Abstract Submitted
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**Laser-Induced Fluorescence Measurements for Optical Single Atom Detection for Nuclear Astrophysics**[1] KRISTEN PARZUCHOWSKI, JAIDEEP SINGH, JENNIFER WENZL, DUSTIN FRISBIE, MAEGAN JOHNSON, National Superconducting Cyclotron Laboratory — We propose a new highly selective detector to measure rare nuclear reactions relevant for nuclear astrophysics. Our primary interest is the $^{22}\mathrm{Ne}(\alpha, n)^{25}\mathrm{Mg}$ reaction, which is a primary source of neutrons for the s-process. Our proposed detector, in conjunction with a recoil separator, captures the recoil products resulting from the reaction in a cryogenically frozen thin film of solid neon. The fluorescence spectra of the captured atoms is shifted from the absorption spectra by hundreds of nanometers. This allows for the optical detection of individual fluorescence photons against a background of intense excitation light. We will describe our initial studies of laser-induced fluorescence of Yb and Mg in solid Ne. Neon is an attractive medium because it is optically transparent and provides efficient, pure, stable, & chemically inert confinement for a wide variety of atomic and molecular species. Yb is used as a test atom because of its similar atomic structure to Mg and much brighter fluorescence signal.

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