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**Spectrum of Emission and Photocount Statistics of Laser
with Overlapping Modes**

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Abstract:

Due to its richness, the emission properties of random lasers is still a subject of interest both theoretically and experimentally. From a theoretical perspective we still lack a satisfactory quantum theory of laser which is able to incorporate entirely the varied phenomenology exhibit by random lasers. In this contribution I present a quantum theory for lasers with overlapping modes which allows for a statistical description of random lasers. The grounding point of the theory is the quantum description of light in optical cavities with low quality factors, i.e. cavities with large losses. The emphasis of our work is on the description of the spectrum of emission in the nonlinear regime above the laser threshold, for lasers working in a single mode, as well as the calculation of the photocount statistics of random lasers.