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A Nuclear Data perspective for Nuclear Level Densities

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Nuclear level densities (NLD) impact directly many aspects of nuclear data evaluations, from Hauser-Feshbach calculations to
decay spectra. Therefore, accurate description of NLD are essential to ensure reliability of nuclear applications. Despite its
importance, however, proper extraction of NLD as a function of excitation energy, spin and parity from experimental
measurements has historically encountered significant challenges. Recent developments of experimental methods such as the
Oslo, beta-Oslo and shape methods have produced a wide breadth of experimental information on NLD. This is
normally obtained with many model assumptions, since what is actually measured is not the NLD but rather a convolution of
NLD with gamma strength functions. Additionally, experimental assumptions are also made in the sense that the measured
reaction may not necessarily populate a complete range of spins and parities.

Our research plan involves performing a complete investigation of the data directly measured through the Oslo method and
carefully determine what are, in each case, the spin and parity coverage in the level population for each excitation energy in a
model-independent way. That will impact the total NLD estimation and redefine their corresponding uncertainties. Additionally, we intend to investigate the normalization at separation energy coming from resonance spacings to provide realistic
uncertainties to total NLD. Resonance spacings only constrain, in a model-independent way, the NLD for specific spins and
parities, therefore a careful uncertainty propagation to total NLD is crucial. Both approaches will potentially lead to
more realistic, experimentally-constrained, uncertainty bands in NLD, potentially providing more realistic NLD data to
applications and helping microscopic NLD model developers to know precisely what are the actual relevant experimental
constraints.

In this talk we will discuss the nuclear data sources of uncertainties associated with the determination of NLD and how these uncertainties can impact the extraction of NLD from measurements and the constraints assumed in NLD models. We will also explore the creation of a database of directly-measured experimental information to assist the identification of the true data constraints.

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