**Laser Wakefield Acceleration of Electrons at the Jupiter Laser Facility**

**Dr Bradley Pollock**

**(Lawrence Livermore National Laboratory)**

**Abstract**: Conventional RF linear accelerators produce high energy electron beams (10’s of GeV) over kilometer-scale distances, where the long length is due to the maximum electric field these devices can generate without damaging the accelerator (10’s MeV/m). The Laser Wakefield Acceleration mechanism provides a platform for producing high energy electron beams over centimeter-scale distances by creating an accelerating structure in a plasma capable of supporting ~GeV/cm electric fields. Here a short-pulse laser drives a relativistic plasma wave in an underdense plasma which in turn accelerates electrons. We have developed a novel multi-stage accelerator which allows for narrow energy spread electron beams to be produced at low electron densities, which are required to achieve high energy electrons from this technique. Experiments performed using the 60 fs, 200 TW Callisto laser at Lawrence Livermore National Laboratory’s Jupiter Laser Facility have demonstrated ~0.5 GeV electron beam production with 5% energy spread over 8 mm; future experiments will seek to increase the energy gain to >2 GeV in 2 cm, while reducing the energy spread to <1%.