



Charged Fusion Product Diagnostic

Extended McNair Research Project

Carlos Lopez

Omar Leon

Pierre Avila

Mentor: Dr. Werner Boeglin

Carlos Lopez BIO

- Double major in Electrical Engineering and Physics
- Plasma physics research for a year
- Leader of a satellite building senior project
- Desire to aid in the dream of fusion energy
- Strong desire to mentor struggling students

Omar Leon BIO

- Born in Cuba
- Physics major
- Created a course and teaches the course for the Honors College
- Plasma physics research for a year.
- Desire to aide towards the goal of fusion energy and mentor future college students to help them succeed in Physics.

Pierre Avila BIO

- Born & raised in Miami, FL
- FIU - Biology(Genetics) to Physics
- Math & Physics LA
- Working with Dr. Boeglin & Ramona for 2 years
- Future aspirations are to obtain PhD, aid in the dream of Fusion Energy Reactor and to start a research company

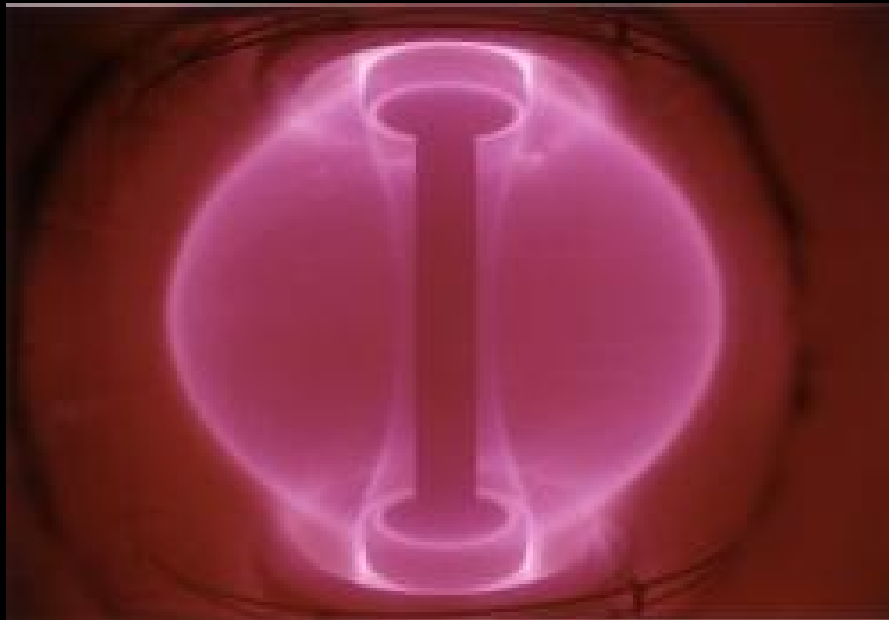
Dr. Ronald E. McNair

"Whether or not you reach your goals in life depends entirely on how well you prepare for them and how badly you want them."

