

Abstract Submitted
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Trace Detection of Metastable He₂ Molecules in Superfluid Helium¹ W.G. RELLERGERT, S.B. CAHN, A. GARVAN, J.C. HANSON, J.A. NIKKEL, D.N. MCKINSEY, Yale University — We present results on the detection and imaging of He₂ triplet molecules in superfluid helium using laser induced fluorescence. A two photon transition at 905 nm results in the emission of a single detectable photon of shorter wavelength (640 nm). This cycling transition can be driven many times over the course of the molecule lifetime (13 s) resulting in good signal to noise. Control over the vibrational state of the molecule with the use of repumping lasers is demonstrated. Emission and absorption spectra in addition to images of the molecules obtained using the technique are shown. Detection of He₂ molecules in liquid helium has potential applications in the detection of gamma rays, WIMP dark matter, and ultracold neutrons, as well as the three-dimensional imaging of fluid flow and vortices in superfluid helium.

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