NEUP Nuclear Energy University Programs
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Enhancing Student Experience in Neutron Detection, Modeling, and Dosimetry

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Program: Infrastructure

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ABSTRACT:

Our proposed work will address the continuing challenge of training students in accurately measuring and modeling neutron fields and educating them on neutron interactions, spectrometry, and dosimetry. These are critical topics for the next generation of health physicists, as they will be part of the DOE and private sector initiatives to design, test, and eventually operate novel nuclear reactors and reactor types. For safe operation and public acceptance, new reactors or reactor types will need to be evaluated for their criticality safety as well as their radiological safety. Health physics students, in general, are trained to provide the requisite expertise in these areas, and certainly with a special emphasis on the latter, radiological safety; Colorado State University (CSU) students, in particular, have the opportunity to pursue this special expertise during their graduate studies in the CSU health physics program.

Our proposed project is aimed at further enhancing the CSU graduate student educational experience by *procuring a new and well-characterized set of neutron detectors (Bonner Spheres) to provide additional neutron detection capacity and neutron spectroscopy capabilities. These will be incorporated in existing laboratory courses and student research projects, and will be supplemented by novel computational tools for neutron field evaluations and neutron dosimetry.*

The objective of our project is to provide the best possible education and training to CSU graduate health physics students and peers from partnering colleges or universities in order to prepare them for positions in the DOE Complex or the private sector where they will be able to utilize their skills in the design, testing, and operation of novel nuclear reactors and reactor types.

We will achieve our objective by supplementing existing facilities and equipment by a new set of well-characterized Bonner Spheres and the ATTILA4MC computer code. The former will be used for neutron spectroscopy measurements, with properly determined and evaluated response functions to allow for the deconvolution of the measurement results into the neutron spectrum. The latter provides special field and dosimetry visualization tools and variance reduction methods through its intrinsic deterministic Boltzmann Equation solver as well as for MCNP-generated field and dosimetry results.

Our proposed project will provide the tools and equipment for use for between five and ten graduate M.S. and between two and five PhD students per year. These students, upon graduation, will be well-positioned to enter the workforce in the DOE Complex or in the private sector in professional areas related to neutron detection, modeling, and dosimetry.