SCISSORS RESONANCES IN THE QUASI-CONTINUUM OF HEAVY NUCLEI

Magne Guttormsen, Department of Physics, University of Oslo, P. Box 1048, N-0316 Oslo

The γ-ray strength function (γSF) determines the average γ-ray decay probability in the quasi-continuum of excited nuclei. It represents an important quantity in the simulations of the nucleosynthesis in hot stellar environment, fuel cycles in fast reactors and transmutation of nuclear waste. A high γSF for γ-ray energies emitted above the particle binding energy will enhance γ-emission in competition with other open channels like neutron or proton emission and fission.

Rare earth nuclei and actinides emit primary γ-ray energies of 2-3 MeV at the particle binding energy (and at the energy threshold of fission). These γ-energies coincide with the centroid of the scissors resonance (SR). The resonance is often visualized as the proton and neutron clouds of deformed nuclei oscillating against each other like the blades of a scissors. The SR is superimposed on the low-energy tail of the γSF of the giant electric dipole resonance (GEDR).

The Oslo group has measured the γSF for several Er, Dy, Sm, Gd, Th, Pa, U, Np, and Pu isotopes. Systematics of the SR strength and γ-energy centroids will be presented.

In order to study the impact of the observed level densities and γ-ray strength functions on the (n, γ) cross section, we have performed statistical Hauser-Feshbach calculations with the TALYS code for
$^{231\text{-}233}$Th, ^{232,233}Pa, $^{237\text{-}239}$U and ^{238}Np. The agreements for known cross sections are very good and indicate a high predictive power for many of the actinides where the cross section cannot be directly measured.

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