Potential Resources in USA for Applied Experimental Nuclear Data Studies

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The Issue

- Expressed concerns about the “diminishing” experimental resources available in the USA for applied nuclear data measurements may stem from overlooking the many facilities currently being used in this country for basic research
- A CSEWG Website (based at Argonne) provides an informational catalogue that identifies some of these “untapped” facility resources and programs … CSEWG should consider them as potential applied nuclear data contributors given the appropriate motivation and support

Context

- Presentations given in this session of the annual CSEWG meeting tend to come from the familiar "stalwart" laboratories we have come to "know and love" as members of our applied community
- This presentation offers a brief overview of 3 labs that are rarely represented at CSEWG in order to broaden our vision of the true experimental situation
- But … those laboratories whose main focus is basic studies will not change their research emphases to applications overnight (issues to be considered include funding, national priorities, interests, experience, etc.)

This Year's Featured Laboratories

- Argonne National Laboratory ATLAS Facility
- University of Notre Dame Accelerator Laboratories
- University of Kentucky – Lexington Low Energy Nuclear Physics Laboratory

Note: Links to each of these laboratories can be found at www.td.anl.gov/nrs/fac_prg2.html

Argonne ATLAS Facility (1)

Location: Physics Division, Argonne National Laboratory, Illinois

Nature of Facility: Heavy-ion accelerator (heavier than an electron and extending up to the trans-plutonium regime!)

Current Emphasis: Nuclear structure and nuclear reactions occurring far from the line of stability, exotic reactions (for astrophysics, etc.)

Major Sponsor: DOE (Office of Science)

Argonne ATLAS Facility (2)

Key Features: Two distinct ion injector facilities … accelerates particles to 17 MeV/nucleon … extensive sample preparation capabilities … extensive beam analysis and radiation detection instrumentation

Technical Staff: Experienced in-house scientists and support personnel … a user facility for researchers around the world … grad students … post docs

History: Operational for about 20 years … continuously upgrading capabilities … programs evolve with changing national (int'l) priorities

Argonne ATLAS Facility (3)

Nuclear Data Applications: Rich source of nuclear structure data … Accelerator Mass Spectrometry (AMS) applications … solving key questions in astrophysics … candidate site for RIA facility

Note: AMS will play a much bigger role in applied nuclear energy studies in the future and ATLAS is a key resource in this growing area of nuclear technology

University of Notre Dame Accelerator Laboratories (1)

Location: Notre Dame Campus, South Bend, Indiana

Nature of Facility: Three Van de Graaff accelerators (JN – 1MV, KN – 4 MV, FN Tandem – 10 MV) offer a wide range of nuclear beam options

Current Emphasis: Astrophysics, nuclear structure and reaction mechanisms, nuclear processes initiated with radioactive nuclear beams

Major Sponsor: National Science Foundation

University of Notre Dame Accelerator Laboratories (2)

Key Features: Wide range of nuclear beam types and energies … extensive sample preparation facilities … extensive nuclear measurement instrumentation

Technical Staff: Experienced faculty and support personnel … grad students … post docs

History: Laboratory in operation for several decades … co-developer of the famous Browne/Buechner magnetic spectrograph … strong player in nuclear astrophysics … acquired JN and KN accelerators from de-commissioned laboratories in Canada

University of Notre Dame Accelerator Laboratories (3)

Nuclear Data Applications: Large contributor to nuclear astrophysics … facilities could be used for a wide range of nuclear structure and nuclear reaction data measurements applicable to nuclear energy development

Note: An important asset of this laboratory is its extensive network of scientific collaborators in the U.S. and abroad

University of Kentucky –Lexington L.E. Nuclear Physics Laboratory (1)

Location: U of K campus, Lexington, Kentucky

Nature of Facility: 7 MV accelerator (modified from the original Van de Graaff design)

Current Emphasis: Nuclear structure and nuclear reaction studies in the MeV region using (CP,n), (CP,nγ), (n,n' γ), etc., reactions on medium and heavy nuclei … properties of low-lying states

Major Sponsor: National Science Foundation

University of Kentucky –Lexington L.E. Nuclear Physics Laboratory (2)

Key Features: Various available gas and solid target arrangements involving ^{7}Li, ^{3}H, and ^{2}H can be used to produce wide range of neutron energies … neutron and gamma-ray spectrometers

Technical Staff: Experienced faculty researchers … grad students … post docs

History: This laboratory has been in operation for several decades and has been very productive in several areas, especially neutron-induced gamma-ray production processes in the MeV region

University of Kentucky –Lexington L.E. Nuclear Physics Laboratory (3)

Nuclear Data Applications: Rich source of nuclear structure data for low-lying levels of stable nuclei … facility could be used for various L.E. nuclear reaction studies and nuclear applications testing

Note: Studies of explosives detection by neutron transmission measurements have been performed at this facility in collaboration with scientists from other institutions … however, one concern is the aging of experienced core staff