INITIAL PERFORMANCE OF THE MAGNET SYSTEM IN THE SPLITTER/COMBINER SECTION OF THE CORNELL-BROOKHAVEN ENERGY-RECOVERY LINAC TEST ACCELERATOR

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Abstract
The Cornell-Brookhaven Energy-recovery Linac Test Accelerator is a four-pass, 150-MeV electron accelerator with a six-cell 1.3 GHz superconducting-RF linear accelerator and a fixed-field alternating-gradient (FFAG) return loop made up of Halbach-style quadrupole magnets. The optics matching between the linear accelerator and the return loop is achieved with a conventional magnet system comprised of 50 dipole magnets and 64 quadrupole magnets in four beamlines at each end of the linac. The 42-, 78-, 114- and 150-MeV electron beams are separated into independent vacuum chambers in order to allow for the path-length adjustment required by energy recovery. We report on the first beam tests of the initial installation of the splitter/combiner section at the exit of the linac. The vacuum system of the 42-MeV S1 line was installed during the first week of April. Nine dipole and four quadrupole magnets were installed and surveyed into position the following week, and the water cooling system was commissioned. A 6-MeV beam passed through the line on April 11 with no need for adjusting pre-set magnet excitation currents. One week later, time-of-flight measurements were used to calibrate and phase the individual superconducting RF cavities. The S1 magnet settings were then scaled up to achieve 5-cavity, 42-MeV operation through the first nine FFAG permanent-magnet quadrupoles. This initial Fractional Arc Test will conclude on May 18, when the installation of the remaining seven splitter/combiner lines and the return loop will begin. CBETA operations are scheduled to begin in early 2019.

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Electron Current up to 320 mA in the linac
Bunch charge Q of up to 2nC
Bunch repetition rate 1.3GHz/N
Beams of 100mA for 1 turn and 40mA for 4 turns

Severe space constraints dictate design of splitter electromagnets

Dipole, quadrupole, and vertical corrector magnets designed and fabricated at
Elytt/Neurus Technologies, Madrid, Spain

*Supported by NSF award DMR-0807731, DOE grant DE-AC02-76SF00515, and New York State Energy Research and Development Authority.

CLASSE facilities are operated by the Cornell Laboratory for Elementary Particle Physics (LEPP) and the Cornell High Energy Synchrotron Source (CHESS) with major support from the National Science Foundation.