FEMTOSECOND QUANTUM CONTROL

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Obtaining active control over the dynamics of quantum mechanical systems is a fascinating perspective in modern physics. With femtosecond laser technologies a promising tool for this purpose is found.[a] The intrinsically broad spectral width $\mathrm{I}(\omega)$ and the corresponding phase function $\Phi(\omega)$ of femtosecond laser pulses can be specifically manipulated to drive atomic as well as molecular systems coherently into the desired reaction pathways. Employing a learning algorithm in combination with a programmable pulse shaper the femtosecond laser pulses are optimally shaped on the basis of direct feedback from the experiment. Automated optimization of branching ratios of photodissociation reactions of complex molecules is achieved by using adaptive femtosecond pulse shaping.[b] The method finds optimal solutions without prior knowledge of the molecular system and the experimental environment. It can be applied to the liquid phase as well.

[a] T. Baumert et al, Appl. Phys. B 65, 779 (1997)
[b] M. Bergt et al, Science 282, 919 (1998)