Localization-landscape generalized Mott-Berezinskiĭ formula

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In semiconductors presenting some form of structural disorder, either in the spatial alloy composition or in the distribution of impurities, electronic states contributing to the conduction at low temperature are localized. In this situation, transport occurs by hopping between these states, and the low-frequency AC electronic conductivity can be modelled through the Mott-Berezinskiĭ (MB) formula, first derived by Mott on physical arguments [1-3], and later proved mathematically by Berezinksiĭ in 1973 [4]. This formula relies on several assumptions that are critical for its proper derivation:

- The temperature is low enough so that the Fermi energy lies in the localized part of the spectrum, where electronic quantum states are assumed to be Anderson-localized.
- The electronic states contributing to the conductivity are spatially well separated.
- The electronic states contributing to the conductivity are localized with uniform localization length ξ.
- Finally, although the MB formula is expressed in any dimension, Berezinskiĭ's mathematical derivation was only one-dimensional.

We generalize the MB formula thanks to the localization landscape (LL) theory [5]. We do not require identical localization length ξ for all states. Instead, it is assumed that the effective potential [6] is statistically isotropic and homogeneous. Original behaviors of the conductivity are then investigated.

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