

Free-electron laser shines at over 14 kilowatts in the infrared

The most powerful tunable laser in the world just shattered another power record: the Free-Electron Laser (FEL), supported by the Office of Naval Research and located at the U.S. Department of Energy's Thomas Jefferson National Accelerator Facility (Jefferson Lab), produced a 14.2 kilowatt (kW) beam of laser light at an infrared wavelength of 1.61 microns on October 30.

"This wavelength is of interest to the Navy for transmission of light through the maritime atmosphere and for material science applications," said Fred Dylla, Jefferson Lab's Chief Technology Officer and Associate Director of the Free-Electron Laser Division. The FEL is supported by the Office of Naval Research, the Naval Sea Systems Command, the Air Force Research Laboratory, and the Joint Technology Office, as well as by the Commonwealth of Virginia.

The laser's new capabilities will enhance a wide range of applications, such as shipboard antimissile defense and other defense applications as well as manufacturing technologies and the support of scientific studies in chemistry, physics, biology and medicine.

This is another record for the powerful laser, which was also the first to achieve 10 kW in the infrared at 6 microns in July 2004. "In this case, the smaller the wavelength in the infrared, the more difficult it was to reach at these tremendously high powers," Dylla said. "Reaching 14 kilowatts at 1.61 microns is a truly remarkable achievement, and we couldn't have done it without the hard work and dedication of the FEL staff and our colleagues at Jefferson Lab. The team created groundbreaking designs that resolved technical challenges never before seen, since these power levels are unprecedented."

"This milestone supports the Navy's vision for the ultimate development of a very high power FEL that will serve as part of a ship-based weapon system and provide precise, speed-of-light energy projection at sea," added ONR program manager Lewis DeSandre. "The Navy and Department of Energy research communities continue to work on the steady development of FEL technology. The goal is to reach higher power levels that will provide persuasive evidence and support the eventual realization of FEL as a promising candidate for meeting several of the Navy's broad mission requirements and defeating 21st century threats."

"This achievement culminates an incredible effort by this dedicated team and my thanks and congratulations go out to the many physicists, engineers, technicians, and support staff members who have made this milestone possible," commented Jefferson Lab Director and JSA, LLC, President, Christoph Leemann.

The FEL program began as the One-Kilowatt Demonstration FEL, which broke power records and made its mark as the world's brightest high average power laser. It delivered 2.1 kW of infrared light--more than twice the level it was initially designed to achieve--before it was taken offline in November 2001 for an upgrade to 10 kW.

Built with Jefferson Lab's expertise in superconducting radiofrequency (SRF) technology, the FEL is the world's most powerful tunable laser. The FEL provides intense beams of laser light that can be tuned to a precise wavelength range in the infrared at higher-average powers than beams from conventional lasers.

Source: Office of Naval Research

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