The Intellectual Merit of the Proposed Activities

The intermediate energy nuclear physics group at Idaho State University (ISU) has an established fundamental physics program based at Jefferson Lab. ISU group members Dr. Dustin McNulty and Dr. Tony Forest are currently managing the construction and testing of the CLAS12 Region I drift chambers at ISU for Jefferson Lab's 12 GeV upgrade. The group's physics program includes nucleon spin structure and resonance studies, analysis of vector meson and hyperon photoproduction, a precision measurement of the π^0 lifetime, and precision measurements of parity violating electron scattering. Dr. Tony Forest and Dr. Philip Cole are co-spokespersons on approved 12 GeV Hall B experiments PR12-06-109 and PR12-09-003, respectively. Dr. Cole and three graduate students are presently focused on comprehensive measurements of vector meson and hyperon photoproduction employing linearly polarized photons to improve our understanding of the underlying symmetry of the quark degrees of freedom in the nucleon, the nature of the parity exchange between the incident photon and the target nucleon, and the mechanism of associated strangeness production in electromagnetic reactions. Dr. Dan Dale is a spokesperson of the PrimEx Collaboration which is performing a high precision measurement of the π^0 lifetime as a test of the QCD chiral anomaly plus corrections. This measurement uses photoproduction in the Coulomb field of a nucleus to facilitate a stringent test of the fundamental predictions of quantum chromodynamics in the confinement scale regime. Dr. Dustin McNulty and Dr. Tony Forest are collaborators in parity violation experiments PR12-09-005 and E05-008, respectively, with a focus on measuring the low energy constant d_Δ using inelastic parity violation.

Broader Impacts of the Proposed Activities

In addition to the scientific program described here, this proposal represents a major effort in the area of educating future scientists. The present shortage of graduate students in experimental and theoretical nuclear physics is having a detrimental impact on our national laboratories and facilities which posses a plethora of data but limited manpower for analyzing and disseminating the information. The Idaho State University Department of Physics is comprised of nine tenure-track faculty, all of whom have research interests which are in some way connected to nuclear physics and are in a position to directly address the shortage of graduate students. With its on campus accelerator and detector laboratories, the Department focuses on experimental and applied physics, giving students a strong hands-on educational experience. ISU's physics program is relatively new and rapidly growing. Last year, ISU physics faculty brought in approximately $8 million in external research funds. Its Ph.D. program, established in the Fall of 2005, presently has approximately 30 students with an additional 15 students pursuing research at the M.S. level.

The PIs are further strengthening the ISU graduate program by recruiting high-caliber students from Latin America. Latin America remains an underutilized intellectual resource. The ISU Group has strong ties to Colombia and has attracted four talented graduate students into nuclear physics at ISU; three are working on JLab-related projects and one graduated in late 2009 and is now an Assistant Professor in Bogotá, Colombia. The activities delineated within this proposal will provide another avenue through which the program can continue to solidify this mutually beneficial bridge of collaboration among countries in the Americas.