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Thermal conductivity of the iron-based superconductor FeSe:
Nodeless gap with strong two-band character PATRICK BOURGEOS-HOPE, SVEN BADOUX, NICOLAS DOIRON-LEYRAUD, LOUIS TAILLEFER, University of Sherbrooke, Sherbrooke, Canada, SHUN CHI, RUIXING LIANG, WALTER HARDY, DOUG BONN, University of British Columbia, Vancouver, Canada — The thermal conductivity $\kappa$ of the iron-based superconductor FeSe was measured at temperatures down to 50 mK in magnetic fields up to 17 T. In zero magnetic field, the residual linear term in the $T = 0$ limit, $\kappa_0/T$, is vanishingly small. Application of a magnetic field $H$ causes no increase in $\kappa_0/T$ initially. Those two facts show that there are no zero-energy quasiparticles that carry heat and therefore no nodes in the superconducting gap of FeSe. The full field dependence of $\kappa_0/T$ has the classic shape of a two-band superconductor, such as MgB$_2$. It rises initially with a characteristic field $H^* \simeq H_{c2}/25$, and then more slowly up to $H_{c2} = 14$ T. We interpret this in terms of a small gap $\Delta_A \simeq \Delta_0/5$ on some part of the Fermi surface, with a large gap $\Delta_B = \Delta_0$ in the region that controls $H_{c2}$.

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