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Simulations for the nEDM@PSI project - The MCUCN and STARucn codes

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The MCUCN and STARucn codes for tracking ultracold neutron trajectories and spin were developed in order to perform optimization studies for UCN optics, and also for simulations supporting studies on nEDM experiment systematics.

In this presentation we will briefly explain capabilities, algorithms, present inter-comparison calculations and analytic benchmarks performed with both codes.

Further we will focus on some applications for the nEDM experiment e.g. (i) on calculations of the depolarization and neutron frequency shift due to higher order field gradients, important to check analytical models for the R-curve analysis, and (ii) on simulations of UCN spin echo for testing the analysis method of measurements aiming to extract the neutron energy distribution, and helping to achieve a best field homogeneity in the nEDM experiment.

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