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Measurement of the Lifetime of Cosmic Ray Muons IAN BRUBAKER, Student, DARREL SMITH, Advisor — In this experiment, cosmic rays create scintillation light as they pass through a 5 gallon mineral oil/scintillator detector, as observed by three photomultiplier tubes. Some of the low-energy cosmic muons come to rest in the detector and their subsequent decays ($\mu^+ \rightarrow e^+ \bar{\nu}_\mu \nu_e$ + $C.C.$) are observed as a second burst of light. The decay lifetime of 498,987 stopping muons were measured and the mean muon lifetime (τ_μ) was calculated to be $\tau_\mu = (2.119 \pm 0.003)\,\mu s$. The composition of cosmic muons includes both positive and negative muons, and a small fraction of the μ^- cosmic rays are captured by hydrogen and carbon nuclei in the mineral oil (CH_2) resulting in a capture lifetime of $\tau_{cap} = (57 \pm 2)\,\mu s$.

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