Bar Ilan University , Optics Seminar

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Field-driven super/subradiant lasing without imposed atomic cooperativity

Abstract:

The first model of stationary superradiance, the superradiant laser, was suggested by Haake et al. [1]. Since then, several theoretical papers discussing this scheme, as well as some other models, have been published [2]. The key mechanism responsible for stationary superradiance in such lasers is the collective nonlinear spontaneous decay of one of the atomic states that is imposed by an additional, ”passive” resonator. As we have shown recently [3], the super/subradiant lasing can be obtained by replacing the passive resonator by a second coherent pumping laser field, so that no initial atomic cooperativity is required. In this talk the results of semiclassical treatment of a three-level ladder model of super/subradiant laser will be discussed in details.

[1] F. Haake, M. I. Kolobov, C. Fabre, E. Giacobino, and S. Reynaud, Phys. Rev. Lett. 71, 995 (1993).
[2] F. Haake et al, Phys. Rev. A 54, 1625 (1996); I. E. Mazets and G. Kurizki, J. Phys. B 40, F105 (2007); C. Wiele et al, ibid, 60, 4986 (1999); D. Yu and J. Chen, ibid, 81, 053809 (2010).
[3] G.A. Koganov and R. Shuker, Opt. Lett. 36, 2779 (2011).