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A millimeter-scale atomic magnetometer PETER SCHWINDT, JOHN KITCHING, SVENJA KNAPPE, Time and Frequency Division, National Institute of Standards and Technology, LI-ANNE LIEW, Electromagnetics Division, National Institute of Standards and Technology, VISHAL SHAH, Time and Frequency Division, National Institute of Standards and Technology, JOHN MORELAND, Electromagnetics Division, National Institute of Standards and Technology, LEO HOLLBERG, Time and Frequency Division, National Institute of Standards and Technology — We are developing a MEMS-fabricated chip-scale atomic magnetometer that uses all-optical excitation to interrogate the spin-precession frequency of alkali atoms. Recently we demonstrated a magnetometer physics package that had sensitivity of 50 pT / $Hz^{1/2}$ at 10 Hz, had a volume of 12 cubic millimeters, and used 195 mW of power. The physics package includes a laser, micro-optics package, rubidium vapor cell, and photo diode. The current magnetometer measures the hyperfine splitting of two magnetically sensitive states via a coherent population trapping resonance, and we are exploring methods to measure the Larmor frequency directly in our small physics package to improve the sensitivity. Operation at the lower Larmor frequency decreases the power consumption of the local oscillator as well. Through improved thermal packaging, we aim to decrease power consumption of physics package to below 20 mW.

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