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Quantum metrology with ultracold atoms and molecules

Central aspects of quantum metrology involve the understanding of the roles of particle statistics and of decoherence mechanisms, as well as of the inherent sensitivity-reliability tradeoffs in quantum sensors. The talk will discuss some aspects of these broad questions, with particular emphasis on dipolar systems. Following a discussion of the ground state properties of trapped quantum-degenerate dipolar gases and of Bose-Fermi mixtures the talk will turn to state preparation in matter-wave interferometry, and conclude with recent developments in the cooling of nanoscale cantilever mirrors and their potential use in the detection and control of quantum-degenerate systems.



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