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Entangled Photon Pairs via Two-Photon Transitions in a Quantum Dot Molecule CAMERON JENNINGS, ANDREW JACOBS, MICHAEL SCHEIBNER, Univ of California - Merced — We theoretically investigate the use of tunnel-coupled quantum dots as a source of entangled photon pairs. By preparing the system in a molecular biexciton state [a], with the charges of one exciton in separate dots, the anisotropic electron-hole exchange splitting is greatly reduced for the first transition in the resulting radiative biexciton cascade. While the splitting returns for the second (intradot) transition, polarization-entangled photon pairs can still be recovered [b]. The fidelity of such a process depends crucially on the excitation conditions; we consider various scenarios, from non-resonant incoherent to coherent two-photon excitation of the biexciton state. We simulate two-photon processes in this system and determine optimal parameters for entangled photon generation experimentally accessible by electrical control of the energy level structure in quantum dot molecules. [a] Scheibner et al., Phys. Rev. Lett. 99, 197402 (2007) [b] Scheibner et al., J. Opt. Soc. Am. B 29, A82 (2012)

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