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Superconductor-insulator transition in 1-D nanowires of different lengths ANTHONY BOLLINGER, ANDREY ROGACHEV, ALEXEY BEZRYADIN, University of Illinois at Urbana-Champaign — It is unclear whether the superconductor-insulator transition (SIT) in thin superconducting wires is controlled by the wire's diameter, normal state resistance, or both. In order to distinguish between these possibilities we study the SIT in wires of different length. A well-defined SIT is only observed in homogeneous wires which are shorter than $\sim$200 nm. For these wires, the superconducting state is well described by the Langer-Ambegaokar-McCumber-Halperin theory of thermally activated phase slips whereas the insulating state can be explained by localization and electron-electron interactions in one dimension. Longer wires, though fabricated in the exact same manner, do not show a well-defined SIT and frequently display signs of non-uniformity such as double transition steps. Data obtained from resistance vs. temperature as well as differential resistance vs. bias current measurements will be presented which illustrate these observed traits.

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