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Type: Invited Talk

KLEVER: An experiment to measure $\text{BR}(\text{KL} \rightarrow \pi^0 \nu \nu)$ at the CERN SPS

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Precise measurements of the branching ratios (BRs) for the flavor-changing neutral current decays $\text{KL} \rightarrow \pi \nu \nu$ can provide unique constraints on CKM unitarity and, potentially, evidence for new physics. It is important to measure both decay modes, $\text{K}^+ \rightarrow \pi^+ \nu \nu$ and $\text{KL} \rightarrow \pi^0 \nu \nu$, since different new physics models affect the rates for each channel differently. For the charged channel, the NA62 experiment at the CERN SPS is currently collecting data and expects to measure the BR to within 10% by the end of LHC Run 3. For the neutral channel, the BR has never been measured. We are designing the KLEVER experiment to measure $\text{BR}(\text{KL} \rightarrow \pi^0 \nu \nu)$ to $\sim 20\%$ using a high-energy neutral beam at the CERN SPS starting in LHC Run 4. The boost from the high-energy beam facilitates the rejection of background channels such as $\text{KL} \rightarrow \pi^0 \pi^0$ by detection of the additional photons in the final state. On the other hand, the layout poses particular challenges for the design of the small-angle vetoes, which must reject photons from KL decays escaping through the beam pipe amidst an intense background from soft photons and neutrons in the beam. Background from $\Lambda \rightarrow n \pi^0$ decays in the beam must also be kept under control. Findings from our design studies will be presented, with an emphasis on the challenges faced and the potential sensitivity for the measurement of $\text{BR}(\text{KL} \rightarrow \pi^0 \nu \nu)$.

Content of the contribution

Experiment

Primary author: VAN DIJK, Maarten (CERN)

Presenter: VAN DIJK, Maarten (CERN)

Session Classification: Emergence of symmetries from entanglement

Track Classification: [8] New results from LHC, new facilities