

EE/CprE/SE 492 Bi-WEEKLY REPORT 02

2/2/20 – 2/13/20

Group number: sdmay20-11

Project title: Design of a Charge Measurement Device

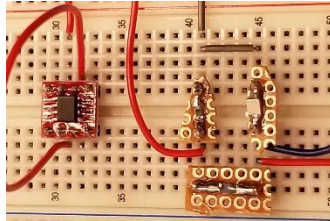
Client &/Advisor: Jacob Starr/ Long Que

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:** This week, the team focused on getting a low voltage prototype put together. Many of the components used are surface mount, so the prototype had to be soldered to a perf board. The circuit was then tested using a voltage across the capacitor. This voltage was able to simulate the charge and allow us to confirm the “charge” we measured was equal to the charge that would be expected using the equation. The team also spent time researching the remainder of the high voltage parts and discussed with a professor how to force a charge for testing.

- **Past Week Accomplishments:**

- Built the initial test circuit



- Initial testing

- Voltage divider was bringing the ratio down the expected amount
- Measured “Charge” was extremely close to the Ideal Charge

$$Q_m = C_s(V_o(t1) - V_o(t0))$$

(Equation Used for calculations and measurement)

"Shell" voltage (VDC)	Vo(t1) - Vo(t0)	Ideal Q	Measured Q	C
5	0.05625	5E-11	5.625E-11	0.000000001
6	0.05975	6E-11	5.975E-11	
7	0.07	7E-11	7E-11	
8	0.07875	8E-11	7.875E-11	
9	0.0875	9E-11	8.75E-11	
10	0.0975	1E-10	9.75E-11	
11	11.03	1.1E-10	1.075E-10	
12	12.01	1.2E-10	1.1875E-10	
13	13.01	1.3E-10	1.275E-10	
14	13.97	1.4E-10	1.375E-10	
15	14.99	1.5E-10	1.5E-10	

- Buffer output matched expected value
- These results make us believe that the circuit is working as we expected so far. The next step is to have a charge induced on the shell node
- Research High Voltage parts
 - Gas Discharge Tube
 - 2087-80-SM-RPLE
 - 800 V
 - Surface mount
 - ADC
 - AD677
 - 16-bit serial output
 - 100 kSPS
 - Serial peripheral interface (SPI)

- AD1674
 - 12-bit serial output
 - 100 kSPS
 - Parallel data interface
- Discussed methods of inducing charge on the shell with professors.
 - Large capacitor
 - Charge it up and then connect that charge to our system
 - Van Der Graaff Generator
 - Generates charge
 - Should be able to induce charge onto the shell
- **Pending Complications:**

- **Individual Contributions:**

<u>Name</u>	<u>Contributions</u>	<u>Hours this Week</u>	<u>Hours Cumulative</u>
Keagan Plummer	Researched parts for high voltage model, Talked with professor about inducing charge	12	80
Ben Buettner	Researched parts for high voltage model, Talked with professor about inducing charge, Performed initial tests	13	81
Nick Wolf	Build low voltage breadboard model, Researched parts for high voltage model	11	79
Colin Ishman	Researched parts for high voltage model, Talked with professor about inducing charge	12	80
Dan Frantik	Build low voltage breadboard model, Performed initial tests	13	81
Brandon Degelau	Researched parts for high voltage model, Performed initial tests	14	82

- **Plans for Upcoming Week:**
 - Continue testing the initial circuit.
 - Discuss all parts found and create a second parts list to get ordered for the high voltage model.
 - Begin Kicad file to create prototype for the high voltage model to be tested on.
 - Document test procedure