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Inelastic decay from integrability

Tuesday, 4 July 2023 15:00 (30 minutes)

A hallmark of integrable systems is the purely elastic scattering of their excitations. Such systems posses an extensive number of local conserved charges, leading to the conservation of the number of scattered excitations, as well as their set of individual momenta. In this talk, I will show that inelastic decay can nevertheless be observed in circuit QED realizations of integrable boundary models. I will consider scattering of microwave photons off impurities in superconducting circuits implementing the boundary sine-Gordon and Kondo models, which are both integrable. I will show that not only inelastic decay is possible for the microwave photons, in spite of integrability, and thanks to a nonlinear relation between them and the ellastically-scattered excitations, but also that integrability in fact provides strong analytical tools allowing to obtain exact expressions for response functions describing the inelastic decay, using the framework of form factors. I will show how one may obtain not only the total inelastic decay rate of the microwave photons, extracted from a 2-point response function, but also go beyond linear response and obtain the energy-resolved inelastic decay spectrum, using a novel method to evaluate form factor expansions of 3-point response functions which could prove useful in other applications of integrable quantum field theories. Our results compare quantitatively well with measurements from the Manucharyan group, and are instrumental in shedding light on experimental data that provide evidence for the elusive Schmid-Bulgadaev dissipative quantum phase transition.

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Track Classification: Participants Talks