

# Comprehensive Test of the Brink-Axel Hypothesis in the Energy Region of the Pygmy Dipole Resonance

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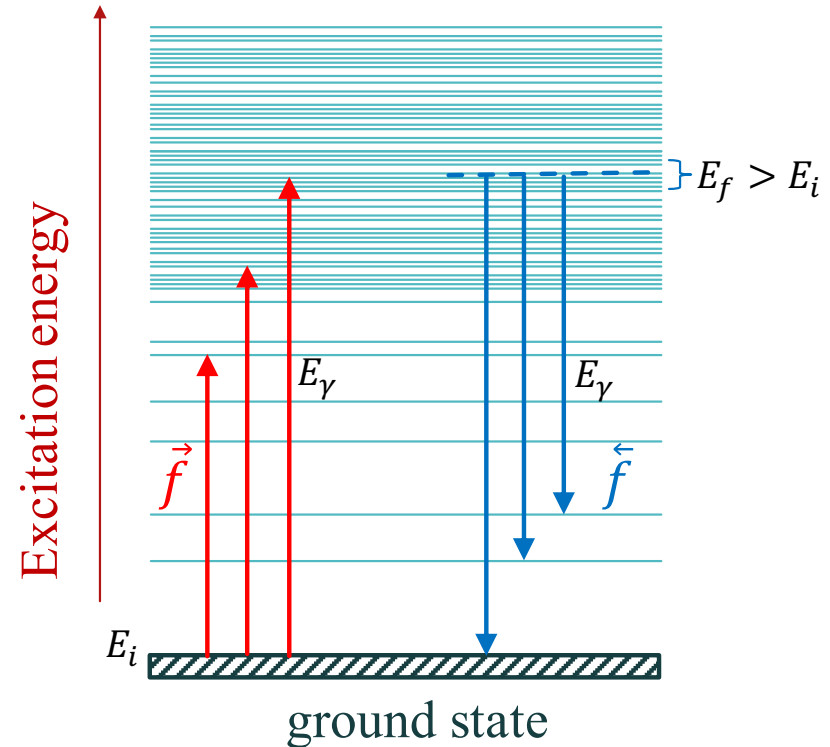


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# Briefly about the gamma-ray strength function

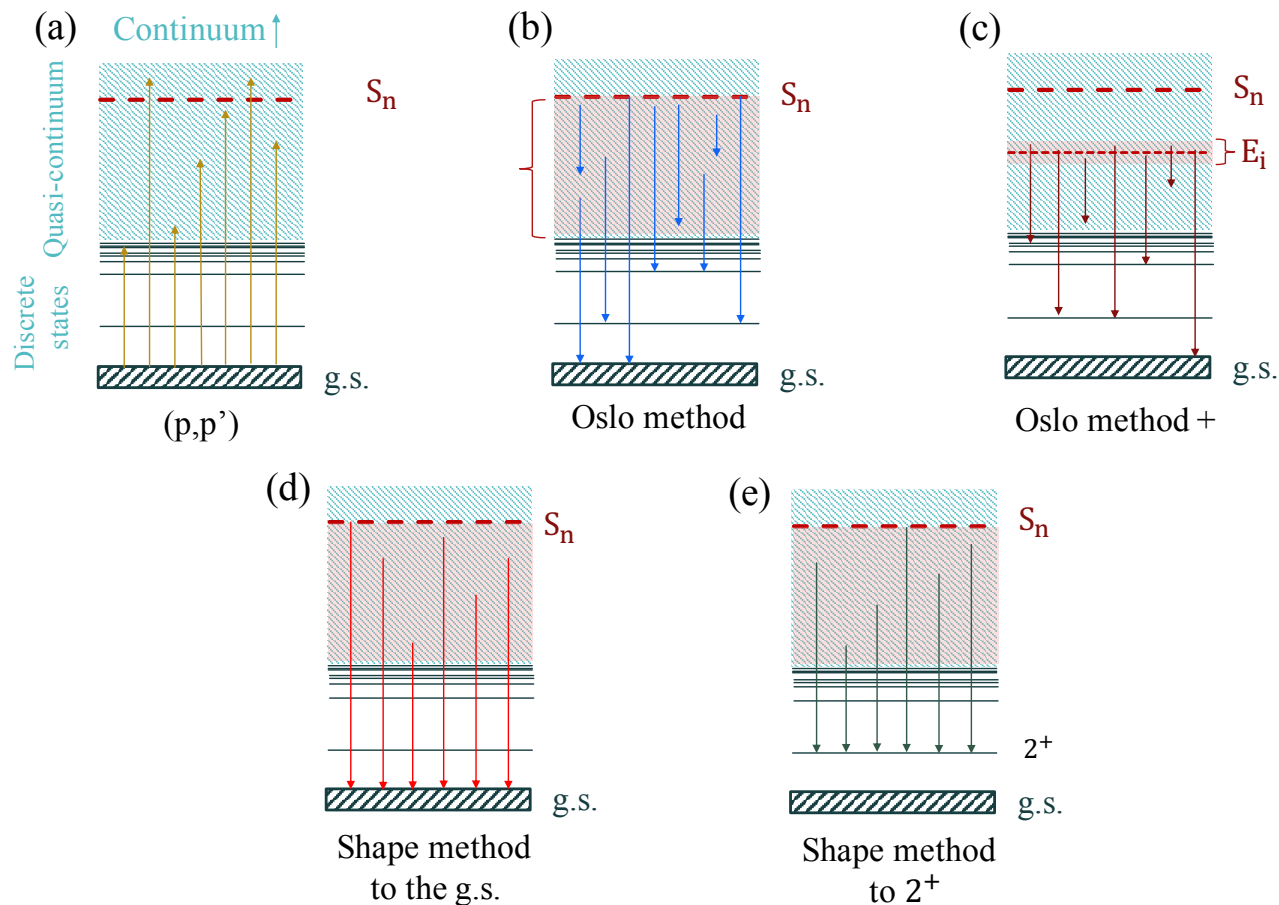
- ▶ Gamma-ray strength function (GSF) is an **average property** of excited nuclei (by analogy with the level density).
- ▶ *i.e.* proportional to the reduced matrix element squared per unit excitation energy interval → **transition probability**.
- ▶ The Brink-Axel hypothesis states:  
*The GSF is independent of the energies, spins, and parities of the initial and final states and depends on the  $\gamma$  energy only.*
- ▶ Due to its particular importance for **astrophysical calculations**, testing the validity of the hypothesis is of high relevance.



