ESRF	**Experiment title:** **Investigating the network topology in structural glasses**	**Experiment number**: HC-4901
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Shifts: 12	**Local contact(s)**: Yuriy Chushkin	*Received at ESRF:*

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Report:

With the experiment HC-4901 we aimed at characterizing in details the beam-induced dynamics, an effect observed in oxide glasses probed with x-ray photon correlation spectroscopy (XPCS). In particular, we wanted to tackle the dependence of these dynamics as a function of the structural topology of the glass. The chosen sample was $LiBO_2$: in this glass the boron exhibits a hybridization transition from sp^3 to sp^2 as a function of the temperature [1]. We decided to exploit this property by measuring the relaxation time (τ) with XPCS on the first diffraction peak (q~17 nm^{-1}) as a function of temperature. In order to extract quantitative information, the beam-induced dynamics need to be disentangled from the spontaneous one. Approaching the glass transition temperature (Tg=694 K [2]) the system starts to thermally relax, and the measured relaxation time becomes faster. It was observed that across the glass transition region the measured rate ($1/\tau$) can be modelled as the sum of the rates for the beam-induced and the spontaneous relaxation [3].

We performed measurements with different incident fluxes (the beam was attenuated with silicon foils) and for each temperature a flux-independent parameter, characterizing the beam induced dynamics, can be extracted: Precisely knowing the number of atoms in the scattering volume, one can define the number of atoms which are in average displaced by a photon absorption event, *Nu* [3].

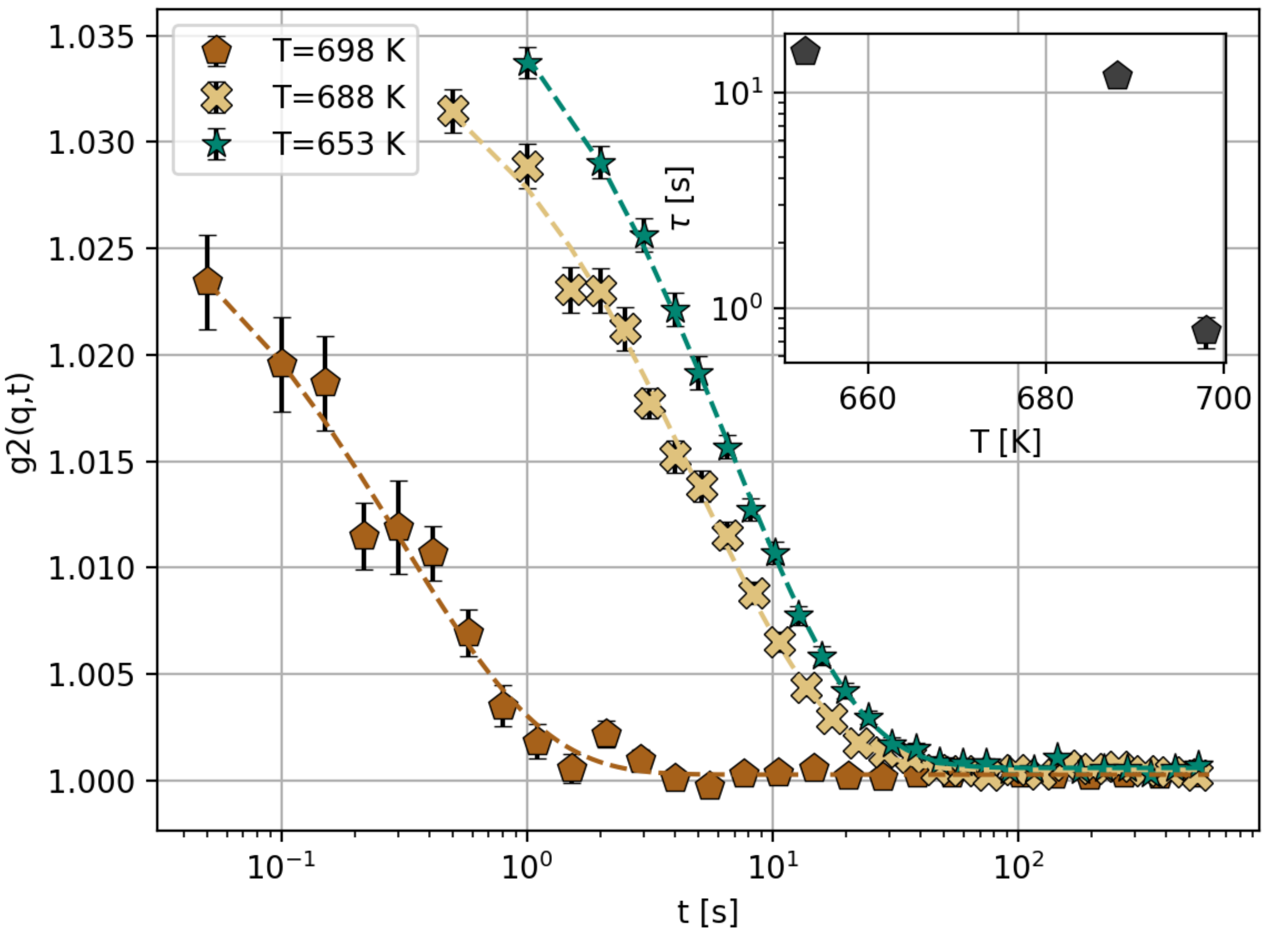

Figure 1:Intensity-intensity autocorrelation functions (g2) measured on the peak of the structure factor at $q=17\ nm^{-1}$ for different temperatures. In the inset the relaxation time is reported as a function of the temperature. As expected, the relaxation time becomes faster approaching the glass transition temperature (Tg=694 K).

In Figure 1 we reported some preliminary data collected. The intensity-intensity correlation function for a given incident flux has been calculated on the peak of the structure factor ($q\sim17\ nm^{-1}$) and shows the expected decreasing trend as a function of temperature approaching Tg (in the inset the relaxation time is shown as a function of temperature).

The data analysis is ongoing, and we expect to extract the full set of correlation functions for all temperatures and fluxes in the next few months.

References

[1] O. Alderman et al., Appl. Phys. Lett. 117, 131901 (2020).
[2] W. Takeda et al., J. Non-Cryst. Solids: X 3, 100028 (2019).
[3] G. Pintori et al., Phys. Rev. B 99, 224206 (2019).