

GRADUATE STUDENT SEMINAR

Friday, 16th Sept., 4:00pm, Robeson 116

The Borexino Solar Neutrino Detector and its Internal Source Calibration Program

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ABSTRACT

Borexino is a liquid scintillator detector designed to measure the flux, and energy spectrum, of the mono-energetic neutrinos produced by electron capture on ${}^7\text{Be}$ in the sun's core. Borexino affords the real-time measurement of the ${}^7\text{Be}$ neutrino energy spectrum to the lowest energy threshold to-date, thus allowing us to probe new physics. However, the low energy threshold, coupled with a low count rate, requires Borexino to have extremely low backgrounds, and additionally requires us to have an excellent understanding of the backgrounds that do exist. The purification techniques employed for the scintillator have lowered the radioactive contaminants to levels never before achieved; however, we must still apply cuts to the data.

At Virginia Tech, we have developed an internal source calibration program that employs radioactive and optical sources, and will give us a thorough understanding of both the pulse shape discrimination efficiency, as well as the energy and time response of Borexino. The radioactive sources allow us to obtain the energy scales for alpha, beta, and gamma backgrounds present in the detector. When the calibration sources are used in conjunction with an accurate source location system, we can discover, and correct for, any spatial or energy dependencies found.