BEAM DYNAMICS OF A LASER-DRIVEN RF ELECTRON GUN

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The beam dynamics of a short-pulse, high-gradient rf electron gun have been examined during the design of such a gun for the Accelerator Test Facility at BNL. Two principles emerge: apply the largest possible field at the photocathode; and operate the multicell rf structure in π-mode with a cell length of one-half rf wavelength. An apparently unavoidable feature of a high-gradient gun is a strong correlation in the x-x' emittance ellipse at the exit of the gun. These notions will be illustrated for the BNL electron gun, which incorporates a laser-driven photocathode in the wall of a 1-$\frac{1}{2}$ cell rf cavity operated at 2856 MHz with a peak field of 100 MV/m. Pulses of 4.5-MeV energy, 5-ps width and 1-nC charge will be produced with very little emittance growth due to the effects of space-charge and nonlinear rf fields. The full text of this paper has recently been published elsewhere.[1]

[1] K.T. McDonald, *Design of the Laser-Driven RF Electron Gun for the BNL Accelerator Test Facility*, IEEE Trans. Electron Devices **35**, 2052 (1988).