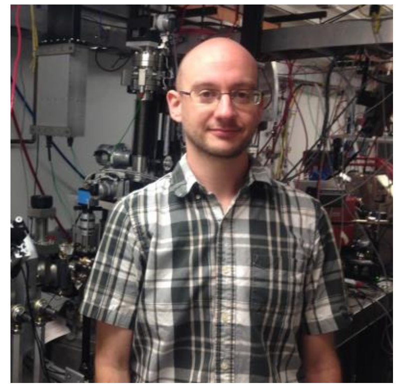
LABORATORY FOR ELEMENTARY-PARTICLE PHYSICS (LEPP)

Journal Club



Jared Maxson

UCLA

Pushing electron beam brightness to its limits across accelerator length scales

Electron beam brightness, or the electron beam's density in phase space, is the critical performance parameter for a wide variety of electron beam applications. These applications range from kilometer scale colliders and synchrotron light sources to single meter scale accelerators for electron diffraction and microscopy. In a linear accelerator, the beam brightness has been traditionally limited by the brightness of the electron source, whereas in a circular accelerator the beam brightness is given by the continuous competition between synchrotron radiation damping and fundamental phase space diluting effects like quantum excitation and electron-electron scattering. However, as the beam brightness of photoemission linac sources continues to grow, we are approaching a regime in which strong electron-electron scattering will govern the linac beam brightness, rather than the source.

In this talk, I'll first give an overview of the search for maximally bright beams from state of the art photoinjectors used for both light source applications and ultrafast electron diffraction and microscopy. Next, I'll give two examples of how this search has pointed toward novel regimes of electron-electron scattering in cold, dense beams, in which the microscopic electron distribution undergoes rapid and violent rearrangement. Finally, I will argue that these new scattering effects in linacs are dynamically distinct from but highly analogous to intrabeam scattering in storage rings, and exciting opportunities for cross-disciplinary study exist.

Friday, Nov. 18, 2016

2:30pm

401 Physical Sciences Bldg.

LEPP and CHESS resources have merged and a new lab, (CLASSE), has formed. LEPP's primary source of support is the National Science Foundation. Visit us at www.lepp.cornell.edu