Direct measurement of the $^{18}F(p,\alpha)\ ^{15}O$ cross section at nova temperatures

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Nova explosions are among the most violent events in the Universe and responsible for the production of selected proton-rich nuclei. The direct observation of gamma rays from these events will provide crucial isotopic information and allow theorists to place important constraints on nova models.

The major source of ≤ 511 keV gamma rays from novae is from the decay of ^{18}F. The main uncertainty in the predicted final abundance of ^{18}F arises from the destruction reaction $^{18}F(p,\alpha)\ ^{15}O$. The cross section of this reaction, at nova temperatures, is thought to be dominated by the unknown interference term between two low-lying states at 8 and 38 keV and the well studied 665 keV state. By constraining the contribution of this interference term, the uncertainly in this reaction rate can be significantly reduced and the maximum distance at which such nova observations can be made determined.

An off resonance measurement of the $^{18}F(p,\alpha)\ ^{15}O$ cross section at a centre of mass energy of 250 keV, the lowest energy direct measurement to date and within the Gamow window for novae, was performed at the TRIUMF-ISAC radioactive beam facility. A ^{18}F beam of ~ 5 x 10^6 pps was delivered to the TUDA silicon detector array for a total of 10 days. The energy and timing of both reaction products were measured in four highly-segmented silicon strip detectors allowing complete kinematic reconstruction of each event. Additional measurements were made at energies of 665 keV, 430 keV and 330 keV. Preliminary results will be presented.