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Volovik effect in the s± state of $Ba_{0.67}K_{0.33}Fe_2As_2$ from high field NMR[1] SANGWON OH, ANDREW MOUNCE, WILLIAM HALPERIN,
Northwestern University, CHENGLIN ZHANG, PENGCHENG DAI, The University of Tennessee, PHILIP KUHNS, ARNEIL REYES, National High Magnetic Field Laboratory — he spatially averaged density of states of an unconventional d-wave superconductor is magnetic field dependent, proportional to $H^{1/2}$, owing to the Doppler shift of quasiparticle excitations in a background of vortex supercurrents. [1, 2] This phenomenon, called the Volovik effect, is absent in an s-wave state; however, it has been predicted [3] to exist for a sign changing $s\pm$ state with a characteristic field dependence, proportional to H. We have observed this behavior in the ^{75}As NMR spin-lattice relaxation rate of a single crystal of $Ba_{0.67}K_{0.33}Fe_2As_2$ studied over a wide range of fields up to 28 T. Our spatially resolved measurements show that Doppler contributions to the rate increase toward the vortex core, consistent with the superconducting state having unconventional $s\pm$ symmetry.
[1] G. E. Volovik, J. Phys. C. **21**, L221 (1988)
[2] G. E. Volovik, JETP Lett. **58**, L221 (1988)
[3] Y. Bang, Phys. Rev. Lett. **104**, 217001 (2010)

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