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Measuring the weak value of atomic spin

The idea of a weak value has been brought to prominence by Aharonov, Albert and Vaidman [1]. Measuring a weak value can reveal more details of quantum processes than is possible with the traditional Von Neumann (strong) measurement [2] which is a single stage process where the wave function collapses. In contrast the weak measurement process has three stages; preselection, weak stage and finally a post selection.
Although it has been observed using photons and neutrons, weak measurement has not yet been demonstrated for atoms obeying the Schrödinger equation (Schrödinger particles).
We are following the method outlined by Duck et al [3] which is a variant on the original Stern-Gerlach experiment. We are using a metastable, 23S1, form of helium which has three spin angular momentum states of +1; 0; -1, a magnetic dipole moment with a magnitude of two Bohr Magnetons [4] [5] and a lifetime of approximately 8000 seconds [6]. Although this metastable state has three substates we will only use the +1 states. The design and realisation of the experiment will be presented.

References
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