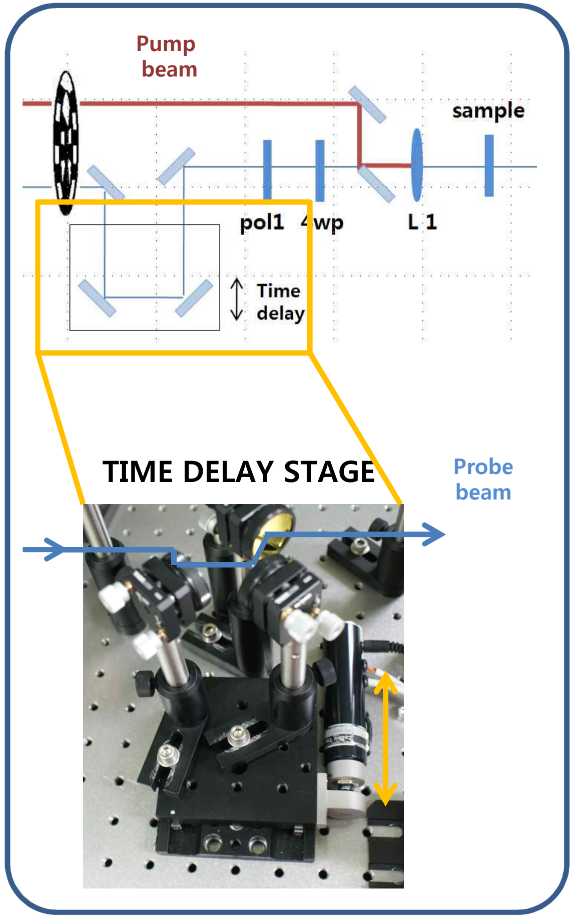
How to process CS_2 Kerr signal for finding the zero on the Kerr signal of ionic liquids

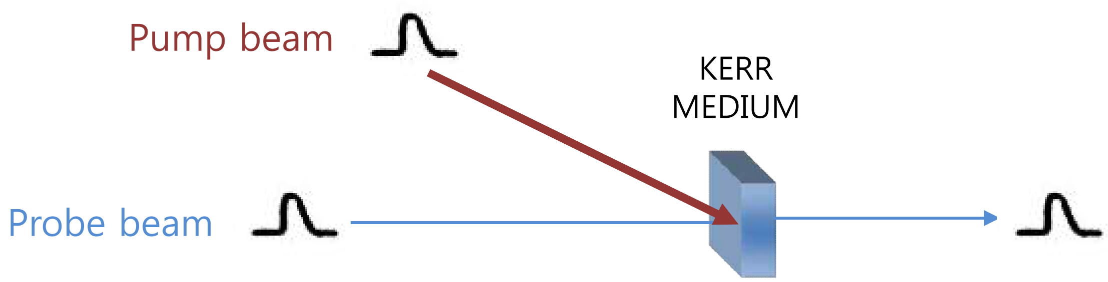
and

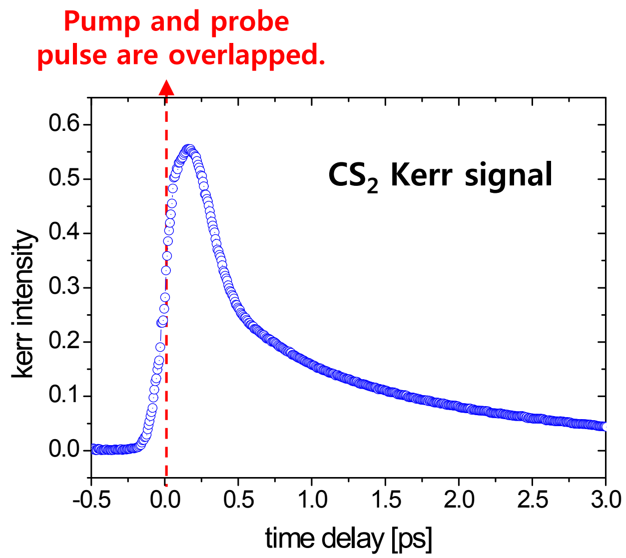
How to do the tail-matching of Kerr signal.

