

A HIGH-BRIGHTNESS LOW-ENERGY PHOTOINJECTOR OPTION FOR THE FERMILAB ELECTRON ACCELERATOR FACILITY

P. Piot, Northern Illinois University, DeKalb, Illinois;
M. Church, Fermilab, Batavia;
D. Mihalcea, Northern Illinois University, DeKalb, Illinois;
S. Nagaitsev, Fermilab, Batavia;
I. V. Pogorelov, LBNL, Berkeley, California;
Y.-E. Sun, Fermilab, Batavia

Abstract

Fermilab is currently constructing a GeV-scale electron accelerator test facility. The accelerator will serve as a backbone for several Fermilab R&D programs, e.g., to test sub-system associated to project-X, ILC and the muon collider program. It is also anticipated that this facility will support beam physics and accelerator R&D programs such as testing of novel acceleration techniques, beam diagnostics and radiation sources concepts. In this paper we describe a possible option for the electron injector based on a photoemission rf gun. Optimization and performance studies of this ~50 MeV photoinjector are performed with various tracking programs (Astra, GPT, Impact-T, Impact-Z). We explore the performances of the magnetic bunch compressor which is extremely challenging at 50 MeV due to strong phase space dilution via collective effects (space charge and coherent synchrotron radiation). We also investigate the generation of flat beams with very high transverse emittance ratio using a round-to-flat beam transformer.

**CONTRIBUTION NOT
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