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Nonlinear quantum optics assisted by atomic motion[1] WANXIA CAO, XINGDA LU, YANHONG XIAO, Fudan University, HENG SHEN, University of Oxford — We present an atomic system where quantum nonlinear optics can be realized using linear atom-light interactions, but with effective feedback provided by moving atoms. Two spatially-separated optical fields (channels) can display quantum correlations with each other, with each channel undergoing the normal Electromagnetically Induced Transparency. We present a theoretical model to describe such a system. Atomic dynamics in three different regions of a vapor cell are considered, two within each laser beams and one outside the laser beams, and the coupling between regions, including the Langevin noises, are taken into account. We achieved excellent agreement between the experiment and the theory. Our system demonstrates the possibility of low power nonlinear quantum optics without the need of traditional nonlinear atom-light interaction configuration.

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