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Superfluid Atom Circuits GRETCHEN CAMPBELL, Joint Quantum Institute, NIST and UMD — Weak connections between superconductors or superfluids can differ from classical links due to quantum coherence, which allows for flow without resistance. The properties of a weak link are characterized by a single function, the current-phase relationship. In recent experiments with a ring-shaped Bose Einstein condensate, we have developed a technique to directly measure the current-phase relationship of a weak link. Our weak link is created using a laser beam that acts as a barrier across one side of the ring condensate. By rotating the weak link we can control the current around the ring. When the weak link is rotated at low rotation rates, we have observed phase slips between well-defined, quantized, current states, and have demonstrated that the system exhibits hysteresis. Recently, we have studied the time needed for phase slips to occur, as well as the role temperature plays in the process. At higher rotation rates we have directly measured the onset of resistive flow across the weak link. Such measurements may open new avenues of research in quantum transport.

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