

Fast, Compact, High Strength Magnetic Pulse Generator

EE 492 Weekly Report

May 15-30

Week 12

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>

Weekly Summary

This week, our team has been working hard to achieve 500 gauss in order to affect the MO material in our client's configuration. We are still looking for the best coil design with the hopes of hitting 500 gauss by the end of next week.

Meeting Notes

03/31 Meeting with John

Duration: 1 hour **Members Present:** Adam

Purpose and Goals: Test the Helmholtz coil with our circuit to see if the magnetic field is strong enough to affect the MO material.

Achievements: Discovered that the Helmholtz coil will not work with John's setup. The coil takes up too much space. John suggested using a smaller gauge with more turns (he suggested 16). I discovered that with the current gauge (approximately 18) we could make 7 turns and have it fit with his setup. After the meeting, I used a much smaller gauge (approximately 38) and made a 16 turn coil that is currently cured to the wooden rod I used for forming the coil. Megan will assist me in removing it. I also obtained a gauge somewhere in between 18 and 38 (not 100% sure, maybe 24?) that is less flimsy than the 38 gauge but much smaller than the 18.

04/01 Meeting with John

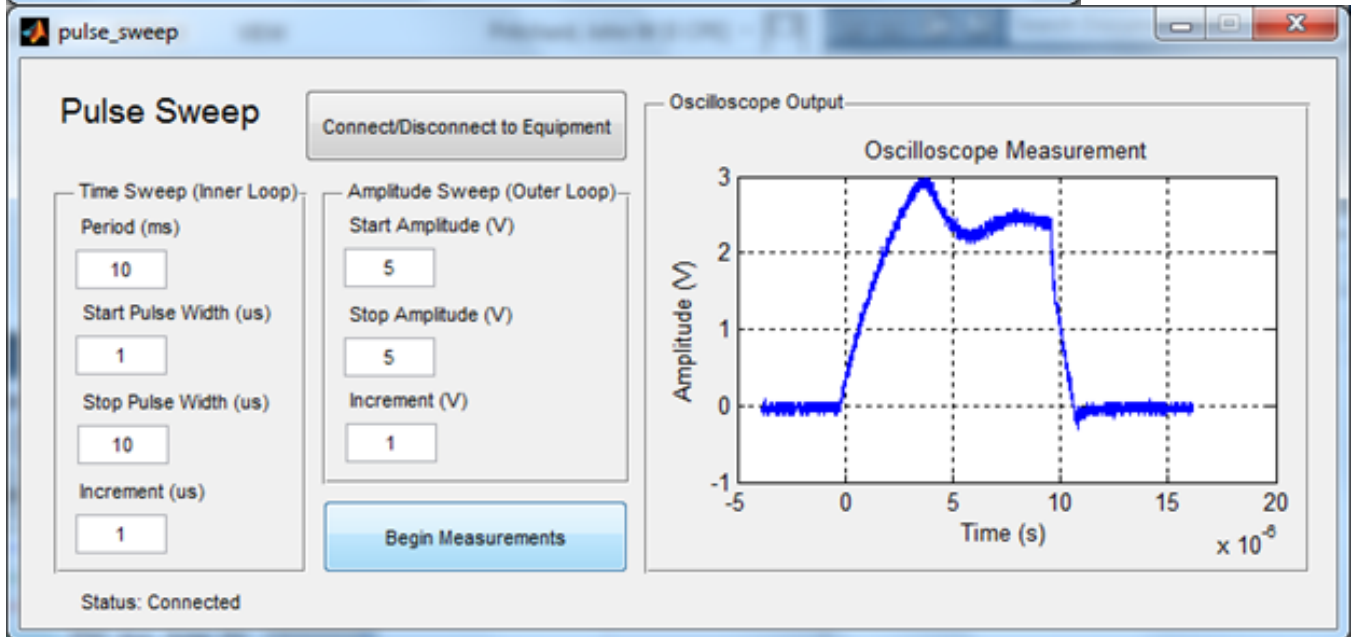
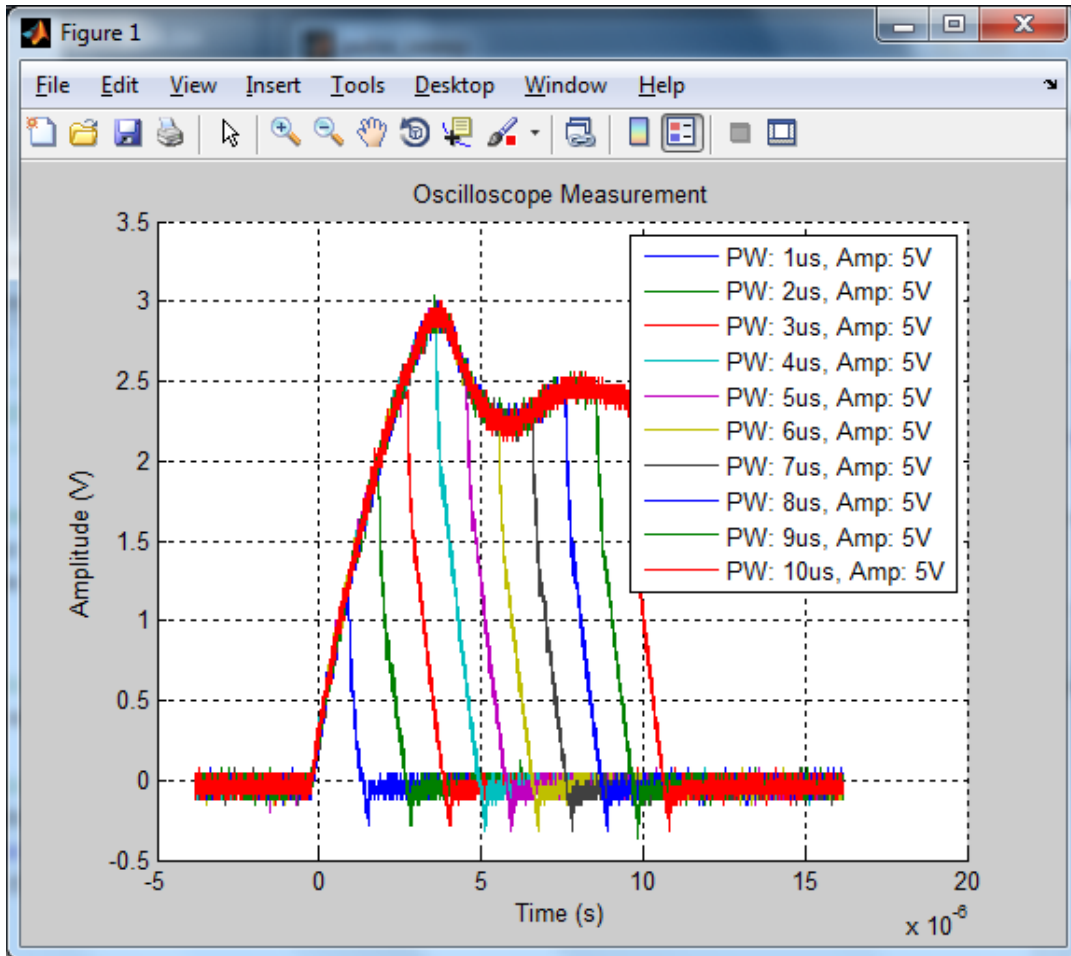
Duration: 1.5 hours **Members Present:** Adam

Purpose and Goals: Test the new wire I obtained.

