

On the Lugiato-Lefever Model for Frequency Combs in a Dual-Pumped Ring Resonator

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Abstract

Kerr frequency combs are described as solutions of the Lugiato-Lefever equation (LLE)

$$ia_t = -da_{xx} + (\zeta - i)a - |a|^2a + if(x, t), \quad a \text{ } 2\pi\text{-periodic in } x.$$

The LLE is a nonlinear Schrödinger equation with added terms $-ia$ corresponding to damping and $if(x, t)$ corresponding to forcing. From an experimental point of view it is quite attractive to study the generation of Kerr frequency combs by pumping two modes ($k_0 = 0, k_1 \in \mathbb{Z} \setminus \{0\}$) which corresponds to a forcing term $f(x, t) = f_0 + f_1 e^{i(k_1 x - \nu_1 t)}$. We will discuss existence results as well as optimality questions with respect to the design of the pump/microresonator.