
SPIN DEPENDENT NUCLEAR LEVEL DENSITY FORMULAE USING ANALYTIC NUMBER THEORY

Alfonso Anzaldo-Meneses

Universidad Autonoma Metropolitana. Mexico D.F.

We compute the spin dependent nuclear level density for a set of nuclei at moderate excitation energies. Our method is an exact calculation using procedures of analytic number theory by consideration of the statistical partition functions in terms of elliptic functions. The basis is an arbitrary finite set of single particle energy levels around the Fermi level. To avoid edge effects, a periodic spectrum is constructed. Ground state as well as energy dependent shell effects are naturally included. The usual Gaussian angular momentum distribution is extended to an exact description for these spectra. This new description allows therefore the analytical calculation of additional terms beyond the well known relations. Also, a set of simple asymptotic formulae can be deduced from our results providing the next correction terms to the usual level density formulae. These new relations could be used to describe experimental data in simple terms. Comparisons with older methods will be presented showing their limitations. Our approach is based on a solid mathematical framework, instead of the standard phenomenological ad-hoc relations or of the lengthy brute force numerical methods.