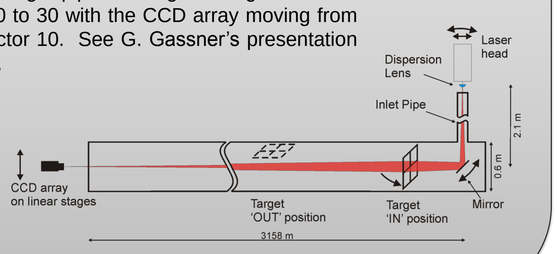
SLAC Status Report 2016

Michael Gaydosh, Georg Gassner

Sector 0

August 2015 was the last time Sector 0 was used for linac laser alignment measurements supporting the new alignment network finally connecting Sector 0 to Sector 30 for the LCLS II project. After the FACET shut down in April of 2016, Sector 0 through 10 are being cleared out for the new LCLS-II Superconducting linac. The linac light pipe is being reconfigured to run from Sector 10 to 30 with the CCD array moving from Sector 0 to Sector 10. See G. Gassner's presentation on Wednesday.

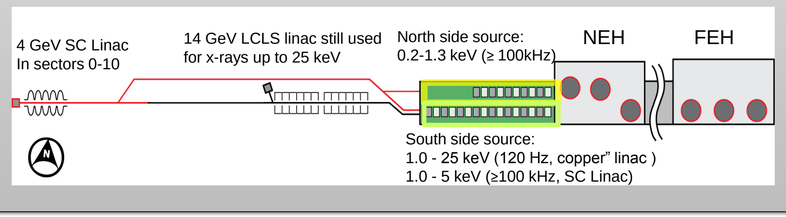


Linac Coherent Light Source II

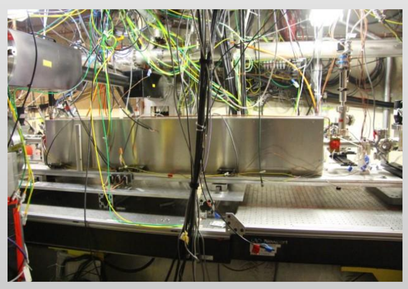
For the LCLS-II project Metrology installed a monument-based network in the two-mile long linac. The process began with the installation of about 120 new floor monuments and 250 new wall monuments, augmenting the 400 existing monuments. After installation, digital level and laser tracker measurements were taken. During a period of 3 months more than 5000 unique measurements where made with 320 Leica AT401 setups and almost 600 height differences using a Leica DNA03. For the adjustment of the network, 200 linac light-pipe measurements constrained to a straight line were integrated into the analysis. This network is presented in detail during G. Gassner's Wednesday presentation.

Planning for LCLS-II includes the use of the Metrology Department's Z&F Laser Scanner. Currently the LCLS-II project is analyzing existing tunnels where SLAC designers and engineers have requested numerous as-built scans to determine what should be removed, modified, or added for the future LCLS-II beamline.

In addition to the tunnel measurements, Metrology has performed vibration measurements at future installation sites, has laid out the newly planned LCLS-II cryogenic plant, and supported the design phase of this project by providing recommendations on how components should be aligned. The fiducialization of various quadrupole and dipole magnets has also started.



Facility for Advanced Accelerator Experimental Tests



FACET had used part of SLAC's two-mile-long linear accelerator to generate high-density beams of electrons and their antimatter counterparts, positrons. This had produced large electric and magnetic fields in a very short time creating exotic states of matter and researching advanced accelerator technologies.

FACET successfully ended in April 2016 making way for the start of construction of LCLS-II.

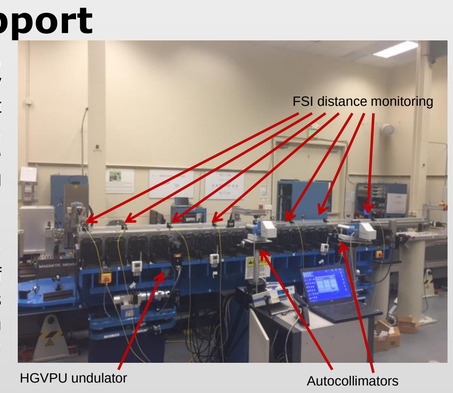
SLAC's Alignment Engineering group spent considerable time realigning the 50-year old linac and supporting the repair of beamline components in the 30-year old electron and positron damping rings.

FACET II proposes to make use of Sectors 10 to 20 with a new gun at S10 and the existing FACET experimental area in Sector 20.

