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Evanescent Wave Magnetometer TYLER HILBUN, SPENCER OLSON, Air Force Research Labs Albuquerque — Atomic magnetometers generally operate by measuring the precession frequency of an atom; this is known as the Larmor frequency and is proportional to the magnetic field strength. Our goal is to make a chip-based nanoscale atomic magnetometer with high sensitivity and fast-scanning capabilities. To achieve this goal, we are using macroscopic techniques to refine experimentation and signal-to-noise ratio of an evanescent wave based magnetometer. The small measurement volume of an evanescent field promises a uniformed population. We draw inspiration from the paper "Evanescent Wave Magnetometer" authored by K. F. Zhao (2006). Our atomic magnetometer will use an evanescent field generated from two lasers incident on a cell containing ^{87}Rb to pump atoms in such a way as to trap most of the population in a dark, spin-polarized, magnetically-stretched ground state. These lasers are combined by a fiber splitter so both maintain the critical angle needed for maximum evanescent field penetration depth. We use an RF source to scan the Larmor frequencies of the ^{87}Rb atoms. When the RF matches the Larmor precession rate, the atoms leave the dark stretched state and begin scattering photons. We use a lock-in amplifier to detect the absorption and generate the magnetometer output.

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