

A “Schrödinger Cat” Superposition State of an Atom

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A “Schrödinger cat”-like state of matter was generated at the single atom level. A trapped ${}^9\text{Be}^+$ ion was laser-cooled to the zero-point energy and then prepared in a superposition of spatially separated coherent harmonic oscillator states. This state was created by application of a sequence of laser pulses, which entangles internal (electronic) and external (motional) states of the ion. The Schrödinger cat superposition was verified by detection of the quantum mechanical interference between the localized wave packets. This mesoscopic system may provide insight into the fuzzy boundary between the classical and quantum worlds by allowing controlled studies of quantum measurement and quantum decoherence.