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A Superconducting Phase Gradiometer Made Out of DNA-Templated Nanowires DAVID HOPKINS, ALEXEY BEZRYADIN, DAVID PEKKER, PAUL GOLDBART, University of Illinois at Urbana-Champaign — Continuous superconducting nanowires with diameters less than 10 nm can be fabricated by sputter-coating suspended DNA molecules. We have fabricated and measured pairs of such nanowires, using DNA as a mechanical template. It is found that a pair of nanowires connected in parallel between two superconducting thin-film electrodes acts as a phase gradiometer. We measure oscillations in the resistance and the critical current of the device with respect to magnetic field at various temperatures and bias currents. Surprisingly, the period of the magnetoresistance oscillations is not determined by the area of the loop formed by the pair of nanowires. Instead, it is determined by the phase difference along the edge of the leads created by screening currents. The results are in good quantitative agreement with our theoretical model, which predicts the phase gradients occurring in the system due to these currents and predicts the response of our double-wire device to such phase gradients.

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