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Investigation of 0^+ states in mercury isotopes after two-neutron pickup

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In recent years, much effort was invested in systematic studies of low-lying 0^+ excitations in medium- to heavy-mass nuclei, ranging from ^{152}Gd to ^{194}Pt. This region is particularly interesting, as the structure of these nuclei changes from transitional nuclei in the Gd region, over well-deformed nuclei in the Yb region, to γ-soft nuclei in the Pt region [1].

Experiments at the high-resolution Q3D magnetic spectrograph [2,3] in Munich allowed the study of 0^+ states in unprecedented detail using (p,t) transfer reactions, and started with the discovery of an unforeseen high number of low-lying 0^+ excitations in ^{158}Gd [4]. Extending these studies to other nuclei, the enhanced density of low-lying 0^+ states in the Gd region was interpreted as a new signature for the shape-phase transition from spherical to deformed nuclei [5].

By investigating the mercury isotopes, we now probe further towards the end of the proton and neutron shell. Studying their 0^+ excitations is particularly interesting, as they lie in a shape-phase transitional region too: A prolate-oblate phase transition has been identified by investigating several observables from ^{180}Hf to ^{200}Hg [6]. By extending the 0^+ studies to the Hg isotopes, we can test if the low-lying 0^+ density can be applied as a signature of this shape-phase transition as well.

We present the results of our high-resolution study on excited 0^+ states in the mercury isotopes ^{198}Hg, ^{200}Hg, and ^{202}Hg up to 3-MeV excitation energy. In these experiments, we observed significantly fewer 0^+ states than in other experiments of the (p,t) transfer campaign. We discuss the low-energy 0^+ state density as a function of the valence nucleon number N_{val} and test if the 0^+ density can be used as a signature for the prolate-oblate shape-phase transition in the Hf-Hg region.

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