

Current and planned precision studies of rare pion decays

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As we mark the passage of 75 years since the discovery of the pi meson, the role that the pion plays in the strong interaction remains clear and central. The pi meson also presents a rich subject of study when it comes to weak interaction processes, in particular exploring the limits of the validity of the Standard Model, and searches for its possible extensions. Thanks to few and simple final states, and strict symmetry protections, rare decays of the charged pion play an exceptional role in this respect. We will review the current status of the theoretical implications for the rare decay channels: $\pi^+ \rightarrow e^+ \nu(\gamma)$, and $\pi^+ \rightarrow \pi^0 e^+ \nu(\gamma)$, the status of their experimental study to date (particularly the PiBeta, PEN, and PiENU experiments), and plans for the PIONEER experiment, currently under preparation.

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