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Exploring dynamic processes in biological systems with SPHERES

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The neutron backscattering spectrometer SPHERES (SPectrometer for High Energy RESolution) at MLZ is a third generation backscattering spectrometer with focusing optics and phase-space transform (PST) chopper. It covers a dynamic range of $\pm 31\mu\text{eV}$ with a high resolution of about $0.66\mu\text{eV}$ and a good signal-to-noise ratio. The instrument performance has been improved over the recent years by different measures. The intensity has been more than doubled by the upgrade of the PST chopper and the focusing guide. The signal-to-noise ratio can be significantly improved by employing the new background chopper.

SPHERES enables investigations on a broad range of scientific topics. It is in particular sensitive to the incoherent scattering from hydrogen and allows to access dynamic processes up to a timescale of a few ns. Therefore it is well suited to study dynamic processes in various biological systems. Selective deuteration allows for example to follow the mobility of water on the surface of proteins (e.g. Y. Fichou et al., PNAS 112, 6365 (2015)) or measure internal protein motions (e.g. A. Stadler et al., J. Phys. Chem. B 123, 7372 (2019)).

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