Ultracold mercury as a probe for physics beyond the standard model

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Mercury, being one of the heaviest elements that can be laser cooled, is a promising platform for searches for a permanent electric dipole moment (EDM). These are of particular interest in the context of the baryon asymmetry of the universe, because the observation of a permanent EDM would point to CP-violating physics beyond the Standard Model.

Furthermore, owing to its heavy nucleus and its many naturally occurring isotopes, mercury also enables isotope-shift studies that connect precision spectroscopy with nuclear structure and interaction studies [1].

We report on recent improvements and upgrades to the machine for transferring magneto-optically trapped mercury atoms to a high-power optical dipole trap, paving the way toward degenerate quantum gases of mercury and next-generation atomic EDM searches.

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[1] T. Groh *et al.*, *Probing Nuclear Interactions Through Isotope Shift Spectroscopy of Mercury*, arXiv:2510.18514 [physics.atom-ph] (2025).

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