Role of the range of the interactions in heat transport

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We consider a paradigmatic Hamiltonian system known in the literature as α-XY model, which consists of a one-dimensional lattice of classical rotators with attractive couplings that decrease with distance as a power law, with exponent α, allowing to scan from nearest-neighbors to infinite range interactions. The ends of the chain are put in contact with Brownian heat reservoirs at different temperatures with mean value T. By means of numerical integration of the Hamiltonian equations of motion, we show the effects of the range of the interactions in the temperature profile and energy flux, determining the domain of validity of Fourier's law in this context. We find that Fourier's law holds only for sufficiently short range interactions, while a kind of insulator behavior appears for global interactions. For intermediate ranges, we establish different regimes for the behavior of the conductivity with system size, depending on α and the average temperature T.