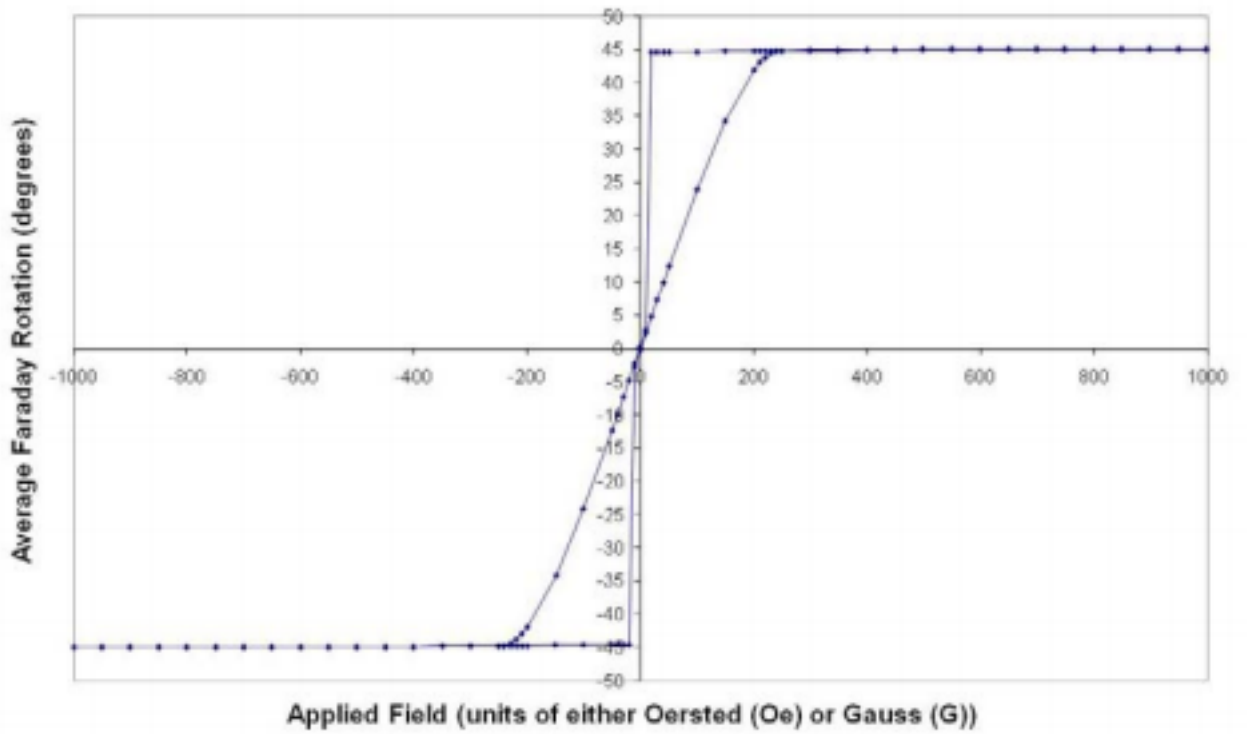
Achievements: I made a 12 turn coil using this medium gauge wire and began to perform tests. The voltage graph with the MATLAB setup are shown in the pictures below. You can see the level off voltage is approximately 2.5 V which gives us only 50 A of current. Unfortunately I had a strong indication before even beginning testing that it wouldn't be successful. The rise time of this coil was also way too long at approximately 4 μ s for just the rise time.

John and I also attempted to use a new material for the MO material. We were previously using the [BIG \(Bismuth-doped rare-earth Iron Garnet\) MGL Latching Faraday Rotator](#). We switched to the [BIG \(Bismuth-doped rare-earth Iron Garnet\) FLM Low Moment Faraday Rotator](#). The difference between the two are the MGL latches into place when the required magnetic field is met. The FLM changes based on the magnetic field so as the magnetic field increases, the direction will change with it. However, after a certain point you reach saturation (225 Gauss)

