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Self-Excitation and Feedback Cooling of an Isolated Proton[1] J. DISCIACCA, N. GUISE, G. GABRIELSE, Harvard University — Using techniques similar to the electron g-2 experiment, a one-proton self-excited oscillator (SEO) is realized. The SEO frequency resolution is at the high precision needed for the direct observation of a single-proton spin-flip transition. Such spin-flip spectroscopy could lead to a million-fold improved comparison of the proton and antiproton magnetic moments. Feedback cooling is realized for the first time with a proton and is used to vary the proton's temperature. This temperature is investigated with sideband cooling, as each application of sideband cooling typically changes the frequency by an amount much greater than the SEO resolution. Understanding this and employing the tools of feedback cooling along with the SEO open a path towards observing a single-proton spin-flip.

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