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Emergence of dissipative structures in current-carrying stabilized superconducting wires. GEORGE LEVIN, PAUL BARNES, Air Force Research Laboratory, JOSE RODRIGUEZ, Department of Physics and Astronomy, California State University, Los Angeles, JOHN BULMER, Air Force Research Laboratory, JAKE CONNORS, Ohio State University — We discuss the emergence of a dissipative structure in current-carrying superconducting wire. This is a phenomenon similar to the emergence of thermal convection cells, oscillatory chemical reactions, etc. In response to the initial localized temperature perturbation that leads to current exchange between the superconductor and the stabilizer the temperature and critical current density of the wire acquire spontaneous spatial modulation that forces the transport current to crisscross the interface between the superconducting film and metal stabilizer. This generates additional heat that makes such a structure self-sustainable. The central role in this phenomenon is played by the interfacial resistance between the stabilizer and superconducting film. The spatial scale of the modulation is of the order of the thermal diffusion length. This resistance also determines the speed of propagation of the conventional normal zone. We will present the results of numerical and analytical analysis of a model which describes current sharing between the superconducting and normal metal layers - a configuration typical of the state of the art YBCO-coated conductors.

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