

EE/CprE/SE 491 WEEKLY REPORT 03

10/7/19 – 10/20/19

Group number: sdmay20-11

Project title: Design of a Charge Measurement Device

Client &/Advisor: Jacob Starr/ Long Que

Team Members/Role: Nicholas Wolf – Scribe, Internal Meeting Facilitator – Daniel Frantik, External Meeting Facilitator – Brandon Degelau, Test Engineer – Ben Buettner, Chief Engineer – Keagan Plummer, Report Manager – Colin Ishman

- **Weekly Summary:** After talking with the client, we decided to have half of the group investigate purchasing a High Voltage DC power supply. We were unable to find one at Iowa State and the client suggested using our budget to purchase one. The other half of the group focused on finishing the research of circuits to implement our charge measurement device.
- **Past Week Accomplishments:**
 - Power Supply options
 - XP Power Glassman Fj1P120 – quote pending
 - Provides a voltage and current suitable to this project
 - EL 9000 DT Series – quote pending
 - Within the range requirements for our project but price could be to high
 - Charge Measurement methods found
 - Charge amplifiers
 - The charge must be transferred onto a reference capacitor. The product of the measured voltage across the reference capacitor and the reference capacitance value yields the measure of the charge.
 - Two main types of charge amplifiers: *Shunt* type and *feedback* type arrangements
 - In both arrangements, there is a source capacitor and a reference capacitor. For the *shunt* arrangement, the charge is proportional to the output voltage and the sum of the source and reference capacitances. For the *feedback* arrangement, the charge is proportional to the output voltage and the sum of the source capacitance and the amplifier gain times the reference capacitance (Measured charge $\propto (C_s + A \cdot C_r)$).
 - [Academic article on charge measurement](#)
- **Pending Complications:**
 - We are having trouble getting companies to give us quotes with power supplies. We have filled out quotes with multiple companies and attempted to call multiple companies. They have not responded at this time. Many of the power supplies on Digikey and similar sites either don't provide the voltage we need, or it would consume most of our budget.
- **Individual Contributions:**

<u>Name</u>	<u>Contributions</u>	<u>Hours this Week</u>	<u>Hours Cumulative</u>
Keagan Plummer	Researched potential High Voltage power sources we could purchase for testing.	12	25

Ben Buettner	Researched charge measurement devices, thought of pros and cons of the circuits we found last week	13	25
Nick Wolf	Researched charge measurement devices, thought of pros and cons of the circuits we found last week	12	25
Colin Ishman	Researched charge measurement devices, thought of pros and cons of the circuits we found last week	13	25
Dan Frantik	Researched potential High Voltage power sources we could purchase for testing.	13	25
Brandon Degelau	Researched potential High Voltage power sources we could purchase for testing.	13	25

- **Plans for Upcoming Week:**

- Full group chooses a circuit to begin low voltage testing
- Build what we can of a design using parts available at the ETG
- Begin looking at parts to create the high voltage circuits