

Rare Eta and Eta-prime Decay Program at Hall D/Jefferson Lab

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Measurements of several rare η and η' decay channels will be carried out with an upgraded GlueX detector in Hall D, Jefferson Lab as part of the the Jefferson Lab Eta Factory (JEF) program. JEF will commence in late March 2025: the combination of highly-boosted η/η' production, recoil proton detection, and a new fine-granularity high-resolution lead-tungstate insert in the GlueX forward calorimeter confers uniqueness to JEF, compared to other experiments worldwide. JEF will search for new sub-GeV gauge bosons in portals coupling the Standard Model sector to the Dark sector, will provide constraints on C-violating/P-conserving reactions, and will allow precision tests of low-energy QCD. Simulations have been driving methods towards significant background reduction and signal isolation for key rare decay channels: the $\eta \rightarrow \pi^+\pi^-e^+e^-$ channel will be shown as an example. Details on the hardware upgrade and initial look at the commissioning of the device will also be presented.