Heesun Jun, 2011.8.13

General Optical Kerr Effect

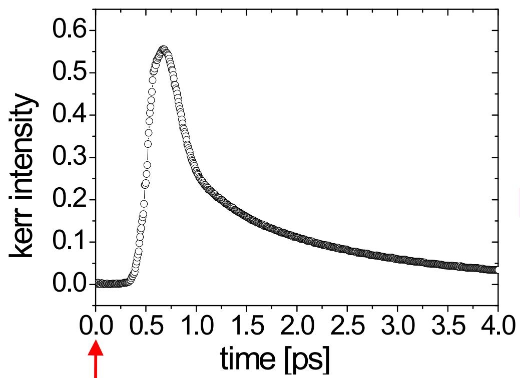






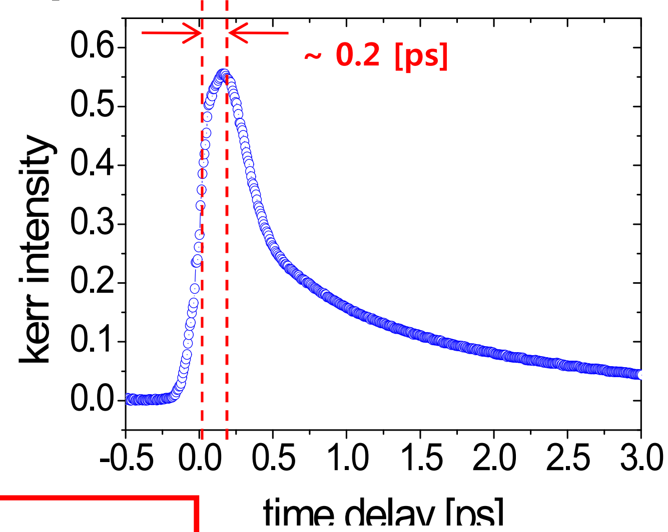
I. How to determine exact t=0 and its importance.

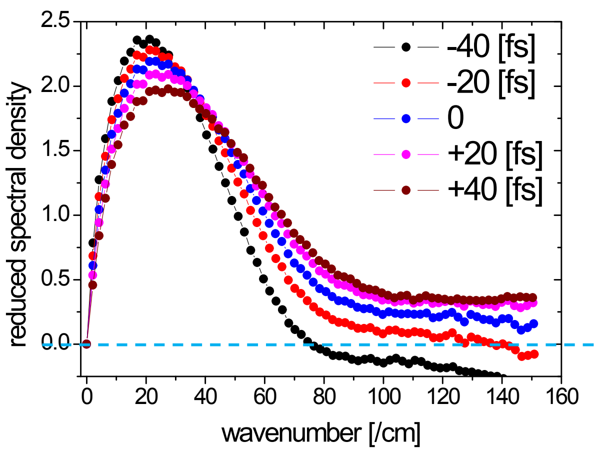
Raw data



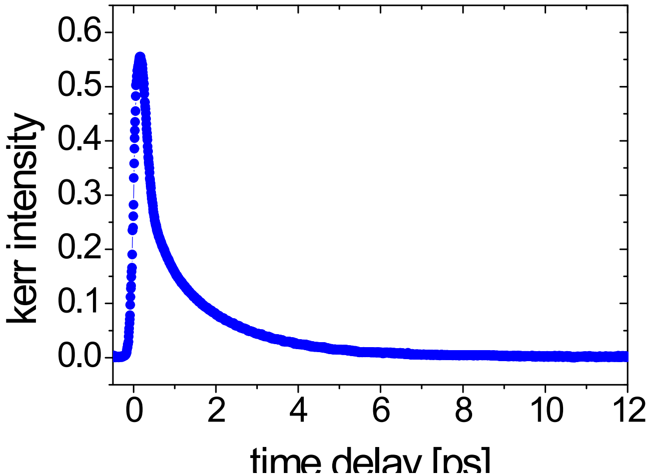
Start to measure!!!

