

Abstract Submitted
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Behavior of laser diodes in the small particle number quantum limit. KAUSHIK ROY CHOUDHURY, ANTHONY F.J. LEVI — We use master equations to model the steady-state and transient response of a laser diode in the small particle number quantum limit. In scaled laser diodes n electrons and s photons are correlated such that $\langle ns \rangle$ may not be factorized and there are significant differences in behavior compared to predictions of continuum mean-field theory. Quantization of photon number is found to suppress lasing threshold and create a non-Poisson probability distribution for n discrete electrons and s discrete photons. The same correlation effect damps the transient dynamic response of laser emission. The predictions of conventional mean-field and Langevin theory are recovered in the large particle number limit.

Kaushik Roy Choudhury

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