Concerning the non-linear response in biased disordered systems

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Abstract

An effective medium approximation considering anisotropic and asymmetric transition rates is presented for a D-dimensional random walk in a random media. Our approach allows to obtain a set of 2xD frequency-dependent effective transition rates in a self-consistent way. Even when these coupled equations could look unwielding, we have been able to work-out analytically some particular cases, i.e.: using a separable-like ansatz the anisotropic asymmetric effective medium approximation is shown to be reduced, under a random variable transformation of variables, to the study of the symmetric case. Within this basic formalism, a biased diffusion problem in an anisotropic two-dimensional percolation model is analyzed. The asymmetric effective medium approximation is finally compared against Monte Carlo simulations .

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Related references:

J. Bernasconi and W. R. Schneider, J. Phys. A 15, L729 (1982)
J. Bernasconi and W. R. Schneider, Helvetica Physica Acta 58 597 (1985).
Kin-Wa Yu and R. Orbach, Phys. Rev. B 31, 6337 (1985).
T. Wichmann and K. W. Kehr, J. Phys.: Condens. Matter 7, 717 (1995).
D. Dhar and D. Stauffer, Int. J. Mod. Phys. C \QTR{bf}{9} 349 (1998).
P. Maass, B. Rinn, and W. Schirmacher, Phil. Mag. B 79, 1915 (1999).
R. Reyes, M. O. Cáceres, and P. A. Pury, Phys. Rev. B{61} 308 (2000).
Bustingorry, E. R. Reyes, and M. O. Cáceres, Phys. Rev. E 2, 7664 (2000).
Bustingorry, M. O. Cáceres and E. R. Reyes, Phys. Rev. B 65, 165205, (2002).