

Hội thảo: “Lý thuyết trường bảo giác và ứng dụng” - Phần 1
Workshop: “Conformal Field Theory and its applications” - Part 1

Institute of Physics, VAST. Tuesday, August 25th, 2026

Host: Dr. Nguyen Thi Kim Thanh

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Talk 1 (9am – 10am): Speaker: Dang Hai Dang

Shanghai Institute for Mathematics and Interdisciplinary Sciences, China

Title : A brief introduction to Conformal Field Theory

Abstract: The goal of this talk is to give a broad overview of 2d conformal field theory (CFT). Since this is a very broad subject, we will only be able to explore some of the important aspects that are particularly relevant to applications in condensed matter physics.

We will begin by motivating CFT through phase transitions. Then we will explain conformal symmetry and why in dim 2 is special. Next, we will express familiar objects in QFT (the stress-energy tensor, fields, and correlation functions) in the language of CFT. After that, we will exploit the fact that 2d conformal symmetry is described by the Virasoro algebra to make the discussion more concrete and algebraic. Lastly, we will describe some well-known examples of CFTs.

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Talk 2 (10am – 11am): Speaker: Tran Chi Quy

Faculty of Physics, VNU University of Science, Hanoi, Vietnam

Title: Conformal Field Theory Approach to Bosonization, Fusion rules and applications in multi-channel Kondo problem

Abstract:

Two-dimensional conformal field theory plays an important role in both theoretical high-energy and condensed matter physics. In this talk, I focus on the magical two-dimensional conformal field theory (2D CFT) approach to (chiral) fermionic systems. Firstly, by studying the quantization of chiral massless Dirac fermion on a complex plane, quantum anomaly emerges as a central extension of infinite-dimensional algebras such as affine Lie algebra, affine Kac-Moody algebra and Virasoro algebra. The second part of this talk introduces the theory of abelian/nonabelian bosonization and fusion rule of irreducible

highest-weight modules of affine Kac-Moody algebra. Finally, this talk presents an application of 2D CFT in multi-channel Kondo problem with impurity, for instance, the renormalization group flow from UV fixed point to IR fixed point via affine fusion prescription, which is based on 2D CFT, between UV, IR, and impurity irreducible modules. This talk is based on the studies of Affleck and Ludwig (see arXiv:cond-mat/9512099, and DOI:10.1016/0550-3213(91)90109-B) and other related references therein.

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Morning discussion 30 minutes

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Lunch break (11.30am – 1.30pm)

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Talk 3 (1.30pm – 2.30pm): Speaker: Dr. Pham Van Ky

Institute of Physics, Vietnam Academy of Science and Technology, Hanoi, Vietnam

Title: Introduction to the AdS/CFT Duality and Some Applications: Superconductivity, Thermal Phase Transitions, Holographic Cosmology

Abstract:

Explain why there is a duality between AdS, a gravitational field theory with a negative cosmological constant, and CFT, a conformally invariant field theory existing on the boundary of the AdS bulk spacetime. Present the mapping principles between AdS and CFT (the AdS/CFT dictionary). Then apply them to the study of some physical phenomena as follows: First, in the phenomenon of superconductivity, present the spontaneous symmetry-breaking mechanism of field theory in order to obtain superconducting properties in the Ginzburg–Landau model. Then explain why the AdS/CFT principles can be applied to obtain superconducting properties. Second, study the thermodynamics of AdS black holes, then use the AdS/CFT dictionary to derive thermodynamic laws such as first-order and second-order phase transitions. Finally, the holographic principle is applied to study the expansion rate of the universe, inflation, dark energy, and the thermodynamic laws of the universe.

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Talk 4 (2.30pm – 3.30pm): Speaker: Assoc. Prof. Nguyen Quynh Lan

Astrophysics Group at PIAS, Phenikaa University, Hanoi, Vietnam

Title: Conformal Field Theory Applications in Gravitational Wave Observations

Abstract: Gravitational wave signals from binary neutron star mergers allow us to probe matter at extreme densities that are impossible to study in Earth-based laboratories. In this talk, we explain the step-by-step methodology of applying Conformal Field Theory to model dense matter and extract physics from astronomical observations.

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Afternoon discussion: 30 minutes and more