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Radio-frequency tunable atomic magnetometer for detection of solid-state NQR S.-K. LEE, Princeton University, K.L. SAUER, George Mason University, S.J. SELTZER, Princeton University, O. ALEM, George Mason University, M.V. ROMALIS, Princeton University — We constructed a potassium atomic magnetometer which resonantly detects rf magnetic fields with subfemtotesla sensitivity. The resonance frequency is set by the Zeeman resonance of the potassium atoms in a static magnetic field applied to the magnetometer cell. Strong optical pumping of the potassium atoms into a stretched state reduces spin-exchange broadening of the Zeeman resonance, resulting in relatively small linewidth of about 200 Hz (half-width at half-maximum). The magnetometer was used to detect ^{14}N NQR signal from powdered ammonium nitrate at 423 kHz, with sensitivity an order of magnitude higher than with a conventional room temperature pickup coil with comparable geometry. The demonstrated sensitivity of 0.24 fT/Hz$^{1/2}$ can be improved by several means, including use of higher power lasers for pumping and probing. Our technique can potentially be used to develop a mobile, open-access NQR spectrometer for detection of nitrogen-containing solids of interest in security applications.

S.-K. Lee
Princeton University

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