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NMR Search for the Spin Nematic State in LaFeAsO Single Crystal MINGXUAN FU, DAVID A. TORCHETTI, Department of Physics and Astronomy, McMaster University, Hamilton, ON, L8S4M1 CAN, TAKASHI IMAI, Department of Physics and Astronomy, McMaster University, Hamilton, ON, L8S4M1 CAN; Canadian Institute for Advanced Research, Toronto M5G 1Z8 CAN, FANLONG NING, Department of Physics, Zhejiang University, Hangzhou 310027, China, JIAQIAN YAN, ATHENA S. SEFAT, Materials Science and Technology Division, Oak Ridge National Laboratory, TN 37831, USA — The mechanism underlying high-T_c superconductivity in iron-pnictides remains a major puzzle in condensed matter. Earlier NMR measurements provide evidence for a correlation between T_c and the enhancement of low frequency spin fluctuations[1]. However, slowing of spin fluctuations is accompanied by lattice softening, which is a major complication in this scenario. The intermediate temperature range between the tetragonal-orthorhombic structural phase transition at T_{TO} and SDW transition at T_{SDW} may be a realization of spin nematic state[2]. We report ^{75}As single crystal NMR study of LaFeAsO [3]. We have found that the low frequency spin dynamics exhibits a strong two-fold anisotropy within each orthorhombic domain below T_{TO} This intermediate state then freezes progressively into a static SDW below T_{SDW}. Our results reveal the presence of an exotic intermediate spin state below T_{TO} with the signature of spin nematicity.

[1]F. L. Ning, T. Imai. et al., Phys. Rev. Lett. 104, 037001 (2010).
[2]C. Fang et al., Phys. Rev. B 77, 224509 (2008)
[3]M. Fu et al., arXiv:1208.5652, to appear in Phys. Rev. Lett.

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