Ising chain: Thermal conductivity and first-principle validation of Fourier's law

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The thermal conductivity of a $d=1$ lattice of ferromagnetically coupled planar rotators is studied through molecular dynamics. Two different types of anisotropies (local and in the coupling) are assumed in the inertial XY model. In the limit of extreme anisotropy, both models approach the Ising model and its thermal conductivity κ, which, at high temperatures, scales like $\kappa\sim T^{-3}$. This behavior reinforces the result obtained in various d-dimensional models, namely $\kappa \propto L\, e_{q}^{-B(L^{\gamma}T)^{\eta}}$ where $e_q^z \equiv[1+(1-q)z]^{\frac{1}{1-q}}\;(e_1^z=e^z)$, L being the linear size of the d-dimensional macroscopic lattice. The scaling law $\frac{\eta \,\gamma}{q-1}=1$ guarantees the validity of Fourier's law, for all dimensions.