Radiative strength functions of warm nuclei in the $1f_{7/2}$ shell

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We report on experiments done at the Oslo Cyclotron Laboratory on the nuclei ^{44,45}Sc and ^{50,51}V. All of the investigated nuclei have their protons and neutrons in the $f_{7/2}$ shell, which is isolated from other orbitals by the N, $Z = 20$ and 28 shell gaps. As within every major shell, the presence of only one parity for single-particle orbitals in the low-spin domain means that transitions of $E1$ type will be supressed. The low-energy tail of the giant electric dipole resonance is relatively weak for the investigated nuclei; hence, possible finestructures and nonstatistical effects might stand out in the nuclear radiative strength function.

The Oslo Cyclotron group has developed the so-called Oslo method, which gives the opportunity of extracting both level density and γ-strength function of warm nuclei for excitation energies up to the neutron separation energy. With the multidetector system CACTUS at the Oslo Cyclotron Laboratory, this extraction can be done in one and the same experiment from primary γ spectra. The method relies on the Brink-Axel hypothesis, which states that the primary γ spectrum is proportional to both the level density and the radiative transmission coefficient.

The experimentally found level densities and radiative strength functions of ^{44,45}Sc and ^{50,51}V will be presented and compared with a BCS quasiparticle model. A surprising enhancement of the strength functions at low γ-ray energies, most apparent for ^{50,51}V, will be discussed.

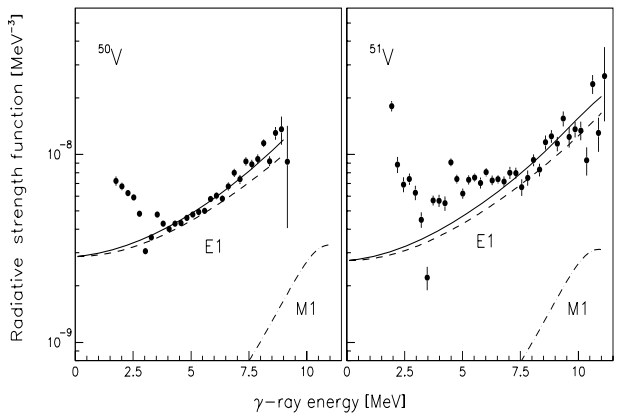

FIG. 1. The radiative strength functions of ^{50,51}V. The dashed and dash-dotted line show the extrapolated tails of the giant electric and giant magnetic dipole resonance, respectively. The solid line is the summed strength for the giant dipole resonances.

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