Rare Symmetry Violating Processes

Exploring Rare Phenomena

Purpose:
Probe the most fundamental processes of particle physics

Sponsor:
National Science Foundation

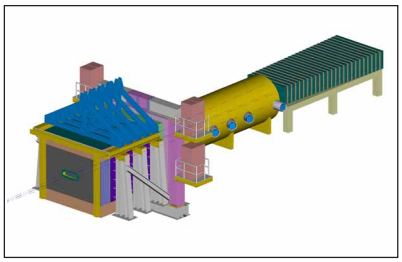
Project Funding:
- $117 million to New York University and distributed to U.S. universities and Brookhaven National Laboratory
- $60 million from NSF to Brookhaven and collaborating U.S. universities over 5 years

U.S. University Collaborators:
Boston University
University of California, Irvine
University of Cincinnati
University of Houston
University of Massachusetts/Amherst
University of New Mexico
New York University
University of Pennsylvania
Stony Brook University
Syracuse University
University of Virginia
Virginia Polytechnic Institute and State University
College of William and Mary
Yale University

International Collaborators:
Canada
Italy
Japan
Russia
Switzerland

The Alternating Gradient Synchrotron.

RSVP stands for Rare Symmetry Violating Processes, a name that captures the essence of the physics to be explored with this unique initiative at Brookhaven National Laboratory. RSVP will combine two ground breaking experiments, named KOPIO and MECO, at Brookhaven's Alternating Gradient Synchrotron (AGS). The AGS was chosen as the location for these experiments because it provides proton beams with the right combination of high energy and high intensity.



A diagram of the KOPIO experiment at the Alternating Gradient Synchrotron.

Cutting-Edge Techniques

Each experiment contains technical elements that are currently the state-of-the-art in particle physics techniques. KOPIO and MECO will explore new physics phenomena in a way that cannot be done at any of the existing or planned high-energy particle accelerators. The two experiments will perform extremely sensitive measurements to test the so-called Standard Model of particle physics, the extremely successful theoretical framework that describes fundamental particles and the way they interact.

Particles interact with each other and decay according to well-defined quantum rules. KOPIO will be the first experiment in the world to be able to observe the exceedingly rare decay of particles called "long-lived neutral kaons" into three other particles called "neutral pion," "neutrino," and "anti-neutrino." MECO seeks to observe evidence of the conversion of a particle called a muon into an electron with a sensitivity 10,000 times better than previously achieved; this process is forbidden by the Standard Model.

If the results of either of these two experiments differ from what is expected by reliable Standard Model predictions, it will lead to a major change in our understanding of the most fundamental constituents of matter and will force scientists to adopt a new and expanded view on nature.

Project Status

The RSVP project has been approved by the National Science Board of the National Science Foundation (NSF), and is awaiting Congressional action. It will be funded through a cooperative agreement between the NSF and New York University, the RSVP grant-holding institution. R&D funding began in fiscal year 2001, through grants to Yale, UC-Irvine, and Stony Brook. The RSVP experiments are being conducted by two international scientific collaborations, including several U.S. university groups that play a leading role.

RSVP will also serve an important role in the education of future U.S. scientists by stimulating interest in the most basic principles of science and by providing students with direct learning experiences.

RSVP at the AGS - Home to 3 Nobels

Since 1960, the Alternating Gradient Synchrotron, home to RSVP, has been one of the world's premiere particle accelerators, best known for the three Nobel Prizes awarded as a result of research performed there. As Brookhaven moves forward with RSVP, that role will be expanded as the AGS becomes the world's foremost facility for exploration of very rare phenomena in particle physics.