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The MuSun Experiment: First analysis of production data

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Using a unique cryogenic time projection chamber as an active stopping target, the MuSun experiment has acquired the 10^{10} fully reconstructed muon decay events necessary to measure the rate of muon capture on the deuteron to better than 1.5% precision. Once completed, the analysis will lead to a benchmark result in calibrating weak interactions in the two nucleon system, relevant for calculating fundamental nuclear reactions within modern effective field theories. MuSun employs a technique to extract the capture rate via measurement of the deviation of the negative muon lifetime in deuterium gas from the positive muon lifetime. Such a technique requires excellent gas purity, knowledge of the μd hyperfine state prior to capture, and verification that each muon stopped within the gas target. Advanced muon tracking algorithms have been developed to reduce systematic effects associated with muon catalyzed fusion interference, in addition to methods to estimate gas purity. These analysis tools are now being applied to the first high statistics production dataset from the 2014 run, consisting of 5×10^9 events. An overview of systematics will be presented, along with the status of the first analysis of production data.

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