

The 242th seminar by Xin An, Ghent University, 15:30, Feb. 5th, 2026 (Beijing time): Pushing the Limits of Fluctuating Hydrodynamics

Title: Pushing the Limits of Fluctuating Hydrodynamics

Abstract: Fluctuations are important measures for stochastic systems, while hydrodynamics is a universal effective description for systems at large scales in spacetime. Their interplay – fluctuating hydrodynamics – thus becomes crucial for describing near-equilibrium systems with a finite number of degrees of freedom, and an ideal scenario of its application is the quark-gluon plasma created in relativistic heavy-ion collisions. While fluctuating hydrodynamics has achieved significant progress in the past decades, this talk will discuss recent attempts that push its boundaries of applicability in two key directions: first, into the non-Gaussian regime, for which a stochastic frame is needed for a consistent framework including the fluctuations of fluid velocity; and second, into the far-from-equilibrium regime, where the role of non-hydrodynamic modes, governed by their underlying symmetry principles, becomes prominent. These extensions are essential for understanding systems that incorporate a critical point or that thermalize from far-from-equilibrium initial conditions, both of which are closely relevant to the ongoing experiments in high-energy nuclear physics.

Brief introduction about the speaker: Xin An is a postdoc researcher in the High Energy Theory Group at Ghent University. He received BS from Nankai University and PhD from University of Illinois Chicago (2020). After that, he held postdoctoral positions at University of North Carolina at Chapel Hill, National Centre for Nuclear Research, and currently at Ghent University. His research interests range from statistical physics to non-equilibrium effective theories, including hydrodynamics and field theories, in the context of strongly interacting systems described by Quantum Chromodynamics.

Summary