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Edward D. Farnum* (efarnum@kean.edu), Kean University, 1000 Morris Ave, CSTME, T-117 F, Union, NJ 07083, and **J. Nathan Kutz**. *Linear Stability of Multi-frequency Mode-locked Lasers*.

A theoretical model is constructed which describes the operation of a pulsed mode-locked laser operating simultaneously at N frequency channels. The model, which is a combination of standard wavelength division multiplexed interactions in the canonical master mode-locking model is subject to both self- and cross-saturating gain effects. The combination of self- and cross-gain saturation allows for mode-locking at N frequencies simultaneously, which can be of significantly different energies and pulsewidths. Furthermore, the stability of such mode-locked pulse solutions depends critically on the balance of self- and cross-channel saturation in the gain model. A linear stability analysis is presented which gives a framework for understanding the operation and stability of the increasingly important and timely technology of multi-frequency mode-locked laser cavities. (Received July 31, 2007)