Contribution ID : **120** Type : **Poster**

Neutron Activation Analysis of Titanium in a Heavy Water Moderator

Content

Titanium is a desired material for cryostat construction for the purpose of low background rare-event detection experiments due to its low intrinsic radioactivity, material strength, and ease of machining/welding. In order to characterize the backgrounds of an experiment, a precise measurement of the trace radioisotope concentration is desired. The traditional neutron activation analysis technique subjects the titanium to reactor neutrons, which have a mixed spectrum of thermal and fast (> 1 MeV) energies. The fast component produces scandium isotopes via (n,p) interactions with the bulk titanium. Some of these isotopes have significant gamma lines, and their Compton tails create large backgrounds in the regions of interest for gamma lines from the activation of trace radioisotopes. A heavy water moderator tank was installed at the UC Irvine reactor in order to slow the incoming neutron flux and suppress the production of scandium on a sample of titanium. Furthermore, the irradiated samples are counted in a custom NaI-enclosed HPGe detector (described in a separate abstract by James Morad), which provides Compton suppression. The results from this measurement will be presented.

About the Presenter

Tessa Johnson is a postdoctoral researcher at the University of California Davis concentrating on the DarkSide direct dark matter search.

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Session Classification : Non-radiometric Measurements

Track Classification : Non-radiometric Measurements