MULTIFRACTAL SCALING AND UNIVERSALITY AT THE 3-D ANDERSON TRANSITION

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We will analyze the multifractal properties of the critical wavefunctions at the disorder-induced metal-insulator transition (MIT) in the three dimensional Anderson model. We will discuss the relation between the multifractal spectrum and the probability density function (PDF) of wavefunction intensities at criticality. The importance of a PDF-based characterization of the MIT, is emphasized in connection with the latest experimental observations of critical phenomena, using STM techniques on semiconductors and direct imaging of cold-atom condensates. We will finally describe a new multifractal finite size scaling (MFSS) procedure that permits the simultaneous estimation of the critical parameters and the multifractal exponents. Simulations of system sizes up to $L^3=120^3$ and involving nearly 10^6 independent wavefunctions have yielded unprecedented precision for the critical disorder $W_c = 16.530$ (16.524, 16.536) and the critical exponent $\nu = 1.590$ (1.579, 1.602). The MFSS procedure is applicable to any continuous phase transition exhibiting multifractal fluctuations in the vicinity of the critical point.