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One Dimensional Superconducting Transition in Quasi-Two-Dimensional Stripes MATTHEW BELL, ANDREI SERGEEV, ALEKSANDR VEREVKIN, University at Buffalo — We investigate the nature of the superconducting transition in NbN ultrathin nano stripes where the thickness of the stripe (4 nm) is about or less then the coherence length, and the width (100 nm) is significantly larger then the coherence length. It is well known that in micro stripes the resistive state below the Berezinskii-Kosterlitz-Thouless transition is produced by dissociated vortex-antivortex pairs. However, our data clearly demonstrates that in such structures the resistive state is formed due to one-dimensional phase slip centers (PSCs) at low current densities. Our analysis shows that the resistive state is actually a result from the competition between the PSCs and two-dimensional vortices. At low currents, the PSC mechanism prevails over the contribution from vortices over a broad temperature range. At higher currents, current induced unbinding of vortex-antivortex pairs contributes the most to resistivity, however this effect is limited by electron heating. From this analysis we will develop a current-temperature phase diagram for superconducting nano stripes.

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