For Immediate Release

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CEBAF Beam Goes Over the Hump
Highest-Energy Beam Ever Delivered at Jefferson Lab

NEWPORT NEWS, VA, May 14, 2014 – The Continuous Electron Beam Accelerator Facility (CEBAF) at the U.S. Department of Energy's Thomas Jefferson National Accelerator Facility has achieved the final two accelerator commissioning milestones needed for approval to start experimental operations following its first major upgrade.

In the early hours of May 7, the machine delivered its highest-energy beams ever, 10.5 billion electron-volts (10.5 GeV) through the entire accelerator and up to the start of the beamline for its newest experimental complex, Hall D. Then, in the last minutes of the day on May 7, the machine delivered beam, for the first time, into Hall D.

In addressing staff, Jefferson Lab Director Hugh Montgomery praised the efforts of the many Jefferson Lab staff members who made the accomplishment a reality, "It's really appreciated the way you have worked together and, in particular, the safe way in which you have pulled this off," he said.

The CEBAF accelerator is based on superconducting radiofrequency (SRF) technology and produces a stream of charged electrons that scientists use to probe the nucleus of the atom. CEBAF was the first large-scale application of SRF technology in the U.S., and it is the world's most advanced particle accelerator for investigating the quark structure of the atom's nucleus. CEBAF was originally designed to operate at 4 GeV, and it reached 6 GeV, or 6 billion electron volts in its original configuration.

The 12 GeV Upgrade is a $338 million project to double CEBAF's maximum operational energy and includes the construction of the fourth experimental hall, as well as upgrades to equipment in the existing halls.

On May 7, 10.5 GeV beam was delivered to the Hall D Tagger Facility, which converts CEBAF's electron beam into photons that will be used for experiments in Hall D. To deliver the beam to the Tagger Facility, operators steered it through a newly installed beamline that rises 5 meters, more than 16 feet, as it approaches the Tagger Facility.

"With this accomplished, the beamline elements from the photocathode that generates the electrons through 5.5 passes of the CEBAF racetrack and the new Hall D electron beamline have gloriously transported beam!" said Arne Freyberger, Accelerator Operations manager. "This is not luck. This is a direct reflection of the quality of the staff."

Leigh Harwood, 12 GeV Upgrade project lead for Accelerator, concurred, "The 12 GeV Upgrade project team thanks you for your dedication and the hard work that got us to this moment."

In addition to setting a new energy record for beam in CEBAF, these significant accomplishments complete two of the major 12 GeV Project milestones necessary for Jefferson Lab to be granted the next DOE approval step, Critical Decision-4A (Accelerator Project Completion and Start of Operations).

These two accomplishments build on others. On Feb. 5, accelerator operators sent streams of electrons around the CEBAF accelerator once and achieved full upgrade-energy acceleration of 2.2 GeV in one pass. Then they ran the accelerator at this specification for the next eight hours, achieving 50 percent availability on their first run of the machine at design specifications. On April 1, the CEBAF accelerator delivered electron beams into a target in an experimental hall, recording the first data of the 12 GeV era. The machine sent electrons around the racetrack three times (known as "3-pass" beam), resulting in 6.11 GeV electrons at 2 nanoAmps average current for more than an hour. On May 3, the first beam, with energy of 6.18 GeV, was delivered to the front section of the beamline to Hall D, thus demonstrating that all 5.5 passes of the accelerator were functional and there were no obstructions in the way of the beam. With 5.5 passes functional, CEBAF energy was scaled to 10.5 GeV to achieve these last two milestones.

DOE approval of Critical Decision-4A will permit accelerator operators to continue commissioning the accelerator in order to achieve full 12 GeV energy and to send electron beams to Jefferson Lab's experimental halls for commissioning and the start of experiments.

Jefferson Science Associates, LLC, a joint venture of the Southeastern Universities Research Association, Inc. and PAE Applied Technologies, manages and operates the Thomas Jefferson National Accelerator Facility, or Jefferson Lab, for the U.S. Department of Energy's Office of Science.

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