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Snapping single flying photons based on tunneling assisted multi-photon absorption[1] ZHENGYONG LI, Beijing Jiaotong University, CLEMENS MATTHIESEN, University of Cambridge, CHONGQING WU, Beijing Jiaotong University, METE ATATURE, University of Cambridge, INSTITUTE OF OPTICAL INFORMATION TEAM, QUANTUM INFORMATION AND NANOSCALE METROLOGY GROUP TEAM — Multi-photon absorption (MPA) can be used to measure the temporal correlation of flying photons at a much shorter timescale within a maximum delay (about 1 fs) given by the Heisenberg principle. We first measure the 2PA and 3PA of GaAsP material by using a mode locked laser (Mira 900) with pulse width less than 100 fs (76 MHz), and obtain pronounced 2PA and 3PA at 60 mW and 130 mW respectively (wavelength: 900 nm). We further strengthen the absorption process by using an extra electrical field through photon assisted tunneling, and double the MPA coefficient by a bias voltage of 5 V. Then, we demonstrate the tunneling assisted MPA in GaAsP by a pump-probe scheme, and successfully snap flying single photons in 1550-nm telecom band by using a synchronous 900-nm fs sampling pulse train, which scanning the flying photons through a motorizing translation stage. Experimental results show that the time-domain width of the single photon is around 250 fs, and further statistical investigations demonstrate that the single photons follow subPoisson distribution with Mandel Q parameter of about -0.2, which means the photons are antibunching definitely.

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