

中央大學物理學系

Department of Physics, National Central University



Colloquium

Search for new CP-violating source through rare kaon decays

Prof. Chieh Lin (林杰)

Dept. of Physics, National Changhua

University of Education

Date: 2025/11/04 (Tue)

Venue: S4-625

Time: 14:00

Abstract :

CP violation is a necessary ingredient to generate the observed matter–antimatter asymmetry in the Universe. Within the Standard Model (SM), it arises from the mixing of the three quark generations, described by the KM mechanism, but the resulting asymmetry is orders of magnitude too small to account for the present Universe. The rare kaon decay $K_L^0 \rightarrow \pi^0 \nu \bar{\nu}$ provides one of the most sensitive tests of physics beyond the SM, as its branching ratio is predicted to be 3×10^{-11} with a theoretical uncertainty of only 1%. KOTO is a dedicated experiment to search for this decay and currently sets the world-best upper limit on its branching ratio of $< 2.1 \times 10^{-9}$. The experiment is expected to operate for another 3–5 years to reach the sensitivity to a single SM event, and an upgraded program, KOTO-II, featuring enhanced detectors and new beamline, is planned to start around 2030. The overarching goal is to observe $K_L^0 \rightarrow \pi^0 \nu \bar{\nu}$ or to obtain evidence of New Physics, while also delivering additional kaon measurements of interest. In this talk, I will review the current status of kaon physics and outline the prospects for the coming decade.