ESRF	**Experiment title:** **Studies of disordering in semi-conductors using time-resolved x-ray diffraction**	**Experiment number:** HS-798
Beamline: ID9	**Date of experiment:** from:990707 to: 990710	**Date of report:** 990817
Shifts: 12	**Local contact(s):** Michael Wulff, Graham Naylor, Kees Scheidt	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

Jorgen Larsson, Lund*

Justin Wark, Oxford*

Adrian Allen, Oxford*

Aaron Lindenberg, UC Berkeley

Report:

We observe laser-induced melting of GaAs on a timescale of 10 ps or faster using the ID9 beamline and the ESRF ultrafast x-ray streak camera. We furthermore directly observe propagation of a strain wave through the wafer. This strain wave can also be interpreted as an excitation of a range of acoustic phonon modes.

The current results will be important in designing experiments which will elucidate the role of optical and acoustic phonons in the disordering of semi-conductors following laser illumination.

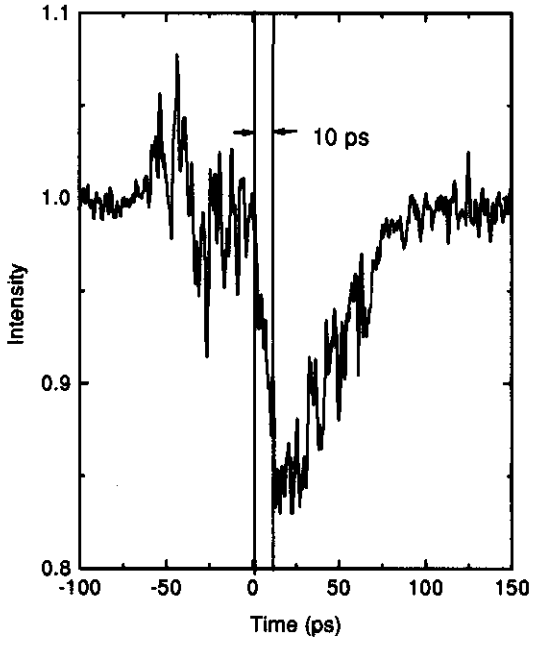

Figure 1 . A rapid reduction of the intensity of a bragg spot is found when the top layer is

The results shown here represent the fastest event recorded at the ESRF and can be used as a straight-forward way of producing rapid structures in the time-profile of the x-ray radiation. Such rapid structures can be used for the development of ultrafast detectors and methodology at ID9.

Theoretical modelling is ongoing in order to interpret the results and to show the complementary nature on models based on phonon theory and on dynamical diffraction theory.

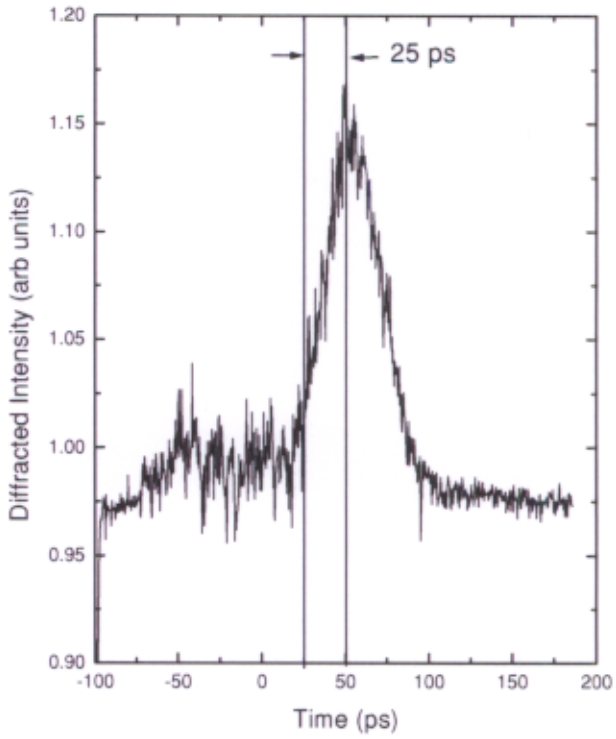

Figure 2. Laser-induced strain causes an increase of the bragg diffracted intensity on the negative side of the rocking curve.

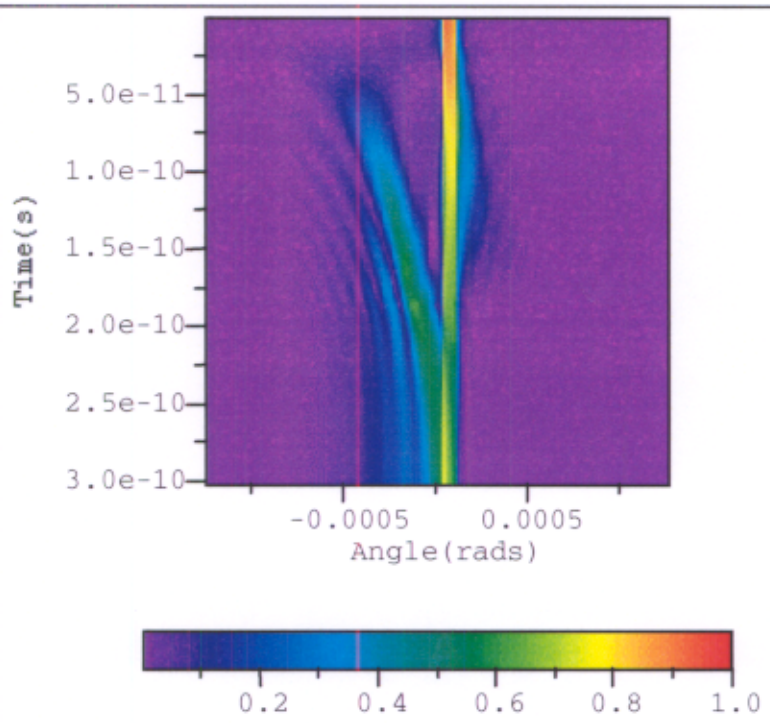

Figure 3. Theoretical modelling, using dynamical diffraction accurately predict the intensiy as function of bragg angle and time.