

Recent High Precision Measurement of the Neutral Pion Lifetime and the PrimEx Experimental Program at Jefferson Lab

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The neutral pion is the lightest two-quarks strongly interacting particle in Nature. As such, the properties of π^0 decay are especially sensitive to the underlying fundamental symmetries of quantum chromodynamics (QCD). In particular, the $\pi^0 \rightarrow \gamma\gamma$ decay width is primarily defined by the breaking effects of axial and chiral symmetries (chiral anomaly) in QCD. Theoretical activities in this domain over the last years resulted in small corrections to the anomaly with a percent level accuracy for the $\pi^0 \rightarrow \gamma\gamma$ decay width. The PrimEx collaboration at Jefferson Laboratory has developed and performed two new experiments to measure the $\pi^0 \rightarrow \gamma\gamma$ decay width with high precision using the Primakoff effect. The combined result from two experiments: $\Gamma(\pi^0 \rightarrow \gamma\gamma) = 7.802 \pm 0.052(\text{stat.}) \pm 0.105(\text{syst.})$ eV was recently published in the Science journal. With its 1.50% total uncertainty it represents the most accurate measurement of this fundamental quantity to date. The results of these experiments together with the experimental method will be presented and discussed in this talk.

Collaboration

PrimEx at Jefferson Lab

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