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Simulations of Proton in the BL3 Experiment[1] TRANG BUI, BL3 Collaboration, BL3 COLLABORATION COLLABORATION — For over 70 years, scientists have been performing measurements of the neutron lifetime, finding a world average of approximately 15 minutes. However, the beam method and the ultracold neutron storage method gave the average value that currently differs by 8.7 seconds (4 standard deviations). The BL3 experiment at the National Institute of Standards and Technology, USA, aims to improve the precision of one of the beam-type measurements in the hope of resolving this discrepancy. The present goal is to decrease uncertainty in the experiment to 3 seconds. In the experiment, a neutron beam passes through a quasi-Penning trap, and decay protons are trapped electrostatically between mirror electrodes at +800V, central trap electrodes at 0V, and door electrodes at +800V, and magnetically by an axial magnetic field that does not vary by more than 0.2% of its average. When enough decay protons have accumulated, the trap will open and decay protons in the trap follow a bend in the magnetic field to a silicon detector, where they are counted. In this project, we studied the motion of protons moving around in the BL3 proton trap by running simulations in a program called 'Kassiopeia' developed for the KATRIN experiment in Karlsruhe, Germany. We used the program SRIM (Stopping and Range of Ions in Matter) to simulate backscattered protons.

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