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**All optical absorptive pump-probe magnetometer** RUI ZHANG, NOBUKO FUJIKAWA, RAHUL MHASKAR, Geometrics, Inc. — We demonstrate the functioning of an all-optical pump-probe atomic magnetometer. Different from previous all-optical atomic magnetometers, in the new scheme, circularly polarized pump and probe beams resonantly address the two hyperfine ground states of the cesium D1 line. Amplitude modulated pump beam optically pumps atomic population into a dark state of the probe beam. The presence of a magnetic field (not parallel with light) mixes the dark state with the bright states through Larmor precession. Synchronization of the optical pumping frequency with the Larmor frequency generates a magnetic resonance, which can be detected through the probe light absorption. This variation of the Bell-Bloom [1] magnetometry scheme greatly reduces the side effects of the optical pumping on the magnetic resonance, such as the power broadening and the light-shift. The new scheme also provides free repumping from the probe light, thus enhancing the resonance. The magnetometer can reach close to photon shot-noise limited sensitivity using simply the absorption signal, which significantly simplifies the signal detection setup. Inside a less than 0.06 $cm^3$ Cs vapor cell, a sensitivity of 210 fT/rt-Hz is achieved.

[1] W. E. Bell and H. L. Bloom, Phys. Rev. Lett. **6**, 280 (1961)

Rahul Mhaskar
Geometrics, Inc.

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