# EE 491 Weekly Report

Week 7: 10/7-10/13

**Group:** *May14-03* **Advisors:** *Dr. Sumit Chaudhary, John Carr* **Client:** *ISU NanoLab*

**Members:** *Andersen, Martin; Diallo, Mouhamadou; Rodriguez, Nicholas; Straquadine, Joshua (Leader)*

**Project Title:** *"Design and implementation of cryogenic current measurements on organic photovoltaic cells"*

## Weekly Summary

This week we did more work on our Project Plan, took measurement of our setup and built a 3D model, built a prototype cold-trap and finally began characterizing our new parts. Now that those parts finally came in, we can really begin testing, characterization, and moving forward with the design.

## Meetings

### 10/7 Lab Meeting

**Duration:** *2 hours* **Members Present:** *All*

**Purpose and Goals:**
Attempt again to characterize the heating and cooling rates in the system and to further test the old thermistors

**Achievements:**

- We found that our measurements for the thermistor resistance were very different for similar temperatures, but weren't sure why. We ended up spending more time trying to figure out the thermistor than actually looking at the heating and cooling rates. This made our need for those new parts very obvious.

### 10/10 Lab Meeting

**Duration:** *2 hours* **Members Present:** *Joshua and Mouhamadou*

**Purpose and Goals:**
Gather physical measurements of the cryo chamber so that we can set up some simulations, and determine the necessary dimensions for the cold trap.

**Achievements:**

- The measurements were fairly easy to take, and the model was simple to design after that We now have an accurate 3D model.
- We determined that our aluminum foil and Styrofoam cup prototype for the cold trap would indeed fit very well in the system, which will be a good first step in testing the efficacy of a cold trap. We proved that we can place the cold trap in the system and still measure resistance of a thermistor, though we didn't have enough time to change the temperature at all.
- Determined that the vacuum chamber walls are much thinner than we thought

### 10/12 Lab Meeting

**Duration:** *6 hours* **Members Present:** *Joshua, Mouhamadou, and Nicholas*

**Purpose and Goals:**
We got our new parts in! The purpose of this meeting was to characterize our new thermistor device and to explore the operation of the cryostat below 200 K (the limit of the old thermistor).

**Achievements:**

- Got the new thermistor on a glass slide with copper contacts so we could test it in the existing setup

- Ran a large-scale temperature test from 300 K to 80 K in 20 K increments, soaking for 10 minutes at each interval
- Determined the limit temperature of our given setup—we couldn't get the cryostat below 90 K (at least not within our time constraints for the day) and the thermistor hit the wall at about 107 K.

## Pending issues

Getting those parts in cleared up most of our complaints and frustrations. We're currently doing very well and have a clear path forward. Our biggest issue overall is finding materials in the lab we're working in; for instance, we couldn't find any copper tape or a soldering iron, though we knew we needed them to build our thermistor setup. The grad students in the area are always helpful, but they don't always know where things are either. In the end, we spend a lot of time trying to find materials and not much time actually making progress. As we get more used to the lab space at the MRC we're sure those issues will improve.

## Plans for next week

Now that we have a baseline, we can start implementing our improvements. We hope to run some thermal simulations to find what would be the best place to start, and to finish building our cold-trap so that we can make some more full-scale runs next weekend.

## Individual Contributions

- Andersen, Martin: Attended the meeting, worked on Project Plan (3 hr)
- Diallo, Mouhamadou: Attended the meetings, experimented with new thermal pad, took measurements of system, edited Project Plan (9 hr)
- Rodriguez, Nicholas: Attended meetings, experimented with new thermal pad, edited Project Plan (8 hr)
- Straquadine, Joshua (Leader): Attended meetings, built 3D model, built thermistor setup, finished editing and submitting Project Plan (10 hr.)