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Stochastic geometry in disordered systems, applications to quantum Hall transitions

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A spectacular success in the study of random fractal clusters and their boundaries in statistical mechanics systems at or near criticality using Schramm-Loewner Evolutions (SLE) naturally calls for extensions in various directions. Can this success be repeated for disordered and/or non-equilibrium systems? Naively, when one thinks about disordered systems and their average correlation functions one of the very basic assumptions of SLE, the so called domain Markov property, is lost. Also, in some lattice models of Anderson transitions (the network models) there are no natural clusters to consider. Nevertheless, in this talk I will argue that one can apply the so called conformal restriction, a notion of stochastic conformal geometry closely related to SLE, to study the integer quantum Hall transition and its variants. I will focus on the Chalker-Coddington network model and will demonstrate that its average transport properties can be mapped to a classical problem where the basic objects are geometric shapes (loosely speaking, the current paths) that obey an important restriction property. At the transition point this allows to use the theory of conformal restriction to derive exact expressions for point contact conductances in the presence of various non-trivial boundary conditions.