-Dr. Ronald E. McNair



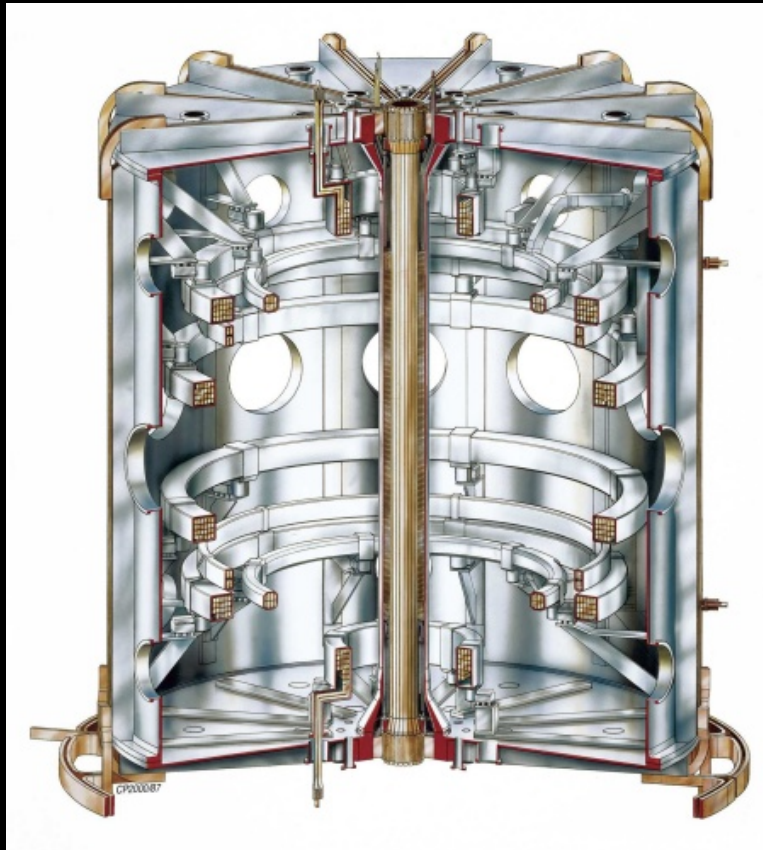
Plasma



- A soup composed of electrons and positive ions.

MAST

(Mega Amp Spherical Tokamak)

