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Studies of 198Hg(d, d') Inelastic Scattering Reaction

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Motivated by fundamental symmetry tests, a measure of large electric dipole moment (EDM) would represent a clear signal of the violation of the CP symmetries. This observation highlights the imbalance in the matter and antimatter observed in our Universe. The Standard Model (SM) predicts an EDM lower than the experimental reach, prompting the need to explore beyond the SM. The ^{199}Hg isotope sets an upper limit on atomic EDM, accessed through Schiff moment. In order to guide nuclear structure models required for the calculation of the Schiff moment of ^{199}Hg , we have undertaken detailed inelastic scattering reactions of $^{198,200}Hg$ to map the distribution of $E2$ and $E3$ in these nuclei since the Schiff moment is proportional to the product of the nuclear deformation parameters $\beta_2\beta_3$. The adjacent even-even nuclei were chosen over a direct study of ^{199}Hg itself due to the lower-level density, as well as taking advantage of the spin 0 ground state, making the analysis of the inelastic scattering reactions much easier. We have chosen to perform (d, d') reactions that present good population of 2^+ and 3^- states even with rather smaller matrix elements for excitation from the ground state. Several experiments on $^{198,200}Hg$ were performed at the Maier-Leibnitz Laboratorium of the Ludwig-Maximilians Universität München. A 22 MeV deuteron beam bombarded the targets of the compound of $^{198,200}Hg^{32}S$, and the scattered particles that were separated using the quadruple three-dipole (Q3D) magnetic spectrograph and detected on the focal plane. Very high-statistics data sets were collected from this reaction, resulting in the observation of a considerable number of new states. The cross section angular distributions are used to provide information on the spin and parities, and ultimately will be used to determine the excitation matrix elements.
Details of the analysis of the $^{198}Hg(d, d')$ reaction to date will be given.

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