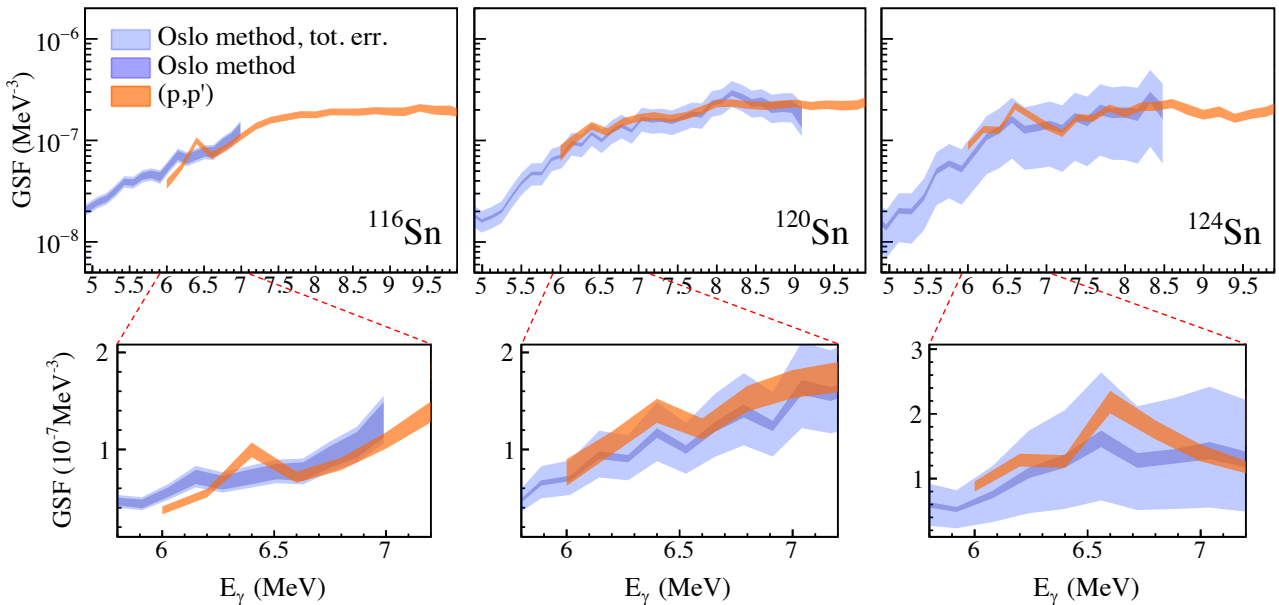
Schematic representation of the GSF in terms of  $\gamma$ -transitions.

