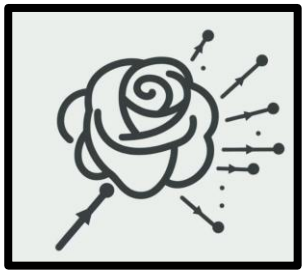
BAND Science Highlight

Reduced Order Scattering Emulator (ROSE) software

Bayesian Analysis of Nuclear Dynamics



The Reduced Order Scattering Emulator (ROSE) is a piece of the Bayesian Analysis of Nuclear Dynamics Software framework that enables full Bayesian analysis of nuclear reaction data.

ROSE uses the Reduced Basis Method to efficiently solve the Schrödinger equation as the parameters of the nuclear interaction governing the scattering process change. By dramatically reducing the dimensions of the wavefunctions and operators involved, ROSE can calculate cross sections in milliseconds with negligible loss in accuracy, more than 100 times faster than traditional solvers like Runge-Kutta.

Our publication in physical Review C describes the theory behind ROSE and presents results. Our documentation shows how it works and includes examples and tutorials.

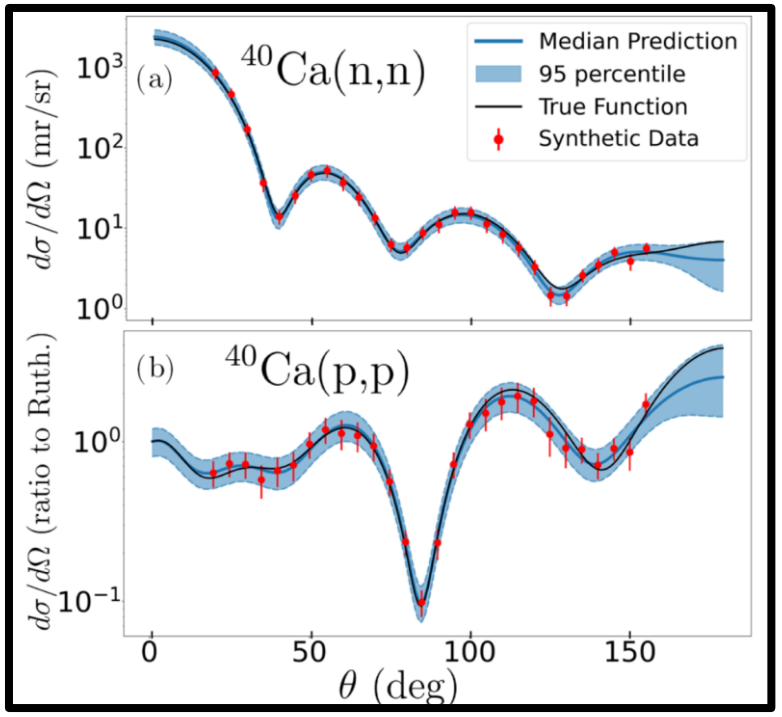


Figure 2: Predictive posterior distribution for the elastic differential cross-section of neutrons (top) and protons (bottom) incident in ^{40}Ca at 14 MeV. Exploring the posterior distribution through Markov Chains required 1 million model evaluations, a task that took ROSE an hour, a high contrast with the traditional method that would have required a week of computing power.