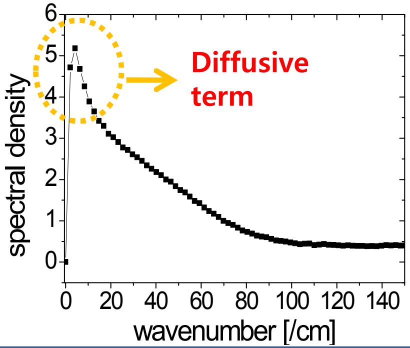
Data are shifted to the left



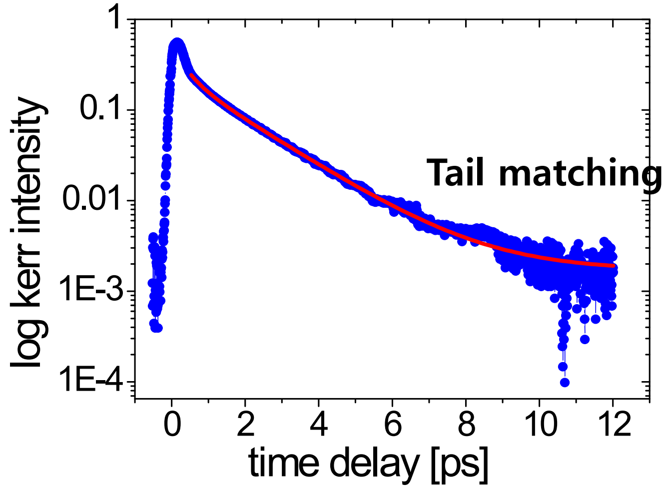


II. The tail-matching.





subtract diffusive term



Empirical response function

$$r(t) = A_1 \exp(-\frac{t}{\tau_1}) + A_2 \exp(-\frac{t}{\tau_2})$$

A_1	τ_1[ps]	A_1	τ_2[ps]
0.25	1.68	0.24	0.36

III. The Fourier Transform.

$$T(\tau)=\int_{-\infty}^{\infty} G_0^{(2)}(\tau-t)R(t)dt = G_0^{(2)}(\tau)*R(\tau) \text{.......(1)}$$

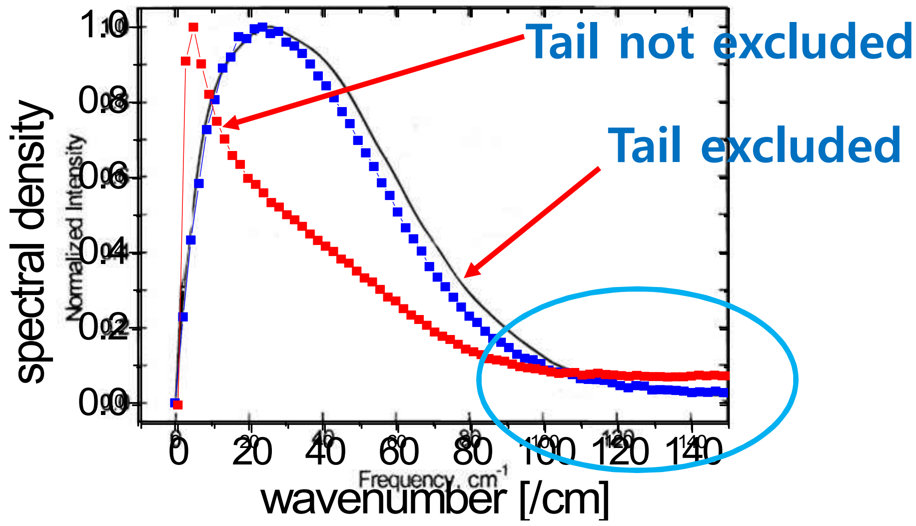
$$G_0^{(2)}(\tau)=\int_{-\infty}^{\infty} I_{pump}(t')I_{probe}(\tau-t')dt' \text{..................(2)}$$

: laser pulse intensity autocorrelation function

$$R(\tau)=\sigma(\tau)+\sum_i r_i(\tau) \text{.......................................(3)}$$

: $\sigma(\tau)$: insttantaneous electronic response

$\sum_i r_i(\tau)$: time domain nuclear response function



$$D(\omega)=\frac{\Im[T(\tau)]}{\Im[G_0^{(2)}(\tau)]}=\frac{\Im[G_0^{(2)}(\tau)]\Im[R(\tau)]}{\Im[G_0^{(2)}(\tau)]} \text{............(4)}$$

$$\equiv \Im[R(\tau)]$$

$$D(\omega)=\frac{\Im[T(\tau)]}{\Im[G_0^{(2)}(\tau)]}=\frac{\operatorname{Im}\Im T(\tau)+\operatorname{Re}\Im T(\tau)}{A\int_{-\infty}^{\infty} e^{-\frac{(\tau-t_0)^2}{2a^2}} e^{i\omega\tau} d\tau}=\frac{\operatorname{Im}\Im T(\tau)+\operatorname{Re}\Im T(\tau)}{A'\left[\cos(2t_0a^2\omega)-i\sin(2t_0a^2\omega)\right]} \text{...(5)}$$