Towards a High Precision Measurement of the Magnetic Moment of the Antiproton

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We observed spin-flips with a single trapped proton for the first time and measured the particle's magnetic moment with a relative precision of $8.9*10^{-6}$. The experiment is based on the so-called continuous Stern Gerlach effect, where a strong magnetic field inhomogeneity is superimposed to a Penning trap. In such a superposition of electric and magnetic fields, the axial oscillation frequency of the single proton depends on its spin direction. Monitoring this frequency while a spin flip drive is applied, single proton spin-flips were observed directly.

The developed techniques can be transferred to measure the magnetic moment of a single trapped antiproton, which is currently known at a level of 10^{-3} only. Using our method, this number can be improved now by more than a factor of 100. By application of the so-called double Penning trap technique, we finally aim at a measurement with a relative precision of 10^{-9}, and thus, a millionfold improvement of the antiproton's magnetic moment.

In the talk the current status of the experiment as well as our activities towards a high precision measurement of the magnetic moment of the antiproton will be presented.