

NSYSU

physics 書報討論 Weekly Seminar

From Hidden Forces to Dark Matter: A Non-Abelian Portal

Dr. Van Que Tran 陳文桂

Physics Division, National Center for Theoretical Sciences,
National Taiwan University

<https://inspirehep.net/authors/1603951>

speaker's URL



14:10, Apr. 30 (Thu) 2026 at 物理館 PH2006

The nature of dark matter remains one of the most important open questions in particle physics. In this talk, I will introduce a simple and predictive framework in which dark matter arises from a hidden sector governed by a non-Abelian gauge symmetry. After symmetry breaking, this sector contains a massless dark photon and a massive dark vector particle that plays the role of dark matter.

The connection between the dark sector and the Standard Model is established through non-Abelian kinetic mixing, which originates from a higher-dimensional operator. As a result of this mixing, the dark matter particle acquires a small millicharge under ordinary electromagnetism. Consequently, dark matter is very weakly coupled and is produced via the freeze-in mechanism, rather than the conventional freeze-out scenario.

To determine the dark matter abundance, we solve the Boltzmann equations in a framework where the visible and dark sectors can have different temperatures, taking into account important plasma effects such as plasmon decay. We show that this scenario can naturally reproduce the observed dark matter density while remaining consistent with astrophysical and cosmological constraints.

Finally, we demonstrate that this framework can be tested in upcoming sub-GeV dark matter direct-detection experiments.

future seminars

