

Abstract Submitted
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Quantum Beats Magnetometer SCOTT SELTZER, PARKER MEARES, MICHAEL ROMALIS, Princeton University — In Earth's magnetic field the Zeeman resonance in alkali atoms is split into several lines given by the Breit-Rabi equation. We demonstrate coherent optical pumping of quantum beats corresponding to interference between different Zeeman resonances. Using a circularly polarized pump laser transverse to the direction of the magnetic field and modulated at both the average Larmor frequency and the frequency corresponding to the second-order splitting between Zeeman lines, we pump potassium atoms into a superposition state corresponding to maximum transverse spin precession. This double-modulation technique has several advantages for an Earth-field atomic magnetometer. In addition to increasing the signal strength, it largely eliminates the heading error caused by changes in the relative strength of the Zeeman resonances depending on the orientation of the magnetometer relative to the magnetic field.

Scott Seltzer
Princeton University

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