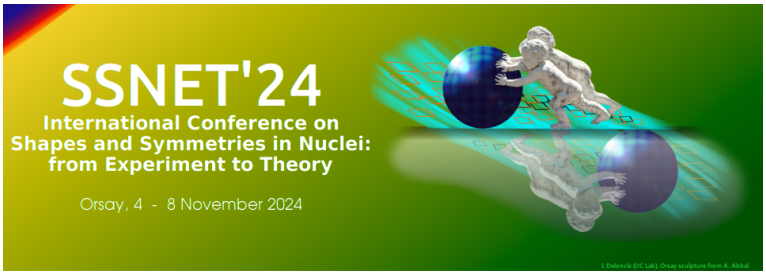

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Abnormal Bifurcation of the Double Binding Energy Differences and Proton-Neutron Pairing: Nuclei Close to N = Z Line from Ni to Rb

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The recently observed abnormal bifurcation of the double binding energy differences δV_{pn} between the odd-odd and even-even nuclei along the $N = Z$ line from Ni to Rb has challenged the nuclear theories. To solve this problem, a shell-model-like approach based on the relativistic density functional theory is established, by treating simultaneously the neutron-neutron, proton-neutron, and proton-proton pairing correlations both microscopically and self-consistently. Without any ad hoc parameters, the calculated results well reproduce the observations, and the mechanism for this abnormal bifurcation is found to be due to the enhanced proton-neutron pairing correlations in the odd-odd $N = Z$ nuclei, compared with the even-even ones. The present results provide an excellent interpretation for the abnormal δV_{pn} bifurcation, and provide a clear signal for the existence of the proton-neutron pairing correlations for nuclei close to the $N = Z$ line.

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