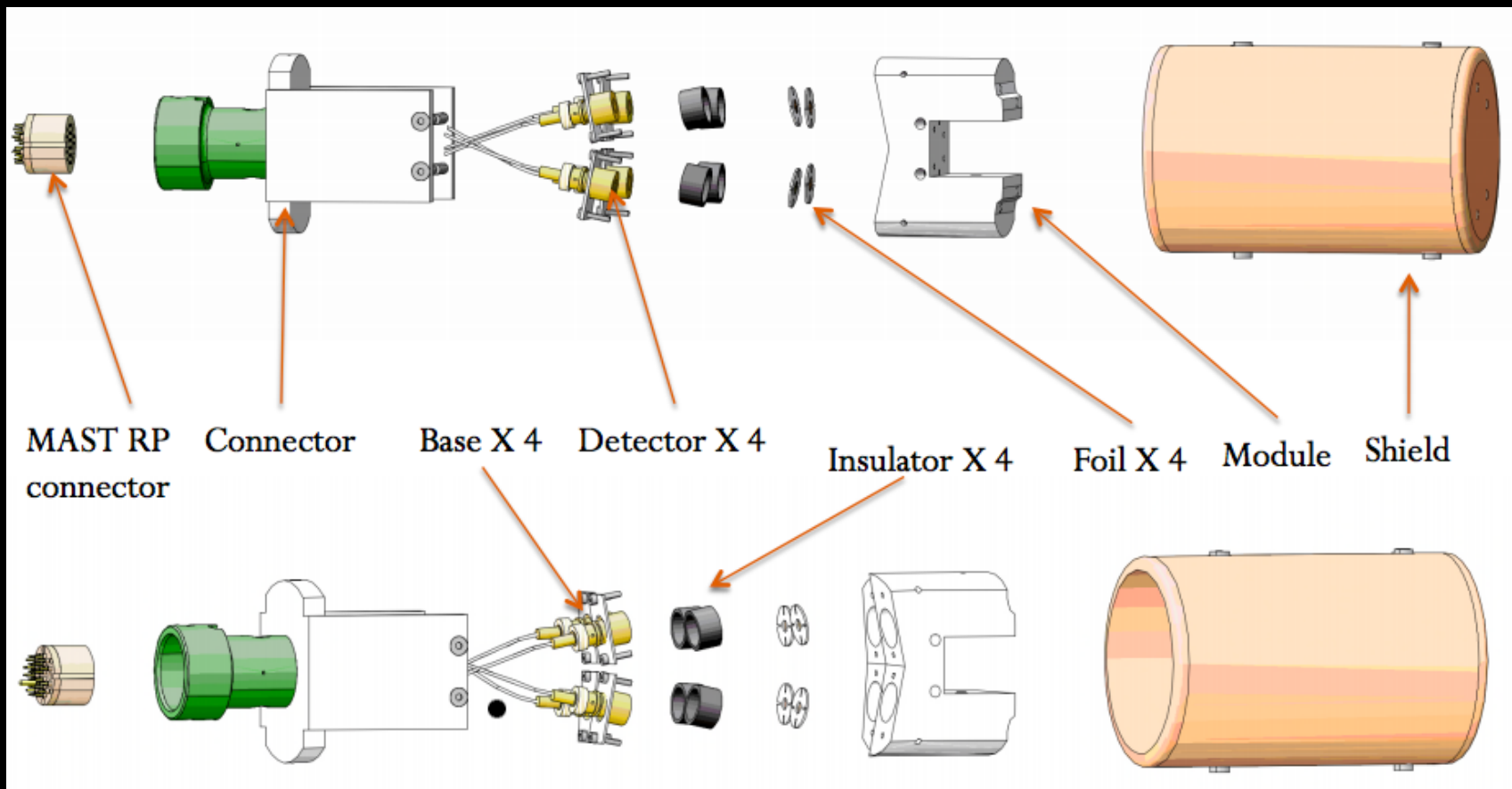


- Confines plasmas using magnetic coils.
- Located at Culham Centre for Fusion Energy, England.
- Multiple steps in creating and maintaining plasmas.

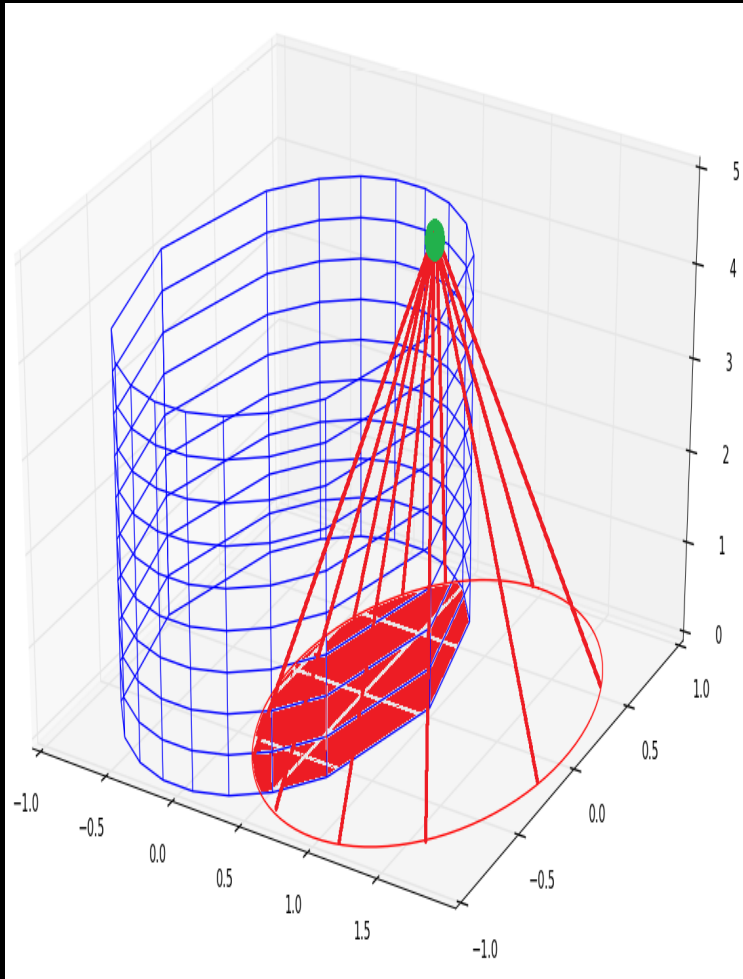
Research Motivation

- Current plasma diagnostics use the electromagnetic spectrum and neutrons.
- Reactions of greatest interest:
 - $D + D \rightarrow 0.8 \text{ MeV } ^3\text{He} + 2.6 \text{ MeV } n$
 - $D + D \rightarrow 1 \text{ MeV } T + 3 \text{ MeV } p$
- Our research looks to use protons to study plasmas.

