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Muon Capture on the Deuteron FREDERICK GRAY, Regis University, MUSUN COLLABORATION — The MuSun Collaboration is preparing to measure the rate of nuclear muon capture by the deuteron ($\mu^- + d \to \nu_\mu + n + n$) from the doublet spin state of the $\mu^- + d$ atom, with better than 1.5% precision. It will determine this rate by observing the difference between the disappearance rates of positive and negative muons in a purified deuterium gas target. It is built upon the success of the MuCap experiment, which has measured the rate of muon capture in protium using a similar technique. The MuSun experiment will provide the most precise determination to date of the rate for any two-nucleon weak-interaction process. Using effective field theories (including chiral perturbation theory), $\mu^- + d$ capture can be related to similar processes, including proton-proton fusion and charged- and neutral-current deuteron breakup reactions. A measurement of its rate will therefore also serve as a calibration of other processes that are of fundamental importance to nuclear astrophysics. This presentation will describe the current status of the experiment, including some results from a first beam test conducted at the Paul Scherrer Institute in fall 2008.

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