

**Project Title:**

Measurement of time varying magnetic fields with B-dot probes

Project Reference Code:

UAH-XU

Host Facility:

Propulsion Research Center
The University of Alabama in Huntsville

Host Facility Location: UAH

301 Sparkman Dr.
Huntsville, AL 35899
<https://www.uah.edu>

Project Description:

The goal of this project is to build a small B-dot probe to measure and map the magnetic field in a pulse magnetic nozzle. A magnetic nozzle is an electromagnetic equivalent to a rocket nozzle. However, instead of using the physical walls of the nozzle to accelerate and direct a hot gas to produce thrust as in the rocket nozzle, the magnetic nozzle generates strong magnetic fields to accelerate and direct plasma to produce thrust. The magnetic nozzle has applications to space-based plasma propulsion such as magnetoplasmadynamic thrusters or pulsed fusion propulsion.

One of the most common ways to measure time-varying magnetic fields is with a B-dot probe. B here refers to the magnetic field, and the dot refers to the time derivative. A B-dot probe in the simplest form is just a small coil of wire, or a solenoid. By Faraday's law of induction, a time-varying magnetic field creates an electric field in the wire, which generates a measurable current. So by placing the probe in the region of the pulsed magnetic field, one can measure the current from the probe and relate that to the changing magnetic field.

The student will design and construct the probes. Different probe sizes and number of windings will be tested to determine an optimal design for both size and resolution. An existing solenoidal magnetic field will be used to calibrate their probes. Once the calibration is complete, then probes will be tested in a pulsed magnetic nozzle currently being studied in the lab.

Disciplines:

Engineering, Physics

Is U.S. citizenship required to participate in this project?

No

Internship Location and COVID-19 related Backup Plan

The internship location is at the University of Alabama in Huntsville. We are planning for an in-person internship. However, due to the continuing COVID-19 pandemic, we are preparing additional options to ensure that the internship will take place, such as a hybrid or fully virtual option.



Alabama Plasma Internship Program



Name(s) of Mentor(s) and contact information:

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Internship Coordinator/ HR manager:

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The name and contact information of personnel at the host facility is provided for further assistance with questions regarding the host facility or the project.

Interns will not enter into an employee/employer relationship with the host facility. No commitment with regard to later employment is implied or should be inferred.