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Multifractal Behavior in $Ga_{1-x}Mn_xAs$ Close to the Metal-Insulator Transition[1] PEDRAM ROUSHAN, Department of Physics, Princeton University, ANTHONY RICHARDELLA, Department of Physics, Princeton University, and Department of Physics, Penn State University, SHAWN MACK, Department of Physics, UCSB, BRIAN ZHOU, DAVID HUSE, Department of Physics, Princeton University, DAVID AWSCHALOM, Department of Physics, UCSB, ALI YAZDANI, Department of Physics, Princeton University — We have used a low temperature scanning tunneling microscope (STM) to study the metal-insulator transition in $Ga_{1-x}Mn_xAs$. STM topographies reveal a variety of electronic modulations indicating the presence of a high level of disorder. Furthermore, spectroscopic mapping reveals that the local density of states (LDOS) near E_F is strongly influenced by e-e correlations. Therefore, $Ga_{1-x}Mn_xAs$ provides an opportunity to examine critical behavior of electronic states close to the MIT in a correlated system. We have studied the probability distribution and the multifractal character of the spatial distribution of the LDOS. Near the MIT, LDOS shows a transition from a Gaussian to a lognormal distribution. The multifractal character which was studied by calculating the singularity spectrum shows a trend towards strong multifractality with decreasing Mn doping. Our work demonstrates the fractal nature of wavefunctions in a correlated system, and constitutes the first experimental results to map the critical behavior of states near this quantum phase transition

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