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# Investigation of 198Hg and 199Hg Through Direct Reactions for the Interpretation of EDM Limits

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The observation of a large permanent electric dipole moment (EDM) would represent a clear signal of CP violation from new physics outside the Standard Model. The 199Hg isotope currently provides the most stringent limit on an atomic EDM, which is converted to a limit on the nuclear EDM via a calculation of the Schiff moment. To do this knowledge of the nuclear structure of 199Hg is required. Ideal information to further develop and constrain the 199Hg Schiff moment nuclear structure theoretical models are the E3 and E1 strength distributions to the ground state, and E2 transitions amongst excited states. The high level density of 199Hg makes those determinations extremely challenging, however similar information can be obtained from exploring surrounding even-even Hg isotopes. One of the most direct ways of measuring the E3 and E2 matrix elements is through inelastic hadron scattering, and single-nucleon transfer reactions on targets of even-even isotopes of Hg can yield important information on the single-particle nature of 199Hg.
As part of a campaign to study the Hg isotopes, a number of experiments have been performed using the Q3D spectrograph at the Maier-Leibnitz Laboratory, with 22 MeV deuteron beams impinging on enriched Hg32S targets. The first experiment accesses the E2 and E3 matrix elements in 198Hg via inelastic deuteron scattering. We measured 9 angles ranging from 10 to 115 degrees up to an excitation energy of 5 MeV. The second set of measurements discussed will be single-nucleon transfer reactions, 198Hg(d,p)199Hg with spin-parity assignments and spectroscopic factors extracted through distorted-wave Born approximation calculations with global optical model parameter sets.

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