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NIF Fires Record-Setting Laser Shot

LIVERMORE, Calif., March 22, 2012 — The 192 lasers fired in unison at the National Ignition Facility (NIF) this week delivered a record 1.875 million joules of ultraviolet laser light to its target chamber, exceeding NIF's original design specification and setting the stage for full-power experiments in the coming months, officials said.

"For the past 15 years, since NIF groundbreaking in 1997, the scientific community has regarded the 1.8-MJ milestone as a tremendous technical challenge," said NIF Operations Manager Bruno Van Wonterghem. "In 2003, we demonstrated this performance level on a single beam line, and in 2008 we repeated the demonstration on a single quad of four beams. To achieve this performance level with this kind of precision, quality and reliability on all 192 beams is unprecedented and very exciting." (See also: 1st Successful Ignition Experiment at NIF)

Control room staff members at the National Ignition Facility monitor the progress of the world's most energetic laser, shot on March 15. From left: Rodrigo Miramontes-Ortiz, Dean LaTray, Scott Phillip Rogers, Dean Steven Felzkowski. (Image: Damien Jemison/NIF)

The record-breaking laser shot, made March 15, involved a shaped pulse of energy 23-billionths of a second long generating 411 trillion watts of peak power, 1000 times more than the entire US uses at any given moment. It surpassed a critical milestone toward achieving fusion ignition and capturing the power of the sun in a laboratory.

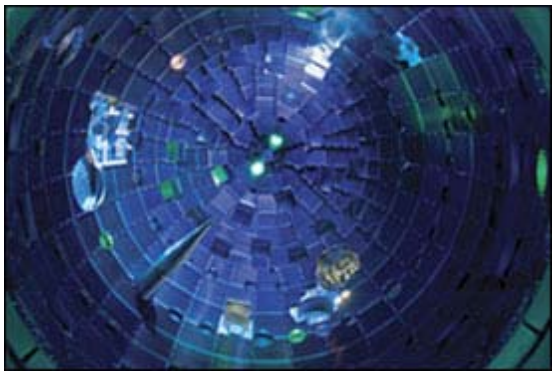
In addition to having the highest recorded energy threshold, the shot was also one of the most precise ever fired at NIF: The energy produced was within 1.3 percent of its goal.

Norris Lao and Dean LaTray smile as they view the results of the world's most energetic laser, shot on March 15. (Image: Damien Jemison/NIF)

Such precision is vital because the energy distribution among the beams determines how symmetrical an implosion is obtained in capsules containing fusion fuel. Implosion symmetry is a critical factor in achieving the pressures and temperatures required for ignition.

The achievement comes as NIF celebrates its third anniversary: Operations began in March 2009, when 1-MJ operation was first achieved. Since then, the facility has increased its operational energy about 1 kJ every day.

"This event marks a key milestone in the National Ignition Campaign's drive toward fusion ignition," said NIF Director Edward Moses. "While there have been many demonstrations of similar equivalent energy performance on individual beams or quads during the completion of the NIF project, this is the first time the full complement of 192 beams has operated at this sound barrier."



NIF Target Chamber This view from the bottom of the chamber shows the target positioner being inserted. Pulses from NIF's high-power lasers race toward the Target Bay at the speed of light. They arrive at the center of the target chamber within a few trillionths of a second of each other, aligned to the accuracy of the diameter of a human hair. (Credit: Lawrence Livermore National Laboratory)

The ultraviolet energy produced by NIF (after conversion from the original infrared to ultraviolet light) was 2.03 MJ before passing through diagnostic instruments and other optics on the way to the target chamber. Located at Lawrence Livermore National Laboratory, NIF is now the first 2-MJ ultraviolet laser, generating nearly 100 times more energy than any other laser in operation, and operating around the clock.

Moses said that NIF will pursue operations at even higher power and higher energy levels to achieve ignition.

For more information, visit: https://lasers.llnl.gov/

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