

Test Fundamental Symmetries via Precision Measurements of π^0 , η and η' Decays

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Light neutral meson decays provide a unique laboratory to probe fundamental symmetries. A comprehensive Primakoff experimental program at Jefferson Laboratory (JLab) is aimed at gathering high precision measurements on the two-photon decay widths and the transition form factors at low four-momentum transfer squares of π^0 , η and η' via the Primakoff effect. Completed experiments on the π^0 radiative decay width at JLab 6 GeV, and planned measurements of η and η' at JLab 12 GeV will provide sensitive probes to test the chiral anomaly and to study the origin and dynamics of chiral symmetry breaking in the confinement QCD. Recently developed Jlab Eta Factory (JEF) experiment in Hall D will measure the rare η and η' decays. The result of these measurements will offer a strong constraint on a leptophobic gauge boson B' in the sub-GeV mass range (with a sensitivity to the baryonic fine structure constant as low as 10^{-7}) and provide a unique probe for new source of CP violation by directly testing C-violating, P-conserving interactions. A preliminary result of the π^0 radiative decay width and the status of planned η and η' measurements will be presented.

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