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Dynamical Evolution of Interacting Photon Pulses in Rydberg Medium BING HE, LIU YANG, University of Arkansas, JIN-HUI WU, Jilin University, ZHAOYANG ZHANG, MIN XIAO, University of Arkansas — We present a study to simulate the absorption and propagation of single photon pulses under their mutual effective interaction in Rydberg atomic ensemble.The study is based on the complete dynamics of the involved quantum fields in Rydberg medium of electromagnetically induced transparency, and considers the tunable control fields to stop and regenerate photon pulses. We find that photons of opposite-sign detunings can have distinct dynamical behaviors when they approach each other. The space-time dependent dissipation of photons under mutual interaction and the passages toward the stopped photons with different control fields are also illustrated in terms of the evolutions of their quantum field profiles. These processes can be applied to implementing various quantum devices such as photon switchers and photon-photon gates.

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