ESRF	**Experiment title:** *Study of of the beta-relaxation in the intermediate-fragility glass-former propanol with nuclear resonant scattering*	**Experiment number:** SC-4585
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Report:

In the last few years different techniques based on nuclear resonant scattering from Mössbauer isotopes have given access to the investigation of the β- and α-relaxation at the inter-atomic and intra-atomic length scales [1] [2] [3], contributing significantly to the study of the glass transition.

The aim of our experiment was to use a combination of nuclear quasi-elastic scattering (NQFS) [2] and synchrotron radiation based perturbed angular correlation (SRPAC) [3] to probe the relaxations in the intermediate fragility glass-former 1-propanol.

These techniques require the presence of a resonant isotope dissolved in the sample as probe. The time evolution of the resonant scattered intensity from the probe is then detected in time-domain [3]. The resonant probe usually used is the ferrocene (FC) molecule.

We unfortunately experienced several problems in dissolving FC in 1-propanol because of the induced crystallization of the sample, and we were not able to perform NQFS and SRPAC measurments as initialially planned.

We could only carry out the nuclear γ-resonance time-domain interferometry (TDI) measurments. TDI is in fact another NRS-based technique able to probe relaxations in non-resonant samples [3], and some of the proposers had already experience with the experimental technique [4].

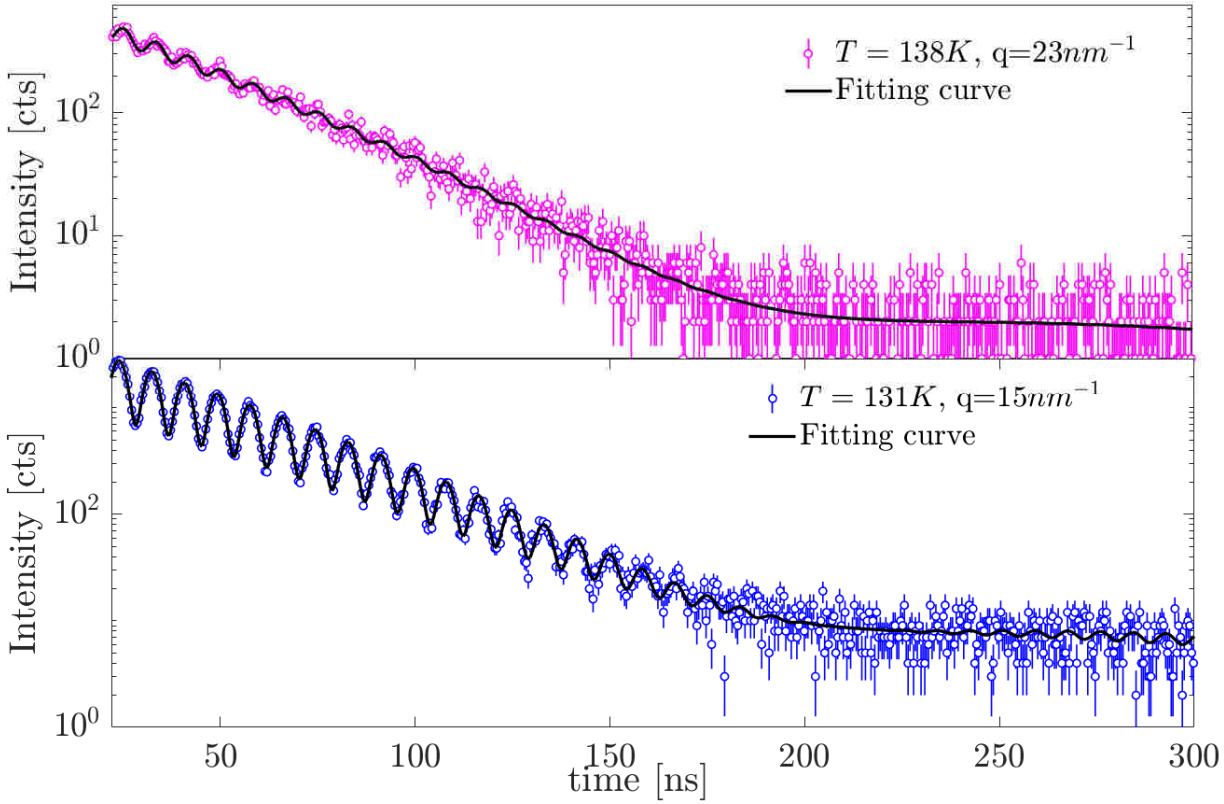

Figure 1: Time domain interferometer (TDI) patterns as function of time measured from 1-propanol at two different temperatures (T=138K and T=131K) and at two at two different exchanged wave-vectors (q=15 nm^{-1} and q=23 nm^{-1}).

Using TDI we were thus able to probe the intermidiate scattering function of 1-propanol at several temperatures ranging from its melting temperature (146K) down to the glass transition temperature (97K) and at different exchanged wave-vectors around and above its static structure factor, up to 40nm^{-1}.
Fig.1 shows some of the obtained TDI beating patterns we measured along with the curves obtained from the fitting procedure.
The quality of the collected data allows us to estimate with accuracy the relaxation parameters of 1-propanol, even in absence of a resonant probe dissolved in the sample.
The data processing is basically completed to characterize the relaxation processes of 1 -propanol, and we are starting to prepare a paper to present them [5].

References

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