

# Plasma Physics Seminar

Physics & Astronomy Building (PAB) Room 4-330

Via Zoom: <https://ucla.zoom.us/j/92785449357?pwd=SVBTSko3bTdEUW03dzQwNks1Q2IKZz09>

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11:30 AM Lunch will be served

## Unlocking new physics regimes using ultra-high intensity laser-plasma interactions



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**Abstract:** The newly constructed laser facilities at the Extreme Light Infrastructure in EU are expected to reach record breaking laser power and intensity that are the key to probing qualitatively different regimes of light-matter interactions. The purpose of this talk is to overview some of the regimes that can be accessed in the near-term. At high-intensity, a laser-irradiated material turns into a plasma and its electrons quickly becomes ultra-relativistic, which renders even a very dense plasma transparent. The effect enables generation of laser-driven plasma magnetic fields that are as strong as the fields of a neutron star. Electrons moving in these fields emit gamma-rays in large quantities. This aspect can be leveraged to produce a unique gamma-ray source suitable for creating matter from light alone via photon-photon collisions in the laboratory. It will be shown how, employing the same physics, lasers can be used to create a self-organized photon collider and an adjoining accelerator for the generated positrons. Previously, strong-field physics regimes have been reserved exclusively to astrophysical environments, but the discussed light-matter interactions provide a path towards creating relevant scenarios in laboratory conditions.