

Antiproton-induced background in μ -e conversion experiments

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Antiprotons, which are generated in a pion production target and slowly transported to a muon stopping target, could cause a potential background source in muon-to-electron conversion experiments. Due to its large annihilation energy, an antiproton produces a few negative pions which undergo a radiative capture process and may emit around 100-MeV electrons that imitate the μ -e conversion signal. Moreover, since the antiprotons are slowly delivered, the induced background cannot completely be suppressed by masking the prompt beam timing.

The antiproton-induced background was estimated to be negligible thus far, but recently a concern is raised based on detailed simulations. The background might not be negligible in forthcoming experiments aiming at 10^{-17} sensitivity and beyond. The largest uncertainty of the current simulation is originated from lack of experimental cross section data for the antiproton production. In this situation, we propose to measure the antiproton production cross section at around 8-GeV proton beam which both the COMET and Mu2e experiments adopt to utilize. The measured data will make the background estimation more reliable.

In this presentation, we will revisit the antiproton-induced background and discuss a conceptual design of the cross section measurement plan.

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