CSU PHYSICS COLLOQUIUM

"Particle Colliders – past, present and future"

Dmitri Denisov

Brookhaven National Laboratory

Monday, November 30th at 4:00pm

Virtual via Zoom (see announcement for link)

Abstract

Developments of the particle colliders over last 50 years have seen tremendous progress in both the energy of the collisions and the intensity of the colliding beams. In order to reach even higher collision energy many fundamental inventions in the colliders design have been achieved. Progress to even higher energies was strongly stimulated by physics interests in studying smaller and smaller distances and in creation of heavier and heavier elementary particles. Experiments at colliders required major breakthroughs in the particle detection methods in order to discover new particles such as c and t quarks, gluons, tau lepton, W, Z and Higgs bosons which completed currently expected set of elementary particles. Options for even higher energy and intensity colliders will be discussed, including their design parameters, acceleration principles as well as construction challenges. Such colliders is the only way to understand the Nature at even smaller distances and create particles with higher masses than we can reach today.

Biography

Dmitri Denisov is Deputy Associate Director at Brookhaven National Laboratory leading the laboratory particle physics program and the spokesperson of the DZero collaboration, which is performing studies of subnuclear particles using data collected at proton-antiproton collider Tevatron at Fermilab. He graduated from Moscow Physical Technical Institute and joined Institute for High Energy Physics (Protvino) where he performed a series of experiments at the 70-GeV proton accelerator for his Ph.D. research. He became a worldwide expert on the development of new particle detectors for subnuclear physics experiments, including fast coordinate detectors and calorimeters based on liquid argon. Denisov joined the DZero collaboration in 1987 and helped built a large, complex particle detector to study the world's highest-energy collisions of protons and antiprotons at the Tevatron. In 1995, he played major role in Tevatron's discovery of the top quark, the heaviest elementary particle. In the late 1990s, his research led to the precise measurements of bottom-quark production across a wide kinematic region, which led to advances in the theoretical explanation of this process. Denisov oversaw major part of the upgrade of the DZero detector in time for the start of Tevatron second run, which began in 2001. He led successful commissioning of the DZero experiment and readied it for physics data collection. From 2004 to 2006, he was the leader of the electroweak physics group of the experiment, leading studies of the production and properties of electroweak force carriers known as W and Z bosons. In 2006, Denisov was elected spokesperson of the DZero collaboration, which comprises over 500 physicists from 20 countries. He has led the collaboration to many exciting scientific results, including the discovery of new heavy baryons containing bottom quarks, the highest-precision measurements of the W boson and top quark masses, searches for a wide spectrum of new subatomic phenomena predicted by theoretical models, and extensive hunt and then studies of the Higgs boson. The DZero collaboration published more than 300 papers during his term. Since 2015 Denisov is involved in developing physics program, accelerators and detectors for future high energy colliders. In 2019 Denisov joint Brookhaven National Laboratory to lead the laboratory particles physics program covering programs at energy, intensity, cosmic and theory frontiers. Denisov serves on various advisory boards in Americas, Europe and Asia. Denisov received the Medal for achievements in high energy physics and development of international cooperation from Czech Technical University in 2008, he was elected Fellow of the American Physical Society in 2010 for his numerous contributions to the development of experimental high energy physics and received 2019 European Physical Society prize for the discovery and studies of the top quark.