FOR IMMEDIATE RELEASE
April 10, 2015

Contact: Jennifer Klay
805-756-1250; jklay@calpoly.edu

Cal Poly Faculty and Students Celebrate the Restart of the Large Hadron Collider

SAN LUIS OBISPO — The world's most powerful particle accelerator began its second act on April 5. After two years of upgrades and repairs, proton beams once again circulated around the Large Hadron Collider, located at the CERN laboratory near Geneva, Switzerland.

With the collider back in action, Cal Poly professor Jennifer Klay and her students will be heading back to CERN this summer to help collect and analyze data for the highest-energy particle collisions ever achieved in the laboratory.

These collisions — hundreds of millions of them every second — will lead scientists to new and unexplored realms of physics, and could yield extraordinary insights into the nature of the physical universe.

A highlight of the LHC's first run, which began in 2009, was the discovery of the Higgs boson, the last in the suite of elementary particles that make up scientists' best picture of the universe and how it works. The discovery of the Higgs was announced in July 2012 by two experimental collaborations, ATLAS and CMS. Continuing to measure the properties of the Higgs will be a major focus of LHC Run 2.

"The Higgs discovery was one of the most important scientific achievements of our time," said James Siegrist, the U.S. Department of Energy's (DOE) Associate Director of Science for High Energy Physics. "With the LHC operational again, at even higher energies, the possibilities for new discoveries are endless, and the United States will be at the forefront of those discoveries."

During the LHC's second run, particles will collide at a staggering 13 teraelectronvolts (TeV), which is 60 percent higher than any accelerator has achieved before. The LHC's four major particle detectors — ATLAS, CMS, ALICE and LHCb — will collect and analyze data from these collisions, allowing them to probe new areas of research that were previously unattainable.

At 17 miles around, the Large Hadron Collider is one of the largest machines ever built. The U.S. played a vital role in the construction of the LHC and the huge and intricate detectors for its experiments. Seven U.S. Department of Energy national laboratories joined roughly 90 U.S. universities to build key components of the accelerator, detectors and computing infrastructure, with funding from the DOE Office of Science and the National Science Foundation.

The U.S. contingent was part of an estimated 10,000 people from 113 different countries who helped to design, build and upgrade the LHC accelerator and its four particle detectors. Klay and her students were part of the U.S.-led team that developed the electromagnetic calorimeter detector for the ALICE experiment. They fabricated electronic cables, tested detector components, and analyzed simulations and test data to ready the calorimeter for operation in ALICE.

"We are on the threshold of an exciting time in particle physics: the LHC will turn on with the highest energy beam ever achieved," said Fleming Crim, National Science Foundation Assistant Director for Mathematical and Physical Sciences. "This energy regime will open the door to new discoveries about our universe that were impossible as recently as two years ago."

In addition to the scientists pushing toward new discoveries on the four main experiments, the U.S. provides a significant portion of the computing and data analysis — roughly 23 percent for ATLAS and 33 percent for CMS. U.S. scientists on the ALICE experiment developed control and tracking systems for the detector and made significant contributions in software, hardware and computing support. U.S. scientists also helped improve trigger software for data analysis for the LHCb experiment.

U.S. institutions will continue to make important contributions to the LHC and its experiments, even beyond the second run, which is scheduled to continue through the middle of 2018. Universities and national laboratories are developing new accelerator and detector technology for future upgrades of the LHC and its experiments.

In January, Klay submitted a grant proposal to the National Science Foundation to build a new detector at Cal Poly. The detector would be used in the ALICE experiment during the LHC run 3, which is scheduled to begin in 2020.

"If we receive this grant, it will enable us not only to contribute directly to understanding the fundamental building blocks of the universe but also to build a world-class detector development laboratory right here at Cal Poly," Klay said. "It will open up new Learn by Doing opportunities in particle and nuclear physics research. Students will learn how to design, test and build advanced devices for detecting subatomic particles."

For more information on the U.S. role in the Large Hadron Collider, visit: http://uslhc.web.cern.ch. For a series of videos on the LHC featuring U.S. scientists, visit: https://www.youtube.com/playlist?list=PLAK332aXG2YIlKE8XPHhevgo9vsLb_CYh

About CERN
CERN, the European Organization for Nuclear Research, is the world's leading laboratory for particle physics. It has its headquarters in Geneva. At present, its member states are Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Israel, Italy, the Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom. Romania is a candidate for accession. Serbia is an associate member in the pre-stage to membership. India, Japan, the Russian Federation, the U.S., Turkey, the European Union, JINR and UNESCO have Observer Status.

About the DOE
The DOE Office of Science is the single largest supporter of basic research in the physical sciences in the U.S. and is working to address some of the most pressing challenges of our time. For more information, please visit science.energy.gov.

About the NSF
The National Science Foundation (NSF) is an independent federal agency that supports fundamental research and education across all fields of science and engineering. In fiscal year (FY) 2015, its budget is $7.3 billion. NSF funds reach all 50 states through grants to nearly 2,000 colleges, universities and other institutions. Each year, NSF receives about 48,000 competitive proposals for funding, and makes about 11,000 new funding awards. NSF also awards about $626 million in professional and service contracts yearly.

For more on the Large Hadron Collider:
— Sarah Charley, US LHC communications coordinator, scharley@fnal.gov, 630-338-3034 (cell)
— Rick Borchelt, director, Office of Communications and Public Affairs, U.S. Department of Energy,rick.borchelt@science.doe.gov, 202-586-4477
— Ivy F. Kupec, National Science Foundation, ikupec@nsf.gov, 703-292-8796

# # #