Installation and first commissioning results of the JEF lead tungstate calorimeter.

(short version, 150 words text only)

The Electromagnetic Calorimeter (ECAL), consisting of 1,596 lead tungstate scintillating crystals, has been recently constructed and installed in Experimental Hall D at Jefferson Lab (JLab). The calorimeter is a key component of the JLab Eta Factory Experiment, whose main goal is to measure the decays of η and η' mesons into multi-photon final states. The ECAL replaces the inner part of the former forward lead-glass calorimeter. Scintillation light from each crystal is detected using Hamamatsu R4125 photomultiplier tubes. Calorimeter modules were fabricated and tested in the lab using light from light-emitting diodes before being installed in the detector frame. The detector is currently undergoing commissioning using the light monitoring system and cosmic rays. We will present an overview of the fabrication and testing of the calorimeter modules, along with the first detector commissioning results. The ECAL is expected to be ready for data-taking in March 2025.

(long version, 300 words text only)

The Electromagnetic Calorimeter (ECAL), consisting of 1,596 lead tungstate (PbWO₄) scintillating crystals, has been recently constructed and installed in Experimental Hall D at Jefferson Lab (JLab). It is the largest PbWO₄ calorimeter ever built at JLab. The ECAL is a key component of the JLab Eta Factory Experiment, whose main goal is to measure the decays of η and η' mesons into multi-photon final states. The high-granularity, high-resolution ECAL replaces the inner part of the former forward lead-glass calorimeter, and provides approximately a factor of two improvement in energy resolution and better separation of photon showers. Scintillation light from each crystal is detected using Hamamatsu R4125 photomultiplier tubes (PMTs), and the signal pulses are digitized using flash ADCs operating at a 250 MHz sampling rate. Construction of the calorimeter began with characterization and quality checks of the scintillating crystals, which were provided by two vendors: SICCAS (China) and Crytur (Czech Republic). Performance characteristics such as light transmittance and light yield were verified on preselected crystal samples. The calorimeter modules were fabricated and initially tested using a custom test setup in the lab before installation in the detector frame. This setup allowed verification of the PMT performance and front-end electronics using light from light-emitting diodes (LEDs). After installation, the detector was integrated into the data acquisition and trigger systems and is currently undergoing commissioning using the light monitoring system, which supplies LED light to the face of each module. A cosmic ray data set has been collected and will be used for the initial calibration of PMT gains. We will present an overview of the fabrication and testing of the calorimeter modules, along with the first results from detector commissioning. The ECAL is expected to be ready for data-taking in March 2025.