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Phenomenological R-Matrix Theory and Bayesian Inference[1]
DANIEL ODELL, CARL BRUNE, DANIEL PHILLIPS, Ohio University, JAMES DEBOER, University of Notre Dame, SOM PANERU, Ohio University — For many years, χ^2 minimization has been the tool of choice for applying the phenomenological R-matrix theory. The need for comprehensive error estimates, more flexible statistical models, and the inclusion of prior information has driven progress in applying Bayesian inference to the R-matrix. While those projects have included sophisticated statistical models, they are limited to fairly simple R-matrix approximations. I will discuss recent efforts to expand the reach of Bayesian inference to much more complex R-matrix calculations. This has been achieved by coupling a Markov Chain Monte Carlo sampler to a high-performance R-matrix code, AZURE2. I will present the results of a benchmark calculation of $^{12}\mathrm{C}(\mathrm{p},\gamma)$ as well as recent developments in the analysis of $^{3}\mathrm{He}-^{4}\mathrm{He}$ scattering and capture. In particular, I will emphasize the usefulness and scope of the implementation as well as the importance of statistical modeling.

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