Charged Fusion Product Diagnostic

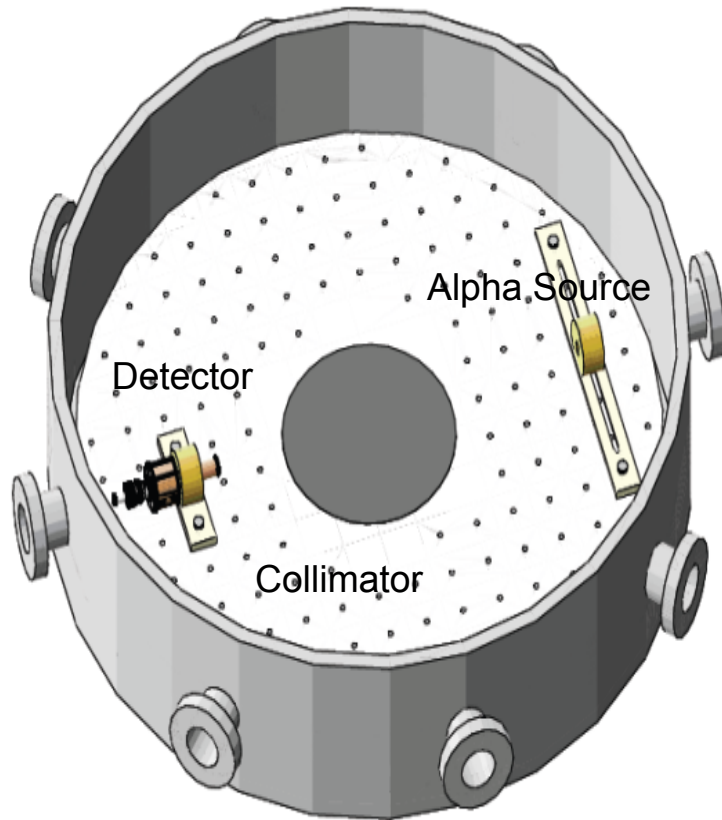


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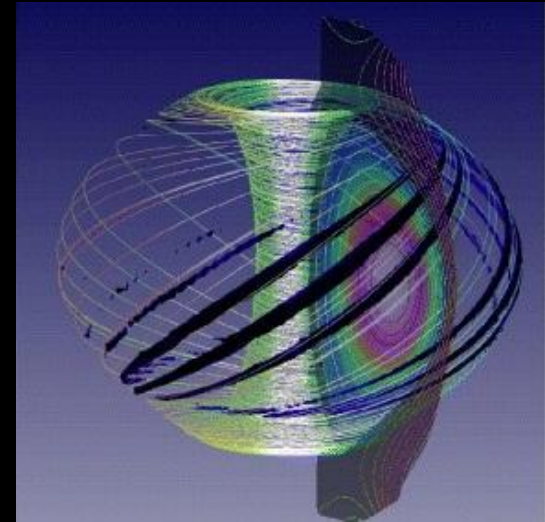
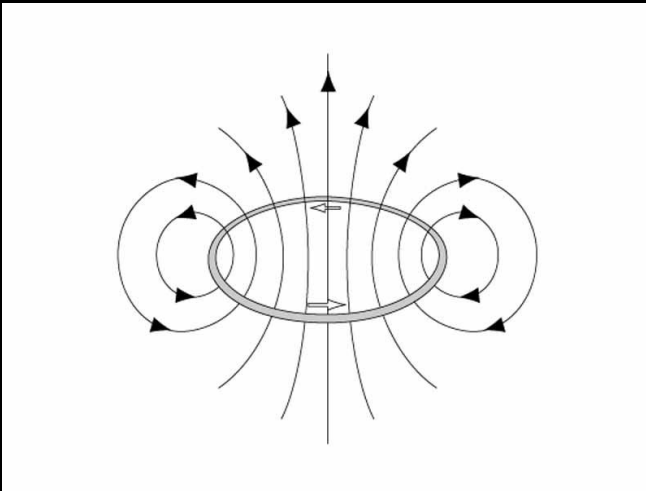
- Analysis of Silicon Surface barrier detector array
- Measure solid angle of acceptance
- Measure total efficiency

