Parametric Studies of Free Electron Laser Nonlinear Ponderomotive Trapping Buckets

J. Fajans
Department of Physics
University of California, Berkeley
Berkeley, California 94720

R. Chu and J.S. Wurtele
Dept. of Physics and Plasma Fusion Center
Massachusetts Institute of Technology
Cambridge, MA 02139

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Abstract
Experimental and computational studies of free electron lasers operating at high input powers have been undertaken. These studies constitute a novel method of investigating saturation and trapping effects in free electron lasers.

A crucial issue in the practical application of free electron lasers (FELs) is the maximization of output efficiency. Since high efficiency operation inevitably occurs in the nonlinear regime, understanding FEL nonlinear behavior is very important. However, although FEL linear behavior is now well explored and understood, there have been relatively few experimental studies of FEL nonlinear behavior. Most saturated FEL experiments have run as oscillators[1, 2, 3, 4, 5], where, because of the lack of precise control