

Postdoctoral Research Associate for the Total Absorption Gamma Spectroscopy

**Holifield Radioactive Ion Beam Facility
Physics Division
Oak Ridge National Laboratory
Oak Ridge, Tennessee**

ORNL10-38-PD

Project Description:

The Holifield Radioactive Ion Beam Facility (HRIBF) is operated as a National User facility for the U.S. Department of Energy, at the Physics Division of ORNL, producing high quality beams of short-lived radioactivities for studies of exotic nuclei. Most of these nuclei are produced using proton-induced fission of ^{238}U . The ionized radioactive products diffuse out of the target-ion source system, are formed into a beam and selected according to their mass. These radioactive ions can be accelerated to about 0.2 MeV or to few hundreds of MeV total energy, to perform decay studies by means of beta, gamma, X-ray, conversion electrons and neutrons spectroscopy. These investigations are expected to be complemented by the Total Absorption Gamma Spectroscopy with a new Modular Total Absorption Spectrometer (MTAS) to be constructed at the HRIBF. The proposed MTAS device will be used as a calorimeter measuring nearly all gamma radiation emitted from excited states populated in beta decay. This device would consist of many segments requiring individual testing and characterization of the response to different kinds of radiation, and have an active volume much larger than that of previous such spectrometers, and create the potential for discrimination of neutron-induced signals from gamma radiation. The MTAS measurements of total gamma energies released in the decay of ^{238}U fission products will allow us to establish a true beta-feeding pattern, leading to the experimental determination of beta strength function. These new reliable experimental data will be used to verify and develop further the microscopic models of beta decay properties and of related structure of neutron-rich nuclei. The importance of the studies with the MTAS reaches well beyond nuclear structure. In particular, measuring and understanding the “decay heat”, namely the amount and forms of energy released in the decay of fission products, is crucial for the analysis of nuclear reactor operations and the shut-down procedures, as well as for handling nuclear spent fuels. The MTAS measurements determining the decay heat related to gamma-emission will be used to refine and eventually replace the phenomenological description with a more accurate microscopic picture, accounting for the experimentally studied decays of individual fission products. This task represents an important contribution of low energy nuclear physics to the operation of existing nuclear power plants and to the design of future power reactors.

Qualifications:

Ph.D in nuclear physics, based on the studies involving the spectroscopy of nuclear radiation. About 7 years of post master degree experience, including about two to three years of post-doctoral experience at the university or at the nuclear physics laboratory, are required. The candidate should have knowledge on the structure of atomic nucleus studied through the spectroscopy methods (e.g., gamma counting, neutron detection) confirmed by

a co-authorship of over ten publications (including master's and Ph.D. thesis) in the international journal and conference proceedings. Preference is given to the candidate having additional technical skills related to the construction of experimental set-up or equipment at the nuclear laboratory. The candidate should be self-motivated, have good interpersonal and communication skills and the team-work ability.

The candidate is expected:

- to perform numerous measurements with radioactive sources at different geometries (at the micro-Curie activity level).
- to provide a quality test and characterize experimentally the response of each out of nineteen large NaI(Tl) scintillator modules of the Modular Total Absorption Spectrometer (MTAS) to the different kinds of radiation.
- to test and analyze of the response function of the full MTAS array, with a different auxiliary detector materials.
- to help during the design and construction of MTAS shielding structure.
- to help during setting-up and running the on-line decay spectroscopy experiments, including the measurements with MTAS, at the Holifield Radioactive Ion Beam Facility.

Technical Questions:

For more information about this position please contact Dr. K.P. Rykaczewski (rykaczewskik@ornl.gov) or Dr R. K. Grzywacz (rgrzywac@utk.edu), at the Physics Division, Oak Ridge National laboratory, P.O. Box 2008, Oak Ridge, TN 37831-6371, and reference this position title and number in your correspondence.

How to Apply:

Applications will be accepted until 15th of January, 2010 or until the position is filled. Qualified applicants must apply online at https://www2.ornl.gov/ORNL_POST/. All applicants will need to register before they can begin the online application. For complete instructions, on how to apply, please see the instructions at <http://www.ornl.gov/orise/edu/ornl/ornl-pdpm/application.htm>.

This appointment is offered through the ORNL Postgraduate Research Participation Program and is administered by the Oak Ridge Institute for Science and Education (ORISE). The program is open to all qualified U.S. and non-U.S. citizens without regard to race, color, age, religion, sex, national origin, physical or mental disability, or status as a Vietnam-era veteran or disabled veteran.