

Probes of new physics and technological advancements from particle physics experiments. A cooperative Europe - United States - Japan effort.

PROBES promotes the international and intersectoral collaboration among European, American and Japanese research institutions and industries involved in the most important research projects in fundamental physics. Astrophysical observations and anomalies in processes involving electromagnetic currents could be reconciled assuming the existence of a Dark Matter not directly interacting with light. Numerous experimental efforts are dedicated to the direct detection of galactic Dark Matter as well as to the search for Dark Matter hints at particle accelerators. The nature of quark confinement is challenging our understanding of the fundamental structure of matter. The dynamical generation of mass by the strong gluon-quark interaction within the nucleon, that accounts for 99% of standard matter, is beyond the origin of fermionic mass linked to the Higgs mechanism. The observation of neutrino oscillations established a picture consistent with the mixing of three neutrino flavors with three mass eigenstates and small mass differences. Experimental anomalies point to the presence of sterile neutrino states participating in the mixing and not coupling to fermions. Lepton mixings and massive neutrinos offer a gateway to deviations from the Standard Model in the lepton sector including Charged Lepton Flavor Violation. PROBES researchers have made outstanding contributions to the design of cutting-edge physics experiments capable of providing new answers to these challenging questions. They are now involved in the construction, commissioning and data analysis of these projects, and the next generation projects, which require maximum exchange of skills and knowledge and substantial technological advancements with potential applications outside particle physics and market opportunities for non-academic participants. Through the extended exposure to new research environments in world-class laboratories and universities in US and Japan, PROBES researchers and technical staff will have their career perspectives broadly widened.