

ACCELERATOR SEMINAR

“Experiments with Free Electron Vortex Beams”

***Benjamin McMorran,
University of Oregon***

Electron vortex beams are composed of free electrons in quantized orbital states. Each electron wavefunction in the beam has a helical shape, with a resulting quantized orbital angular momentum (OAM) and a corresponding magnetic moment, independent of the spin angular momentum (SAM). To produce such states, we use nanofabricated diffraction gratings to holographically “sculpt” a phase vortex onto free electron matter waves in a transmission electron microscope (TEM). We also use this approach to place free electrons in coherent superpositions of orbital states. The generation of these beams depends upon the spatial coherence of the electron beam, which can be related to the brightness or emittance of the electron source. These beams can interact with surfaces and materials in unique, albeit subtle, ways. For example, electron vortex beams can transfer quantized OAM to another system through inelastic scattering. These applications, the fundamental physics of free electron orbital states, and possible future experiments with spin polarized and accelerated vortex beams will be discussed.

Thursday, February 12, 2015

11:00 a.m.

CEBAF Center, F113

Coffee before seminar beginning at 10:45 a.m.