Measurement of the 330 keV resonance in $^{18}F(p,\alpha)^{15}O$*

B.H. Moazen[1], J.C. Blackmon[2,3], D.W. Bardayan[3], K.Y. Chae[1], K.A. Chipps[4], C.P. Domizioli[5], R. Fitzgerald[6], U. Greife[4], W.R. Hix[3], K.L. Jones[1], R.L. Kozub[5], E.J. Lingerfelt[1], R.J. Livesay[4], C. Matei[7], C.D. Nesaraja[1,3], S.D. Pain[7], L.F. Roberts[3], J.F. Shriner Jr.[5], M.S. Smith[3], and J.S. Thomas[7]

[1]*University of Tennessee*

[2]*Louisiana State University*

[3]*Oak Ridge National Laboratory*

[4]*Colorado School of Mines*

[5]*Tennessee Technological University*

[6]*University of North Carolina*

[7]*Rutgers University*

Determination of isotopic abundances created in novae requires the accurate measurement of reaction rates. Of particular importance are reactions leading to the production and destruction of ^{18}F, whose e^+-decay is believed to be the most important source of γ-ray emission after the initial explosion and is a target of γ-ray astronomy. A resonance at $E_{c.m.}$=330 keV in $^{18}F(p,\alpha)^{15}O$ dominates the reaction rate at novae temperatures; however, there is still a 30% uncertainty in the strength of this resonance, leading to significant uncertainties in the ^{18}F abundance. To reduce these uncertainties, we plan to measure the energy and strength of this resonance using a novel technique developed at the Holifield Radioactive Ion Beam Facility at Oak Ridge National Laboratory to measure narrow resonant (p,α) reactions. This technique involves filling a large scattering chamber filled with hydrogen gas at pressures of up to 4 Torr. The chamber is pumped differentially through a 5 mm aperture. The ion beam bombards the gas and the alpha particles are detected by the SIDAR annular array of segmented silicon strip detectors. Heavy recoils pass through the center of the silicon array and are detected by a Micron Type S1 annular Si detector segmented into 4 quadrants of 16 strips each. The relative kinematics of the two reaction products allows the reaction vertex (and therefore the interaction energy) to be identified.

This technique was used to measure the 183 keV resonance in $^{17}O(p,\alpha)^{14}N$ that had been reported to significantly increase the reaction rate at novae temperatures and affect ^{18}F production as much as a factor of 10 in low mass ONeMg novae [1,2,3]. An overview of the planned $^{18}F(p,\alpha)^{15}O$ experiment and technique will be presented, as well as results of the $^{17}O(p,\alpha)^{14}N$ experiment.

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