

# Probing New Physics Using $\eta$ Mesons at the Jefferson Lab Eta Factory

Jonathan Zarling  
University of Regina  
[Jonathan.Zarling@uregina.ca](mailto:Jonathan.Zarling@uregina.ca)  
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The  $\eta$  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  $\eta$  meson provides a portal to look for beyond standard model (BSM) dark sector bosons, constraints to C-violating P-conserving (CVPC) physics, high precision tests of low-energy QCD descriptions, and strange-to-light-quark mass ratio  $Q$ . The GLUEX spectrometer at Jefferson Lab offers a high-statistics sample of photoproduced  $\eta$  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 the granularity and resolution of the inner forward calorimeter to improve sensitivity in key decay channels. We present the current status of  $\eta$  detection with the GLUEX spectrometer and key objectives of the JEF experimental upgrade.

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