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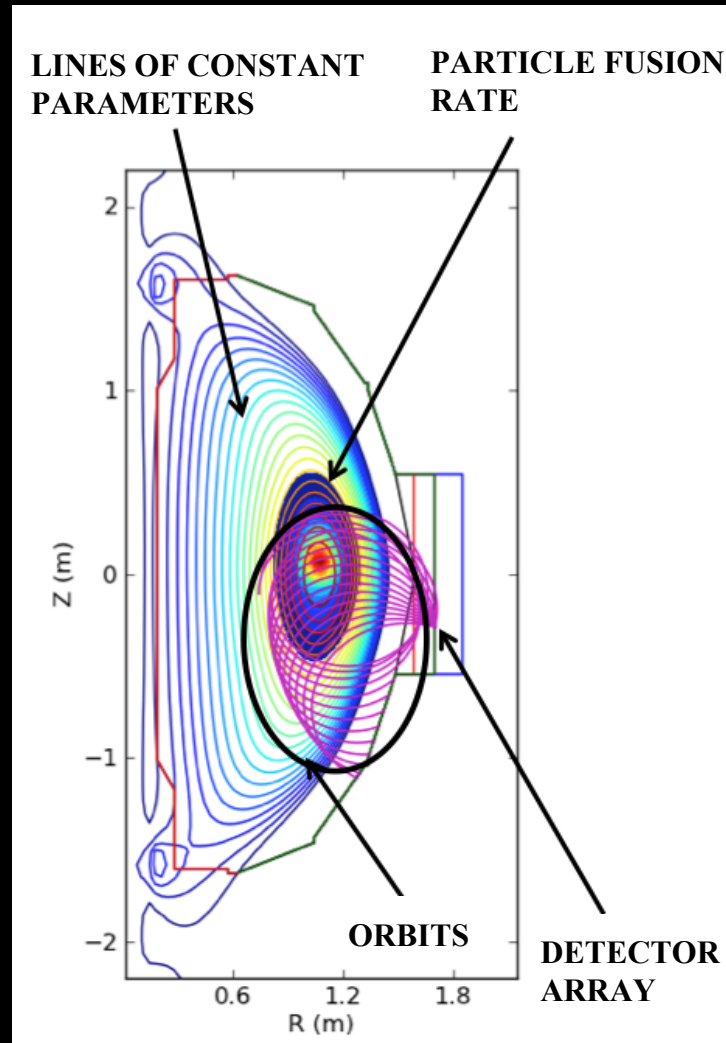
- Test array in FIU vacuum chamber with alpha source
- Measure detection events at various position relative to source
- Compare with my code

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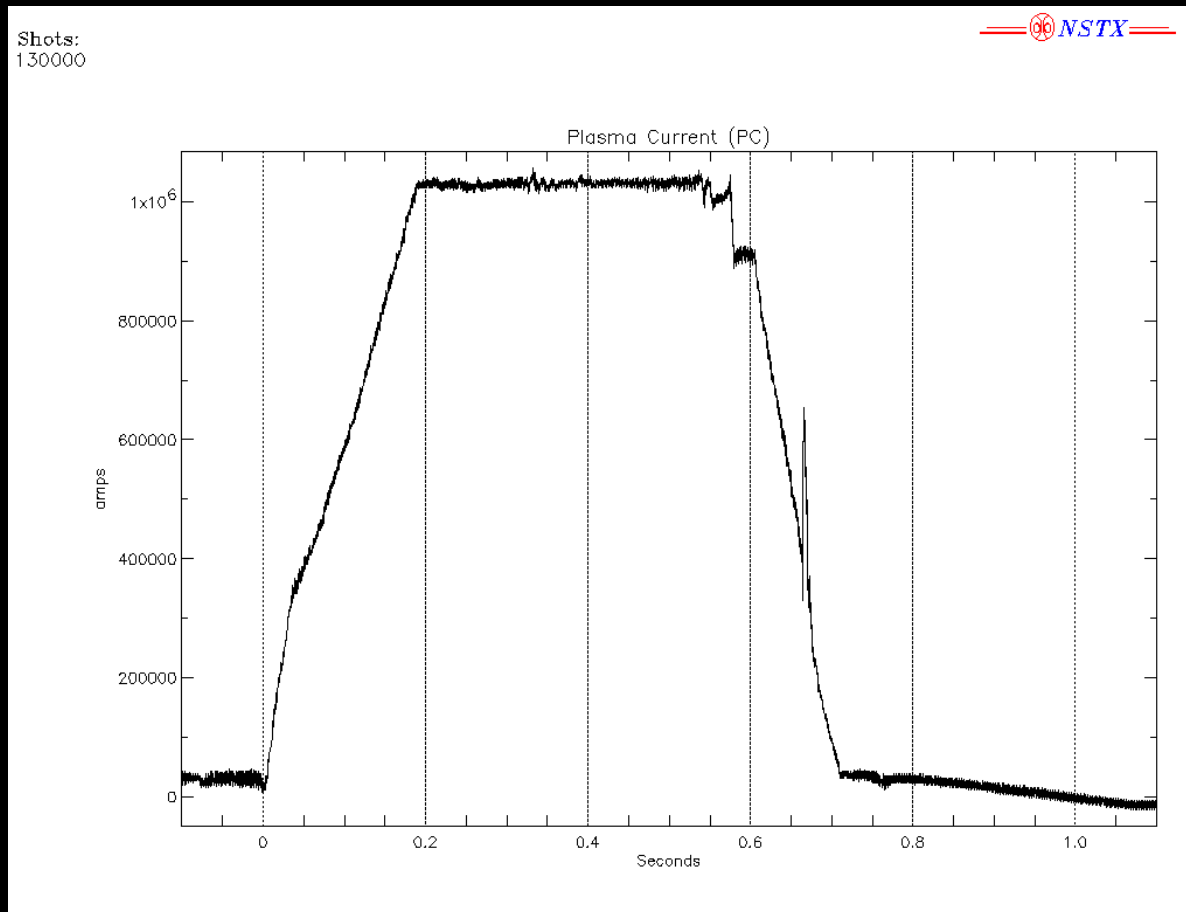
- The orbit code has been developed to create a model of the plasma properties and proton trajectories.
- There are several parts of the code that need to be adapted.
- Changes to physical parameters must be made.

