Weak binding effects on the structure of ^{40}Mg*

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While the phenomenon of one- and two-neutron ground-state halo nuclei is well established, the effects of weak binding on the low-lying excitation spectrum remain largely unexplored. To address this interesting question, we have studied the coupling of weakly bound (halo) valence neutrons to a deformed core using a Weak-Coupling phenomenological approach and the Particle-Rotor model. "Universal" indicators that relate the *2n* separation energy to the volume overlap between the core and halo can be used to characterize and identify possible halo nuclei.

Our results are contrasted to the known properties of ^{38,40}Mg, to assess the impact of weak binding on the low-lying excitation spectrum, one-proton removal reaction cross-sections and transition probabilities. Despite its simplicity, the phenomenological model appears to capture the main physical ingredients and provides a framework that allows us to examine possible coupling schemes involving a core and a *2n* halo. Other approaches to the structure of ^{40}Mg exist that differ in the nature of the second experimental γ transition.

Further experimental and theoretical works will be required to elucidate their intriguing structure, which we trust will be motivated by this work.

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