# Quantum-assisted molecule metrology

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The wave nature of molecules is a perfect example of the peculiarities of quantum physics. Molecular quantum optics deals with phenomena related to this wave nature and in particular the interaction of molecules with light [1]. Modern molecule interferometry can further test the notions of macroscopicity and the speculative limits of the linearity of quantum physics by observing quantum effects in massive particles and more recently also biologically relevant molecules [2,3]. Intrinsically, molecule interferometers generate nanoscale fringes in the density distribution of molecular beams which can be shifted by external perturbations and be read with nanometre accuracy. This high sensitivity to beam shifts and wave dephasing can in turn be used to extract a variety of interesting molecular electronic properties [4]. Molecular matter-wave experiments hence open a wide field of research at the interdisciplinary interface between quantum optics and chemical physics. Complex many-body systems further offer a vast variety of electric, magnetic and optical properties that render quantum decoherence interesting and may be technologically useful for future applications.

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