

Paired Project I

- **Who are the partners in this team?**

The team will consist of Danny Jammooa and Manuel Catacora

- **What are you and your partner proposing to do?**

We are proposing to explore and model the plasma theory. There are several plasma models such as single particle, kinetic, fluid, hybrid kinetic/fluid, gyrokinetic, and as a system of many particles; which we must choose from. However, we believe we will focus on Plasma Fluid Theory.

- **What area of E&M will you be conducting original calculations for?**

For plasma, the original calculations that we will be conducting about Electricity and Magnetism are solutions of equations of motion that describe the state of plasma. These equations of motion are combined with Maxwell's electromagnetic fields equations and the Navier-Stokes equations.

- **What source material are you drawing from?**

The source material we will be drawing from are papers describing the fluid model, and general science articles.

- **What has been done so far and what are you going to do? It's ok if it's a solved problem, but you will need to reproduce what has been done and extend it beyond what your reference material offers.**

Plasma is one of the four fundamental states of matter, however out of the four it does not naturally exist on earth. To better understand plasma experiments are conducted where artificial plasma is created, and mathematical models that try and explain it. The two biggest plasma mathematical models are the Kinetic model and Fluid model. The kinetic model was introduced first to explain plasma. The Fluid model was later introduced because some thought that kinetic model was too complex and hard to keep track of. So, the fluid model tries to explain plasma in terms of smoothed density and averaged velocity around each position. We hope to do an in-depth exploration of the fluid model of plasma and compare it to the kinetic model, and also explore some experimental that use the fluid model.

Paired Project II

The next five weeks will be broken down into one to two weeks of research, one week of brainstorming and outlining our project, and the last two weeks creating and polishing our presentation. The work will be split in half, where one will focus on the history, general knowledge, applications around the topic. The other will focus on the mathematical proofs behind the topic. We believe that the mathematical model and proofs behind our topic is enough material for it to equal half of the material. While we conclude the rest to be equivalent in the amount of work.

Depending on how much research needs to be done and how fast we do it. We have put aside the first two weeks for research. If we can finish it in one week then even better, however we gave ourselves two weeks as a buffer. For the first two weeks, Manuel will research about the mathematical derivation behind the fluid model and other theories that revolve around it. Danny will do research about the general description of the fluid model, experimental uses of it, and general knowledge about plasma. After one to two weeks of research, we will have a week where we will brainstorm ideas and create an outline on how we want our presentation to be set up together. After an outline is created, Manuel will start to formulate what he has learned from the research per the outline, and Danny will do the same. With one week left we will put what we were working on last week together, and polishing and practicing for our presentation.

