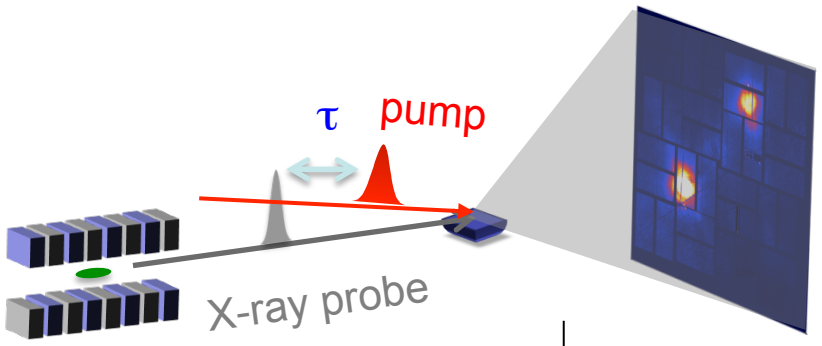
Fourier-Transform IXS (e.g. phonons)

Stanford PULSE Institute

$$S(\Delta\vec{K},\omega) \propto \sum_{\lambda} \int \mathrm{d}t e^{i\omega t} \langle u^{\dagger}_{\lambda,-\Delta\vec{K}}(0) u_{\lambda,\Delta\vec{K}}(t) \rangle$$

$$S(\Delta\vec{K};\tau) \propto \sum_{\lambda,\lambda'} \langle u^{\dagger}_{\lambda',-\Delta\vec{K}}(\tau) u_{\lambda,\Delta\vec{K}}(\tau) \rangle$$



$$S(\Delta\vec{K},t) \propto \sum_{\lambda,\lambda'} \langle u^{\dagger}_{\lambda',-\Delta\vec{K}}(0) u_{\lambda,\Delta\vec{K}}(t)$$

+e-ph, +resonance, +nonequilibrium, +…

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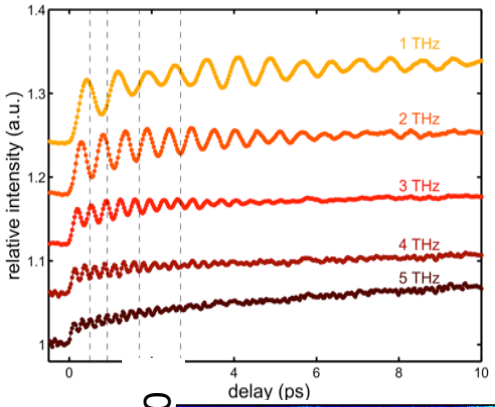
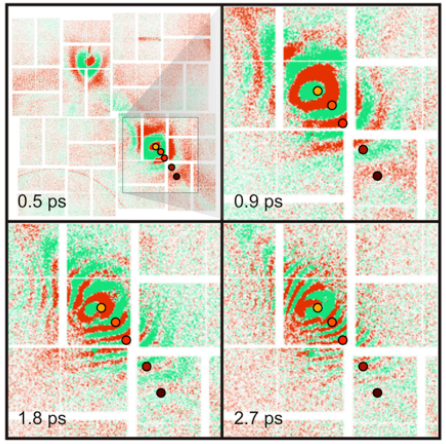
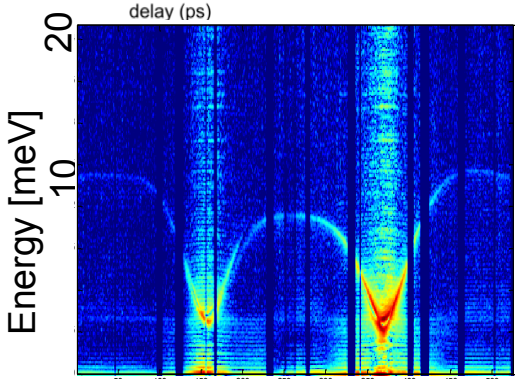
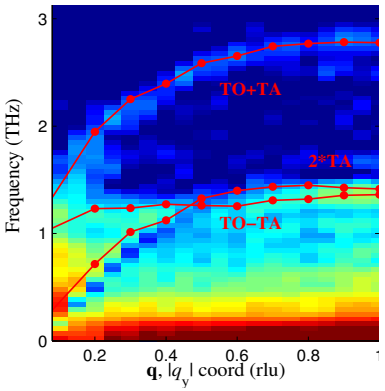
Trigo et al. Nature Physics. 2013
Zhu et al., Phys. Rev. B, 2015
Henighan et al., PRB in press
Jiang et al., Nat. Comm. In press

