



THE CHINESE UNIVERSITY OF HONG KONG
Department of Physics
SEMINAR

New Insights in Modeling Reionization Signals for Precision Cosmology

by

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Place: Rm. 311, Science Centre North Block, CUHK

ALL INTERESTED ARE WELCOME

Abstract

As we enter the era of precision cosmology, the 21-cm line of neutral hydrogen stands at the forefront of cosmological studies, enabling unprecedented 3D mapping of the early Universe. Cutting-edge experiments such as EDGES, SARAS, HERA, and the forthcoming SKA, alongside cosmological simulations like THESAN, underscore the importance of accurate modeling of the 21-cm line signal to maximize the scientific gains of these efforts.

Traditionally, the 21-cm signal associated with cosmic reionization is computed using the optical depth parameterization method, which relies on various simplified assumptions. Recent studies (Chan et al. 2024; Wu, Han, Chan 2024) reveal that this conventional approach incurs errors of about 5-10% within the redshift range $5.5 < z < 35$, even in scenarios with smooth reionization histories. This talk will discuss these findings, identify conditions where comprehensive cosmological radiative transfer (CRT) treatments are essential, and outline refined approaches for reliable 21-cm signal modeling. These advancements set the stage for deeper insights into the processes that shaped the Universe's structure and evolution.

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