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 in the near future at the Jefferson Lab Eta Factory (JEF). 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.