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Raman Spectroscopy as a way to determine Ortho to Para Ratio of Deuterium PATRICK WONG, ALBERT YOUNG, GUILHEM RIBEILL, VIJYA MEHTA, NCSU — A superthermal ultracold (<350 neV) neutron source using a solid Deuterium (D_2) crystal is being developed at the NC State University PULSTAR nuclear reactor. Ultracold neutron production in the solid D_2 crystal requires that the D_2 be in the ortho (total nuclear spin of 0) rotational state, as D_2 in the para (spin 1) rotational state interacts with ultracold neutrons by transferring energy to the neutrons. A novel method to determine the ortho/para-D_2 ratio is to use Raman spectroscopy to determine the fraction of rotational states in the D_2. This project focuses on the design, construction, and ultimate use of a double-grating Raman spectrometer to determine the ratio of ortho-D_2 to para-D_2. This system is critical to the optimization of the para-to- ortho-D_2 converter which produces D_2 for the ultracold neutron source. I will present details on the Raman spectrometer's construction and performance, as well as Raman spectra obtained for air and regular D_2 (with 30% para-D_2 content).

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