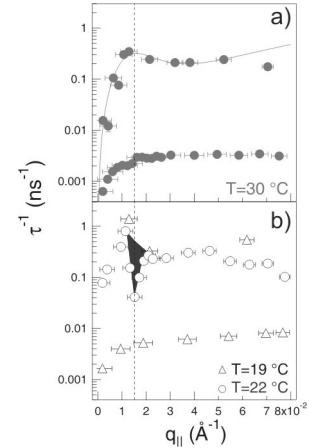


Using Neutron Spectroscopy to Study Collective Dynamics of Biological and Model Membrane System.
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Only recently, it has become possible to study collective dynamics of planar lipid bilayers using neutron spectroscopy techniques [1]. We determined the dispersion relations of the coherent fast picosecond density fluctuations on nearest neighbor distances of the phospholipid acyl chains in the gel and in the fluid phases of a DMPC bilayer. By combining different neutron scattering techniques, namely three-axis, backscattering and spin-echo spectroscopy, we present measurements of short and long wavelength collective fluctuations in phospholipid model membranes in a large range in momentum and energy transfer, covering time scales from about 0.1ps to almost 1 μ s and length scales from 3 \AA to about 0.1 μ m [1-3]. From smectic hydrodynamic theory, the long wavelength dispersion relations, as shown in the Figure, give direct access to the elasticity parameters of the membranes in the fluid phase (30 °C) [3].



- [1] M.C. Rheinstädter et al., Phys. Rev. Lett. 93, 108107 (2004).
 [2] Maikel C. Rheinstädter et al., Phys. Rev. E 71, 061908 (2005).
 [3] M.C. Rheinstädter, Wolfgang Häußler, Tim Salditt, submitted.