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Magnetic-field stability in unshielded Helmholtz coils[1] DAVID P. MORIN, SHENG ZOU, CHAMITHRI ADIKARIGE, ZAHRA ARMANFARD, TREVOR FOOTE, BRIAN SAAM, Washington State University — Many table-top AMO experiments require magnetic field stability, *e.g.*, for precise measurement of resonance frequencies and shifts. This is often achieved with a very small or nominally zero field, where the entire apparatus is shielded with several layers of expensive mu-metal. Spin-exchange optical pumping (SEOP), by contrast, practically requires a larger (tens of gauss) field that defines a lab quantization axis and mitigates low-field spin-relaxation effects. We routinely stabilize unshielded Helmholtz coils to better than a part in 10^5 at 30 G in an $\approx$ 10 Hz bandwidth, and achieve a few parts in 10^6 late at night with less external interference [1]. In this work, we compare several stabilization techniques based on driving the inductive load with a commercial (CV/CC) power supply, including: using the supply in current-control mode (worst result); and using it in voltage-control mode coupled with one or more of: (1) a stable sensing resistor in series with the coils, (2) an external comparator driving the gate of a FET in series with the coils, and (3) the output voltage generated by a commercial magnetometer fed directly to the power supply sensing inputs. [1] A. Nahlawi *et al.*, in prep.; see poster by S. Zou *et al.*, at this conference.

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