

# The Jefferson lab Free Electron Laser Program, and energy recovery linac 4th generation light source

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## Abstract content

### Summary

In 1998, JLab's IR Demo Free Electron Laser (FEL) established itself as the world's most powerful tunable laser in the world demonstrating 2 kW average power at 3-microns wavelength and unprecedented 5 mA CW, un-polarized electron beam current. The JLab FEL adopted Jefferson Lab's Continuous Electron Beam Accelerator Facility (CEBAF) super conducting radio frequency linear accelerator (SRF) technology and demonstrated routine operation based on energy recovery at 60 MeV. The FEL also adopted CEBAF's DC photoemission gun technology to drive the injector, although based on bulk Cs:GaAs photocathode since polarized electrons are not required to produce light. Later in 2006, the Upgrade version of the IR FEL demonstrated 14 kW average power at 1.6-microns wavelength operating with 140 MeV electron beam at 8 mA CW. This 4th generation light source is unique in its capabilities for generating sub-ps laser-light pulses in a wide range of wavelengths and energy. Key experiments on medical physics, materials science and accelerator physics have already been performed with fantastic success. A new machine has been proposed to generate VUV and soft-x ray CW laser light, with unprecedented electron beam average brightness and operating at 600 MeV.

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