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Topological Excitations in Superconducting Nanostripes: Resistive States and Noise[1] MATT BELL, ANDREI SERGEEV, VLADIMIR MITIN, ALEKSANDR VEREVKIN, SUNY at Buffalo — We investigate competition between one- and two-dimensional topological excitations - phase slips and vortices - in formation of resistive states and noise generation in ultrathin superconducting NbN nanostripes in a wide temperature range below the mean-field transition temperature T_{C0}. The widths $w = 100$ nm of our ultrathin NbN samples is substantially larger than the Ginzburg-Landau coherence length $\xi = 4$nm and the fluctuation resistivity above T_{C0} has a two-dimensional character. However, our data shows that the resistivity below T_{C0} is produced by one-dimensional excitations, - thermally activated phase slip strips (PSSs) overlapping the sample cross-section. We determine the scaling phase diagram, which shows that even in wider samples the PSS contribution dominates over vortices in a substantial region of current/temperature variations [1]. The above fluctuations generated by topological excitations also provide a noise limit to superconducting detectors operating in a resistive state, e.g. for dark counts in single-photon detectors. [1] M. Bell et al., Phys. Rev. B 76, 094521 (2007).

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