



Contribution ID: 21

Type: **Contributed Oral**

Finite-temperature criticality through quantum annealing

Tuesday 2 December 2025 11:55 (15 minutes)

Critical phenomena at finite temperature underpin a broad range of physical systems, yet their study remains challenging due to computational bottlenecks near phase transitions. Quantum annealers have attracted significant interest as a potential tool for accessing finite temperature criticality beyond classical reach, but their utility in precisely resolving criticality has remained limited by noise, hardware constraints, and thermal fluctuations. Here we overcome these challenges, showing that careful calibration and embedding allow quantum annealers to capture the full finite-temperature critical behavior of the paradigmatic two-dimensional Ising ferromagnet. By tuning the energy scale of the system and mitigating device asymmetries, we sample effective Boltzmann distributions and extract both the critical temperature and the associated critical exponents. Our approach opens the study of equilibrium and non-equilibrium critical phenomena in a broad class of systems at finite temperature.

Authors: CAMPAIOLI, Francesco (RMIT University); Dr TEZA, Gianluca (Max Planck Institute for the Physics of Complex Systems, Germany); Dr AVESANI, Marco (Dipartimento di Ingegneria dell'Informazione, UNIPD, Italy); Prof. RAZ, Oren (Weizmann Institute of Science, Israel,)

Presenter: CAMPAIOLI, Francesco (RMIT University)

Session Classification: Condensed Matter & Materials

Track Classification: Topical Groups: Condensed Matter & Materials