EE/CprE/SE 491 Weekly Report

1/27 - 2/10

Group number: 38

Macro and Microscopic Ion Trap Junction Prototype for Quantum Computing

Client/Advisors: Durga Paudyal, Gavin Nop, John Smith

Ezra Manus, Robert Laskey, Calvin Mitchell, Andrew Wilken

Weekly Summary:

Over the past two weeks, we have been in contact with our advisors and clients to form a parts list to order from ETG. We plan on sending this off to ETG by the end of the weekend so that we can begin to start building our prototype design for an ion trap. There have been no changes to our project since last semester, and we are invested in sticking with our current proposed design once we begin building.

Past week accomplishments:

- Finalized design specs and formed a parts list (ongoing)
    - We are currently working on finding suitible parts for our project, which is proving to be somewhat difficult due to specificity
- Needed parts:
    - High voltage coil transformer: 110-120V, 50-60Hz AC input and up to 2kV 50-60Hz output. Actual requirement for the system ***should*** be 500V, but the extra headroom has been encouraged by our client due to the lack of knowledge or expectation of how our system is going to work.
    - Variac/Voltage regulator: Needed to control the output of the transformer; we have found options for this already and believe we can acquire one easily.

- Copper plates for electrodes: Found on amazon, we need 6”x1” thin copper plates to serve as electrodes. The power will be soldered directly to these plates.
- 3D printed parts for constructing the system and mounting the electrodes: Needs to be designed and printed on campus; we need to finalize our other parts before we can make the mounting hardware so that we can be sure on sizing and other constraints we may not yet be aware of.

Work breakdown table:

Name	Individual contributions	Weekly hours	Cumulative hours
Robert Laskey	Researched sources for copper electrodes; looked into ways of wiring our system to avoid electrode cross-talk and overheating issues	6	6
Ezra Manus	Worked on reading two papers that our advisors and client published which is the key inspiration for this prototype design. Also did some more research on the charge-to-mass ratio.	6	6
Andrew Wilken	Researched sources for dealing with high voltage charged electrodes. Compiled proper insulation and grounding techniques to stay safe during testing.	6	6
Calvin Mitchell	Researched sources for high-voltage coil transformers to provide power to our electrodes as well as different variacs/variable voltage regulators to aid in testing of our system	6	6

Plans for the upcoming week:

Send out our parts list to ETG, hoping it will arrive within the next two weeks. We also plan on meeting with our client/advisors to discuss final design specifications and logistics. One last

thing we should finalize before the end of the week is getting in contact with someone from MRC to occupy a space in the building to work on constructing the prototype.

Summary of weekly advisor meeting

During our meeting with our client/advisors, the following were discussed:

- Size of the prototype.
    - We must be conscious of this because the field effect will vary depending on the trap structure's size (copper plate.)
    - We came up with the decision that the size should be a little larger than a phone.
- We will need a couple hundred volts to make the trap work, which is kind of a relief because we expected that we would need a high-voltage generator supplying around 3kV. Since we don't need that much, the cost of purchasing a high-voltage generator will be lower than expected.
- Need to be cautious about the prototype getting too hot.
    - Copper should work fine, but aluminum could be dangerous…
- The top layer is critical
    - Electrodes will be on the bottom of the panel
    - One unit of guiding electrodes for both top (lower copper plate) and bottom (upper copper plate)