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Computer optimization can explore a larger parameter space than practical with manual design, particularly for complex 3D geometries. This allows rapid, economical development of higher performance devices. The proliferation of parametric solid modeling programs allows optimization of both geometric and operating parameters. This presentation will describe computer optimization in the 3D trajectory code Beam Optics Analysis (BOA). In particular, using (BOA) software, we design and model a sheet-beam electron gun, which has the advantage of lower operating voltage, improved efficiency, and greater bandwidth. The physical parameters of the electron gun are then optimized for several different physical goals using parametric modeling software and various optimization algorithms. Results are presented along with a detailed treatment of the optimization methodology. (Received September 18, 2007)