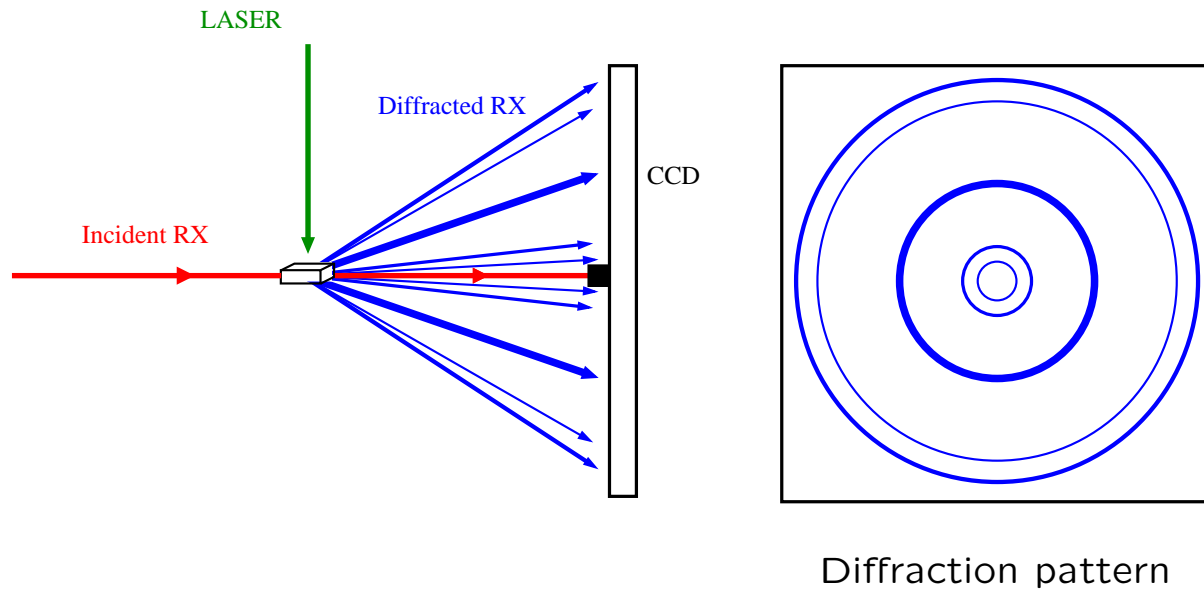


TEAM

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S. Bratos, F. Mirloup, R. Vuilleumier

TIME-RESOLVED X-RAY DIFFRACTION



Zernicke-Prins

$$\frac{1}{2\pi^2 r} \int_0^{+\infty} dq q i(q) \sin(qr) = \rho_0 (g(r) - 1)$$

where

$$i(q) = \frac{S(q)/N - f^2(q)}{f^2(q)}$$

TIME RESOLVED X-RAY SIGNAL: GENERAL EXPRESSION

$$\begin{aligned}\Delta S(\mathbf{q}, \tau) &= S(\mathbf{q}, \tau) - S_0(\mathbf{q}) \\ &= \int_{-\infty}^{+\infty} I_X(t - \tau) \Delta S_{inst}(\mathbf{q}, \tau) dt\end{aligned}$$

$$\begin{aligned}\Delta S_{inst}(\mathbf{q}, \tau) &= - \left(\frac{e^2}{mc^2 \hbar^2} \right)^2 P \\ &\times \int_0^{+\infty} \int_0^{+\infty} d\tau_1 d\tau_2 \left\langle E_i(\vec{r}, \tau - \tau_1) E_i(\vec{r}, \tau - \tau_1 - \tau_2) \right\rangle_O \\ &\times \left\langle \left[[f(\mathbf{q}, \tau_1 + \tau_2) f^*(\mathbf{q}, \tau_1 + \tau_2), M_i(\tau_2)], M_j(0) \right] \right\rangle_s\end{aligned}$$

S. Bratos, F. Mirloup, R. Vuilleumier and M. Wulff,
J. Chem. Phys. 116, 10615, 2002

TIME RESOLVED X-RAY SIGNAL: SLOW PROCESSES

$$\Delta S(\mathbf{q}, \tau) = \left(\frac{e^2}{mc^2 \hbar^2} \right)^2 P \left(\sum_j n_j(\tau) \left(\sum_{\mu\nu} \langle e^{-i\mathbf{q}\mathbf{r}_{\mu\nu}(\tau)} \rangle_S - \langle e^{-i\mathbf{q}\mathbf{r}_{\mu\nu}(0)} \rangle_0 \right) \right)$$

$$\frac{1}{2\pi^2 r} \int_0^{+\infty} dq M(q) q \Delta S(q, \tau) \sin(qr) = \left(\frac{e^2}{mc^2 \hbar^2} \right)^2 P \times \left(\sum_{\mu \neq \nu} \left(\frac{1}{V(\tau)} g_{\mu\nu}(r, \tau) - \frac{1}{V(0)} g_{\mu\nu}(r, 0) \right) - \left(\frac{1}{V(\tau)} - \frac{1}{V(0)} \right) \right)$$

RECOMBINATION OF PHOTOEXCITED IODINE ATOMS

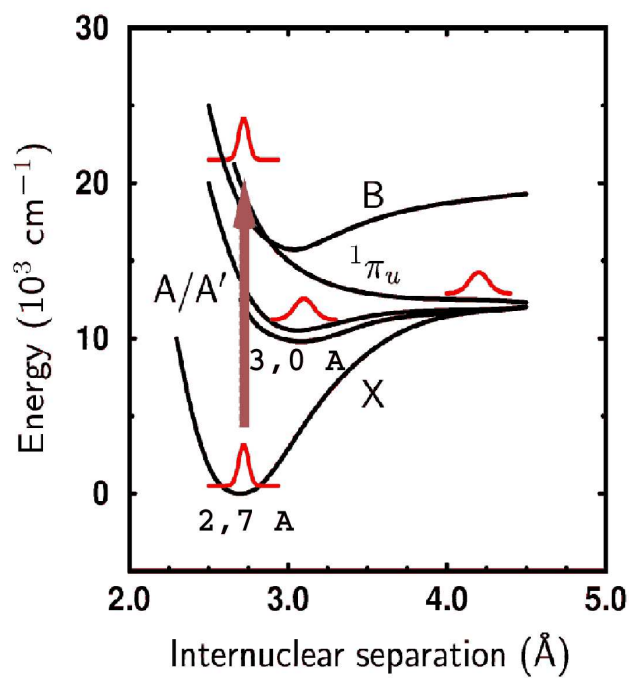
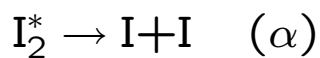
Solvents :

I_2/CCl_4

Characteristic times :

τ_X, τ_o, τ_R and $\tau_I = 1/\omega$

Reaction :



R. Neutze, R. Wouts, S. Techert, J. Davidson, M. Koczis, A. Kirrander, F. Schotte, and M. Wulff, Phys. Rev. Lett. 87, 195508, 2001

"FILMING" ATOMIC MOTIONS

