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Investigation of Vortex Lattice in Optimally Doped (Ba$_{1-x}$K$_x$)Fe$_2$As$_2$ Using SANS S. DEMIRDIS, Julich Center for Neutron Science (JCNS), Forschungszentrum Julich GmbH, JCNS at MLZ, Lichtenberstr. 1, D-85747, Garching, Germany, C.J. VAN DER BEEK, Laboratoire des Solides Irradies, Ecole Polytechnique CNRS UMR 7642 & CEA-DSM-IRAMIS, F 91128 PALAISEAU/France, S. MUHLBAUER, Technische Universitat Munchen, Forschungsneutronenquelle Heinz Maier-Leibnitz (FRM II) D-85748, Garching, Germany, Y. SU, Julich Center for Neutron Science (JCNS), Forschungszentrum Julich GmbH, JCNS at MLZ, Lichtenberstr. 1, D-85747, Garching, Germany, TH. WOLF, Karlsruher Institut fur Technologie, Institut fur Festkorperphysik, 7602, Karlsruhe, Germany — Small-angle neutron scattering is used to study the vortex lattice (VL) in optimally doped (Ba$_{1-x}$K$_x$)Fe$_2$As$_2$ single crystal. Previous SANS studies, as well as real-space imaging methods applied to the study of the VL in single crystalline (Ba$_{1-x}$K$_x$)Fe$_2$As$_2$, Co-, and P-substituted BaFe$_2$As$_2$, have consistently reported highly disordered vortex structures. Present SANS study reveals the first time in doped pnictides, clear vortex lattice Bragg peaks. Here we show SANS data taken in a magnetic field ranging between 0.25 and 2 Tesla that reveals resolution limited sharp Bragg spots, indicating the existence of a long-range ordered Bragg glass. Field dependence of the vortex structure factor, obtained by correcting the intensity by the field-dependent vortex form factor, shows a sharp drop well below the second critical field. This vortex structural transition shows clear correlations with features observed around the so-called “second magnetization peak” present in isothermal hysteresis loops.

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