1060-78-199   **Edward D. Farnum*** (`efarnum@kean.edu`), Kean University, NJCSTM, Room T-117F, Union, NJ 07083, and **J. Nathan Kutz**. *A Master Mode-locking Equation for Ultra-short Laser Pulses.*

We propose a new model for pulse formation and propagation in a mode-locked laser cavity, which is valid in the few-femtosecond regime. The standard model for a mode-locked laser is based on a dissipative perturbation to the Nonlinear Schrodinger Equation, to allow nonlinear gain and loss terms. However, the slow envelope approximation of the NLS breaks down for very short time scales, making an NLS-based model suspect. Instead, we perturb the Short Pulse Equation, with dissipative gain and loss terms. This model is valid beyond breakdown of NLS-based models, and successfully produces stable ultra-short pulses from initial white-noise. This provides an initial theoretical framework for quantifying dynamics and stability as pulses approach the attosecond regime. (Received March 30, 2010)

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