Langmuir Plasma Research

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In our project, we set out to create a device that could create density maps of plasmas inside of an Inertial Electrostatic Confinement (IEC) D-D fusor. Going with our chosen architecture, we had to create two components, one responsible for measuring the density of the plasma and another responsible for sensing position of the plasma measurement device. Early in the project, we discovered that we could measure relative voltage potentials that appear to correspond with density values in the plasma. The plasma measurement device itself is a voltage potential plasma probe based around a high impedance voltage divider and other safety systems, all of which could maneuver together about a cross-section of the reactor's plasma. For determining position, we used potentiometers as angular sensors. The potentiometers were connected to the probe with linkage assemblies that turned potentiometers when the probe moved. After recording voltage from the potentiometer on a digital storage oscilloscope, we used trigonometry to find the slopes of the lines between the potentiometer and the probe. By plugging these slopes into a system of equations that set two point-slope equations equal, we were able to find the point of intersection. When the coordinates of the probe were graphed along with density readings from the probe, we were able to create a cross-sectional image of the plasma in which density could be observed through relative color. Ultimately, we successfully completed our goal of creating a plasma measurement system that creates density maps of plasmas inside of a fusion reactor.

Awards Won:
Coalition for Plasma Science (CPS): First Award of 2,500.00