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Random and modulated noise spectroscopy in a Lambda system¹

PENGXIONG LI, LEI FENG, Fudan University, LIANG JIANG, California Institute of Technology, YANHONG XIAO, Fudan University — Lasers have inherent phase noise, which can be converted to amplitude noise after atom-light interaction. Previously, such PM-AM conversion has been extensively studied in a two-level system. The three-level Lambda system has attracted much attention in recent years due to its relevance to quantum memory, magnetometers and atomic clocks. We investigate PM-AM in this system with both random phase noise and modulated phase “noise”. Atomic dynamics from both ground and excited states can be revealed from the output intensity noise spectrum. Responses of the system to noise show resonance behavior distinct from a two-level system. For the modulated noise case, adiabatic and nonadiabatic regimes were identified. In particular, using the intensity cross-correlation of the two optical fields as an observable leads to subnatural spectrum for the transition between the two ground states. We will present experimental and theoretical results.

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