

Cyclotron Colloquium, Tuesday, May 11, at 3:45 pm

Surrogate reactions for nuclear energy applications

Dr. J. J. Ressler

Lawrence Livermore National Labs, Livermore, CA

New reactor designs and materials, reprocessing efforts, and transmutation of nuclear waste play significant roles in the future of nuclear energy science. New or improved neutron measurements on a number of different isotopes are needed to determine feasibility, effectiveness, and safety issues for the novel engineering efforts. Data collection efforts are often hampered by the need for radioactive targets; the use of radioactive targets is limited to longer-lived isotopes (half-lives \gg 100 days) due to the large background induced by the decay of the material.

Near stability, alternate or "surrogate" reactions can be used to probe isotopes of interest. In the actinide region, short-lived isotopes often have longer-lived neighbors; these isotopes can be used to form the same compound nucleus as the initial desired reaction. Decay from the compound state is assumed to be independent of the production reaction, thereby allowing reactions with the neighbouring isotopes to be used as a surrogate for the reaction of interest. Preliminary results from the neutron induced fission of ^{238}Pu will be shown to highlight the technique.

To access isotopes further from stability, accelerated radioactive ion beams are necessary. The reactions will be "inverse", as the beam content is similar to the isotope of interest and will impinge a low-mass target. Neutron targets are not possible, but surrogate reactions, similar to above, can be used. Examples of desired reactions, in reference to nuclear energy applications, will be given.

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