nanoX invited scientist

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Host lab at NanoX LPT
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Dates of stay 5th of May 2022 - 7th of June 2022

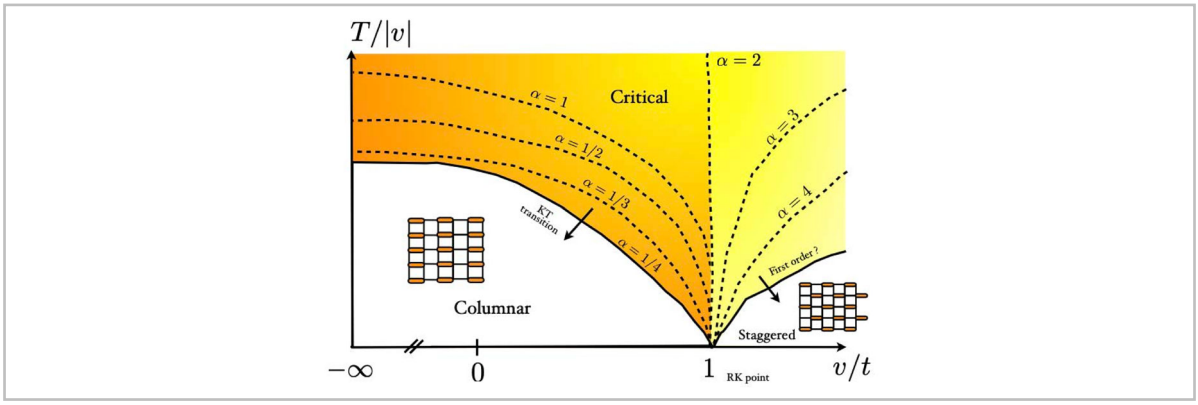
Brief Biodata

PhD in Physics, University of Pennsylvania, US (2012)
Nordita Fellow, Nordic Institute for Theoretical Physics, Sweden (2012-2014)
Guest scientist, Max Planck Dresden, Germany (2014-2016)
Assistant (2012-2017), Associate (2021-) Professor of Physics, IISER Pune, Indi

Research project during the visit at nanoX

Dynamics and thermodynamics of constrained quantum systems

1. Finite-temperature properties of the quantum dimer model.The quantum dimer model (QDM) is an effective model to describe the physics of frustrated spin systems where one and only one dimer must touch every lattice site. The QDM associates a kinetic energy to dimer flips and a potential energy to vdimer alignment. After several years of studies and controversies, the zero-temperature phase diagram of this model is now reasonably well-understood in 2D. The question remains open for finite-temperature properties and we have conjectured a phase diagram for the square lattice (see Figure). Expanding on a recently developed quantum Monte Carlo algorithm, we have just developed an ergodic finite-temperature version which allows to sample correctly the finite-T phase diagram. One key question is the characterisation of the high-temperature phase.
2. Transport properties of quantum chiral chains:
We will study the energy transport in a spin chain which has some chiral properties, in order to understand how the later might affect the ballistic/diffusive transport expected according to the integrable/chaotic nature of the system. We will use a Matrix-Product-State formalism to compute the Drude weight which finite-size scaling should allow to clarify different transport regimes.



Conjectured phase diagram for the quantum dimer model on the square lattice