Omar Leon Research cont'd



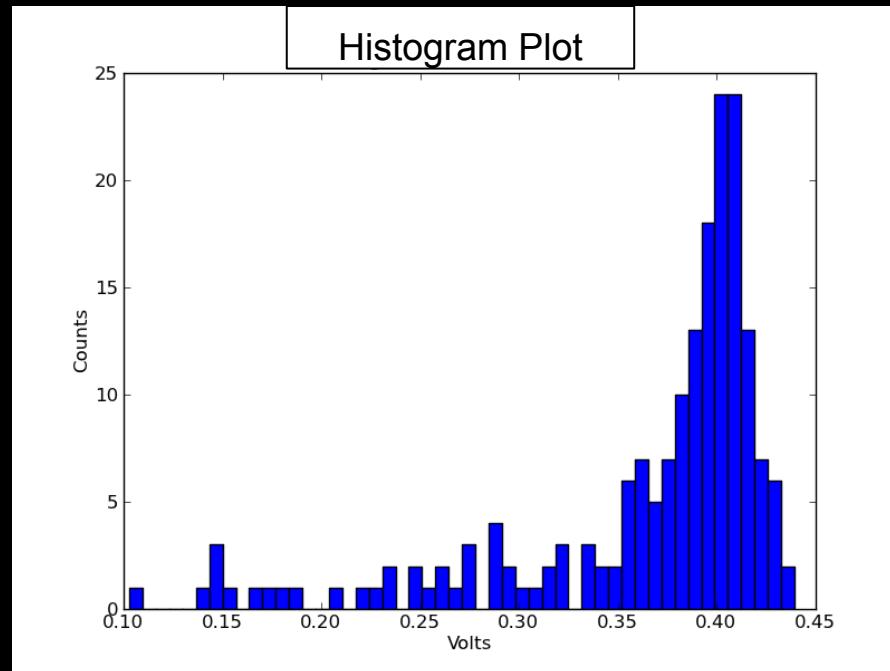
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- Select relevant data

