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Large scale Bayesian data evaluation with consistent model defects

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The aim of nuclear data evaluation is to provide consistent sets of best estimates of reaction cross sections and spectra of nuclei. These evaluated data sets are an important prerequisite for the design of safe and efficient nuclear facilities such as nuclear power plants, fusion devices and medical devices using radiation for diagnosis and treatment. Therefore, evaluation methods should be statistically sound and based on physics principles in order to produce reliable results. We present a Bayesian evaluation method to consistently estimate a huge number of observables such as cross sections, spectra and angle-differential cross sections. The method relies on both experimental data and model calculations to generate estimates and associated uncertainty bounds. Deficiencies of the nuclear model are taken into account in a statistical sound way. Two novel features distinguish this evaluation method from other approaches: First, the magnitude of the model error is explicitly estimated; and second, the treatment of the model error is done in a way that preserves important consistency constraints on the observables, such as sum rules of cross sections. Work partly supported by the EC project CHANDA and the Austrian Academy of Sciences via a KKKÖ Impulsprojekt. The use of the Vienna Scientific Cluster for part of the calculations is acknowledged.

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