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In-situ light scattering at neutron beam lines - experiences made and challenges ahead

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What is often well established at many synchrotron beam lines is still in the development phase at neutron beam lines: In-situ light scattering techniques. The science case for in-situ light scattering at neutron instruments lies mostly in the limited reproducibility of sample preparation and stability of the samples over time. Whereas many soft matter or hard matter samples are not transparent for light, many biological samples often show a sufficiently broad spectral range where light absorption does not play a dominant role. Natural candidates for neutron instruments to be equipped with in-situ light scattering techniques are small angle scattering, spin echo, time-of-flight and backscattering beam lines. We routinely supply in-situ dynamic light scattering with one fixed scattering angle at the instrument KWS-2 at MLZ to users who would like to control their sample during the neutron measurement. Recently, we have successfully tested a three angle dynamic light scattering set-up at KWS-2. For the Jülich neutron spin echo spectrometer we are currently developing a prototype sample environment which includes two scattering angles and a transmission detector. The transmission detector reports on a change in turbidity with a very high time resolution. This is especially attractive to thermoresponsive soft matter samples with a very narrow transition from a swollen to a more compact micellar state.

Authors: BALACESCU, Livia (RWTH Aachen); Mr VOEGL, Florian (Jülich Centre for Neutron Science); Mr HEIGL, Raimund (TÜV Rheinland); HOLDERER, Olaf; RADULESCU, Aurel (Jülich Centre for Neutron Science - Outstation at MLZ); HOUSTON, Judith (JCNS at MLZ); Mr STARINGER, Simon (Jülich Centre for Neutron Science); BRANDL, Georg; Prof. FITTER, Jörg (I. Physikalisches Institut RWTH Aachen); SCHRADER, Tobias

Presenter: SCHRADER, Tobias

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