***Laser Pulse Shaping and Coherent Control of Molecules**, Brijuni, Croatia, August 26th - 31st, 2007.*

Control of nonlinear laser-molecule interactions with shaped femtosecond pulses

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The Dantus Research Group has been working on a number of projects for which pulse shaping can be used to control nonlinear laser-molecule interactions. The presentation will cover four current areas of interest. First, open-loop experiments on strong-field control of chemical reactions have revealed some surprising observations. The most striking is that fragmentation patterns vary monotonically with pulse duration, and once this variation has been quantified one can predict the fragmentation pattern that will result for *any shaped laser pulse*. This conclusion has been tested successfully against results on thirteen different molecules [1].

Second, our group has been working on shaping sub-5 femtosecond pulses [2] and using them to characterize nonlinear optical materials. Measurement of two-photon excitation spectroscopy and group velocity dispersion [3] of different materials will illustrate these efforts.

Third, our group has adapted the single beam CARS approach demonstrated for microscopy, for the remote detection of compounds [4]. Results at distances of the order of 10 m will be shown. Fourth, we have been using shaped sub-10 fs pulses for improving biomedical imaging [5]. Our latest results will illustrate this application.

References:

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[3] Y. Coello, B. Xu, T.L. Miller, V.V. Lozovoy, M. Dantus, "Group-velocity and third-order dispersion measurements of ocular components and seawater", Applied Optics *in preparation* (2007).

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