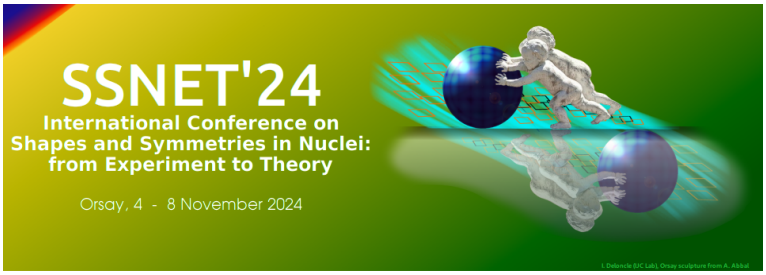

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Shape coexistence and superdeformation in 28Si

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We study the shape coexistence in the nucleus ^{28}Si with the nuclear shell model using numerical diagonalizations complemented with variational calculations based on the projected generator-coordinate method. The theoretical electric quadrupole moments and transitions as well as the collective wavefunctions indicate that the standard USDB interaction in the sd shell describes well the ground-state oblate rotational band, but misses the experimental prolate band.

Guided by the quasi-SU(3) model, we show that the prolate band can be reproduced in the sd shell by reducing the energy of the $0d_{3/2}$ orbital. Alternatively, in the extended $sdpf$ configuration space the SDPF-NR interaction, which describes well other Si isotopes, also reproduces the oblate and prolate bands. Finally, we address the possibility of superdeformation in ^{28}Si within the $sdpf$ space. Our results disfavour the appearance of superdeformed states with excitation energy below 20 MeV.

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