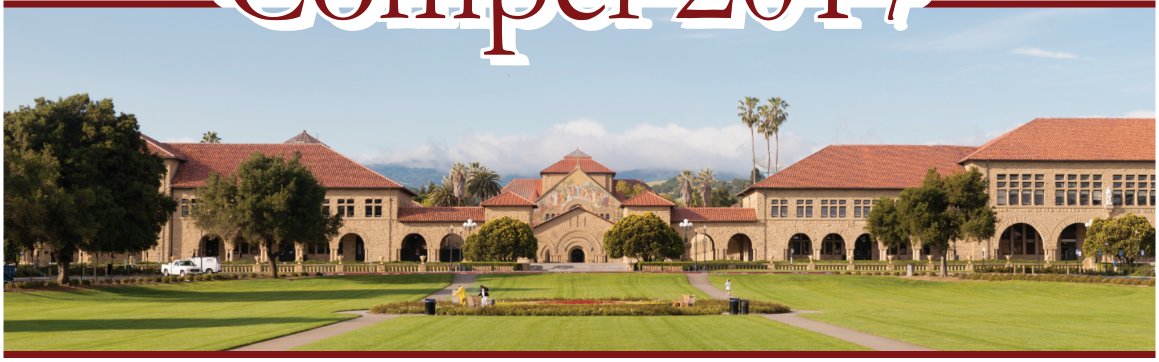
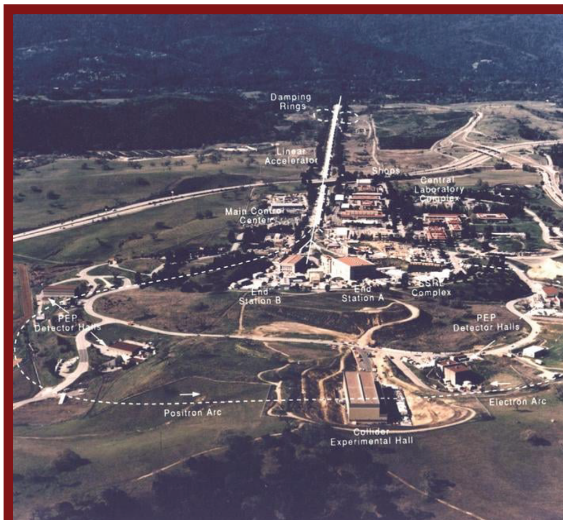
Compel 2017



Tour to SLAC National Accelerator Laboratory



Welcome to SLAC National Accelerator Laboratory (SLAC – originally: 'Stanford Linear Accelerator Center')

SLAC combines a broad research program in atomic and solid-state physics, chemistry, and medicine using X-rays from synchrotron radiation and free-electron laser, as well as experimental and theoretical research in elementary particle physics, astroparticle physics, and cosmology. Additionally, new research programs in applied energy are re-defining SLAC as a multi-program research laboratory.

History

SLAC was dreamt up by the Stanford Physics Department and created under the direction of Profs. W. Panofsky and E. Ginzton. Congress approved the proposal on September 1961.
The main accelerator is 3.2 kilometers (2 mi) long—the longest linear accelerator in the world—and has been operational since 1966. It is a radio frequency linear accelerator that can accelerate electron and positron up to 50 GeV.
Research at SLAC has produced 3 Nobel Prizes in Physics:

- 1976: The charm quark
- 1990: Quark structure inside protons and neutrons
- 1995: The tau lepton

High Energy Physics Research

Stanford Linear Collider

The Stanford Linear Collider was an accelerator that collided electrons and positrons. The bulk of the data was collected by the SLAC Large Detector (SLD). This detector was designed primarily to detect Z bosons produced by the collision of electron-positrons.

PEP-II

The Positron-Electron Project (PEP) was a circular storage machine with 2.2 km in circumference composed by two rings in the tunnel. The main purpose of the Linear Accelerator in this facility was to inject positrons and electrons into the rings. The BaBar Experiment was used as detector of this B-Factory to study the charge-parity symmetry.
The B-factory operated up to 2008, and it was the last High Energy Experiment running at SLAC. After that, the linear accelerator became part of the lightsource facilities.

Lightsources

Stanford Synchrotron Radiation Lightsource (SSRL)

SSRL is a synchrotron light user facility. Originally built for particle physics, it was used in experiments where the J/ψ meson was discovered. It is now used exclusively for materials science and biology experiments, which take advantage of the high-intensity synchrotron radiation emitted by the stored electron beam to study the structure of molecules.
It has been indispensable in the research leading to the 2006 Nobel Prize in Chemistry awarded to Stanford Professor Roger Kornberg.

Linac Coherent Light Source (LCLS)

LCLS is a free-electron laser facility. The LCLS is partially a reconstruction of the last 1/3 of the original linear accelerator at SLAC, and can deliver extremely intense x-ray radiation for research in a number of areas. It achieved first lasing in April 2009.

The laser produces hard X-rays, 10^9 times the relative brightness of traditional synchrotron sources and is the most powerful x-ray source in the world. The laser's wavelength, ranging from 0.13 to 6.2 nm (200 to 9500 eV) is similar to the width of an atom, providing extremely detailed information that was previously unattainable.

