

Experimental Results from an Injector for an IR FEL*, S. BENSON, C.L. BOHN, D.R. DOUGLAS, D. ENGWALL, D. KEHNE, G.A. KRAFFT, R. LEGG, L. MERMINGA, P. PIOT, J. PREBLE, B. YUNN, TJNAF - An electron injector capable of delivering the high brightness electron beam necessary for an infrared free electron laser (FEL) is described. The injector is composed of a high-DC-voltage GaAs photocathode coupled with a normal conducting rf buncher and a superconducting rf linac operating at 1.497 Ghz. The gun pulse structure is mode locked to the fortieth sub-harmonic of the rf fundamental using an Nd:YLF drive laser. The gun is to provide 50 picosecond FWHM bunches at 60 pC/bunch with a normalized, RMS, transverse emittance less than 6 Pi-mm-mradian at 9 MeV/c and an average current of 1.1 milliamps. Experimental measurements of the momentum spread and transverse beam properties of the injector are described for a variety of bunching conditions in the regime where space charge is dominant. These results are compared with PARMELA. Operational issues for the injector are described.

* Supported by DOE under contract #DE-AC05-84-ER40150 and by the Office of Naval Research, The Commonwealth of Virginia and the Laser Processing Consortium.