I. Abstract
Inertial confinement fusion is a tool that can be used for fundamental nuclear science measurements. In the method under consideration, nuclear reaction products in the expanding atomic gas following the target implosion will be collected and trapped using a turbomolecular pump. The beta-decay of reaction products with half-lives ranging between 20 ns and 10 s will be measured in situ using a phoswich detector system starting milliseconds after the implosion. Several previously unmeasured low-energy deuterium and tritium radiative capture and stripping cross sections could possibly be measured using this technique. To study the feasibility, several small scale experiments are being carried out at Houghton College and SUNY Geneseo to simulate the rapid release of gas by the ICF target, its subsequent capture and decay counting.

II. ICF Experimental Setup

Method 1: Some fraction of the reaction products will be captured through the collection tube, trapped and detected.

Method 2: All reaction products will be collected and trapped by a large turbomolecular pump system.

Method 3: Some reaction products will stick to a getter placed in front of the detector system, near the target center.

III. Theory
Several zero threshold energy, light ion triton and deuterium reactions produce nuclei with sub-second half-lives. Total yield and number of trapped product nuclei has been estimated using TALYS and other predicted cross sections.

IV. ⁴¹Ar Experiment
Deuterons from the Tandem Pelletron Accelerator at SUNY Geneseo induced the ⁴¹Ar(t,p)⁴⁰Ar reaction. The resulting ⁴⁰Ar gas was then transported to Houghton College and released into the vacuum chamber. Gas entering the collection tube was trapped in the turbomolecular pump. The HPGe and silicon surface barrier detectors counted the foreline trap for about one half-life, 109 minutes.

Table 1: Reactions that might be measurable using the OMEGA laser. Estimates for yields and number of trapped product nuclei are given for two typical OMEGA shots. Rows highlighted in yellow indicate the most feasible reactions.