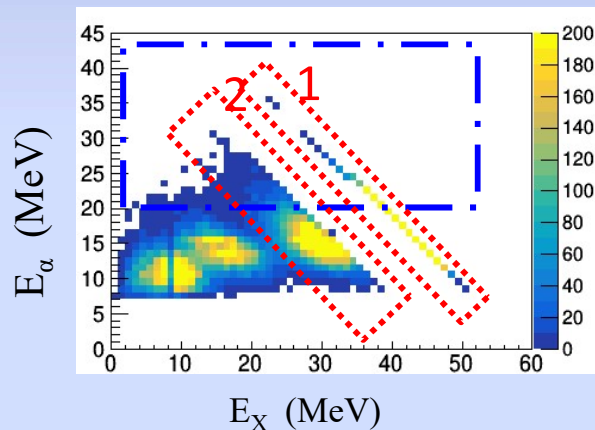
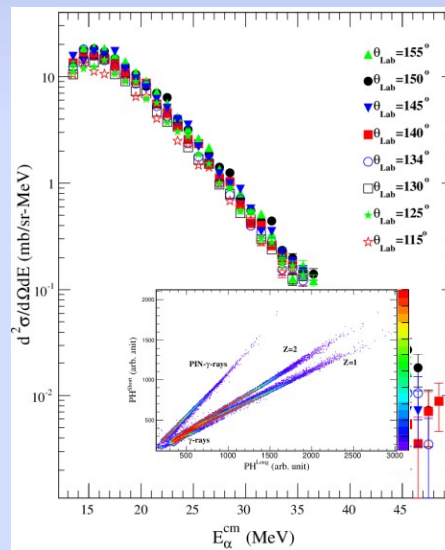


Variation of nuclear level density with excitation and isospin in nuclei of size typical of fission fragments

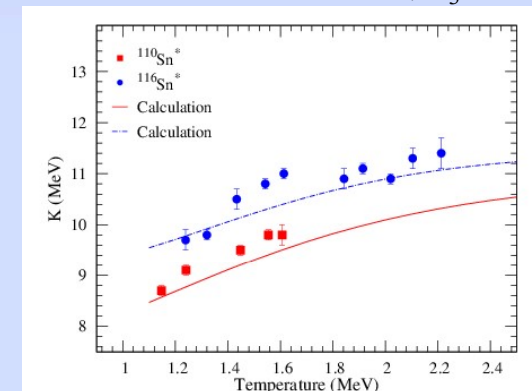
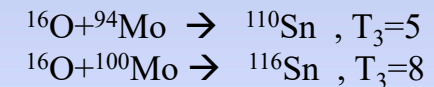
Experimental values of nuclear level density parameter are known only sporadically at excitation energies that corresponds to nuclear temperature $T = 1$ to 4 MeV. Its isospin dependence is even lesser known. We are pursuing a program to measure this quantity in nuclei of size typical of fission fragments and the results will be useful for basic understanding as well as new nuclear technology applications. Experimental tool is evaporative alpha-particle spectra measurement in fusion reactions and a statistical model analysis thereof. Recent results from two reactions are given below.



Simulated scatter plot of energy of evaporated alpha particle versus excitation energy in residual nuclei (PACE2 code), shown to illustrate the experimental method. Events appear in red boxes labelled 1 and 2 are first chance and second chance emissions, respectively, and the events appear in blue dash dotted box is the region of interest in experimental spectra. The high energy tail in ROI is dominated by first and second chance emissions and its slope is influenced only by the nuclear level density.



Spectra of alpha particle kinetic energy in cm system at various back angles overlapped. The slope at high energy tail is related to the NLD parameter. The inset shows the $Z=2$ particle discrimination. The measurement was carried out using CPDA setup at Pelletron-LINAC facility.



Temperature dependence of inverse level density parameter K . The experimental data are compared with semi-classical model predictions for the residual nuclei in respective reactions.

Selected Publications:

1. B. John et al., Phys Rev C 56, 2582(1997) ; ibid Phys. Rev. C 63 , 054301(2001)
2. Y. K. Gupta et al., Phys. Rev. C 78, 054609 (2008); ibid Phys. Rev. C 80, 054611 (2009)
3. G. K. Prajapati et al., Phys. Rev. C 102, 054605 (2020)