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Single parameter scaling for 1d systems with scale-free long-range correlated disordered potentials[1] NANCY SANDLER, GREG PETERSEN, Ohio University — Disordered optical lattices have renewed the interest in localization physics under power-law long-range correlated disorder potentials. For these systems, insight can be gained by combining numerical data and analytic expressions based on scaling laws. Thus, the absence of a transition in short-range correlated disordered systems can been proved by verifying the validity of the single parameter scaling (SPS) hypothesis for the distribution function of the dimensionless conductance. In this talk we discuss this hypothesis for a system with scale-free long-range correlated disorder potentials of the form $\sim 1/r^{\alpha}$ as a function of the correlation exponent α. We present results for the 1^{st} (the β-function) and 2^{nd} (variance) cumulants of the distribution function, and show a violation of SPS at an energy scale E_{SPS}, that scales with an α-renormalized disorder strength. Calculations for the localization length reveals the existence of a crossover scale E_{cross} between two regions as correlations increase. An increased number of more extended-like states appear near the band-center while states near the band edges experience reduced localization lengths. We confirm previously predicted scaling behavior near the band edge and center.

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