Probing New Physics Using η Mesons at the Jefferson Lab Eta Factory

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The η meson offers the opportunity to probe a wide range of physics owing to its unique combination of additive quantum numbers, narrow mass width, flavor-conserving decays, and relative ease of production. In particular, the η meson provides a portal to look for beyond standard model (BSM) dark sector bosons, constraints to C-violating P-conserving physics, high precision tests of low-energy QCD descriptions, and access to the light quark mass ratio. The GlueX spectrometer at Jefferson Lab offers a high-statistics sample of photoproduced η mesons and a unique degree of forward boosting in the lab frame ($p_\eta \approx 8$ GeV) to suppress backgrounds. Furthermore, the near-future Jefferson Eta Factory (JEF) experiment plans to improve photon position and energy resolution at small polar angles to improve sensitivity in key decay channels. We present the current status of η measurements using the GlueX spectrometer and key objectives of the JEF experimental upgrade.

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