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A Generalized hydrodynamics approach to impurities in integrable models: Mesoscopic impurities

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It is well established that the large-scale behaviour of integrable models is captured by Generalized Hydrodynamics (GHD). Inserting an impurity into an integrable model typically breaks integrability and therefore its effect is hard to analyse analytically. In this talk I will first briefly introduce a GHD viewpoint on impurities: An impurity is given by a boundary condition in the GHD equation, which relates the ingoing and outgoing currents at the position of the impurity.
Unfortunately, deriving this GHD boundary condition for a specific microscopic impurity requires a full solution of the microscopic impurity and is therefore analytically not possible in general. In the second part of my talk I will focus on impurities whose spatial size L_{impurity} is mesoscopic $L_{\text{micro}} \ll L_{\text{impurity}} \ll L_{\text{system}}$, which is an approximation for large impurities. The large size of the impurity allows to still assume the usual requirements for GHD, like local equilibrium, also at the impurity. This means that the impurity can be fully described using the GHD framework. I will show that the impurity problem reduces to solving the stationary GHD equation and discuss the physical consequences of the approximation. Furthermore, I will explain a general strategy to approach the stationary GHD equation that, in simple cases, allows to find full analytical solutions to the scattering problem.

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