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Upgrades at SPHERES

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The SPectrometer for High Energy RESolution (SPHERES) at MLZ is a third generation backscattering spectrometer with focusing optics and phase-space transform (PST) chopper. It provides high energy resolution with a good signal-to-noise ratio [J. Wuttke et al., Rev. Sci. Instrum. 2012]. Different components of the instrument have been upgraded to further improve the instrument performance.

Some recent years ago the PST chopper has been renewed. The new more compact one-wing chopper can be operated with the desired frequency with a crystal speed of 225m/s close to the optimum velocity for the phase space transformation. Together with the exchange of the chopper also the graphite deflector crystals on its circumference were replaced with ones of a higher reflectivity and mosaicity. Thanks to the increased velocity and the better deflector crystals, the intensity in most detectors had been doubled.

Just recently the focusing neutron guide has been replaced with an elliptic guide. It had been optimized based on simulations, which also considered the new PST chopper. With the new elliptic guide another intensity gain at the sample position of about 30% was obtained. Together with the exchange of the focusing guide also a new background chopper has been installed about 2m upstream of the PST chopper to further reduce background. This will then also allow for a high signal-to-noise setup by eliminating every second pulse, albeit at the cost of intensity.

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