Contribution ID: **42** Type: **Oral Presentation**

Real-time simulations of scattering in two dimensions

Real-time simulations of scattering are a promising avenue for exploring non-perturbative dynamical processes in strongly correlated systems. Unlike scattering experiments in particle colliders which measure the products of scattering, the simulations enable us to measure the system at any point in time. This allows us to directly probe the heart of the scattering process. This is particularly useful in strongly-coupled models, where the dynamics cannot be straightforwardly reconstructed from the scattering products. Accurate simulations of scattering promise to elucidate microscopic processes behind the creation of matter and its confinement into composite particles.

Due to methodological constraints, these simulations remain limited to one spatial dimension. We take the first step towards exploring higher-dimensional systems by simulating scattering of magnons in the quantum Ising model on a square lattice of 24×24 spins.

The ordered phase of the 2D Ising model is a particularly adept toy model for scattering, as its single-excitation spectrum consists entirely of bound states. This allows us to observe a rich interplay of scattering resonances, which produce various inelastic regimes.

Next, we tune the system into a symmetry-broken regime with a stable and a metastable vacuum. There, we investigate the stability of the false vacuum to the highly-energetic scattering of magnons of the stable species. We uncover a regime where the scattering generates a true vacuum bubble of the critical size, which violently expands and encompasses the whole system in a rapid false vacuum decay.

Author: PAVESIC, Luka (University of Padova)

Co-author: MONTANGERO, Simone (Padova University)

Presenter: PAVESIC, Luka (University of Padova)

Session Classification: B - Contributed Talk