Quantum Physics

Ultra-bright biphoton emission from an atomic vapor based on Doppler-free four-wave-mixing and collective emission

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We propose a novel `butterfly' level scheme to generate highly correlated photon pairs from atomic vapors. With multi-photon Doppler-free pumping, background Rayleigh scattering is dipole-forbidden and collective emission is permitted in all directions. This results in usable pairs generated simultaneously in the full 4π solid angle. Collecting these pairs can produce photon pairs at a rate of $\sim 10^{12}$ per second, given only moderate ensemble sizes of $\sim 10^6$ atoms.

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