

Cosmic Ray Event Reconstruction in Mu2e

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The Mu2e experiment at Fermilab seeks to observe the ultra-rare conversion of a muon to an electron in a nuclear field, which produces a monoenergetic electron with an energy close to the muon rest mass. This process violates charged lepton flavor number conservation in the Standard Model, and is a clear signal for New Physics if observed. Mu2e's most dangerous source of background is conversion-like events produced from cosmic rays, which can interact with the apparatus and generate fake signal candidates. Cosmic rays are mitigated by an active cosmic ray veto (CRV) detector that surrounds the apparatus. We will briefly summarize the backgrounds to the conversion signal and then dive into how Mu2e detects, reconstructs, and rejects cosmic ray events, including discussion of some recent work that was done to improve the timing reconstruction of the cosmic rays. In this discussion, we study the impact of the signal propagation time through long, up to 6m, scintillating CRV counter bars and the time-of-flight corrections on the cosmic rejection efficiency. These newly introduced corrections will be used to improve the cosmic ray vetoing and optimize event selection.

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