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Deep UV Strategy for Discriminating Biomolecules

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Abstract Label-free selective discrimination of spectrally similar biomolecules, such as peptides and proteins using Optimal Control strategies is a challenge in a variety of practical applications such as label-free fluorescence imaging and protein identification. The principle of Optimal Control is based on the fact that a suitably shaped laser field can differently drive the dynamics of almost identical quantum systems [1, 2].

Most of the biomolecules (including DNA) have absorption bands in the deep UV, a spectral region that is hardly accessible by transmissive devices. MEMS pulse-shapers using Reflective -Electro-Mechanical Systems (MEMS) have proven their broadband applicability for femtosecond pulse shaping [3, 4], even in deep UV and are capable of re-compressing spectrally broadened UV pulses with a closed-loop approach based on a genetic algorithm.

Recent experiments demonstrate that discriminating between nearly identical flavin molecules is possible using a reflective pulse shaping technique. We demonstrate that discrimination is possible between amino-acids, so the Optimal Control of complex systems such as proteins is envisioned as an all-optical method for identification of biomolecules.

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B. Di Bartolo et al. (eds.), *Nano-Optics for Enhancing Light-Matter Interactions on a Molecular Scale*, NATO Science for Peace and Security Series B: Physics and Biophysics, DOI 10.1007/978-94-007-5313-6_28,

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