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Metal–Insulator Transition in the Flux-Flow Resistivity of Optimally Doped $YBa_2Cu_3O_{6+x}$ BENJAMIN MORGAN, University of Cambridge, DAVID BROUN, Simon Fraser University, RUIXING LIANG, DOUGLAS BONN, WALTER HARDY, University of British Columbia, JOHN WALDRAM, University of Cambridge — We have made high resolution microwave measurements of the flux-flow resistivity of optimally doped $YBa_2Cu_3O_{6+x}$ in the mixed state at temperatures down to 1.2 K. We find that the effective resistivity of the vortex cores exhibits a metal–insulator transition, with a minimum at 13 K and a logarithmically growing form below 5 K, as has been seen in the low-temperature DC resistivity of underdoped cuprates in which superconductivity has been globally suppressed. Our work is the first report of a metal–insulator transition in optimally doped $YBa_2Cu_3O_{6+x}$, and the first to be seen in a system in which superconductivity has not been globally suppressed. The transition is seen in samples of the highest quality and in magnetic fields as low as 1 T.

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