

A New Proposal to the High Intensity Gamma-Ray Source (HIγS) PAC-12

Cross Section Measurements for $^{94}\text{Mo}(\gamma,n)^{93}\text{Mo}$ – Key
Photonuclear Reaction for Understanding the Origin of *p*-Nuclei

A. Banu (Spokesperson), B. Glassman, D. Votaw

James Madison University, Department of Physics and Astronomy, Harrisonburg, VA 22801, USA

C. Travaglio

INAF – Astronomical Observatory Turin, Italy

and

B2FH – Association – Turin, Italy

October 19th, 2012

1. Experiment Summary

The proposed research aims to contribute to enhancing the current state of fundamental knowledge on a forefront topic in nuclear astrophysics - the nucleosynthesis beyond iron of the rarest stable isotopes (the origin of p -nuclei). More specifically is focused on the cross section measurement of $^{94}\text{Mo}(\gamma,n)^{93}\text{Mo}$, a key photonuclear reaction for understanding the γ -process (the mechanism responsible for the origin of p -nuclei).

The experimentally unknown reaction cross section is proposed to be study close to and above the neutron threshold with quasi-monochromatic photon beams at the High Intensity Gamma-ray Source (HI γ S) facility at Duke University. The measurement is focused primarily on studying the energy dependence of the photoneutron cross section which is the most direct way of testing the predictions of statistical models. The measurements of the total (ground state + isomeric) cross sections for $^{94}\text{Mo}(\gamma,n)^{93}\text{Mo}$ with an energy threshold at 9.7 MeV will be performed at beam energies starting from above the neutron thresholds to around 13 MeV in steps of 100 – 150 keV. A highly enriched target sample of the ^{94}Mo isotope is required. Neutrons from the (γ,n) reaction will be detected using an assembly of 4π ^3He proportional counters developed at Los Alamos National Laboratories and presently available at HI γ S-Triangle University Nuclear Laboratory (TUNL).