Proposal for a pre-exponential dependent Efros-Shklovskii regime

MIGUEL RODRIGUEZ, ISMARDO BONALDE, ERNESTO MEDINA, Centro de Fisica, IVIC, Caracas, Venezuela — We address the variable range hopping regime in the range for which the measured temperatures are of the order of the characteristic Mott or Efros-Shklovskii temperatures $T_M$ and $T_{ES}$ respectively. In such a range present theories imply $R_{hop}/\xi < 1$ where $R_{hop}$ is the hopping length and $\xi$ is the localization length. Using the Mott optimization procedure, including prefactor corrections in the wavefunction overlap, we obtain expressions for the dependence on temperature for the typical hopping length and the resistivity in an Anderson insulator with coulombic interactions. Such expressions lead to a regular Efros-Shklovskii law when $T \ll T_{ES}$ while for $T \sim T_{ES}$ they can lead to a meaningful pre-exponential dominated regime such that $R_{hop}/\xi > 1$. We propose that the optimization procedure can consistently explain contradictory results in the critical regime and recent experimental results showing a maximum in resistivity due to an interplay between prefactor and exponential terms.