



Contribution ID: 754

Type: **Poster**

Studies of Beam Induced Radiation Backgrounds for the Cosmic Ray Veto Detector Operations at the Mu2e Experiment

Saturday, 6 August 2016 18:00 (2 hours)

The Mu2e experiment will search for a neutrinoless muon-to-electron conversion process with almost four orders of magnitude of sensitivity improvement relative to the current best limit. One important background is caused by cosmic-ray muons and their secondaries faking the conversion electron signature. In order to reach the designed sensitivity, Mu2e needs to identify cosmic-ray muons with an efficiency of 99.99%. The Cosmic Ray Veto (CRV) detector consists of four layers of plastic scintillator which surrounds the Mu2e detector, with an area of approximately 300 square meters. The CRV must operate in the presence of large neutron and gamma fluxes produced from beam interactions. This radiation can damage the detector components and generate significant background rates in the CRV. We estimate the background rates and the total dead-time produced by these backgrounds using a simulation which includes a sophisticated model of the Mu2e apparatus and the CRV response.

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