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FLASH-NT –A new imaging instrument on a cold neutron guide

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Neutron imaging is an invaluable tool for many applications where X-rays fail to provide sufficient contrast, or penetrate at all. Together with recent achievements in high-resolution detectors and the development of advanced imaging techniques, many novel fields of applications become possible. High resolution neutron imaging has shown great potential in the optimization of the water management in anionic exchange membrane fuel or electrolyzer cells, which is a key feature for their large-scale application in a fossil-free chemical industry. Similarly, the visualization of lithium transport phenomena and dendrite growth with highest possible spatial resolution provides novel insights for the improvement of safety and lifetime of Li-ion batteries. Moreover, the use of modern and advanced neutron imaging techniques helps to find solutions for many important scientific challenges. These are e.g. the study of magnetic domains in electric steels using neutron grating interferometry (nGI) with the aim of developing electric drives with higher efficiency or the spatially resolved investigation of magnetic properties of weakly ferromagnetic materials using polarized neutrons that may eventually lead to the development of novel storage devices. Additionally, the spatially resolved determination of phase composition or strain mapping in alloys using Bragg edge imaging provides tremendous potential particularly for industrial applications.
We propose to build the additional neutron imaging instrument FLASH-NT, which is complementary to the higher energy spectrum at NECTAR and ANTARES, at an end position of a cold neutron guide. FLASH-NT will provide a fully moderated cold neutron spectrum with a minimum wavelength of ~2 Å, combined with an extremely low background. The instrument will be optimized for applications requiring highest possible spatial resolution down to the single µm range and applications using advanced imaging techniques that will benefit most from the broad spectral range and the low background at a neutron guide, thus adding new possibilities to the portfolio of neutron imaging applications at MLZ.

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