

A Herriott-cavity-assisted closed-loop xenon isotope comagnetometer

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In this talk, we will show a Herriott-cavity-assisted xenon isotope gas comagnetometer, as demonstrated in Fig. 1. ¹²⁹Xe and ¹³¹Xe atoms are pumped and probed by polarized Rb atoms, and continuously driven by oscillating magnetic fields, whose frequencies are kept on resonance by phase locked loops. Different from other schemes, we use a Herriott cavity to improve the Rb magnetometer sensitivity instead of the parametric modulation method, where this passive method is used to improve the system stability. With a multipass cell filled with 3 Torr ¹²⁹Xe, 37 Torr ¹³¹Xe, Rb with natural abundance and 150 Torr N₂, this system has reached a bias instability better than 0.2 %/h (0.15 μHz) with a bandwidth of 8 Hz. This comagnetometer has wide applications in precision measurements, including the advanced GNOME experiment, where we can simultaneously and independently measure the anomalous coupling with proton spin and neutron spin.

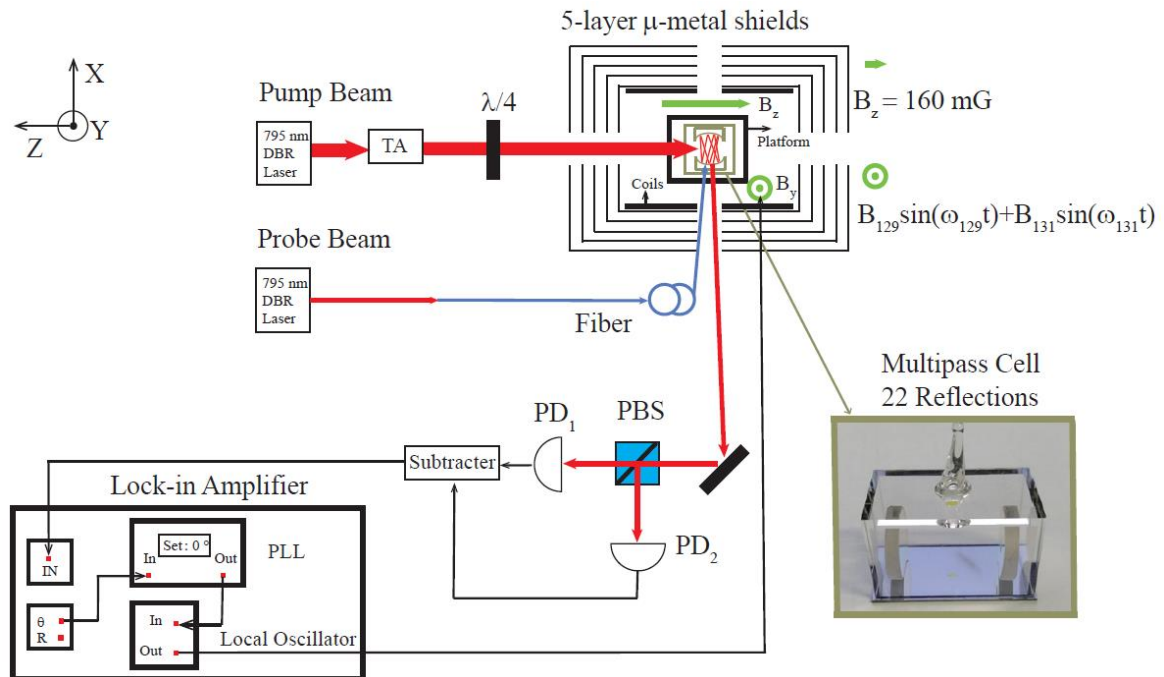


Figure 1. The comagnetometer setup.