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Plasma Physics Seminar

Physics & Astronomy Building (PAB) Room 4-330
Via Zoom: https://ucla.zoom.us/j/92785449357?pwd=SVBTSko3bTdEUW03dzQwNks1Q2lKZz09
Friday, February 2, 2024 at 12:30PM
Lunch will be served at 12:00PM

Beyond the Petawatt: Plasma Optics for Ultra-High-Power Lasers

Matthew R. Edwards(Stanford University)

Abstract: Our ability to continue building lasers of higher peak power and advance into higher-intensity regimes of laser science is fundamentally limited by the optical damage thresholds of the dielectric coatings, glass, and metal that make up modern optics. Although we would like to have lasers capable of probing Schwinger-limit field strengths or accelerating large plasma volumes to relativistic speeds, current laser technology cannot be scaled much beyond the 10-petawatt level without prohibitive cost. Plasma physics offers a solution: plasma can tolerate light intensities far beyond the damage thresholds of solid-state optics. In principle, the use of plasmas as optics therefore allows the construction of compact ultra-high-power lasers, but a range of plasma physics and engineering problems must first be solved. This talk will discuss recent steps we have taken to address these problems and to design plasma optics suitable for use in high-power lasers. We will show recent experimental, computational, and analytic results on the performance, dynamics, and characteristics of plasma diffraction gratings and lenses. We will then discuss designs for plasma-based laser systems and how plasma optics could enable compact lasers with multi-petawatt to exawatt peak powers.

BIO: Matthew Edwards is currently an Assistant Professor of Mechanical Engineering at Stanford University. He received BSE, MA, and PhD degrees from Princeton University in Mechanical and Aerospace Engineering. From 2019 to 2022 he was a Lawrence Fellow in NIF and Photon Science at Lawrence Livermore National Laboratory.