CFEL SCIENCE

SEMINAR

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DESY building 49 - seminar room (108)

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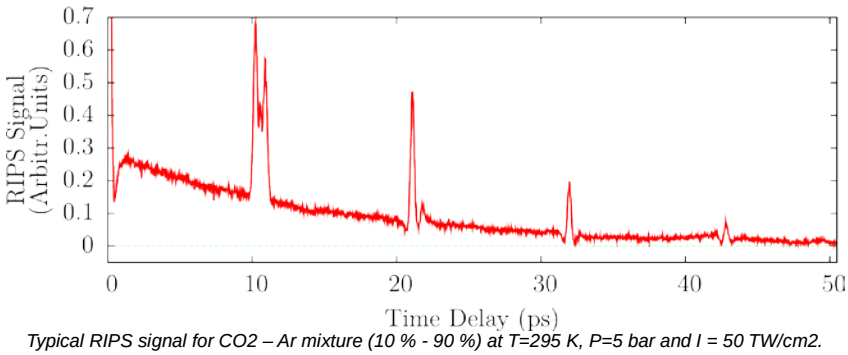
Dynamics induced by femtosecond laser pulses: molecular alignment of CO_2 mixture & High Order Kerr effect



Typical RIPS signal for CO2 – Ar mixture (10 % - 90 %) at T=295 K, P=5 bar and I = 50 TW/cm2.

This talk is devoted to the study of two dynamics induced by intense femtoseconds laser pulses. The first studied dynamics deals with molecular alignment of CO_2-X mixtures (X=CO_2, Ar, N2), in dense gases (up to 20 bar). Up to now, this regime has never been studied experimentally. In the field-free regime (after laser/matter interaction), molecular alignment exhibits two components: a permanent alignment and a transient one. The influence of collisions appears through population transfers between rotational states [1], which leads to a decrease of these two contributions. Permanent alignment relaxation time is only tied to inelastics collisions whereas transient alignment relaxation time is tied to both inelastics and elastics ones. I will show that the determination of elastic collisions contribution (difficult to access experimentally), is then possible thanks to the analysis of molecular alignment measurements.

The second studied dynamics is the intensity dependence of the electronic Kerr effect. In a recent work [2], led by Loriot et al., it is shown that electronic Kerr index (HOKE) saturated, before nullifying and then presenting a negative contribution when the intensity increases (inversion of the sign for some tens of terawatts by square centimeter). This observation displays noteworthy implications in different topics including laser filamentation. I will present results, completing the initial ones, performed in air at 400 nm (800 nm in the original study).

[1] S. Ramakrishna and T. Seideman, PRL, 95, 113001 (2005)
[2] V. Loriot et al., Opt. Expr., 17, 13429 (2009)

Host: Jochen Küpper - Coherent Imaging Division - Controlled Molecule Imaging