

## **Dense plasma investigations on fourth generation X-ray free-electron laser light sources**

Sam M. Vinko

The past few years have seen a revolution in the field of X-ray science. The advent of the world's first hard X-ray laser – the Linac Coherent Light Source free-electron laser at SLAC – in one step in 2009 increased the spectral brightness of X-ray sources over that of any synchrotron on the planet by a factor of a billion. Spatially coherent, monochromatic, femtosecond X-ray pulses can now be routinely produced over a wide spectral range, enabling the access of spatial and temporal scales of atomic processes simultaneously for the first time. In this seminar I will review some of the exciting recent scientific advances made possible by such sources, with a particular emphasis on atomic and plasma physics, as well as elucidate future research directions and opportunities.