Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **3898** Type: **Oral Competition (Graduate Student) / Compétition orale (Étudiant(e) du 2e ou 3e cycle)**

(G*) STUDIES OF 198Hg(d, d') INELASTIC SCATTERING REACTION

Tuesday 20 June 2023 17:00 (15 minutes)

Motivated by fundamental symmetry tests, a non-zero measurement of a permanent electric dipole moment (EDM) would represent a clear signal of the violation of the CP symmetries. The imbalance in the matter and antimatter observed in our Universe is believed to arise from such violations, although the amount that is present in the Standard Model (SM) is insufficient. Many extensions to the SM predict EDMs much larger than the SM itself («10^{-30} e cm) that could be within experimental reach. Experimentally, EMDs of nuclei in atoms or molecules are only accessible through the Schiff moment that measures the difference in the charge and dipole distributions. To relate the Schiff moment to the underlying EDM, a nuclear structure model must be used. To date, the upper limit of the EDM of ^{199}Hg remains as the most stringent.
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 $^{198,200}Hg$ in order to map the distribution of both E2 and E3 in these nuclei since the Schiff moment is proportional to the product of the nuclear deformation parameters $\beta_2\beta_3$. Performing an experiment for ^{199}Hg is challenging, as such 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. 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.

[1] T. E. Chupp, P. Fierlinger, M.J. Ramsey-Musolf, and J.T. Singh. Electric Dipole Moments of Atoms, Molecules, nuclei, and Particles. https://doi.org/10.1103/RevModPhys.91.015001, Jan 2019.

Keyword-1

inelastic scattering reaction

Keyword-2

studies of 198Hg

Keyword-3

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Session Classification: (DNP) T4-6 Precision Physics and Tests of Fundamental Symmetries | Physique de précision et tests des symétries fondamentales (DPN)

Track Classification: Technical Sessions / Sessions techniques: Nuclear Physics / Physique nucléaire (DNP-DPN)