



	<b>Experiment title:</b> Picosecond time-resolved x-ray scattering probed isomerisation reaction in the liquid phase	<b>Experiment number:</b> SC 811
<b>Beamline:</b>	<b>Date of experiment:</b> from: 11/07/01 to: 23/07/01	<b>Date of report:</b> 31/08/04
<b>Shifts:</b> 15	<b>Local contact(s):</b> A. Plech	<i>Received at ESRF:</i>
<b>Names and affiliations of applicants (* indicates experimentalists):</b> * Simone Techert, MPibpc – Structural dynamics of (Bio)chemical Systems, 37077 Goettingen, Germany * Linda Woo, MPibpc – Structural dynamics of (Bio)chemical Systems, 37077 Goettingen, Germany		

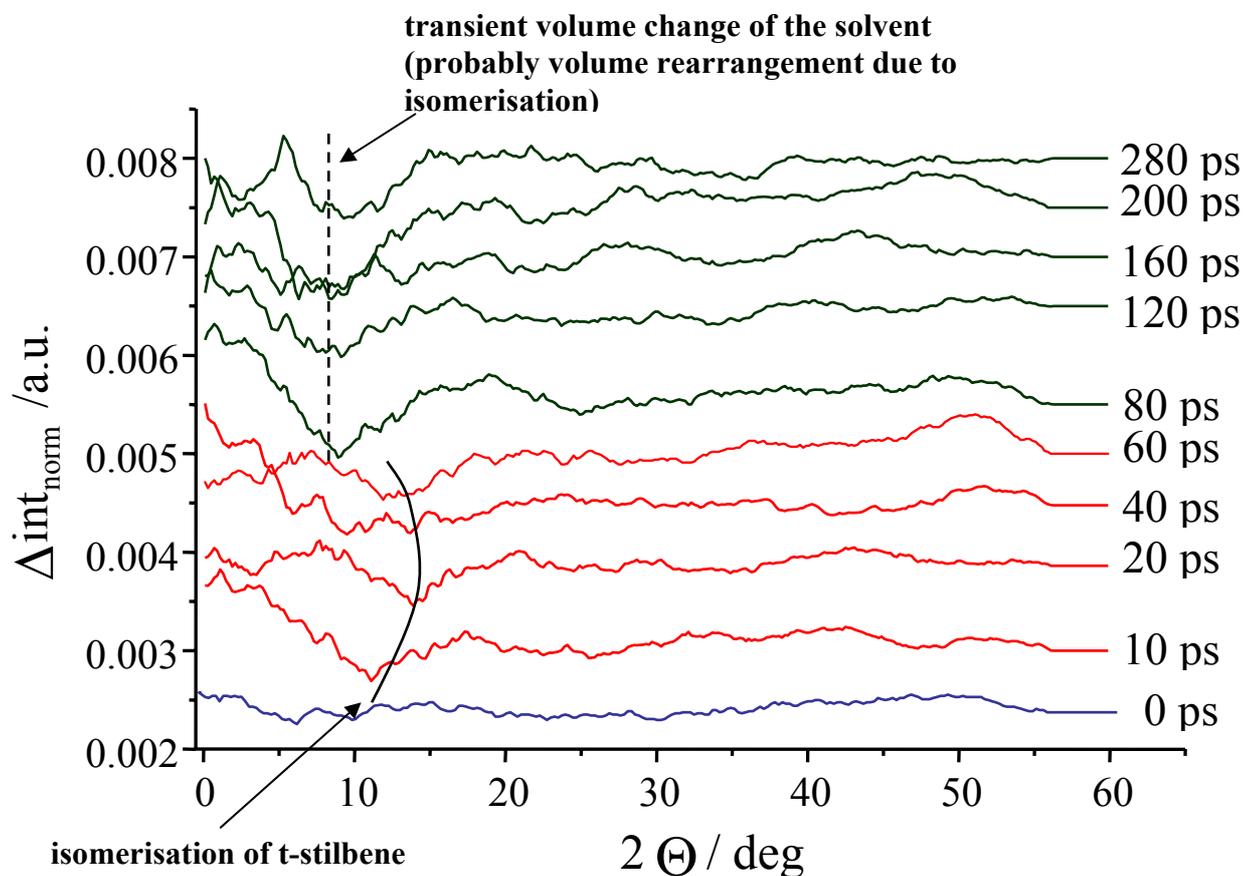
### Report:

In experiment No **SC-811** we investigated the trans / cis isomerisation of stilbene in methanol. As method, picosecond time-resolved x-ray scattering in monochromatic mode was applied (at ID09B). The largest possible intramolecular motion of a small chemical system is the isomerisation around a double bond with 180° turning. This kind of large amplitude motion can photo-chemically be triggered, when light excites the electrons of this double bond from a bonding to an anti-bonding state. The “answer” on the population of this repulsive state is the structural rearrangement of the substituted entities at the two sides of the double bond, in the case of stilbene the phenyl moieties to a 90° conformation and furthermore to the trans (or cis) product (when starting from the trans side, the detailed photochemical pathway has been given in prop No **SC-811**). Trans-Stilbene is an ideal candidate for such kind of investigations of large amplitude motions in liquids. If trans-stilbene is crystallised, the isomerisation reaction is hindered and the electronically excited state decays mainly radiative via fluorescence (ca. 2 ns fluorescence lifetime). However, in the liquid phase, trans-stilbene undergoes an isomerisation to the cis-product. The time constant for the isomerisation is known to be around 40 ps.

Figure 1 summarises an example of a found time evolution of the scattering signal as a function of time in **SC-811**. Though the transient changes look promising and could reproduce the results of **CH-707**, the S/N ratio in the scattering experiment are yet not satisfying to a publishable level. A repeat of the experiment with

the up-graded ID09B set-up, now, in 2004, would therefore be of great wish. Furthermore a more detailed investigation of the high  $q$  range is necessary in order to derive models which support the interpretation of the

data as large amplitude motion of the chromophore (on a time scale up to 60 ps) and solvent rearrangement (on the longer time scale).



**Figure 1:** Time evolution of the scattering signal of t-stilbene in methanol as a function of time.