CFEL SCIENCE

SEMINAR

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CFEL – Building 99, seminar room I+II

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Collisional dissipation and echoes in aligned CO_2 gas. Quantum and classical modeling versus experiments.

Two completely different theoretical approaches will be presented that enable to predict the alignment of linear gas molecules by short and intense laser pulses and the subsequent dissipation due to intermolecular collisions. The first, very simple, is based on requantized Classical Molecular Dynamics Simulations in which interactions between molecules are taken into account through and input intermolecular potential. The second, quantum mechanical, uses the density matrix formalism and state-to-state collisional rates constructed using the Energy Corrected Sudden approximations.
Comparisons between the predictions of these two models with experiments will be first made for CO_2 gas at low and elevated pressures. These show that both models lead to good agreement with experiments and correctly describe the dissipations of both the permanent and transient components of the alignment over large time intervals after the alignment pulse. In a second step, the phenomenon of echoes, which appear after the system has been kicked by two pulses will be discussed at pressures for which collisional effects are negligible. Again, the proposed models lead to very satisfactory agreement with measurements and do describe the complex time- and polarization-dependent features observed after the two pulses.
Finally, the possible use and extensions of these results for future studies will be discussed.

Host: Terry Mullins / CFEL Molecular Physics Seminar