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Computer simulations of photochemistry controlled with sub-wavelength resolution[1] TRIET NGUYEN, ALEX SMALL, California State Polytechnic University, Pomona — A technique called Stimulated Emission Depletion (STED) has recently been developed to beat the diffraction limit in imaging. We propose to adapt this technique to control chemical reactions with nanoscale resolution. We simulated a process in which a series of laser pulses is applied at each site on a surface. The first pulse excites the molecules and the second pulse (with a TEM10 "doughnut" profile) then causes the excited molecules away from the node at the center to undergo stimulated emission and return to the ground state. The result is that the molecules at the center of the pulses (in a region of size <<lambda) remain in the excited state and can undergo chemical reactions. In this presentation, we will show results of computer simulations of this technique. We will show that even if the reaction rate constants are small, the application of several sequential pulses leads to a fractionation effect that compensates for low reaction rates. We will also show how the resolution of this technique depends on the intensities of the laser pulses used, and propose a few candidate molecules for experimental tests of this concept.

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