First experimental constraints on the interference of $\frac{3}{2}^+$ resonances in the $^{18}$F($p,\alpha$)$^{15}$O reaction

K.Y. CHAE, Univ. of TN, D.W. BADAYAN, J.C. BLACKMON, M.S. SMITH, ORNL, M.W. GUIDRY, C.D. NE-SARAJA, Univ. of TN, ORNL, D. GREGORY, R.L. KOZUB, S. PAULUSKAS, J.F. SHRINER JR., N. SMITH, TN Tech Univ., M.S. JOHNSON, ORAU, R.J. LIVESAY, M. PORTER-PEDEN, CO School of Mines, Z. MA, Univ. of TN, S.D. PAIN, J.S. THOMAS, Rutgers Univ. — The $^{18}$F($p,\alpha$)$^{15}$O reaction plays a crucial role in understanding $\gamma$-ray emission from novae. Because of the importance of understanding the $^{18}$F + $p$ reactions, a number of studies of the A=19 isobars have been made using stable and exotic beams. The interference effects among $J^\pi = \frac{3}{2}^+$ resonances in the $^{18}$F + $p$ system, however, have never been measured, but they can change the S-factor by a factor of 20 at nova energies. $R$-matrix calculations indicate that the cross sections above the $E_{c.m.} = 665$ keV resonance are sensitive to the interference between the $E_{c.m.} = 8, 38$, and 665 keV resonances. In order to study the interference effects, an excitation function for the $^1$H($^{18}$F,$\alpha$)$^{15}$O reaction has been measured in the energy range of $E_{c.m.} = 663$-877 keV using radioactive $^{18}$F beams at the Holifield Radioactive Ion Beam Facility. By measuring the $^{18}$F($p,\alpha$)$^{15}$O cross section off resonance and comparing the cross section with theoretical calculations, we could provide the first experimental constraints on the interference of $\frac{3}{2}^+$ resonances.

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