Physics Research Areas

Energy Frontier

The ATLAS experiment is being constructed by 1800 collaborators in 150 institutes around the world. It will study proton-proton interactions at the Large Hadron Collider (LHC) at the European Laboratory for Particle Physics CERN. The detector is due to begin operation in the year 2007.

Cosmic Frontier

Supernova Cosmology

The SCP is conducting a search for very distant (redshifts greater than 1.2) Type Ia supernovae using the Advanced Camera for Surveys (ACS) on the Hubble Space Telescope.

Nearby Supernova Factory

The Nearby Supernova Factory (SNfactory) is designed to address a wide range of supernova issues using detailed observations of low-redshift SN.

LUX/LZ

The LUX experiment is a 350 kg liquid xenon time-projection chamber that aims to directly detect galactic dark matter in an underground laboratory 1 mile under the earth, in the Black Hills of South Dakota, USA.

CMB Astrophysics Theory

The most conclusive and carefully examined evidence for The Big Bang is the existence of an isotropic radiation bath that permeates the entirety of the universe known as the cosmic microwave background (CMB).
Cosmic Frontier

DESI: Dark Energy Spectroscopic Instrument

DESI will measure the effect of dark energy on the expansion of the universe. It will obtain spectra for tens of millions of galaxies and quasars, constructing a 3D map of the universe to 10 billion light years.

Visit the DESI site

Learn More

BOSS: Baryon Oscillation Spectroscopic Survey

Cosmic Frontier

The Baryon Oscillation Spectroscopic Survey (BOSS) will map the spatial distribution of luminous red galaxies (LRGs) to detect the scale imprinted by early universe oscillations.

Visit the BOSS site

Learn More

Intensity Frontier Physics

BaBar

Intensity Frontier Physics

BaBar

BaBar is a particle physics experiment on the PEP-II B-Factory at SLAC (Stanford Linear Accelerator Center). BaBar was designed primarily to study the (a)symmetries of the neutral B-meson system, but its rich physics program includes a variety of other particle physics topics.

Learn More

Long Baseline Neutrino Experiment (LBNE)

Intensity Frontier Physics

Long Baseline Neutrino Experiment (LBNE)

Over 450 people from over 75 institutions participate in the Long-Baseline Neutrino Experiment (LBNE), working together to plan and develop both the experimental facilities and the physics program. LBNE is expected to be fully constructed and ready for operations in 2022.

Visit the LBNE site

Learn More

Daya Bay

Intensity Frontier Physics

Daya Bay

The Daya Bay neutrino experiment is an exciting new project that will help us understand some of the fundamental properties of neutrinos and their role in the universe.

Visit the Daya Bay site

Learn More
**Intensity Frontier Physics**

Mu2e is a proposed experiment that will search for charged lepton flavor violation, a process which is (nearly) forbidden in the Standard Model, and is sensitive to many forms of New Physics interactions.

Visit the Fermilab Mu2e site
Learn More

**Theoretical Physics**

The research of the theoretical particle physics group is concerned with the standard model and its extensions. We construct possible extensions of the standard model and develop new methods to compare theoretical models with experimental data, and to search for new physics in current and future experiments.

Visit the Theoretical Physics at LBNL site
Learn More

**Particle Data Group**

The PDG is an international collaboration that reviews Particle Physics and related areas of Astrophysics, and compiles/analyzes data on particle properties. PDG products are distributed to 30,000 physicists, teachers, and other interested people.

Visit the Particle Data Group site
Learn More

**Detector R&D**

**CCDs for Dark Energy Studies**

Charge-coupled devices (CCD's) are the imagers of choice in astronomy. The conventional thinned rear-illuminated n-channel CCD's have limitations which are overcome by the innovative LBNL "shocking red" design.

Visit the CCDs site
Learn More

**CMB Polarization Detectors**

The envisioned next-generation CMB experiment, the so-called CMB S4, requires a large number of detectors (500,000) to achieve the necessary
sensitivity. orthogonal to the development aiming the increase of the number of channels.

Detector R&D

Dark Matter

Learn More

Integrated Carbon Composites Structures

Detector R&D

Integrated Carbon Composites Structures

The program relies heavily on the Carbon Composites Fabrication Facility of the LBNL Engineering Division and its expert technical staff, and on collaboration with the Nuclear Science Division, Accelerator Technology, Materials Science and Molecular Foundry, Advanced Light source, and industry.

Visit the Integrated Carbon Composites Structures site

Learn More

Integrated Circuit Development

Detector R&D

Integrated Circuit Development

The IC group has been a critical contributor to the DOE HEP program since the 1980's including readout ICs for CDF and D0 vertex detectors (SVX, SVX', SVX-II, SVX3, SVX4), the BaBar vertex detector (ATOM) and drift chamber, Kamland and IceCube PMTs, the FE-I3 integrated circuit used in the ATLAS pixel detector.

Visit the Integrated Circuit Development site

Learn More

Neutrino Detectors

Detector R&D

Neutrino Detectors

Rare event searches requires detailed understanding of detector behavior, and as sensitivity increases, previously unobserved instrumental effects become important.

Visit the Neutrino Detectors site

Learn More