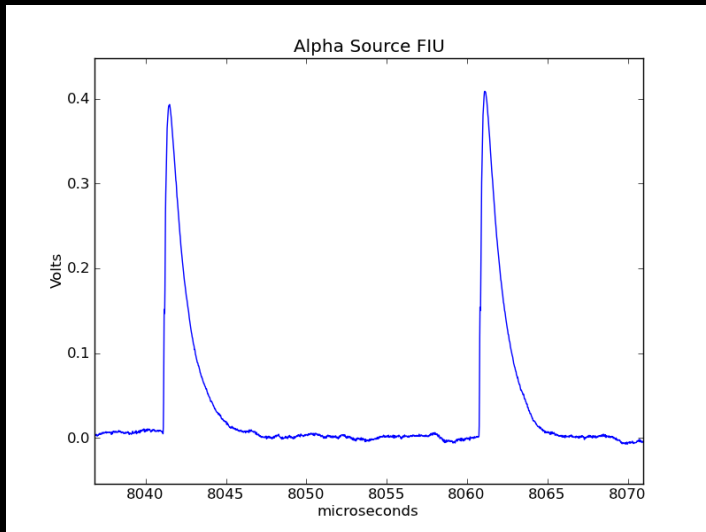
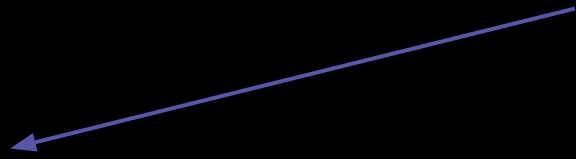
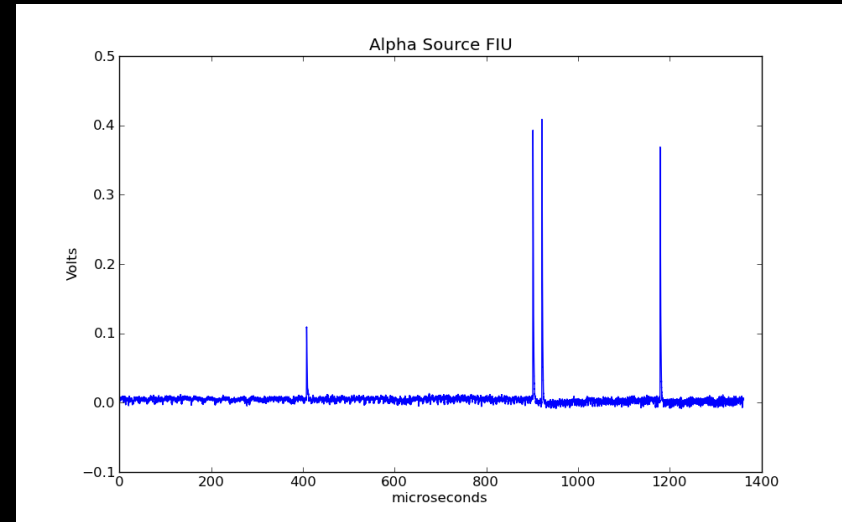
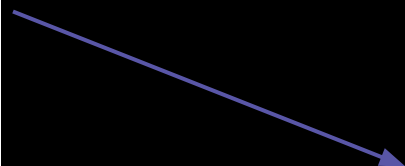
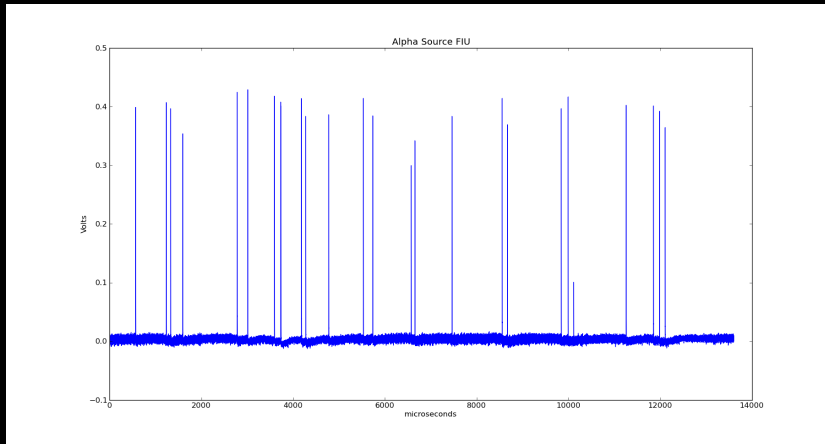


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- Statistical Analysis of Data
 - Histogramming
 - Error Analysis



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Summary

- It is essential for us to go to MAST to take data.
- We are each doing a separate part of the project.
- The long term goal is to determine the nuclear reaction rate of the plasma.

