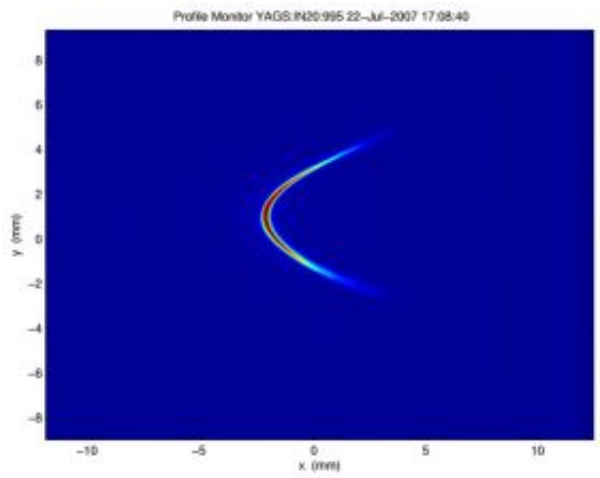
LCLS Beam Already in Action

August 6 2007



The LCLS electron beam incident on a profile monitor at 135 MeV in the injector spectrometer. This image is taken with the transverse deflecting cavity (LOLA) switched on, producing the curvature, which demonstrates that the beam is accelerated on the crest of the radio frequency wave. Credit: SLAC

The Near and Far Experimental halls are still under construction, but already scientists are putting the Linac Coherent Light Source (LCLS) beam to use. The LCLS electron beam, first generated in April, is now traveling from its source near Sector 20, through the Beam Switchyard at the end of the linear accelerator and into End Station A, one of SLAC's original experimental halls.

The one-kilometer journey not only helps the LCLS team commission components along the route, but the beam is already proving useful to

scientists working on a diverse set of experiments in End Station A.

In early July, the beam was first pressed into service to help set up a suite of International Linear Collider (ILC) experiments coordinated by Mike Woods. The ILC research is to develop beam instrumentation and to characterize wakefield effects that degrade beam quality. During setup, the ILC experimenters were able to provide diagnostics for the charge, energy spread and jitter of the LCLS beam.

In a new experiment, currently operating during owl shifts, the LCLS beam strikes a copper block, creating a field of radiation. Spare permanent magnet pieces from the LCLS undulators—which will create x-ray pulses in the finished machine—are strategically arranged around the copper to receive an amount of radiation similar to what the magnets would be exposed to in the undulators if the beam went astray.

"We need to learn how much demagnetization takes place so we can protect the undulator magnets for 20 years of operation," said Undulator Physics Manager Heinz-Dieter Nuhn. The information will help in developing a beam loss monitor that can turn the beam off if it will cause too much damage to the magnets.

In mid-August, the beam will test detector components. For 12 hours a day, the LCLS beam will smash into a target at the Beam Switchyard, creating a secondary beam of electrons that simulate particles created in a collision. Jerry Va'vra is testing a prototype for particle identification that might significantly improve particle identification at a next-generation “Super-B Factory.” Six inches upstream, Tim Nelson will test a new kind of readout chip for the tracker and calorimeter of an ILC silicon detector.

In the midst of all this experimentation, the LCLS continues its work. "We're trying to cooperate with other programs while still aggressively

commissioning the LCLS," said Commissioning Manager Paul Emma.

Source: by Heather Rock Woods, SLAC Today