Faculty Name:

Carlos Paz-Soldan

Faculty Email:

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Lab:

Columbia Plasma Physics Laboratory

Project Title:

Kink Instability Limits in Distorted Tokamak Plasmas

Description:

This project will implement the calculation of a new theoretical limit in the size of “3D” distortions a tokamak plasma can withstand before breaking apart. Tokamaks are designed to be donut shaped plasma columns that are symmetric going (toroidally) around the donut. Asymmetries as small as $\delta B/B0 \sim 1e\text{-}4$ (i.e. a perturbation “error field” 10,000 times smaller than the primary tokamak magnetic field) can drive “reconnection” of field lines that destroys the otherwise good confinement of these toroidal plasmas. Before this, the plasma is simply “kinked” and maintains concentric surfaces in which field lines lie without crossing the field lines on neighboring surfaces. A theoretical approach to determining the limit at which kinks lead to magnetic reconnection is given in [A. Boozer, Physics of Plasma 2019]. At some point, the plasma becomes exponentially sensitive to resistivity and the surfaces fall apart due to any small resistivity. This project will be to implement this theoretic threshold calculation in the Generalized Perturbed Equilibrium Code (GPEC), and predict when this might happen for real tokamak plasmas such as the ones at the DIII-D national user facility in San Diego.

Students will also generally assist with other Columbia Plasma Physics Lab initiatives. More information can be found at https://plasma.apam.columbia.edu

** This position and others in Prof Paz-Soldan’s group have a common application **

** Please apply using the form https://forms.gle/viSUdEneLy66vFaZ6. Do NOT email the PI **

** Flexibility in project choice is welcome **

Location of Research:

On Site

# of hrs/week:

40

Department/Program:

Applied Physics and Applied Mathematics

Eligibility:

BS, First Year, BS, Second Year, BS, Third Year, MS

To apply, please contact:

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