The efficiency of a nonlinear optical process is equal to the product of the transition rate and interaction time. If the interaction time can be maximized, it is possible to achieve high efficiency even at the single-photon level. Based on the techniques of light storage and stationary light pulse, our study reports the first experimental demonstration of enhanced nonlinear efficiency caused by two motionless light pulses [1]. To demonstrate the enhancement of optical nonlinear efficiency, we used the process of one optical pulse switched by another. This study shows that motionless light pulses can activate switching at 0.56 photons per atomic absorption cross section. The great potential of this scheme is that the switching efficiency is not limited to the present result, but can be further improved by increasing the optical density of the medium. This study advances the technology of low-light-level nonlinear optics and quantum information manipulation utilizing photons.
References: