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Restricted Wiedemann-Franz law in 1D conductors MARCELO KURODA, Dept. of Physics and Beckman Institute, University of Illinois at Urbana-Champaign, JEAN-PIERRE LEBURTON, Dept. of Electrical and Computer Engineering and Beckman Institute, University of Illinois at Urbana-Champaign — We show that under external electric fields or thermal gradients, carrier distributions in one-dimensional (1D) conductors with linear E-k dispersion have different temperatures for forward and backward (branch) carrier populations, as a consequence of self-consistent carrier-heat transport. We derive the moment equations of the Boltzmann transport equation, in the presence of elastic scattering, for which: (a) The Wiedemann-Franz law is restricted to each branch with its specific temperature; (b) thermoelectric power vanishes due to electron-hole symmetry. The model depicts different regimes such as ballistic and diffusive and shows excellent agreement with diffusive carrier transport in 1D conductors.

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