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J. Nathan Kutz* (kutz@amath.washington.edu), Department of Applied Mathematics, University of Washington, Box 352420, Seattle, WA 98195-2420, and **Bjorn Sandstede** (b.sandstede@surrey.ac.uk), Department of Mathematics, University of Surrey, Guildford, GU2 7XH, England. *Dynamics and bifurcation structure of harmonic mode-locking.*

A comprehensive theoretical treatment is given of the phenomenon of harmonic mode-locking in a laser cavity mode-locked by the nonlinear mode-coupling behavior in a waveguide array. The theoretical model completely characterizes oscillatory instabilities and the transition from M to $M + 1$ pulses as a function of increased gain. (Received December 20, 2007)