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Low-light-level Ladder-type Electromagnetically Induced Transparency and Two-photon Absorption ZONG-SYUN HE, CHIN-CHUN TSAI, HONG-REN CHEN, WEI-FU CHEN, JING-YUAN SU, MENG-HUANG SIE, JYUN-YA YE, NCKU — In this study, we discuss the ladder-type electromagnetically induced transparency (EIT) and two-photon absorption (TPA) under a low-light-level probe regime (0.2 μW/cm^2 (0.06Γ_2)) and a weakcoupling power. The specific reduction of the fluorescence due to TPA in a room-temperature three-level system via EIT interference is first clearly observed, while the probe Rabi frequency is weakened to about 0.3 MHz to avoid the affect of the vicinity hyperfine state. The EIT transparency rate derived from the loss of fluorescence is about 25%. This result proves that the low transparency rate is inevitable when EIT is applied in the thermal vapor. Additionally, the linewidth below $\Gamma(= \Gamma_2 + \Gamma_3)$ is obtained, while the coupling Rabi frequency is as large as 1.7 Γ (=12.6 MHz). According to the tendency of the experimental and simulation results, the subnatural linewidth is still achievable as $\Omega_c$is 2.5 Γ (=18.5 MHz). The simulation results by solving the optical Bloch equations in the steady state are in good agreement with both EIT and TPA.

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