HIGH-SPIN STATES IN ^{45}Sc AND COEXISTENCE OF COLLECTIVE AND NONCOLLECTIVE STRUCTURES IN THE ODD-A $f_{7/2}$ NUCLEI[1]

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High-spin states in ^{43}Ca, ^{45}Sc, and ^{45}Ti were studied with the GASP multidetector array coupled with the Recoil Mass Spectrometer. The nuclei were excited in the 60 MeV ^{18}O+^{30}Si reaction. Lifetimes were extracted from the analysis of the Doppler-shift attenuation of γ-rays observed in the reversed ^{35}Cl+^{12}C reaction. The measurements suggest significant deformations of the positive-parity intruder bands in ^{45}Sc and ^{45}Ti. These bands are predicted by the mean-field calculations to be the cross-shell particle–hole excitation associated with a strong quadrupole core-polarization. Spherical shell-model calculations reproduce observed excitation energies and transition rates in both spherical and deformed structures.

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[1]Abstract of published paper: *Phys. Lett.* B **393**, 285 (1997).

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