Abstract Submitted
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Prospects of Optical Single Atom Detection for Nuclear Astrophysics[1] JAIDEEP SINGH, National Superconducting Cyclotron Lab./Michigan State U. — We will discuss the prospects of optically detecting single atoms captured in a cryogenic thin film of a noble gas such as neon. This proposed detection scheme, when coupled with a recoil separator, could be used to measure rare nuclear reactions relevant for nuclear astrophysics. In particular, we will focus on the ^{22}Ne(α,n)^{25}Mg reaction, which is an important source of neutrons for the s-process. Noble gas solids are an attractive medium because they are optically transparent and provide efficient, pure, stable, & chemically inert confinement for a wide variety of atomic and molecular species. Atoms embedded inside of noble gas solids have a fluorescence spectrum that is often significantly shifted from its absorption spectrum. This makes possible the detection of individual fluorescence photons against a background of intense excitation light, which can be suppressed using the appropriate optical filters. We will report on our efforts to optically detect single Yb atoms in solid Ne. Yb is an ideal candidate for initial studies because it emits a strong green fluorescence when excited by blue light and it has an atomic structure that very closely resembles that of Mg.

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