Magnetic Measurement Support

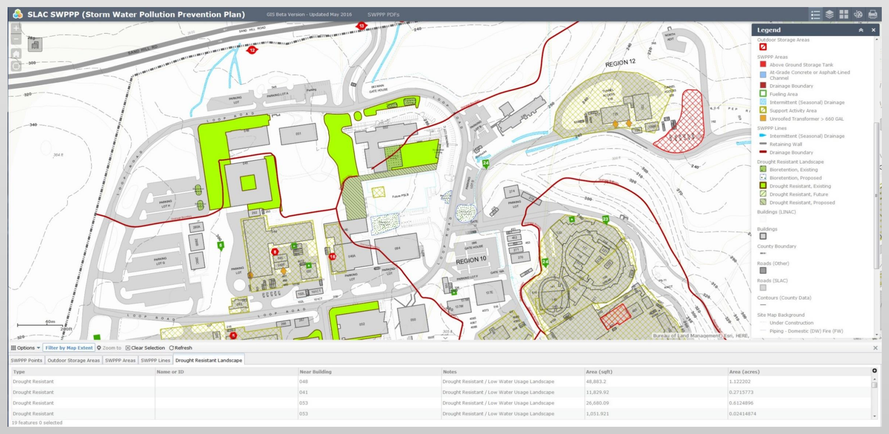
To evaluate new movable-gap undulator designs for LCLS-II, a wide variety of traditional interferometer (Agilent), frequency scanning interferometer (Etalon) and autocollimator (Elcomat 3000, Moeller Wedel) measurements have been performed. Deformation of the magnet jaws, the angle changes of these jaws, and the effect on the quadrupole position by opening and closing the gaps were investigated.

For magnetic measurements of a Delta Undulator, the position of a Hall probe needs to be known to a few tens of micrometers. A dedicated laser alignment system was developed to localize the probe while being pushed through the vacuum chamber. It is still in use. See IWAA presentation 2014



Geographic Information System

Metrology's Geospatial program is continuing in its development of GIS products and services for various groups throughout the SLAC laboratory. Most GIS websites have been updated to the new JavaScript standard which means faster response on more devices including smart phones and tablets. Efforts are ongoing in Space Planning GIS maps that are tied into SLAC's phone and building databases. Several new GIS websites have been created including sites to track storm water pollution prevention as well as for spill prevention control and countermeasure.



Maps and data are continuing to be enhanced for GIS services including emergency pre-incident planning, fire barrier impairments, designated smoking areas and utilities. An interactive GIS website traces domestic water utilities showing the area and valves to be shut-down in an emergency. This utilizes network tracing techniques inherent in the GIS software and well as versioned editing capabilities. New GIS websites are in the planning stages, such as one for facilities asset management to report to the US Department of Energy. Websites and static maps are also being updated and maintained with the latest GIS software.

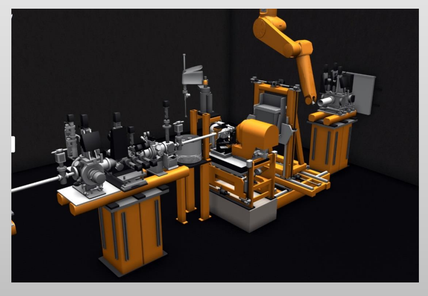
Move of our Geodetic Laboratory

The Geodetic Laboratory at Sector 10 along the linac was situated in an old access tunnel with highly stable temperatures and stable walls. It was used for a variety of tasks from routine calibration runs of leveling equipment and distance meters to HLS sensor calibration. Laser tracker distance and angle measurement calibration tests were carried out. General acceptance tests were performed after instruments were shipped across the country for maintenance.

As part of the LCLS-II project, the Geodetic Laboratory was displaced from the linac access tunnel. Starting in October 2015 the entire lab was reconstructed in a new location; a straight-section of the PEP tunnel next to Interaction Hall 6 (IR6). The move was completed early in 2016 including the installation of the vertical comparator and the 30m horizontal comparator. The geometric and temperature stabilities are comparable to what were observed in Sector 10.

Linac Coherent Light Source

In 2015 construction began on a new experimental hutch In SLAC's Far Experimental Hall. The new Hutch 4.5 MFX (Macromolecular Femtosecond Crystallography) was installed in the downstream end of hutches 4. To deliver beam to this hutch a mirror 200m upstream was reconfigured and realigned to deflect the x-ray beam by 5.5mrad. Associated with this, a beam pipe with a series of collimators had to be aligned. Although not fully configured at this time, the new hutch is already used for experiments with the first successfully beam in spring 2016.

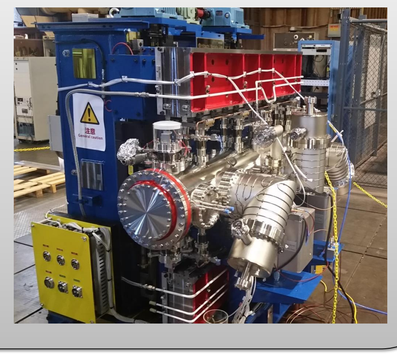


SSRL

Stanford Synchrotron Radiation Lightsource

During the 2015 and 2016 summer down-time the control network as well as all the magnets were measured and those that were out of tolerance were realigned.

During the 2016 downtime a new insertion device for the new 12-1 beamline was aligned. A new bending beamline (16) was aligned as well.



Acknowledgments

We would like to thank our colleagues Brian Fuss, Francis Gaudreault, Hans Imfeld, Franz Peters, Michael Rogers and Bryan Rutledge.

Work supported by Department of Energy contract DE-AC02-76SF00515