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Monte Carlo simulation framework for the neutron lifetime experiment τSPECT

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The τSPECT experiment aims to measure the free neutron lifetime
with an uncertainty goal of sub-second by storing ultra-cold neutrons (UCNs)
in a fully magnetic bottle using a spin-flip loading technique. Monte Carlo (MC) simulations of neutron dynamics in the experiment are a key element to study and understand systematic effects, reduce uncertainties, and improve the experimental design. Based on pre-existing MC UCN software packages, we significantly enhanced their capabilities and set up a comprehensive simulation framework for our experiment. We accurately simulate the production, transport, storage, and detection of UCNs in τSPECT.

This poster presents the simulation framework as well as the latest simulation results.

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