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Measuring Muon Spin Precession in an Experiment for an Advanced Undergraduate Laboratory ABISHEK REDDY WDARU, University of Illinois at Urbana-Champaign, MODERN PHYSICS LAB AT UIUC TEAM — The advanced undergraduate laboratory at the Physics Department at the University of Illinois uses stopped cosmic ray muons to observe their spin precession. The experiment uses a stack of alternating layers of scintillator and absorber plates located in a transverse magnetic field. Stopped negative muons are captured quickly through inverse beta decay. However, the spins of the remaining positively charged stopped muons precess around the transverse magnetic field. The spin precession frequency is measured by observing the difference in yields of decay positrons counted in the scintillators above and below the absorber plate holding a given stopped muon as function of time. Six groups of students assemble the experiment over the course of each semester and use the apparatus to carry out measurements of increasing degree of complexity: muon lifetime, muon capture, various calibration tasks and finally the spin precession measurement. The progress of the experiment is documented by the students through daily entries in the electronic logbook, bi-weekly reports and a monthly presentation in the laboratory seminar. In this contribution we describe the experimental setup, its use in an advanced undergraduate lab and a recent effort to refurbish and further improve the experiment.

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