Rate equation description of quantum noise in nanolasers with few emitters - DTU Orbit (03/01/2019)

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Rate equations for micro- and nanocavity lasers are formulated which take account of the finite number of emitters, Purcell effects as well as stochastic effects of spontaneous emission quantum noise. Analytical results are derived for the intensity noise and intensity correlation properties, g(2), using a Langevin approach and are compared with simulations using a stochastic approach avoiding the mean-field approximation of the rate equations. Good agreement between the two approaches is found even for large values of the spontaneous emission beta-factor, i.e., for threshold-less lasers, as long as more than about ten emitters contribute to lasing. A large value of the beta-factor improves the noise properties.

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