

Abstract Submitted  
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**Fetal Magnetocardiography with an Atomic Magnetometer Array** IBRAHIM SULAI, ZACK DELAND, COLIN WAHL, RONALD WAKAI, THAD WALKER, University of Wisconsin-Madison — Fetal magnetocardiography (fMCG) is a powerful technique for analyzing the heartbeat patterns of *in utero* fetuses. We present results from our array of four Spin-Exchange Relaxation-Free (SERF) rubidium-87 atomic magnetometers which has been used to detect and create these magnetocardiograms. We have demonstrated a magnetic noise sensitivity of  $< 10\text{fT}/\sqrt{\text{Hz}}$ , limited by the Johnson noise of the magnetically-shielded room. We discuss new design features and experimental practices that have increased our sensitivity and allowed us to successfully measure an fMCG at a gestational age of only 21 weeks. We hope to eventually apply these techniques to the detection and diagnosis of heartbeat arrhythmias, which, if detected early enough, can be treated *in utero*. This work is supported by the National Institutes of Health.

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