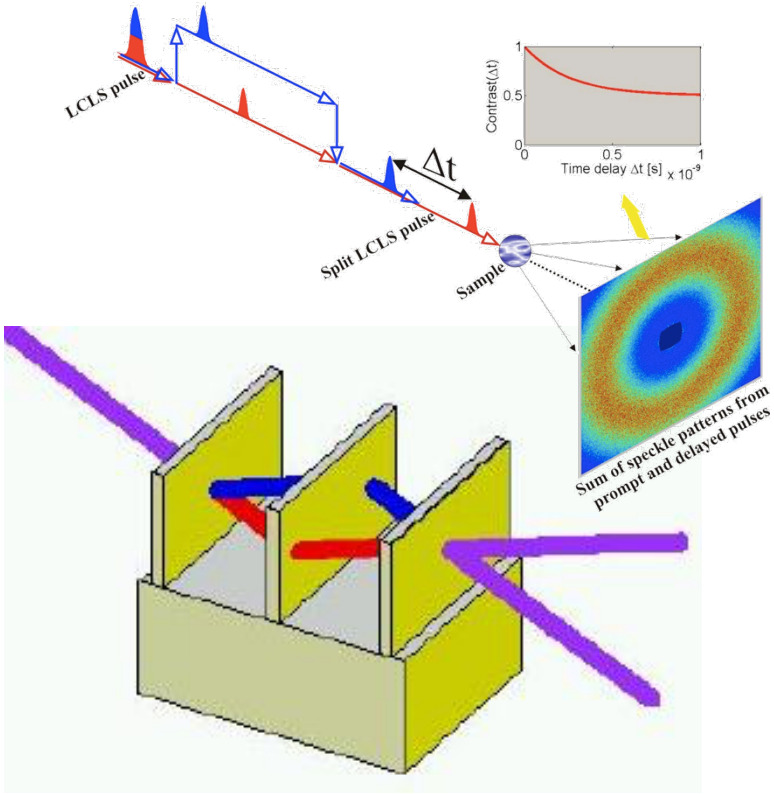




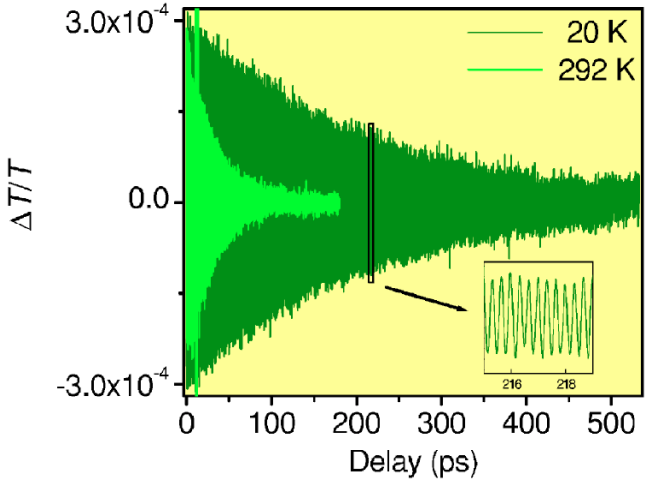




Fourier-Transform IXS (e.g. phonons)

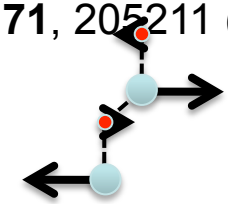


Time=domain-> resolution with broad BW



C. Aku-Leh, et al. PRB **71**, 205211 (2005)

f=(2.9787 ± 0.0002) THz
1/Γ= (211 ± 7) ps @ 5K



+ interferometric stability -> field instead of intensity autocorrelation, +electronic

+ q correlations-> anharmonicity…

+pump pulse -> nonequ. dynamics.

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