Contribution ID: **21** Type: **not specified**

Gaussian orthogonal ensemble model for low-energy neutron-induced reaction to excite weakly overlapped compound nucleus states

Wednesday 11 October 2023 14:20 (35 minutes)

The Gaussian Orthogonal Ensemble (GOE) model for the compound nucleus reaction includes a random matrix in the scattering matrix, which allows us to evaluate average properties of fluctuating cross sections. The GOE model has been successfully applied to study the relation among the channel transmission coefficients, the decay width, and the cross section. It is a powerful tool when many overlapped resonances are involved in the excited compound nucleus. However, since the model itself is so abstract in dimensionless space that no attempt has been made to implement it into the nuclear reaction codes to generate stochastic cross sections. A neutron interaction with a nucleus often shows isolated resonances at very low energies, and they start overlapping as the neutron energy increases. To study the smooth transition from the isolated to overlapped resonance cases, we extend the GOE model to more general circumstances. In this talk, we develop a technique to incorporate the GOE model into realistic nuclear reaction calculations, and discuss calculations of cross sections when the excited compound state includes weakly overlapped resonances.

LA-UR-23-28519

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Track Classification: Theoretical Developments and Advancements