# Experimental techniques used in the present work

The Brink-Axel hypothesis is tested in the energy range below the neutron separation energy for  $^{116,120,124}\text{Sn}$  by means of the following methods:



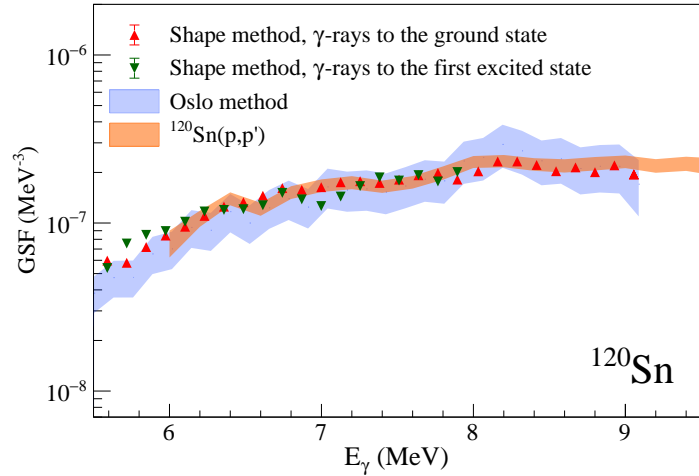
# Main results: GSF for $^{116,120,124}\text{Sn}$ , inelastic proton scattering vs. the Oslo method



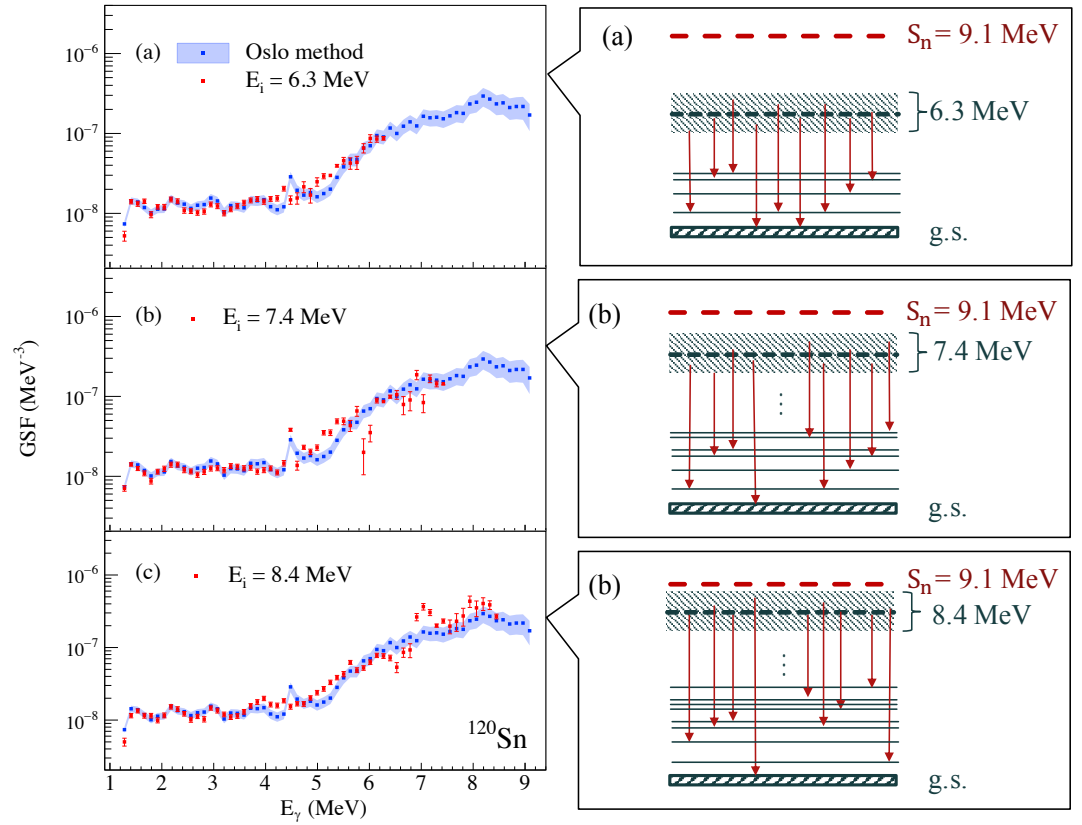
- ▶ Comparison of the GSF extracted from the Oslo-type experiments and the relativistic Coulomb excitation experiment in forward-angle inelastic proton scattering demonstrates good agreement in the energy range between 6 MeV and the neutron separation energy.
- ▶ Experiments based on ground state photoabsorption provide the same information on GSFs in nuclei as Oslo-type experiments.

# Main results: all methods compared

► The GSFs seem to be somewhat independent of the energies and spins of initial and final states.



Comparison of the GSF extracted with different methods.



GSF extracted from different initial excitation energy bins.