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Kaon physics: present status and prospects

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Kaon physics has played a foundational role in particle physics, from the discovery of strangeness and CP violation to some of the most precise tests of the Standard Model (SM). Today, it continues to provide a uniquely sensitive probe of potential new physics through the study of rare processes and flavor-changing neutral currents. This talk will present an overview of the current status and future prospects of the field, with a focus on experimental efforts. I will highlight recent progress from dedicated kaon experiments such as NA62 at CERN and KOTO in Japan, which are leading the search for the ultra-rare decays $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ and $K_L \rightarrow \pi^0 \nu \bar{\nu}$, respectively. These processes are highly suppressed in the SM and theoretically clean, making them powerful indirect probes of heavy new physics, including models with new sources of flavor or CP violation. I will also discuss the feasibility and ongoing studies exploring the potential for rare kaon decay measurements at LHCb, as well as prospects for future kaon experiments that aim to further push the intensity frontier. Together, these efforts reinforce kaon physics as a precision frontier with strong discovery potential in the coming decade.

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