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High sensitivity magnetometry with Cs vapor¹ RUJIE LI, JIANCHENG FANG, WEI QUAN, Beihang University — Spin-exchange relaxation free(SERF) magnetometry based on potassium has broken the magnetic field sensitivity record previously kept by the superconducting quantum interference devices (SQUIDS). We describe a Cs atomic magnetometer also operating in SERF regime. Utilizing a cubic profile, about a 2cm on a side, vapor cell with a relative low temperature of 106 degrees, we achieve the resonance linewidths 2.703Hz corresponding to an electron spin-exchange rate of 357 /s, and demonstrate magnetic field sensitivity of 8 fT/Hz^{1/2} in a single channel. Theoretical analysis shows that fundamental sensitivity limits of this device with a 1 cm³ volume could approach 0.2 fT/Hz^{1/2}. Taking advantage of the higher saturated vapor pressure, Cs magnetometry is particularly appropriate for lower temperatures applications.

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