LCLS enables a variety of new experiments and provides enhancements for existing experimental methods. Often, x-rays are used to take "snapshots" of objects at the atomic level before obliterating samples. It can capture images with a "shutter speed" measured in the order of femtoseconds.

LCLS-II

The LCLS-II project is under construction and will provide a major upgrade to LCLS by adding two new X-ray laser beams. The new system will utilize 500 m (1,600 ft) of the existing tunnel to add a new superconducting accelerator at 4 GeV and two new sets of undulators that will increase the available energy range of LCLS. The advancement from the discoveries using these new capabilities may include new drugs, next-generation computers, and new materials.

Other Facilities, Laboratories and Research Groups

PULSE: It was created by Stanford in 2005 to help Stanford faculty and SLAC scientists develop ultrafast x-ray research at LCLS.

FACET: Facility for Advanced Accelerator Experimental Tests (FACET) was capable of delivering 20 GeV, 3 nC electron (and positron) beams with short bunch lengths and small spot sizes, ideal for beam-driven *plasma acceleration* studies. The FACET-II project will re-establish electron and positron beams in the middle third of the linear accelerator for the continuation of beam-driven *plasma acceleration* studies in 2019.

NLCTA: The Next Linear Collider Test Accelerator (NLCTA) is a 60-120 MeV high-brightness electron beam linear accelerator used for experiments on advanced beam manipulation and acceleration techniques.

KIPAC: The Kavli Institute for Particle Astrophysics and Cosmology (KIPAC) is a Stanford/SLAC Institute conducting research on particle astrophysics and Cosmology.

SIMES: Stanford Institute for Materials and Energy Sciences (SIMES) is conducting research on fundamental and applied energy using breakthroughs in physics, materials, chemistry and ultrafast phenomena.

SUNCAT: The SUNCAT Center for Interface Science and Catalysis is a partnership between Stanford School of Engineering and SLAC. The Center explores challenges associated with the atomic-scale design of catalysts for chemical transformations of interest for energy conversion and storage.

GISMo: Grid Integration, System and Mobility (GISMo) is a new group focused on research in Smart-Grids, Integration of Renewable Energy, Transportation and Transactive Energy Control.

More….

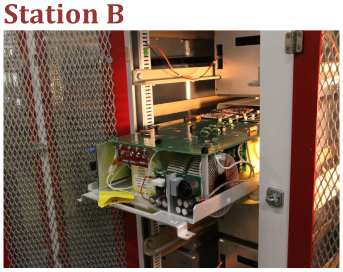
Tour to SLAC - Areas to be visited

Movie presenting SLAC Research- Bechtel Conference Center, Stanford University Campus

Linear klystron Gallery – Visitor Alcove

The main accelerator is buried 9 m (30 ft) below ground. From the alcove, at the ground level, it is possible to see the klystron gallery. In this area, a full reproduction of a seccion of the beam line installed in the underground tunnel is displayed.
(This area has no bathrooms)

Station B



Different high voltage/current power supplies (PS) designed at SLAC for the accelerator will be presented. They include the last generation of PS developed for the radiofrequency stations of the International Linear Collider.
(This area has limited bathroom facilities)

LCLS Control Room

The control room of both the LCLS accelerator and Facet experiment will be presented. During the visit, operators are working on the machine. To avoid disturbing them, the tour will meet outside of the control room and have a full view of the area through the windows. An operator will present to the group details of the operations in the control room.
(Control room is located in Bldg. 52, it has bathrooms)

Tour Schedule – Monday July 10 afternoon

- 3:00pm – 3:20pm - Movie About SLAC – Bechtel Conference Center, Stanford University Campus

- After the movie, the total group participating in COMPEL2017 is divided in two (Group A, Group B)

- 3:20pm Group A starts the visit to SLAC – The group is transported to SLAC in 3 buses departing from Encina Hall

- SLAC visit includes: Linac Klystron Gallery, Station B and Control Room
- Group A returns to Campus at about 5:00pm
- Group B visit Stanford University Campus from 3:20pm to 5:00pm
- 5:00pm Group B starts the visit to SLAC – The group is transported to SLAC in 3 buses departing from Encina Hall
- SLAC visit includes: Linac Klystron Gallery, Station B and Control Room
- At the end of the visit to SLAC, Group B travels to Mountain View using the same tour buses. They depart from SLAC at about 6:30pm
- Group A visit Stanford University Campus from 5:00pm to 6:30pm
- After the visit to Stanford University Campus, Group A departs at 6:30pm from Encina Hall to Mountain View.
- Group A and Group B arrive to Mountain View around 7:00pm for dinner and visit to the Computer Museum.

For safety, please wear shoes for the SLAC tour, no sandals, no flip-flops.
Follows the direction of the tour guides and escorts.

Additional information about SLAC:
https://www6.slac.stanford.edu/
https://vue.slac.stanford.edu/
https://en.wikipedia.org/wiki/SLAC_National_Accelerator_Laboratory

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