Bibliography

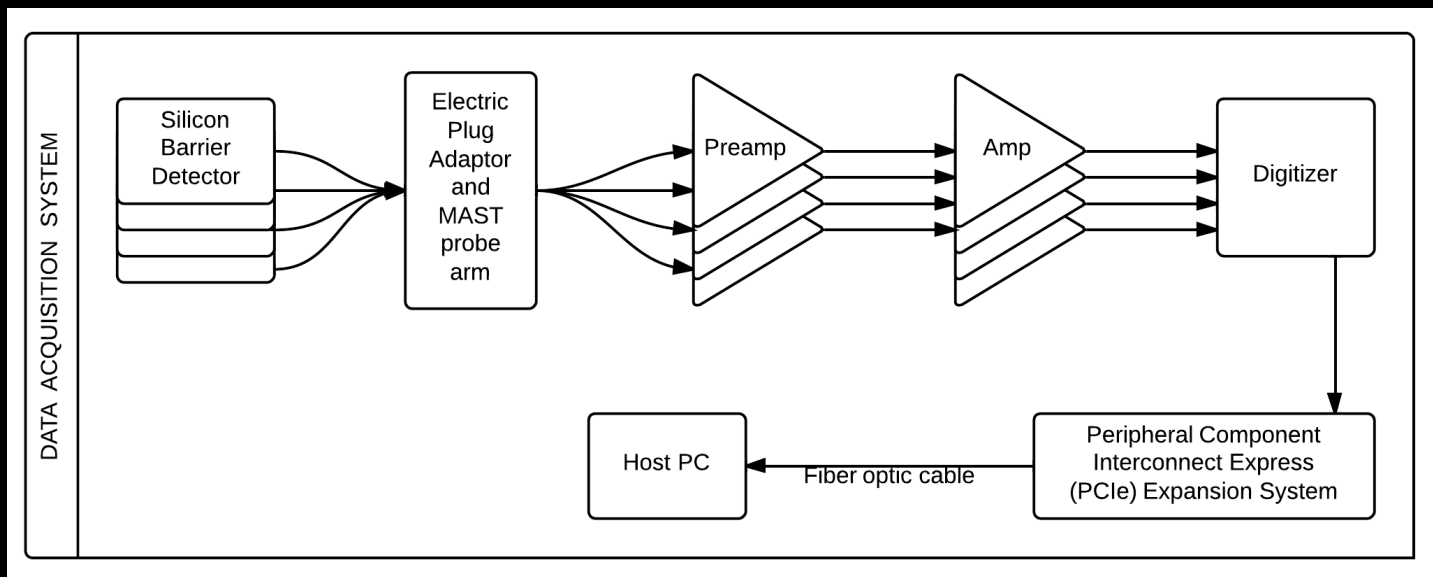
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Thank You



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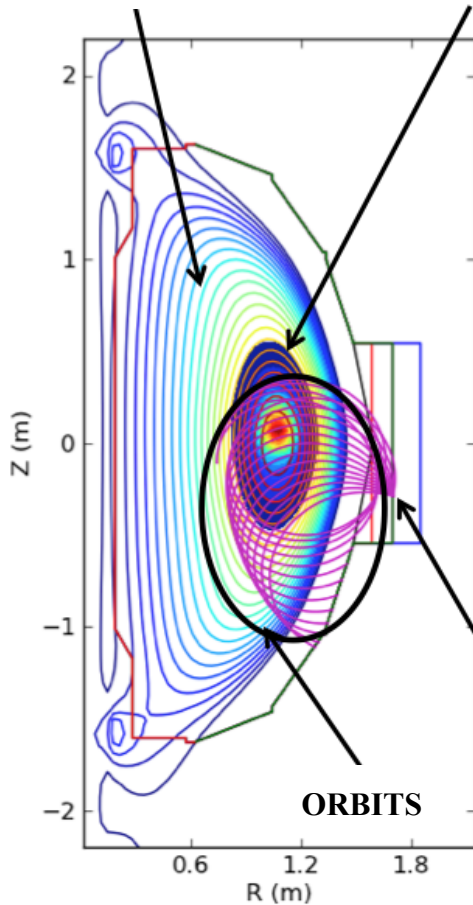
- Data Acquisition



Full Output

LINES OF CONSTANT PARAMETERS

PARTICLE FUSION RATE



ORBITS

DETECTOR ARRAY

ORBITS

DETECTOR ARRAY