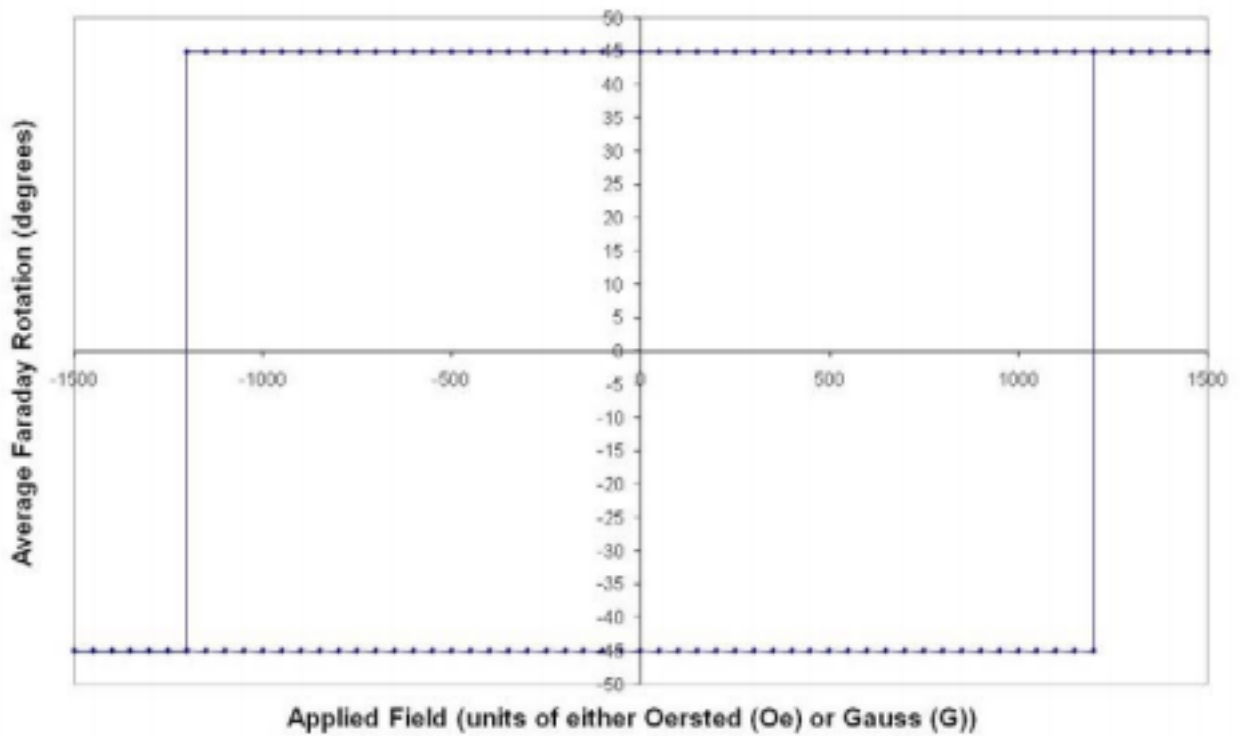
which John and I observed. I haven't figured out how we will use this data effectively yet. Below are two photos showing the hysteresis graphs of the FLM and MGL respectively.



FLM 2x2 mm die



MGL 2x2 mm die



04/03 Meeting with John

Duration: 1 hour Members Present: Alain

Purpose and Goals: More testing to our circuit to have a broader understanding of it.

Achievements: I set up our circuit in John Lab to test the voltage across the coil. We tried to compare how the rise time of our Vgs and our Voltage across the coil to see how they are different. We compared the rising time of both voltages on the oscilloscope. We also noticed two spikes on the Voltage across the coil when the Vgs changed, we had a positive spike and a negative spike on the Vcoil graph(Voltage across the coil). I did not finish the testing to the lack of time but I would continue to work on it next week and post my final results with graphs.

Pending Issues

N/A

Plans for Next Week

Adam: Work on the poster with Brittany.

Greg: Help where needed.

Meiyong: Help Brittany with the poster, work on final document.

Brittany: Begin poster layout, design, and content. Stick time into working on final document. Continue testing of circuit.

Megan: Meet with John about resistance, final design doc, and get the right coil by testing.

Brandon: Take pictures of components and PCB for user guide and final documentation.

Alain: Record a video of prototype fabrication process on protomat S62, Work on final document, (and poster if needed), keep on working on more testing of the circuit.

Individual Contributions This Week

Adam: 03/31 Meeting with John (1 hr), 04/01 Meeting with John (1.5 hrs), Team Meeting (0.5 hrs).

Greg: team meeting (0.5).

Meiyong: Team meeting (0.5 hrs), website updates (0.5 hrs).

Brittany: Team meeting (0.5 hrs), weekly report (0.5 hrs).

Megan: Team meeting (0.5 hrs), double checking coil calculations to see if there is any way we can theoretically get the right coil and work on making small coil (1 hr).

Brandon: Worked on User Guide (2.5 hrs), team meeting (.5 hrs).

Alain: meeting with team(0.5hr), 04/03 More testing on the circuit in John lab with John, measured the voltage across the coil, made plan to do more testing(1hr).

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

Adam: 3 hrs / 40.50 hrs

Greg: 0.5hrs / 36 hrs

Meiyong: 1 hr / 29.75 hrs

Brittany: 1 hr / 33.5 hrs

Megan: 1.5 hrs / 26.75 hrs

Brandon: 3 hrs / 38 hrs

Alain: 1.5 hrs/ 36.25 hrs