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Precision measurement of the neutral pion radiative decay width at Jefferson Lab

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The neutral pion is the lightest strongly interacting particle in Nature. Therefore, 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 spontaneous chiral symmetry breaking effect (chiral anomaly) in QCD. Theoretical activities in this domain over the past several years have resulted in a high precision (1% level) prediction for the $\pi^0 \rightarrow \gamma\gamma$ decay width. The PrimEx collaboration at Jefferson Lab 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 published result from the first experiment (PrimEx-I), $\Gamma(\pi^0 \rightarrow \gamma\gamma) = 7.82 \pm 0.14 \text{ (stat)} \pm 0.17 \text{ (syst)} \text{ eV}$, is a factor of 2.1 more precise than the currently accepted value, and it is in agreement with the chiral anomaly prediction. The second experiment (PrimEx-II) was performed in 2010 with a goal of 1.4% total uncertainty to address the next-to-leading-order chiral perturbation theory calculations. The preliminary results from the PrimEx-II experiment will be presented in this talk.

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