

Abstract Submitted
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Proton Simulation Studies of Neutron Lifetime Measurement at NIST¹ JOSE NEGRON, Gettysburg College, BL2 COLLABORATION — Precise knowledge of the neutron lifetime is crucial to understanding one of the four fundamental forces in the universe, the weak force, and understanding the ratio of hydrogen to helium formed in the early universe. Several major projects have been conducted in order to find the neutron lifetime using two different methods: The Bottle and The Beam methods. The neutron beam experiment underway at NIST shoots a beam of neutrons through an electrostatic trap where protons that decay from the free neutrons are trapped and then directed by a magnetic field to a proton detector and counted. Through Geant4 simulations, the neutron beam apparatus is reproduced, and proton interactions within the apparatus are simulated. Recent focus has been directed at studying proton arrival time at the detector, the effect of different electrostatic fields in the trap, and the proton count rate as a function of trap length. The end goal is to understand the size of systematic errors to ensure they contribute less than 2 seconds to the uncertainty in the neutron lifetime.

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