

**Experiment title:**Quasi-Elastic (neV) scattering from non-resonant samples  
(Rayleigh scattering of MB radiation in the time domain)**Experiment  
number:** MI-197  
(MI-89 MI-95)**Beamline:**

ID 18

**Date of experiment:**

9 shifts Dec 97 (MI-197)

**Date of report:**

27 Aug. 97

**Shifts:**

9

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**Report:**

This experiment was part of a complicated collaboration and really represents the culmination not only of this proposal, but also the work of proposals MI89 and MI95. The goal was to find a method of doing quasi-elastic scattering measurements in the time domain using synchrotron radiation and resonant nuclear scattering. We were successful, and the results have just been accepted for publication in Physical Review Letters. Thus, in accordance with guidelines for proposals, the abstract from the accepted paper is below.

# Quasi-Elastic Scattering of Synchrotron Radiation by Time Domain Interferometry

(Accepted for Publication in Physical Review Letters)

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A.I. Chumakov, E. Burkel, and W. Petry

We use synchrotron radiation and time resolved x-ray detection to measure structural relaxations of glycerol ( $\text{C}_3\text{H}_5(\text{OH})_3$ ) having time scales of 30 to 200 ns at  $1.5\text{\AA}^{-1}$  momentum transfer. Foils containing  $^{57}\text{Fe}$  (14.4 keV nuclear resonance, 141 ns lifetime) are placed before and after the non-resonant sample, and a small difference (-70 MHz) is established in their nuclear response frequencies. Quasi-elastic scattering from the sample frequencies. Quasi-elastic scattering from the sample perturbs the 70 MHz quantum beat pattern of the nuclear scattering. A simple model relates the perturbation to the dynamic structure factor of the sample.