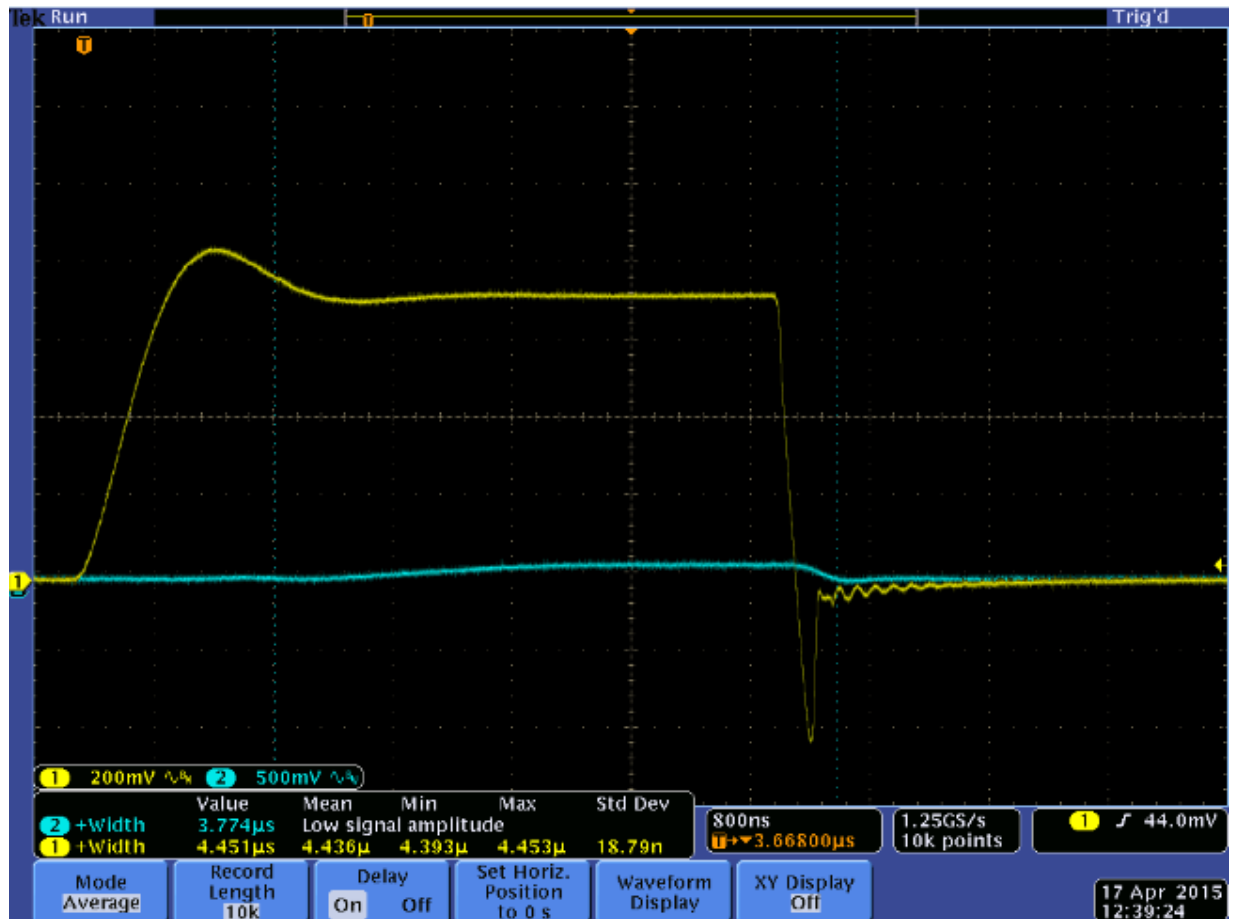


TEK0009 (2.8 V)



TEK0010 (2.9 V)





TEK0011 (3.0 V)

## Pending Issues

N/A

## Plans for Next Week

**Adam:** Work on final document. Test overvoltage protection with Brandon.

**Greg:** Work on final document. Enjoy life.

**Meiyong:** Work on final document.

**Brittany:** Organize documents in our Google drive. Set deadlines for final document. Test overvoltage protection with Brandon.

**Megan:** Work on final document.

**Brandon:** Finalize user guide, help on final document, test overvoltage protection.

**Alain:** Work on Final Document, Ordering parts that we are running out of, Preparing for presentation.

## Individual Contributions This Week

**Adam:** 4/15 Poster Meeting (1 hr), 4/16 Core Team Meeting (1 hr), 04/17 Meeting in Client's Lab (1.5 hrs), Write up 4/17 Data/make calculations (1.5 hrs)

**Greg:** 04/17 Meeting in Client's Lab (1.5 hrs), Core team meeting (1 hr)

**Meiyong:** Work on poster layout (2 hrs), 4/15 Poster Meeting (1 hr), 4/16 Core Team Meeting (1 hr), Completely populate a board (1.5 hrs)

**Brittany:** 4/15 Poster Meeting (1 hr), 4/16 Core Team Meeting (1 hr), 4/17 Meeting in Client's Lab (1 hr), weekly report write-up (0.5 hrs), getting Greg and Megan to write their weekly reports (.25 hrs)

**Megan:** 04/17 Meeting in Client's Lab (1 hr), 4/16 core team meeting (1 hr), Discussing resistance with John and getting the MATLAB programs onto my computer for the Client meeting (1hr), starting on my part of the design doc (1 hr)

**Brandon:** 4/15 Overvoltage meeting (1 hr), 4/16 core team meeting (1 hr), updating user guide, schematic, and layout for finals doc (1.5 hrs)

**Alain:** Core Team (1hr), Kept in touch with Lee, ordering new parts and missing parts (0.5hr), Reflow soldering circuit board(1hrs)

### **Total Contributions for Project (This Week / Total for Semester)**

**Adam:** 5 hrs / 49.5 hrs

**Greg:** 2.5 hrs / 40.5 hrs

**Meiyong:** 5.5 hrs/ 41 hrs

**Brittany:** 3.5 hrs / 42.5 hrs

**Megan:** 4 hrs / 32.75 hrs

**Brandon:** 3.5 hrs / 45 hrs

**Alain:** 2.5 hrs / 42.5 hrs